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AirMaintenance

UPDATE

The Magazine for Aircraft Maintenance Professionals

Transport Canada Approved for R/T



HELI-EXPO 2016

a look at
Boeing's 737 MAX family

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A Case of Authorship

In our recurring department called “Raising the Bar” we republish reports from Transport Canada and the American National Transport Safety Board. The objective is simple: we hope that lessons can be gleaned from the detailed accounts of how circumstance, bad luck and even poor planning have exacted their tolls. Because of the targeted nature of AMU’s readership, I assume that most readers understand the source of the reports, and there have been times when I’ve failed to credit TC or NTSB as the original authors. That’s a mistake on my part — I should never assume, as AMU reader Murray Hamm pointed out in a recent email to me.

“I just received, and was thumbing through my Dec-Jan 2016 issue of Air Maintenance Update magazine and came upon an article I recognized having read before,” said Mr. Hamm. “Your magazine published the article in the Raising the Bar column as “Loss of Tail Rotor Effectiveness” on page 32. No credit to any author or organization is given, but the crest of the U.S. government investigative agency — the NTSB — is prominently shown. The article, however, is essentially a cut & paste of the Transportation Safety Board of Canada’s (TSB) Aviation Investigation Report A13W0070.

“I think it’s fantastic that a trade magazine for aircraft maintenance professionals includes information from TSB reports. As you know, Transport Canada used to send all AME licence holders the ‘Aviation Safety Maintainer,’ and later the ‘Aviation Safety Letter.’ Both were excellent sources of safety information and used excerpts of TSB reports to relay important safety messages. These publications, however, followed up by indicating that the TSB was the source for the information, and later versions of the ASL hyperlinked to the full TSB report on the TSB website. The safety message is important, and I think it’s important to reference the original report as it might encourage the reader to research other safety information.”

Mr. Hamm is completely correct; the source should always be cited, even when the authors are attached to a government agency tasked to disseminate information for public consumption. And for that oversight, I apologize.

— John Campbell
Editor

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Upcoming Events

Kentucky to Host World Helicopter Community



HAI HELI-EXPO is the world's largest trade show dedicated to the international helicopter community. Whether you are new to the industry or an established part of the community, HAI HELI-EXPO is the must-attend event to connect with new and existing customers in the international helicopter industry. This year's edition is hosted by Louisville, Kentucky and will run February 29 to March 3. At the show you'll find the latest in aircraft, avionics, technology, and services from more than 700 exhibitors, all under the roof and on the grounds of the Kentucky Exposition Center. Use your time at HAI HELI-EXPO to further your professional development with professional education courses, rotor safety challenge sessions, IA renewal opportunities, manufacturer technical briefings, and the HAI Helicopter Industry

career fair. Become active in your industry by taking part in HAI committee meetings, forums, workshops, and town halls, and then join your friends for the Salute to Excellence. And of course you don't want to miss the session called FAA: Face to Face, which is your chance to speak directly with the FAA officials who regulate your industry. This session is always a lively one, and is just one of the hundreds of ongoing events and displays at HAI HELI-EXPO.

UNITED STATES

HAI Heli-Expo

February 29 – March 3, 2016
Louisville, Kentucky
www.heliexpo.rotor.org

Minnesota Aviation Maintenance Technician Conference

March 21 – 22, 2016
St. Paul, Minnesota
www.regonline.com

Brazing Symposium

April 4 – 5, 2016
Dallas, Texas
www.brazing.aviationweek.com

MRO Americas

April 5 – 7, 2016
Dallas, Texas
www.mroamericas.aviationweek.com

2016 MCAS Cherry Point Air Show

April 30 – May 1, 2016
Cherry Point, North Carolina
www.cherrypointairshow.com

National BiPlane Fly-In

June 3 – 4, 2016
Junction City, Kansas
www.nationalbiplaneflyin.com

CANADA

CHC Quality and Safety Summit

April 4 – 6, 2016
Vancouver, British Columbia
www.chcsafetyqualitysummit.com

Careers in Aviation Expo

April 9, 2016
Toronto, Ontario
www.careersinaviation.ca

Careers in Aviation Expo

May 14, 2016
Calgary, Alberta
www.careersinaviation.ca

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STCs & new products

Radio frequency perimeter security fence for aviation infrastructure

Aero Sentry is a wireless security system for aircraft and aviation infrastructure. This product consists of four radio-frequency transceivers that can be integrated with traffic or safety cones to form a radio frequency tripwire. The system's 360-degree fisheye camera identifies intruders and accidental events, and communicates with any mobile device, providing alerts of perimeter intrusions events around the aircraft. If any intruders enter the designated secure perimeter, Aero Sentry will dispatch a text message or email notification of the intrusion, containing alert data and captured images.

For more information visit www.i-a-i.com/aero-sentry



The toolbox that keeps digital track of tools

Snap-on Industrial's Level 5 Automated Tool Control toolbox can now be powered by on-board rechargeable batteries. The toolbox uses digital imaging technology and proprietary software to monitor and track tools as they are removed and returned. Six rechargeable, interchangeable batteries provide up to 16 hours of battery life, and Snap-On says the batteries can be fully recharged in 3.5 hours using the ATC's internal charging system when the box is plugged into an AC outlet.

For information visit www.snapon.com



New high-power alternator for UAVs from Hartzell

Hartzell Engine Technologies has developed a new 80A (2.3 KW) high power density alternator for unmanned aerial vehicles. The ES-8024 alternator weighs 10.5 pounds in a compact frame and has a field replaceable brush module to extend the in service life of the unit. This alternator is said to be life tested and ready to be fielded.

For information visit www.Hartzell.aero



Spline sockets now offered in all drive sizes

Stanley Proto now offers a line of spline sockets that includes 55 1/4-, 3/8-, 1/2, 3/4- and 1-inch drive models. Standard depth and deep sockets are available in the three smaller drive sizes. The sockets can be used on spline fasteners, as well as on four-, six, and 12-point fasteners.

The spline socket/fastener system is said to offer higher strength in a more compact profile than conventional fasteners. Stanley claims that the precise fit between spline socket and fastener helps prevent rounding or breaking off of edges.

For more information visit www.stanleyproto.com



Concorde batteries incorporate heated blankets

Concorde's c RG-380E/44, RG-380E/60 and RG-390E series of heated batteries incorporate internal AC (115-V nominal) and DC (28-V nominal) heater blankets that surround cells for equalizing cell heating. Heater control units offered in four different varieties control these blankets. HCU-1 is a DC-only unit; HCU-2 is AC-only; HCU-3 and HCU-4 are dual power units that allow for either AC or DC.

For more information visit www.concordebattery.com



Aircraft tire inflation safety cage from Alberth Aviation

Alberth Aviation's Tire Safety Inflation Cage features a steel structure and bank vault style door latch that allows the cage to contain severe tire inflation failure incidents, preventing injury to personnel and aircraft. This tire cage has been sold worldwide to corporate flight departments, service centers, aircraft manufacturers and the military.

For more information visit www.alberthaviation.com



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GOODYEAR WINS BOEING 777X SUPPLY CONTRACT



The Goodyear Tire & Rubber Company has been selected by the Boeing Company to provide main nose and landing gear tires for its new 777X aircraft, which is scheduled for delivery in 2019. Building on the Boeing 777 and 787 Dreamliner, the Boeing 777X will be the largest and most efficient twin-engine jet in the world, according to Boeing officials. The rubber selection is the Flight Radial, which is said to be Goodyear's most advanced aviation product, offering longer service life and increased cut resistance.

As of December 1, 2015, the Boeing 777X program had received orders and commitments for 306 airplanes.

