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AirMaintenance UPDATE

The Magazine for Aircraft Maintenance Professionals
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HELI-EXPO 2014

Engine installations: stick to the plan

The facts and fictions of PMA

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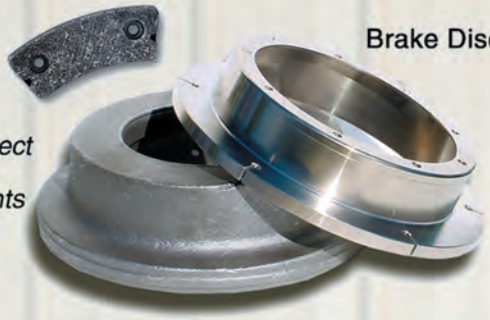

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Heading into Heli-Expo 2014

What is the future of vertical flight? That's a big question, but just one of many that will be examined at length and from every conceivable angle when an estimated 20,000 industry professionals arrive in Anaheim, California, February 24–27, for the world's largest helicopter trade show, sanctioned by Helicopter Association International. Though HAI-Heli-Expo is the premier showcase of new products, technical innovations and business solutions, it's also a learning experience with workshops ranging from the purely technical ("Rotor Blade Preventative Maintenance") to the regulatory ("Regulations 101: Law for the Aviation Professional") to new ideas around workplace safety. "Awake at the Stick: Managing Operational Fatigue" is just one of many safety-oriented workshops. Those who attend at least six Rotor Safety Challenge events at Heli-Expo 2014 can receive a certificate of recognition for completing the Rotor Safety Challenge. Simply make a selection of safety events to attend from the HAI Rotor Safety Challenge schedule, and at the conclusion of each event collect proof of attendance from the room monitor or presenter. Once you have attended at least six events, drop by the Education Registration desk and present your proof of attendance, and you will immediately receive a certificate of recognition.

Literally every major (and minor) corporate player in the game will be at Heli-Expo to present their important new products on the showroom floor, but there will also be opportunities for individual professionals to explore their career options as participating companies such as Airbus Helicopters and CHC Helicopter/Heli-One present the 2014 Helicopter Industry Job Fair—job seekers are admitted to the fair at no charge.

With the many vendor offerings, forums, town halls, roundtables, and HAI committee meetings scheduled for Anaheim, HAI-Heli-Expo is not just a mere snapshot of the rotorcraft industry heading into the year 2014, it's also an opportunity for private pilots, operators, techs, and students alike to determine what the future might hold for them.

— John Campbell
Editor

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Upcoming Events

CANADA

PAMEA Symposium and Tradeshow
February 13 – 14, 2014
Vancouver, BC
www.pamea.ca

Fort McMurray Air Show
May 31 – June 1, 2014
Fort McMurray, AB
www.airshowfortmac.com

Hamilton International Airshow
June 13 – 15 2014
Hamilton International Airport
Hamilton, ON; flyhamilton.ca

UNITED STATES

Heli-Expo 2014
February 24 – 27, 2014
Anaheim, CA; www.rotor.com/heliexpo

2014 International Women in Aviation Conference
March 6 – 8, 2014
Orlando, FL
www.wai.org/14conference

AEA International Convention and Trade Show
March 12 – 15, 2014
Nashville, TN
www.aea.net

International Operators Conference
March 17 – 20, 2014
Tampa, FL
www.nbaa.org

Sun 'n' Fun International Fly-In and Expo
April 1 – 6, 2014
Lakeland, FL
www.sun-n-fun.org

Mariposa Air Fair and Family Adventure Day
April 26, 2014
Mariposa-Yosemite Airport
Mariposa, CA
http://mariposaairfair.com

Virginia Regional Festival of Flight
May 31 – June 1, 2014
Suffolk Executive Airport
Richmond, VA; www.virginiaflyin.org

National Biplane Fly In
June 5 – 8, 2014
Freeman Field
Junction City, KS
www.nationalbiplaneflyin.com

Fly Iowa 2014
June 28 – 29, 2014
Iowa City Municipal Airport
Iowa City, IA; http://flyiowa.org

INTERNATIONAL

Business Airport World Expo
March 26 – 27, 2014
London Farnborough, UK
www.businessairportworldexpo.com

India Aviation Exhibition and Conference
March 12 – 16, 2014
Hyderabad, India
www.india-aviation.in

Aero Friedrichshafen
April 9 – 12, 2014
Hamburg, Germany
www.aero-expo.com

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— Del Richardson
Director of Maintenance,
Fairfax County Police, Helicopter Division

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VECTOR plots a rising flight line

A Canadian-based MRO provider passes some important checkpoints in what promises to be an interesting year in the rotary aircraft business.