ORNGE TO HANG TOUGH WITH AW139S



Ontario's air ambulance agency has abandoned a proposed sell-off of its AW139 helicopters after the market for used choppers collapsed with the drop in oil prices, the Toronto Star reported in December. The decision follows a review that began back in 2013 as officials at ORNGE looked at alternatives to the AgustaWestland helicopters. ORNGE sold two AW139s in 2013 for \$10 million

US each, originally hoping to finance the purchase of replacement helicopters out of the proceeds from selling the AW139s. Today, they would be worth just over \$6 million, making the replacement scheme unworkable, said Dr. Andrew McCallum, president and CEO of ORNGE. "It had to be cash neutral. I couldn't say to the government or the taxpayer that we would spend more in helicopters," McCallum said in an interview. ORNGE had eyed several new helicopters as possible replacements but unable to get the price it needed on the sale of the existing aircraft, the numbers didn't work. "None of them had the combination of cost and operating efficiency that would justify changing the fleet," McCallum said, adding that another factor was the "staggering" cost of retraining pilots and maintenance staff to fly and maintain a new aircraft. ORNGE also operates a fleet of Pilatus PC-12 single-engine turboprop aircraft to transport patients over longer distances. *(With Toronto Star files)*

EXTREME SHOW GIVES HARTZELL THE NOD ... AGAIN



For the third consecutive year, Hartzell Propeller will be the propeller technical partner of the Red Bull Air Race World Championship in 2016. Hartzell will provide its three-blade structural composite propeller known as "The Claw," and lightweight governors to every Red Bull Air Race team. Hartzell will also supply personnel for complete propeller technical support and maintenance services for all of the entrants in the races throughout the world. The three-bladed structural composite propeller was nicknamed by famed aerobatic performer Sean D. Tucker due to its high thrust

and low gyroscopic forces and inertia. The eight-race 2016 season will span seven countries over three continents. Two new locations are established high-speed motorsport venues. The series was scheduled to kick off March 11-12 with the traditional season opener in Abu Dhabi, United Arab Emirates for the ninth straight time.

UBERCHOPPER: DOING BUSINESS VEGAS-STYLE



The Consumer Electronics Show in Las Vegas is the traditional venue for tech companies to unveil brave new ideas. Among the creativity on display at this year's CES during the month of January was a relationship between Maverick Helicopters and Uber who partnered-up to launch UberCHOPPER, a service that allowed guests at the show to book time-limited and steeply-discounted helicopter flights while in Vegas.

"Our partnership with Maverick Helicopters provides riders with another great way to move safely, reliably and affordably throughout the city, while enjoying one of the most beautiful views the Strip has to offer," Uber Nevada general manager Jason Raddison said during the days leading up CES 2016.

To book, users opened the Uber application and slid over to the "CHOPPER" option to schedule a flight. Once confirmed, an Uber vehicle picked guests up from their location and took them to the Maverick Helicopters' Las Vegas terminal for a 12- to 15-minute flight with live-narration and a bird's-eye-view of the Las Vegas Strip. It's an idea that has been explored in other parts of the world and may well catch on in North

America if the two companies involved have their way.

“We look forward to witnessing the success of this unique offer and the possibility of a long-term partnership with the world’s most popular ride sharing tech service,” said Bryan Kroten, vice president of marketing at Maverick Helicopters.

AW-FINMECCANICA NOW ONE BIG HAPPY GROUP



As of the New Year AgustaWestland is officially Finmeccanica Helicopters. The rebrand is part of a change in organizational structure within AgustaWestland’s parent company, Finmeccanica, which has been divided into four areas and seven divisions. The four new areas include: helicopters, aerospace, electronics, defence and security systems, and space. The seven divisions include: helicopters, aircraft, aerostructures, avionics land and naval, defence systems, and security systems and information. Finmeccanica CEO Mauro Moretti says the new structure will improve efficiencies and the effectiveness of the company to reduce costs. “With this one company, Finmeccanica consolidates its competitive position in international markets for aerospace, defence and security, increasingly complex and global, leveraging areas of technology leadership and product enhanced by belonging to one large industrial group.”

SOME GROWTH PREDICTED FOR AEROSPACE SECTORS

Revenues in the global aerospace and defence sector are expected to grow by three percent in 2016 after a 0.5 percent decline in 2015, according to a forecast by Deloitte Touche Tohmatsu. The re-

bound will likely be driven by strong passenger traffic, continued demand for commercial aircraft from growing economies like India and China, and an expected recovery in global military spending fueled by tensions in the Middle East, the firm said in its annual out-

look for the sector. Tom Captain, who leads Deloitte’s aerospace and defence segment, said the commercial aerospace sector will likely boost revenues by 3.4 percent in 2016, buoyed by demand from the Asia-Pacific and Middle East regions. ■





Above: the 737 MAX family

The Replacements:

[Updating an industry best seller](#) is always tricky, but there's plenty of interest in Boeing's pending 737 MAX family. Reports say that by the end of 2015 Boeing had already received 3,072 orders for the model that will replace its narrow-body 737 passenger aircraft—an industry staple, now in its fourth generation since its debut in the 1960s. Several versions of the MAX are scheduled to enter service between now and 2019, with the 737 MAX 8 being the first. Built at the Boeing plant in Renton, Washington the MAX update is hyped as a significant modernization of the 737, including a major revision of the wing to accommodate heavier engines. Here, we offer Boeing engineer Michael Teal the opportunity to pump the tires on the new 737 MAX project.



Above left: The 737 MAX features a number of aft body aerodynamic improvements that reduce drag by one percent.

Above right: The winglets' innovative up-and-down configuration and laminar flow improve fuel efficiency.

Boeing's 737 MAX family

Boeing's newest single-aisle airplanes — 737 MAX 7, 737 MAX 8, and 737 MAX 9 — build on the Next-Generation 737's popularity and reliability while delivering a new level of fuel efficiency for single-aisle airplanes and retaining operational commonality. For example, the fuselage and wings are similar in both models, but they will be strengthened to support the increased engine weight of the 737 MAX, which will fit into customers' existing 737 fleets using the same support system and maintenance program as the Next-Generation 737 airplane.

The 737 MAX also will retain significant spares commonality with the Next-Generation 737, and be 14 percent more

fuel efficient than today's most efficient single-aisle airplanes. When compared to a fleet of 100 of today's most fuel-efficient airplanes, the 737 MAX will emit over 310,000 fewer tons of carbon dioxide and save more than 215 million pounds of fuel per year, translating into more than \$112 million in annual cost savings.

Environmental improvements

The 737 MAX will be cleaner, quieter, and more efficient than its predecessor, the Next-Generation 737. In addition to 14 percent less fuel and carbon emissions, the 737 MAX has up



Currently, Boeing has nearly 3,000 orders on the books for the 737 Max. At 2015 prices, the smaller Max 7 starts at \$90.2 million per plane, while the Max 9 starts at \$116.6 million.

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The 737 MAX flight deck will have four new large displays with significant growth capability while maintaining a common look-and-feel with the Next-Generation 737 display formats that preserves commonality with training across the 737 family.

to a 40 percent smaller operational noise footprint and approximately 50 percent lower nitrogen oxide emissions than the International Civil Aviation Organization's Committee on Aviation Environmental Protection (i.e., CAEP/6) limits.

The new airplane will extend the Next-Generation 737 range advantage with the capability to fly more than 3,500 nautical miles (6,482 kilometres), an increase of 405 to 580 nmi (750 to 1,074 km) over the Next-Generation 737. With better efficiency than competing airplanes, the 737 MAX will enable operators to fly farther or carry more payload than the competition. The more efficient structural and aerodynamic design, lower engine thrust, and reduced required maintenance of the 737 MAX will offer customers large cost advantages. Depending on the model, the 737 MAX will be up to eight percent lighter per seat than competing airplanes. Its reduced weight, combined with its new aerodynamic features, means the more efficient design of the 737 MAX will have the lowest operating costs in the single-aisle market segment with an eight percent per-seat advantage over competing airplanes.

The 737 MAX requires less maintenance less often — with longer check intervals than competing airplanes. This means that rather than being in the hangar undergoing frequent checks, the 737 MAX is more available for revenue service. The 737 MAX maintenance program is based on experience gained from the worldwide fleet of Next-Generation 737s, and airframe and engine maintenance costs are expected to be the same while providing greater fuel and operating efficiency.

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737 MAX 8

SPECS >



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Above: 737 MAX specifications

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Designed for operational efficiency

The 737 MAX features the most advanced winglet technology available. The advanced technology winglet contributes about one percent to the airplane's efficiency on 500-nmi missions. At longer ranges, customers will see more than 1.5 percent improvement over today's winglet technology. The unique up-and-down configuration and natural laminar flow enabled by the winglet design are the innovations that make this feature so efficient. Aft body aerodynamic improvements include a redesigned auxiliary-power-unit (APU) inlet, extended tail cone, and a thickening of the tail cross-section above the elevator to improve the steadiness of airflow. These changes eliminate the need for vortex generators on the tail and reduce drag by one percent, contributing to fuel efficiency.

The 737 MAX will be powered by CFM International LEAP-1B engines with an optimized, more efficient core and increased fan diameter from 61 inches (155 centimeters) to 69.4 in



Above: Boeing's new Advanced Technology winglets are a distinctive feature of the 737 MAX. Below: The 737 MAX uses LEAP-1B engines that combine long-range fuel-efficiency performance with highcycle reliability and durability.



(176 cm). The new engines are the major driver for fuel-efficiency on the new airplane—contributing about 11 percent fuel-use reduction after drag is calculated. The LEAP-1B engine is derived from a suite of advanced technologies that encompass a carbon fibre composite fan and fan case; fourth-generation three-dimensional aerodynamic airfoil designs; the twin-annular, pre-swirl combustor; advanced cooling and coatings in the high-pressure turbine; and state-of-the-art materials, such as ceramics matrix composites and titanium

aluminide. The result is a low-weight, high-performance engine that is optimized for the 737 MAX. Thrust ratings on the 737 MAX are about 1,000 pounds (454 kilograms) higher than the same ratings on the Next-Generation 737 and range between 20,000 lbs (9,072 kg) to 28,000 lbs (12,701 kg).

The engine and wing integration has also been improved, moving the engine up and forward on the wing while keeping ground clearance the same as that of the Next-Generation 737. This improved integration also reduces drag,

contributing about a half a percent of fuel efficiency.

Additional improvements

In addition to its features that enhance fuel efficiency, the 737 MAX incorporates a number of other improvements, including:

- **Fly-by-wire spoiler system:** to improve reliability, reduce weight, and improve stopping distances.
- **Electronic bleed air system:** that allows for increased optimization of the cabin pressurization and ice protection systems. This also contributes to fuel efficiency.
- **Onboard network system:** comprising a Network File Server and an enhanced Digital Flight.
- **Data Acquisition Unit:** These systems will provide a new set of capabilities, including advanced data collection, onboard repository of loadable airplane software parts, and real-time data processing. The system will also leverage available connectivity for secure communications with ground-based systems to support airline operations such as remote software part transferring from the airline back office or analytic capabilities with Boeing airplane health management and electronic logbook. The 737 MAX will build on the 737's enhanced connectivity to provide real-time data about airplane systems to the ground during flight. These changes are designed to make it easier for airlines to make more timely operational decisions about maintenance.
- **Built-in test equipment in flight deck:** The 737 MAX will feature a more centralized Built-in Test Equipment system that will give maintenance technicians better access to maintenance information. Today some fault information is accessed from the forward electronic equipment bay of the airplane, which takes additional time. On the 737 MAX, maintenance technicians will be able to access this data from the flight deck, speeding up their ability to assess dispatch limitations and perform maintenance actions.

The advertisement features a collection of air tools against a blue background with a faint pattern of tools. The tools shown include:

- 13-1127-25 Air Drill
- 13-1227A-2 45° Angle Drill
- 02-AWD Composite Drill Bit
- 53-127-4C Angle Attachment With Chuck
- 20-127-4 Angle Attachment
- 02-241 Countersink
- 13-1629 'Pancake' Offset Drill
- 13-1529 'Pancake' Air Drill

The central logo features a globe with an airplane flying over it, with the text "NY USATCO CA" and "U.S. Air Tool Co." below it. Below the logo, it says "Serving the aerospace & metal working industries since 1951!". At the bottom, there are four small images showing hands using the tools on various metal parts.

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(Michael Teal is Vice President and Chief Project Engineer, 737 MAX)

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Annual Workshop/Symposium

As I submit this newsletter, we do not yet have a confirmed date for our Annual Workshop and Symposium to be held in the fall. Organizing this event is an enormous job and we appreciate the work that our volunteers perform. Check our website for the dates of the workshop. Be sure to book early.

Training Requirements

Both Transport Canada and the FAA are looking at updating AME/A&P training requirements. The Canadian requirements were last

revised in 1999 and since then there have been many changes that have taken place within the aviation industry. TC is expected to remove the detailed requirements from the Canadian Air Regulations where they are currently embedded in Part V – Chapter 566 Appendix C and make them into an Advisory Circular. This will make it easier to amend and we can work with the NTA to update the curriculum. CFAMEA is well suited to be involved on the national level, and our local associations can add their support through the local aviation college Program Advisory Committees.

*Submitted by Stephen Farnworth
For the Board of Directors*

Western AME Association



NATA'S 40th Anniversary Celebration

Celebrating 40 Years of Northern and Remote Aviation in Canada

For 40 years now, the Northern Air Transport Association has been supporting and promoting Northern and remote aviation in Canada. This April 25-27, we will be in Whitehorse, Yukon Territory for our 40th Annual General Meeting, Conference, & Tradeshow. NATA 40 promises to be our biggest and best ever gathering of the aviation industry and government. The theme of this event is the past, present, and future of Northern and remote aviation—we will be honouring our past, celebrating the present, and looking toward the future of what is a critical industry for Canada and, especially Canada's North. On exhibit will be uniforms, pins, aircraft, photos and any other equipment or materials we collect or acquire leading up to next April. Have something to contribute, give us a call or email! We will arrange for copies to be made or items to be shipped as needed and make sure all your originals are returned to you in same condition after the event. These displays will be available for viewing and discussion during the various conference functions we'll be hosting at venues across Whitehorse. We'll be making use of some of Whitehorse's most iconic

locations including the Air North hangars, Kwanlin Dun Cultural Centre, the MacBride Museum, and the Westmark Hotel.

NATA conferences are known industry-wide for providing great opportunities to network and access decision-makers. This year will feature even more receptions and social functions featuring the very best in food, drink, and hospitality that the Yukon has to offer. In addition to the various special events and social functions we will, of course, be holding our usual interactive discussions with industry and government, as well as providing critical updates and information sessions. Our tradeshow promises to be the biggest ever and we'll be providing more details in the coming weeks on how your organization can showcase itself at this fantastic opportunity for networking and sales.

We encourage media and other partners and interested parties to contact us regarding opportunities for partnership, collaboration on content, or promotion related to this event. Please feel free to contact us with any questions or information.

— Colin Dempsey, NATA
admin@nata-yzf.ca

Pacific AME Association



About us

PAMEA is a non-profit association comprised of aircraft maintenance engineers, aircraft maintenance personnel and aviation industry corporate members.

PAMEA is an active member of the Canadian Federation of AME Associations (CFAMEA).

www.pamea.ca
email: pamea@telus.net

Atlantic AME Association



About Us

The Atlantic AME Association is one of five similar associations across Canada which 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 purpose of the association is to maintain and enhance the standards of professionalism of the AME and the aircraft maintenance industry as a whole and to protect the rights and privileges of the AME. The association works with and is consulted by Transport Canada in the formulation of new rules and regulations to promote the viewpoint of the AME. We are represented on various committees and working groups involved with aircraft maintenance and licensing.

A separate committee under the auspices of the association runs an annual conference. This workshop is a two-day event that features speakers as well as a tradeshow with over 50 booths from various companies, suppliers, manufacturers and other organizations. Attendance at the sessions held during the conference may be counted toward the recurrent training requirements required by Transport Canada.

The Purpose and Objectives Of This Association Are

- To promote and protect the profession of the Aircraft Maintenance Engineer and to represent members' views and objectives
- To develop, maintain and improve representation and consultation with regulatory bodies that affect or may affect the profession of the Aircraft Maintenance Engineer
- To promote and develop the knowledge, skills and proficiency of the profession of the Aircraft Maintenance Engineer through education, publication and research
- To promote honourable practices among the membership and between persons in the aviation industry

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

ARAMC Calendar: save these dates

- ARAMC 2016 will be held in Moncton, New Brunswick from April 6-8 at the Delta Beausejour Hotel, 750 Main Street
- ARAMC 2017 will be held in St. John's, Newfoundland from April 26-28 at the Delta Hotel St. John's, 120 New Gower Street

www.atlanticame.ca



Central AME Association



Manitoba Aviation Symposium 2016

Hosted by CAMEA and MAC; Wednesday, March 2-3, 2016
Victoria Inn, 1808 Wellington Avenue, Winnipeg, Manitoba

Symposium highlights:

- Breakout Sessions
- Workshops
- Trade Show Reception
- Keynote Speaker
- Banquet (Wednesday March 2nd)
- Association AGMs
- Symposium includes Coffee Breaks, Lunches and Banquet Ticket

Featured event: AME Skills Competition. Come out and test your skills!