The year 2014 is already shaping up to be a busy one at Vector Aerospace, the Canadian-based maintenance, repair and overhaul provider that offers support for turbine engines, helicopters, fixed wing aircraft and components. On the fixed wing side, Vector recently broke ground on a new US $40-million facility in Singapore that is being purpose-built for the Pratt & Whitney engine powering Bombardier's Dash 8 aircraft. The 5,200 square-metre facility will be equipped with full engine overhaul and test capabilities, and will be one of only three such facilities worldwide.

Over on the helicopter side of operations, in late fall of 2013 Vector Aerospace Helicopter Services - North America (HS-NA) announced the commencement of its Eurocopter AS332L Super Puma helicopter leasing and by-the-hour support program. During 2013 HS-NA had upgraded eight of its 11 AS332Ls, and delivered the first Super Puma to a customer in Los Andes, Peru.

Also in late 2013, Sikorsky Aerospace Services appointed Vector Aerospace's UK facilities as authorized Customer Service Centres (CSC) to support the popular S-76 twin-engined helicopter. "Vector Aerospace is recognized as a leading provider of MRO services," said Frank DiPasquale, SAS vice-president, business development and strategic relationships. *(Continued on page 38)*

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BRITS HAND OVER RESEARCH FUNDS TO DUNLOP

Dunlop Aircraft Tyres has landed a £1.5-million British government grant to develop next-generation aircraft tires intended to be lighter and more robust. The three-year, £3-million project, which is being run in collaboration with Airbus, will see Dunlop focus on developing main-wheel radial tires for the A320 family of aircraft.

"We are following a phased process which will allow us to innovate with new materials and modeling techniques before designing a new product ... and plan to have the first prototype tires ready by 2014," said Dunlop Aircraft Tires' chief designer Steve Barlow.

The UK's Technology Strategy Board awarded the grant to Dunlop.

KAMAN ENTERS $60-MILLION DEAL WITH BOEING WINNIPEG

Connecticut-based Kaman Corporation has entered into an agreement with Boeing Canada Winnipeg to build and assemble two major sections of the 747-8 wing-to-body fairing. Kaman will manufacture most components at its facilities in Connecticut, Florida, Kansas and Vermont, with final assembly to be completed at the company's Jacksonville, Florida, facility and delivered directly to Boeing's wide-body assembly line in Everett, Washington. Boeing currently manufactures the fairing at its Winnipeg facility, but it is expected that Kaman will begin delivering assemblies during the first half of 2014.

The agreement has a potential value of $60 million.

SEE-IN-THE-DARK SECURITY TECH TEST

Securing airport perimeters against unauthorized activity has taken on a whole new level of importance in the post-911 era. With that in mind, California security systems manufacturer JETprotect recently conducted a test of its ActiveSentry system at the San Jose Airport. This all-weather security system is said to be able to detect and track intruders in "zero visibility" conditions and provide continuous monitoring of up to seven square miles by fusing radar and camera sensors to perform uninterrupted surveillance in day, night, smoke, fire, fog, rain or snow. Intrusion scenarios and environmental monitoring were included during the evaluative test sessions.

HOPE AERO MAKES MOVES UP TO BIGGER DIGS

Hope Aero has moved into a new 36,000-sq.-ft. facility near Lester B. Pearson International Airport in Toronto in order to meet growing demand for

maintenance, repair, and overhaul services in the Canadian aerospace market.

"The facility gives us over 50 per cent floor space expansion and fosters significant improvements to our continuous-flow production system," said Terry Hope, president of Hope Aero. "Rapid turnaround time is paramount for all our customers as it reduces their need to invest capital in additional LRU (line-replaceable unit) spares."

The facility features wheel, brake and propeller tear-down and re-assembly areas, with support services such as cleaning, non-destructive testing, painting and machining.

777X: BIGGER REALLY IS BETTER SAYS BOEING

Boeing says its new 777X, with folding wing tips, will be the largest and most efficient twin-engine jet in the world, while reporting that it has already received 342 orders for the new aircraft that was launched with two siblings — the 777-9X and the 777-8X — during the 2013 Dubai Airshow in mid-November. The folding wing tips will increase wingspan and fuel efficiency without limiting access at airports, says Boeing.

The 777-9X will have a factory-spec range of more than 8,200 nautical miles (15,185 km) and, according to Boeing, the lowest operating cost per seat of any commercial airplane, while the 8X will offer a range of more than 9,300 nautical miles (17,220 km). Production is expected to begin in 2017, with the first deliveries in 2020.

WESTJET LAUNCHES NEW IRISH ROUTE

Calgary-based WestJet Airlines has announced it will enter the Atlantic market for the first time when it launches a new route between St. John's, Newfoundland, and Dublin, Ireland, this summer. The 737-700 aircraft used on the new route will originate in Toronto, but WestJet hopes to build St. John's into a jumping off point to Europe.