Owners & Buyers Trade Show Reception

We appreciate your support and value your participation in our Symposium. Once again this year we will be holding an exclusive Owners & Buyers Reception. The intent of this event is to encourage

the owners & buyers of AMOs and Member Companies of MAC to visit the Symposium Trade Show. We invite these individuals to view our exhibitors' products and services while enjoying hors d'oeuvres and refreshments. The reception will take place on Wednesday March 2nd between 2:30 - 4:30 pm in the Trade Show area.

In an effort to provide you a beneficial experience at the 2016 Symposium, please feel free to extend the invitation to your friends and customers.

The Owners & Buyers Trade Show Reception is free of charge. In order to properly plan for this event, we ask that you provide us the number of individuals who will be in attendance. A response to Ms. Kerry Bews via email to camea@mymts.net by February 17th would be appreciated. Thank you for your support of our symposium.

— Jim Bell
Symposium Chair

www.camea.ca

PAMA Dallas – Fort Worth



About us

The DFW Chapter of PAMA is a non-profit association dedicated to promoting professionalism and recognition of the Aviation Maintenance Technician through communication, education, representation and support, for continuous improvement in aviation safety.

email: curtislandrum@charter.net

www.pamadfw.com

www.pamadfw.com

PAMA SoCal Chapter



September 2015 Meeting Wrap

The SoCal Chapter thanks Mr. Jim Taylor, Crewmember Emergency Training, Paul Zapata, Regional Account Executive and all at HRD Aero Systems, Inc. for their time and generosity in hosting the September 2015 Chapter dinner meeting and excellent technical presentation including life-saving demonstrations on “What YOU Need To Know About Safety and Survival Equipment” at the 94th Aero Squadron Restaurant in Van Nuys, California. Jim can be reached by email at training@hrd-aerosystems.com or phone (661) 295-0670 ext. 2541. Or click on their logo on the SoCal PAMA website for a direct link to www.hrd-aerosystems.com.

A&P Student Scholarship

The A&P/IA Continuing Education Scholarship deadline is May 2, 2016. The Awards Presentation will take place June 14, 2016. This scholarship is open to all southern California residents currently enrolled in good standing in an accredited A&P or IA Training School/Program.

www.socalpama.org

Central Ohio PAMA



January 12th Meeting topic: CMH Airspace Review

The FAA Safety Team provided Mr. David R Neef, Operations Manager of the Columbus Air Traffic Control Tower to give a presentation on CMH Airspace to CFI's, Pilots and Student Pilots at our January meeting. The Lane media room was full, even though the morning's weather brought most local traffic to a crawl. Mr. Neef gave an overview of CMH ATC, their airspace operations and procedures. Beside Ground, Tower, Arrival and Departure operations at CMH, Port Columbus ATC is responsible for traffic below 11,000/10,000 to the ground in their eastern and western areas that span from beyond Zanesville in the east to just across the Indiana border in the west.

David discussed the local airports, special operations with air traffic at Dayton and Wilmington airports and the process of becoming an air traffic controller. His question and answer period at the end of the program gave lots of information on how to smooth in-flight operations in National Air Space for all those in attendance. We wish to thank him for his presentation and taking the time to be with us at the meeting.

February Meeting Topic: “UAVs”

The February meeting will be held on Tuesday the 9th in the Lane Aviation Media Room, 4387 International Gateway on the second floor. FAA Inspector John Welsh will give a presentation on UAVs and the recent FAA regulations concerning them. The gathering session starts at 5:30 with dinner at 6:00 and the presentation immediately after. Preregister by signing up at the FAASTeam website once the program is established, RSVP to the February Newsletter or send an email to mail@copama.org with number attending to help with food provisions. See you in February!

2016 Ohio Aviation Maintenance Symposium: March 17th

Vendor booth sales are open for the 2016 Maintenance Symposium. 2016 Vendor Booth Fee \$125.

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Dec-Jan 2015

AMU Chronicles
 Aviation Terms - Part 2
 HRF Explained
 Human Factors
 The Regs

Upcoming Events

5	19th	Middle East Business Aviation Summit @ Al Maktoum International Airport
11	1st	Pacific AME 20th 18th Canadian

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Called to

THE HALL

This summer, Canada's Hall of Fame will once again honour outstanding achievement in aviation during its annual induction ceremony banquet.

Canada's Aviation Hall of Fame (CAHF) will induct four new members, and recognize a Belt of Orion recipient, at its 43rd annual gala dinner and ceremony, to be held Thursday June 9, at the Canada Aviation and Space Museum, at Rockcliffe Airport in Ottawa.

This year's inductees will join the ranks of the 220 esteemed men and women inducted since the Hall's formation in 1973. The new members are:

- Frederick James Carmichael: northern Canada aviation entrepreneur
- Kathleen Carol Fox: Flight Instructor; Nav Canada Chairwoman
- William Ross Lennox: RCAF pilot; Chief Test Pilot P&WC

- Beverley Strahan Shenstone: aerodynamicist; aeronautical engineer
- Royal Canadian Naval Air Branch (1945-1968)
– Belt of Orion Award for Excellence

"Our 2016 inductees come from backgrounds that span the width of Canada's unique aviation industry," said Tom Appleton, CAHF chairman of the board of directors. "The CAHF is proud to honour these four well-deserving individuals for their significant contributions to Canadian aviation, and to Canada's development as a nation. Aviation has brought Canadians together as a country, unlike any other form of transport. Our new inductees reflect that cohesion through their pioneering activities and spirit."



Above: Canada's aviation Hall of Fame 2015 Class

Frederick James Carmichael, C.M.

Fred Carmichael has spent over 60 years in northern aviation in the course of which his accomplishments as an aviation entrepreneur, search and rescue pilot, mentor for aspiring aboriginal youth, pioneer aboriginal commercial pilot and contributor to community life in the North West Territories have made him a legend. In 1955, he was the first aboriginal person in the north to get a pilot's licence. He has worked as a commercial pilot and started up two of his own aviation companies, Reindeer Air Service and Antler Aviation. He has been recognized widely for his accomplishments both locally and throughout the country. He was made a Member of the Order of Canada in 2010.

Kathleen Carol Fox

Kathy Fox has dedicated her entire life to the aviation community in Canada both through her personal activities in the flight instruction, sport aviation and sport parachuting fields but also in her professional capacities in the promotion and advancement of flight safety. In this latter role, she has had an outstanding career in the air traffic control community, transitioning to Nav Canada where she reached the highest levels of management and, following retirement with the Transportation Safety Board, she was appointed Chair in 2014.

During all of this time she has continued to play an active role in the general aviation world promoting flight safety and assisting with the training and examination of aspiring aviators at all levels.

William Ross Lennox

Ross Lennox was involved in aviation in Canada for over six decades, retiring as chief test pilot and head of flight operations for Pratt & Whitney Canada with over 23,000 hours flown during which he was responsible for several remarkable accomplishments. From his beginnings in the wartime RCAF culminating in duties as a Dakota pilot in Europe, he moved on to nearly 20 years in the Canadian north during which time he operated helicopters in support of the DEW Line project. In 1963 he joined United Aircraft of Canada and shortly thereafter flew the first-ever unescorted helicopter transit of the North Atlantic. Other significant accomplishments included test flying every one of the RCN's order of Sikorsky Sea Kings and all subsequent development work on this aircraft, completing the testing of the PT6 engine, and serving as lead test pilot for the PW100, JT15D and PT-6-50 engines. He was recognized officially by many organizations for his thousands of hours of incident free flying, his promotion of safety and his outstanding work as a search and rescue pilot. Mr. Lennox died in November 2013.

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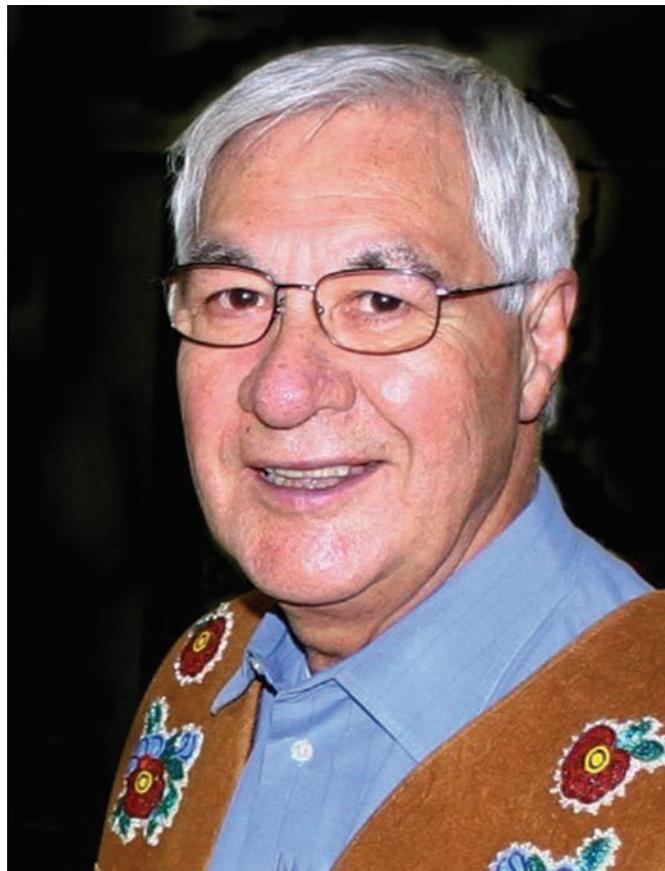
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Frederick James Carmichael

Beverley Strahan Shenstone

Only belatedly recognized as the aerodynamicist responsible for the design of the iconic elliptical wing of the Supermarine Spitfire, Bev Shenstone is regarded as one of the greatest Canadian aeronautical engineers. He broke new ground as the first Canadian to be awarded a graduate degree in aeronautics from a Canadian university. His graduate studies on stability of the Vedette flying boat were of great use to the RCAF. He was part of the team which created the specification which led to the Canadair North Star as well as conducting applied research into airborne radar systems at the National Research Council. He was technical director for BOAC, involved in feasibility work concerning bringing SST aircraft into commercial service.

Privately, he was instrumental in the growth of institutions focused on non-powered, and especially man-powered flight both in Canada and the UK. He was instrumental in the creation of the Soaring Council of Canada, the introduction of rules for licensing pilots, registering sailplanes and training standards plus the development of a family of gliders in conjunction with Waclaw Czerwinski. He was similarly involved with British soaring organizations and in the establishment of a series of prizes for accomplishments in man powered flight. During this period he was the only Canadian to become the president of the Royal Aeronautical Society. Mr. Shenstone died in 1979.



William Ross Lennox



Kathleen Carol Fox

**Belt of Orion Award for Excellence:
Royal Canadian Naval Air Branch (1945-
1968)**

The Royal Canadian Naval Air Branch grew out of the wartime experience of Canadian air and naval forces as integral parts of the Royal Navy married to a decision that the Royal Canadian Navy (RCN) would develop an autonomous aviation capability. The need for this became clear with the onset of the Cold War and the need for Canadian embarked aviation resources to counter Soviet conventional and then nuclear submarine threats in the Atlantic.

From modest beginnings, the small RCN Air Branch developed a highly respected level of operational capability, both from the three carriers it employed during its lifetime but also for its ability to innovate to overcome resource constraints in the face of operational necessities. Such innovation was evidenced by the pioneer work to operate anti-submarine helicopters from small surface warships, including the ground-breaking adoption of a haul-down system



to permit landing on small decks. This occurred far in advance of the adoption of such systems by the RCN's larger NATO allies. The RCN's Air Branch was a distinct organization that made an outstanding contribution to the advancement of aviation in Canada.

Brief History of The Hall

Canada's Aviation Hall of Fame is located in the hangar at the Reynolds-Alberta Museum in Wetaskiwin, Alberta, south

of Edmonton. The Hall was founded in 1973, and its inductees have come from all across Canada having led extraordinary lives as military and civilian pilots, doctors, scientists, inventors, engineers, astronauts and administrators.

The Hall strives to increase the public's understanding and interest in aviation history by making its displays, archives, records and artefacts accessible to current and future generations.

(Provided by Canada's Aviation Hall of Fame: www.cahf.ca) ■

Controlled Flight INTO TERRAIN



Above: Ground Proximity Warning System (GPWS) demo on MPS Boeing 737-800 flight simulator.

There is a tragic flight condition that’s common enough to have its own acronym, but avionics technology is all about adapting to problems.



BY GORDON WALKER, AME ‘E’
Professor of Avionics, Centennial College

Like many, if not all aircraft maintainers, my interest in things mechanical is not restricted to airplanes and helicopters. Most of us also seem to be attracted to cars, motorcycles, boats and so on. And so, it wasn’t much of a challenge for the salesman (who also happens to be my son) to convince me that I absolutely NEEDED to buy myself a new Subaru WRX Sport Tech—a nifty little four-wheel-drive number with a 268-horsepower 2.0-litre direct-injection turbocharged engine. Once I

had endured the torturous tease of the 1,800-kilometre break-in period, I was ready to ring that puppy out with a road trip. Being a musician, the route was easy to create: Nashville, Memphis, New Orleans, and my favourite of all music cities, Austin, Texas. The unofficial motto of Austin is “Keep it Weird” and by “weird” they mean “Not like the rest of Texas.” While the state is renowned for cowboys, oilmen and Republican politics, the city of Austin is a Mecca for artisans, musicians and more left leaning thinkers. The much-loved, iconic “favourite son” of the Austin music scene is the legendary blues guitarist, Stevie Ray Vaughan:

*Alpine valley
In the middle of the night
Six strings down
On the heaven-bound flight*

*Got a pick, a strap, guitar on his back
 Ain't gonna cut the angels no slack
 Heaven done called
 Another blues-stringer back home*

The song, "Six Strings Down," was recorded by Stevie Ray Vaughan's brother Jimmy, as a tribute after Stevie was killed in a helicopter crash at Alpine Valley Wisconsin on August 27, 1990. Whether or not Stevie was "called back home" because they needed another guitar player in Heaven is not my area of expertise, but I can offer some insights into the cause of the crash and the technologies available to prevent a similar accident from occurring.

Four Bell 206B helicopters had been hired to ferry the musicians and their associates from the concert venue at Alpine Valley ski resort to the nearby city of Chicago. Weather conditions that night were less than ideal, with reports of dense fog patches as well as scattered and broken low cloud cover. Three of the four helicopters made it to Chicago safely. Sadly, the number three aircraft, carrying Stevie Ray Vaughan and members of Eric Clapton's entourage did not.



An Enhanced Ground Proximity Warning System screen illustrates terrain above current flight level in red, directly ahead.