NEW TECH BRINGS SAVINGS AT THE PUMP

The U.S. Patent Office has approved a patent protecting AMS Fuel Solutions' aircraft fuel optimization technology that searches out the best fuel prices on multi-trip routes. The goal of the technology is to minimize the total fuel cost for the entire trip and, to do so, the system filters through real-time raw data. AMS claims that in less than 15 seconds the system displays the suggested fuel upload, pricing and overall savings.

"Through real-time technology and an array of algorithms, we're helping minimize each flight's environmental impact by conserving fuel and reducing carbon emissions," says AMS's managing director Anthony Struzik.

ATS EXPANDS OPERATIONS TO KANSAS CITY

Aviation Technical Services, one of North America's largest third-party transport aircraft maintenance, repair and overhaul providers, is opening a new 607,000-sq.-ft. facility in Kansas City, Missouri, company officials announced in late December. ATS's expansion to Missouri is expected to create more than 500 new jobs over the next three to five years, with potential over time for 1,000 employees. Headquartered in Everett, Washington, ATS opened with five employees in 1970, and has since grown to over 1,000 employees who work together to support a global customer base. The company's Kansas City facility will be its first location outside the state of Washington.

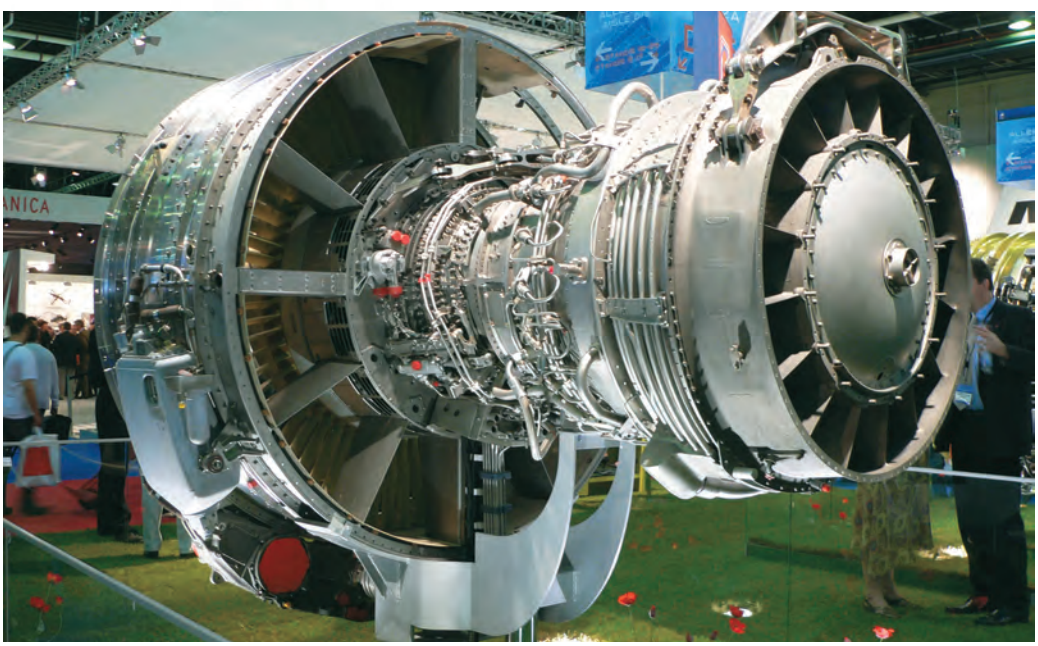
SAYING GOODBYE TO THE DC-9

Since 2008, Delta has retired more than 350 aircraft from its fleet while adding economically efficient, proven-technology aircraft such as the Boeing 777-200LR, two-class 65 and 76-seat regional jets, and variants of the 737 and 717, largely on a capacity-neutral basis.

The DC-9 retirement comes just months after Delta began taking delivery of its orders of 88 Boeing 717-200 aircraft and 100 Boeing 737-900ER aircraft. Delta was the first to fly the original 65-seat version of the DC-9 in 1965 and has flown a total of 305 DC-9s since then. ■

The facts & fictions of PMA

BY MIKE BRODERICK
Helicopter Engine Repair
Overhaul Services



The post-war years brought an eager young player into the business – the builder of PMA parts. Predictably, unpleasantries were exchanged with the big OEMs. But the rulings of acceptance by regulatory bodies have been game-changers for the PMA industry. And now, even its most vocal opponents are climbing aboard.

Welcome to 2014, and welcome back to our bi-monthly discussions on all things aviation. Hope you had a pleasant holiday and are ready to begin what promises to be an exciting and productive new year. So let's open the New Year with a lively discussion about Non-Type Certificated (NTC) aviation parts whose production and distribution is approved by the Federal Aviation Administration (FAA). And your first question is: if these parts are not TC'd then they must be "bogus" right? Wrong! These parts are manufactured as alternatives to the original part produced by the Original Equipment Manufacturer (OEM) and are approved as an alternative by the FAA. Thus, this alternative part is identified as a Parts Manufacturing Approval (PMA) part.