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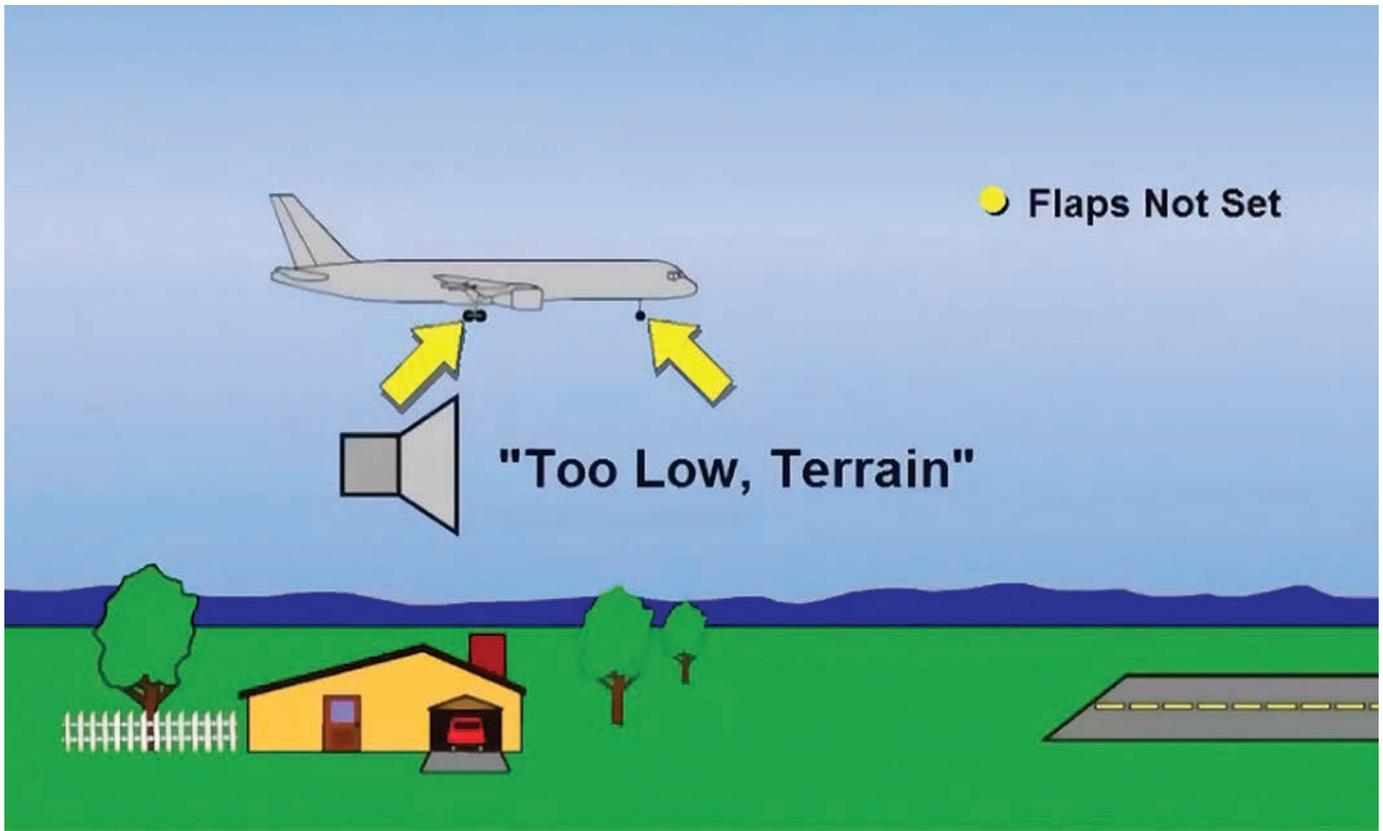


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Above: Boeing-757 Pilot Training, GPWS

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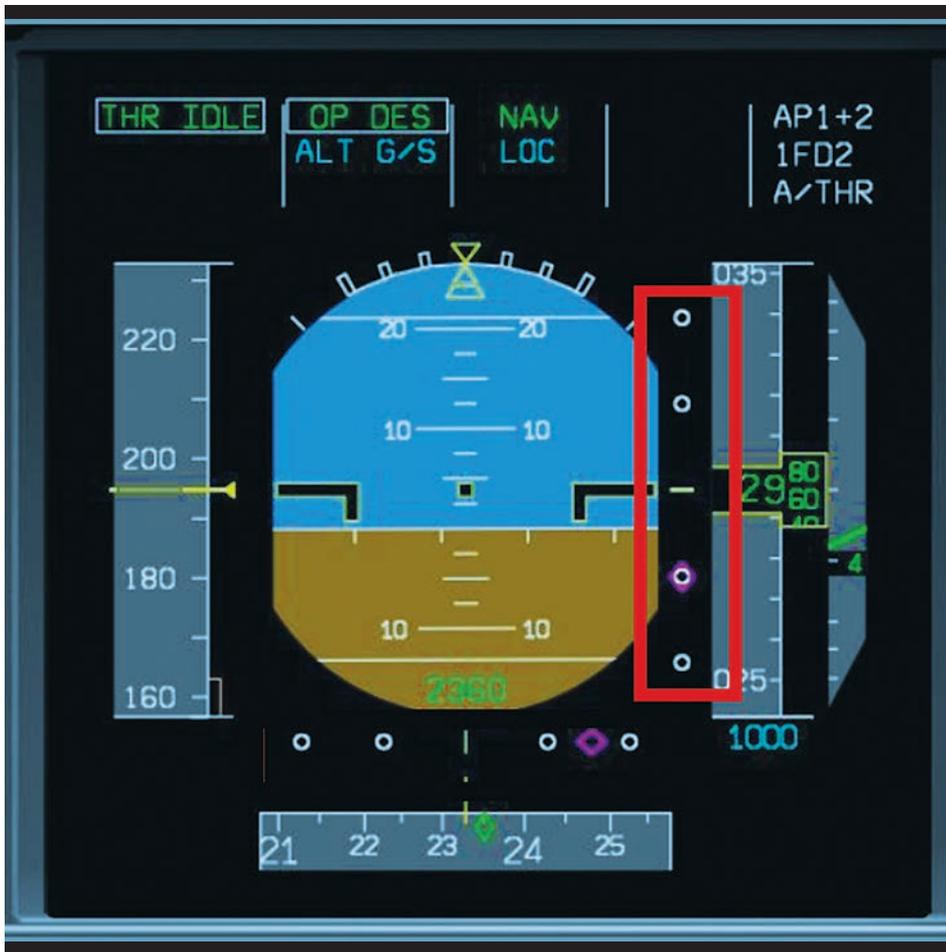
Above: Interconnection of Ground Proximity Warning System

The helicopter slammed into the hillside at high speed, less than one mile from the departure point, instantly killing all five people on board. No mechanical fault was found, thereby defining the cause of the accident as “Controlled Flight Into Terrain,” a condition common enough to have its own pronounceable acronym “See-Fit” (CFIT).

CFIT occurs when an aircraft under full control of the crew impacts terrain. This excludes accidents involving mechanical failures, fuel starvation, pilot incapacitation and so forth. Boeing cites CFIT as the leading cause of airplane

accidents involving loss of life, with a staggering death toll of over 9,000 lives lost. This is particularly tragic, as by its very definition, “Controlled” flight into terrain is a preventable scenario. The pilot need only “control” the flight of the aircraft away from the terrain, in order to avoid a catastrophic accident. Why then do CFIT incidents occur, and how can they be prevented? There are essentially three reasons for an aircraft to make unplanned but controlled contact with terrain.

1. If the airplane is losing altitude without the pilot being aware of the situation, eventually, we will have a controlled flight into terrain.



Above: Primary flight display with the glide slope indication scale highlighted in red

2. An aircraft that is maintaining altitude is in danger of a controlled flight into terrain if the ground below it is rising. That would be a scenario such as the approach to a hillside or mountain.
3. The third scenario would be one in which an aircraft strikes an obstacle, perhaps a cliff or even a building.

In the first of the situations identified above, the aircraft is actually losing barometric altitude. The aircraft's barometric altimeters are referenced to sea level, not ground level, so a loss of barometric altitude means that the aircraft is actually sinking/descending.

Although the pilot would normally be aware of this loss of altitude by noticing the negative rate indicated on the vertical speed indicator, and the decreasing altitude on the barometric altimeter, any number of well known "human factors" (fatigue, distraction, etcetera) could prevent this observation from being made. Further to this, most airports are not located at sea level. Denver Colorado, for example is located some 5,431 feet ABOVE sea level. An attempt to descend the aircraft to 5,000 feet in Denver would result in CFIT.

In the case of rising terrain, the aircraft may be maintaining a steady altitude according to the barometric altimeter, but actual height above the ground is decreasing. Radio altimeters are used primarily as approach aids, and give the pilot or autopilot an indication actual height of the aircraft above the terrain directly below, however they can also be used to determine the closure rate between the aircraft and the ground.

Clearly, based on the sheer volume of CFIT accidents, simple indications of barometric and radio altitude are not enough to prevent pilots from flying aircraft into the ground. Thus was created the "Ground Proximity Warning System" (GPWS) to provide the pilot with visual and aural warnings when contact with terrain is imminent.

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- Too Low...Terrain...Too Low...Terrain
- Glideslope...Glideslope

The last of those warnings, "Glideslope" is the area of GPWS that warns of potential CFIT during the landing phase of the flight. Landing gear position and flap position inputs to the GPWS alert the pilots of incorrect aircraft configuration when the altitude and airspeed indicate the aircraft is on approach. Aural warnings associated with this function are:

- Too Low...Flaps
- Too Low...Gear

GPWS has proven to be very effective in terms of reducing CFIT accidents involving loss of altitude and loss of ground clearance. However, traditional GPWS, using LRRR is only able to determine the topography of the terrain directly below the aircraft; it isn't able to "look ahead" to avoid obstacles such as the buildings and cliffs we cited earlier. Such was the state of affairs for many years, until advances in Global Positioning Systems (GPS) led to the creation of "ENHANCED GPWS"...which will be the subject of discussion in the next issue of Air Maintenance Update.

Q: List six inputs to the GPWS

Answer to previous question:

Q: What is the purpose of a circuit breaker?

A: A circuit breaker is designed to prevent electrical circuits from damage (heat) caused by excessive current. A circuit breaker performs the same function as a fuse, but a circuit breaker can be reset, whereas a fuse must be replaced.

GORDON WALKER entered the avionics industry after graduating from Centennial College in 1980. His career with Nordair, Air Canada, CP Air, PWA, and ultimately Canadian Airlines took him to many remote corners of Canada. Since leaving the flight line to pursue a career as a college professor, Walker has continued to involve himself in the aviation/avionics industry by serving on several CARAC committees concerned with the training and licensing of AMEs. As well, he has been nominated to the CAMC Board of Directors, and has been elected President of the National Training Association (NTA). ■

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Tripped *on a wire*



Investigators look for answers after a crashed Beechcraft failed to extend its landing gear.

On September 26, 2014, Air Creebec Inc. Beechcraft King Air A100 aircraft (C-FEYT, B-210) was operating as Air Creebec flight 140 on a scheduled flight from Moosonee, Ontario, to Timmins, Ontario, with two crewmembers and seven passengers on board. While on approach to Timmins, the crew selected “landing gear down”, but did not get an indication in the handle that the landing gear was down and locked.

A fly-by at the airport provided visual confirmation that the landing gear was not fully extended. The crew followed the Quick Reference Handbook procedures and selected the alternate landing-gear extension system, but they were unable to lower the landing gear manually. An emergency was declared, and the aircraft landed with only the nose gear par-

tially extended. The aircraft came to rest beyond the end of Runway 28. All occupants evacuated the aircraft through the main entrance door. No fire occurred, and there were no injuries to the occupants. Emergency services were on scene for the evacuation. The accident occurred during daylight hours, at 1740 Eastern Daylight Time.

History of the flight

The Air Creebec Beechcraft King Air A100 aircraft had flown on four flights that day without any reported discrepancies. On departure from Moosonee, the landing gear had retracted with no faults observed. As the aircraft approached Timmins Victor M. Power Airport, flight 140 was

cleared by Toronto Area Control Centre to descend to 5,000 feet above sea level (asl). When the crew made visual contact with the airport, the captain cancelled the instrument flight rules (IFR) flight plan and switched frequency to Timmins flight service station (Timmins Radio).

At 4.5 nautical miles (nm) back from Runway 28, and at an altitude of 2,000 feet asl, the crew selected flaps to “approach” and “landing gear down”. The crew heard the landing gear motor operating for approximately five seconds before it stopped. The landing gear handle red light remained on, indicating that the landing gear was in transit. There were no green lights for any of the landing gear components, indicating that they were not down and locked. At approximately the same time, both the generator off lights on the annunciator panel illuminated and the load metres indicated zero.

The captain took control of the aircraft, as the first officer had been the pilot flying (PF). The aircraft was leveled at 2,000 feet asl and flown overhead of the airport. An attempt to reset the two generators was unsuccessful, and there was no indication of a fire or electrical odour in the aircraft. The captain contacted Timmins Radio and declared an emergency. The aircraft remained at circuit altitude while the crew performed the emergency procedures to reset the generators. Knowing that the previous reset attempt had been unsuccessful, the crew began to shed electrical loads by shutting off unnecessary equipment. The crew was aware that the aircraft was now operating on battery power only.

The captain engaged the alternate landing gear extension system. However, when the captain attempted to move the handle, it was jammed. The aircraft remained within the traffic circuit, and the crew stayed in contact with Timmins Radio. They reported that they were operating on battery power only and could potentially lose all communications. The crew reset the landing gear relay circuit breaker located on the pilot’s sub-panel and again attempted to lower the landing gear using the normal system, but were unsuccessful. Another fly-by of the airport confirmed that the landing gear position had not changed from nose gear partially extended and main gear doors open.

The crew briefed the passengers and advised them on the brace position for landing and the evacuation procedure once the aircraft came to a stop. The aircraft flew the approach for Runway 28 with the flaps remaining in the “approach” setting. As the aircraft flew over the threshold, the captain reduced both engines to idle, and the first officer moved the propeller levers to the feather position and the condition levers to cut-off.

The captain then switched all electrical power off and maintained directional control of the aircraft using the rudder. With the nose gear partially extended, the aircraft touched down on the runway 1530 feet beyond the threshold, and settled on the main landing gear doors at 3130 feet beyond the threshold. It continued down the runway, and then slid off the end of the runway, continuing for approximately 40 feet before coming to rest. All of the occupants exited the aircraft through the main cabin door and were met by emergency services. The accident occurred at 1740.

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The aircraft was equipped with a cockpit voice recorder (CVR), which was shipped to the TSB Laboratory for data download and analysis. The CVR data provided information on the period from the point when the landing gear was selected to extend until just prior to touchdown when electrical the captain shut off power.

Damage to aircraft

The following aircraft components were substantially damaged during the landing:

- Propeller blades
- Engines
- Main and nose landing gear doors
- Flaps
- Underbelly skin and antennas

Air Creebec

Air Creebec Inc. is a regional airline based in Val-d'Or, Quebec, operating scheduled and charter services to 16 destinations in Quebec and Ontario.

The company operates 19 aircraft under CARs subparts 705, 704, and 703. As required under CARs subpart 705, Air Creebec has a safety management system (SMS). Its SMS incorporates a combination of guidelines from Transport Canada (TC) and from the International Air Transport Association Operational Safety Audit (IOSA) Standards Manual, and encompasses all of the company's aircraft operations, related equipment, and departments.

Flight crew information

Both pilots were certified and qualified for the flight in accordance with existing regulations. The captain had been an employee of the operator since February 2013 and a captain on the King Air since March 2013. His total flying time was approximately 2,400 hours, of which 1,000 hours were on the King Air. The first officer had been an employee of the operator for approximately one year and had accumulated a total of 580 flying hours, of which 300 hours were as first officer on the King Air.



Landing gear system

Beechcraft King Air A100 aircraft are equipped with a retractable, tricycle landing gear that is operated via an electrical motor and a gearbox assembly. The main landing-gear actuators are driven by torque shafts from the motor gearbox. The nose gear actuator is driven by a duplex chain from a sprocket on the gearbox torque shaft. Depending on the direction of rotation from the gearbox, the landing gear can extend or retract. Control of the system comes from the landing-gear handle in the cockpit. A 200-ampere circuit breaker protects the system from overload. In addition, a safety switch located in the right main gear strut breaks control of the landing-gear circuit when compressed preventing inadvertent gear retraction while the aircraft is on the ground.

The landing-gear system is also equipped with an alternate (manual) extension system as a backup to the normal system. When selected, it removes electrical power from the landing-gear circuit and allows the pilot to extend the gear through a handle in the cockpit floor. When the pilot pumps the handle, the landing gear is extended until the three green lights in the cockpit illuminate, indicating that the gear is down and locked.

Examination of the landing-gear extension system

Before the aircraft was removed from the scene, investigators took off the cabin floor panel, which covers the landing-

gear motor and transmission. A wire bundle that was routed through the area of the landing-gear motor and transmission had caught on the rotating torque shaft that drives the landing-gear screw jacks to extend or retract the landing gear. As the bundle had wrapped itself around the shaft, it had pulled wires connected to the two generator voltage regulators, disconnecting the generator control circuits. One of the voltage regulators had been pulled from its floor mount.

The shaft is in sections, each of which is joined by two bolts that go through a shaft joint perpendicularly to each other. The bolts are secured in place by nuts. The purpose of the shaft joints is to facilitate the removal of the torque shaft in sections during maintenance, such as during landing-gear component replacement or when adjusting the travel of the landing-gear screw jack actuators.

After the landing-gear shaft system seized and the two generators were disabled, the aircraft's only source of electrical power was the single battery. The battery powered the aircraft for approximately 30 minutes, which, under an emergency electrical condition, is the normal length of time a fully charged battery is expected to power aircraft systems. Electrical load shedding will extend battery power.

Aircraft maintenance

The Beechcraft Aircraft Corporation manufactured the aircraft in 1975. According to TC registry records, Air Creebec had been the registered owner since October 2013.



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After the occurrence, Air Creebec performed its own safety management system investigation, and all findings . . . were provided to the TSB. As a precaution, the wiring harnesses surrounding the landing-gear drive shaft were re-secured so that there would be no possibility of contact in future operations.

During its life in service, the aircraft had accumulated approximately 14,985 flight hours and 15,570 cycles. Records indicate that the aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures. The last inspection was an A Check, completed on September 20, 2014.

On May 5, 2014, while the aircraft was in Moosonee, the flight crew entered a defect in the aircraft journey logbook and maintenance record. The entry read “gear selector down unserviceable”. Air Creebec then obtained a ferry flight authorization, and the aircraft was flown to the operator’s main maintenance base in Timmins, where Air Creebec maintenance personnel replaced the landing-gear retraction motor and returned the aircraft to service. This maintenance appears to have been the only time when extensive work was performed by Air Creebec in the area where the wire bundle and the landing-gear rotating shaft are located.

Following completion of the motor replacement, maintenance personnel cycled the landing gear and found no faults with its operation. The aircraft had performed 254 landing-gear cycles without incident since the landing-gear retraction motor had been replaced.

Beechcraft maintenance documentation and Advisory Circular (AC) 43.13-1B provide guidance material for maintenance personnel on how to correctly secure wiring and protect it from chafing. This information is not specific to the landing-gear system and can be applied to other similar installations and systems throughout the aircraft.

Inspection schedule

An A check is a visual inspection that is performed every seven calendar days and includes operational checks of aircraft systems. It is not part of the inspection schedule provided by the aircraft manufacturer, but was incorporated by Air Creebec into its TC-approved maintenance program to improve aircraft in-service reliability.

In addition to A checks, four phase inspections are performed every 200 flight hours. After phase four is completed, the schedule cycles back to phase one. Phases three and four require the removal of floor panels in the area where the landing-gear motor and transmission are located. The removal provides viewing access to the torque shaft and wiring in this area.

Records indicate that the phase four inspection was completed on April 19, 2014. This phase includes, but is not limited to, checking of the security and condition of wiring, general cleanliness of the area, and security of components.

Analysis

During the landing-gear extension, the rotating torque shaft that drives the screw jack actuators to lower the landing gear caught on a wire bundle that is routed through this area. The bundle likely snagged on the torque shaft bolts. As the shaft rotated after “landing gear down” was selected, the wire bundle became entangled around the torque shaft and prevented further rotation of the shaft, which consequently halted the landing-gear extension.

The alternate gear extension system uses the same torque shaft system to extend the landing gear, and so it was disabled as well. The crew was therefore required to conduct a landing with only the nose gear partially extended and the main landing-gear doors open.

The wire bundle included wiring for the generator control units. This wiring was sufficiently damaged to disconnect the generator control circuits and illuminate the generator lights on the annunciator panel.

It could not be determined when or how the wire bundle shifted sufficiently to catch on the rotating shaft during the landing-gear extension. Maintenance had been performed previously in this area when the landing-gear retraction motor was replaced, and the wire bundle may have been inadvertently shifted. However, numerous flights and landing-gear cycles had been performed without incident since this maintenance.

Safety action taken

After the occurrence, Air Creebec performed its own safety management system investigation, and all findings, and actions taken as a result of findings, were provided to the TSB. As part of its investigation, Air Creebec immediately performed an inspection of its two other Beechcraft King Air A100 aircraft, and found no faults. As a precaution, the wiring harnesses surrounding the landing-gear drive shaft were re-secured to ensure that there would be no possibility of contact in future operations.

The operator also submitted a safety deficiency report to TC and issued an in-house maintenance advisory to its staff to check for proximity of wiring harnesses to surrounding rotating parts. It reviewed all pertinent airworthiness directives, service bulletins and safety communiques, but did not find any information that related to this type of event. In addition, Air Creebec contacted other operators using the same type of aircraft and made them aware of the potential for this type of event. (*Transportation Safety Board of Canada report*) ■

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DC3 Memories

A classic aircraft is still flying ... and still available for missed opportunities.

Antique mechanical devices have a unique power to transcend time. Whether it is an automobile, motorcycle or an aircraft, their physical presence can instantly transport you back to misty memories of youthful adventures. Coincidentally, a recent trip to Dallas and a Douglas DC3 rekindled 40-year-old memories of my early apprenticeship days.

The Dallas trip was a little family getaway with my Uncle John and Aunt Joanne. A tradition has begun where my wife Irene and I join them to celebrate American Thanksgiving with their daughter Nicole and her husband Kirk. Fortunately for me, they both work for American Airlines (we are the Aviation Longo's after all!). Nicole is a manager of instructional design and works at the Flight Training Academy, which also houses the C.R. Smith Museum. The centre piece of this aviation museum is a beautifully restored DC3 the "Flagship Knoxville." Interesting to note, Cyrus Rowlett Smith, past president of American Airlines (1934-1968) was a key player in convincing Douglas Aircraft to design and build the DC3, and was the first to use it commercially.

The Douglas DC3 first flew long before I was born. Unknown to its creators, its inaugural flight on Dec. 17, 1935 was the birthing of a legend. Its simple, rugged construction and pleasant flight characteristics have won the hearts of pilots and technicians the world over. According to the DC3 Historical Society a total of 10,632 DC3s were built in the United States, in Santa Monica (966), Long Beach (4,285) and Oklahoma (5,381). More than 1,000 of these iconic classics still remain airborne, in a variety of roles, around the globe. No other aircraft in the history of aviation comes close to its undeniable, reliable, reputation. The classic saying still holds true, "The only replacement for a DC3 is another DC3!"

As I strolled around the gleaming Flagship Knoxville the details of the memories came flooding back. The first aircraft I ever touched as a fully-fledged, paid, AME apprentice was a DC3. My first day on the job at Nordair in Montreal, myself and a few other apprentices were tasked with removing its wings for a spar inspection. The flange just outboard of the engine nacelle had (incredibly) only 328 tiny AN4 bolts holding it in place. We spent the morning with our quarter-inch drive ratchets and sockets clicking away as the wings were carefully separated from the aircraft.

As I passed the engine I was immediately reminded of my first job on day one of my first Baffin Island tour. Again it was

another DC3. This time a starter change on the number one engine. My first test as the new kid on station and I was given no help or guidance. At 22 years of age, I felt alone and very, very far from home but the starter got changed (rather slowly) and I was on my way in Frobisher Bay.

The other engine job I remember was regularly pulling and cleaning the engine oil filters. These "Cuno type" filters had to be removed, disassembled and cleaned every time the pilot used the oil dilution system, which was often in the frigid arctic temperatures.

During that first tour in Frobisher I worked nightshift and we cared for two Twin Otters and one DC3. It would take about one hour to check and prep the two Twin Otters for the next day's flights and about 10 hours coaxing another day's flights out of the tired and well-worn "Greasy 3." Incredibly, it always flew and never failed to return to its perch for more care and feeding. Unfortunately, long after I was gone, that particular aircraft crashed in the arctic while hauling cargo. Sadly, its two young pilots perished which remains a jarring reminder of the perils of arctic operations.

Walking around and climbing inside that Dallas DC3 did indeed generate a lot of memories. Four decades have passed since, with many other memorable mechanical recollections on aircraft large and small. As is often the case with memory the picture becomes rosier with time. You seem to forget the bad times and enhance what was perceived as good. (Even that old cantankerous British sports car or motorcycle you once owned seems to run like a gem in hazy hindsight.) It is also true that memories often trigger regrets of opportunities not taken. Unfortunately I have never flown in a DC3. Foolishly, back in those early days in Frobisher, I turned down an offer by a young Nordair pilot to accompany him on a day-flight to Greenland. Consequently every time I see one of these beautiful "Goony Birds" it also triggers pangs of regret.

Fortunately, there is still time to rectify that melancholy mistake. Against all odds, DC3s are still flying and I am still walking. Thanks Nicole, your American Airlines tour and the pristine Flagship Knoxville have inspired me to pursue a long lost adventure. Lucky for me, there is no statute of limitations on adding items to the bucket list and a "DC3 flight" just flew to the top of the roster. Heck, I may even qualify for a senior citizen discount.

For more published writing by Sam Longo, please visit www.samlongo.com ■

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