Now, for you long-time students, I know you are wondering if I am having a "senior moment". And the answer is no, but as sharp as you are, I know you all remember a conversation we had about two years ago on this very subject. And you are right! We did go into great depth about PMA and all the regulations involved two years ago this month as a matter of fact. "To PMA or not to PMA" was the question and the name of the article. But like many subjects that are worth discussing again, PMA is certainly worth our attention once again because there continues to be a relentless undercurrent of misinformation about PMA.

Since I am the author of that article and it is chock full of good information, I am going to use it as reference for today's

discussion, not as a regurgitation of the original but rather as a sequel that encapsulates the important parts of this controversial subject. Also for today's session, I have used sections from the following FAA approved documents for reference: FAA Order 8110.42c and FAA Special Airworthiness Information Bulletin (SAIB) NE-08-40 and Federal Aviation Regulation (FAR) 21.137.

Let's begin with a little history. The idea of PMA came to fruition in July 1955 when the FAA – in an attempt to keep the flying public safe, and at the behest of the civilian owners of out-of-production surplus military aircraft who were having a difficult time obtaining acceptable OEM parts – considered it acceptable for companies other than the OEM to design and make spare aircraft parts. The rule of the day was "equal to or better than." This created the PMA industry and produced two types of PMA suppliers: **Licensed Suppliers and Competitive Suppliers.**

1. Licensed Suppliers paid licensing agreements with the OEMs and produced these parts. This removed the burden of providing support for the out-of-production aircraft and allowed the OEMs to place their money into developing new products. Everybody was happy with this arrangement.

2. Competitive Suppliers came about when the entrepreneurial spirit grabbed a few of the Licensed Suppliers as well as attracting other manufacturers to this innovative process for supplying aviation parts. They recognized a financial

opportunity and began to challenge the OEM for market share on current production aircraft parts. Thus, the Competitive Supplier who, while providing acceptable, economically attractive alternative parts to the operator, provided financial grief to the OEM. Thus, there is this competition for market share that has strained the relationship between OEMs and PMA manufacturers. **So what are PMA parts?**

The Fact:
PMA is a combined design and production approval for the replacement parts for installation on or into a type-certificated product. A PMA may also be used for the production of modification parts from a Supplemental Type Certificate (STC). The STC approves the design and installation of these modification parts in products. However if any replacement part alters a product by introducing a major change, the 14CFR 21.113 requires an STC for approval of these parts. And as an added bonus, the definition of an STC is a TC issued as a supplement when an applicant has received FAA approval to modify an aircraft from its original design. The STC incorporates, by reference, the related TC, and approves not only the modification but also how that modification affects the original design.

The Myth:
1. A PMA part is not a "bogus part." Ref. FAA SAIB NE-08-40: *"…PMA and STC parts are thoroughly evaluated for compliance with respect to any changes they introduce and their effect on the original type design. The need for supplemental instructions for Continued Airworthiness (ICA), new airworthiness limitations, and other conditions is established by the FAA to ensure the safe integration of the PMA and STC parts into the product…"*
2. Installation of PMA parts does not change the life limits or the OEM warranty of the other parts within the assembly.
3. PMA is not for the approval of inspection procedures, materials or processes. Any specific inspection procedures, material or processes (such as hardening, plating, or shot-peening) approved as part of a PMA are valid only for that particular part.
4. Parts produced under a "one-time only" STC or field approval are ineligible for PMA.

Why PMA over OEM?

PMA parts have become a popular alternative because, as a general rule, they are less expensive than the OEM original parts, and in a lot of cases, more readily available. Less expensive and readily available? OK, how do they do it? To begin with, the PMA manufacturer only has to invest in the engineering and manufacturing costs to produce their PMA part. The PMA manufacturer also can cherry pick the parts they wish to produce. By that I mean they choose those parts with the most replacement activity and/or those parts with an apparent inflated OEM price. The OEM on the other hand has to fund the support of their entire product line, including

engineering research for product improvements, as well as an inventory of spare parts for the aftermarket support of their product.

Let's look at an engine manufacturer for example. They have to pay for the development of the engine, certification costs of the engine, production of the engine, spare parts, and finally, a network to distribute the parts and support the product in the field. Put all these costs together — then add the financial obligation of continuing airworthiness documents (overhaul, parts, and field maintenance manuals), inventory costs, personnel to manage all of this — and you can possibly understand the acrimonious feelings of the OEM toward the PMA manufacturer.

Now, one thing I want you to notice in my last paragraph. I have not used the word "cheaper" when comparing the cost of the OEM and the PMA part. I don't want any misconceptions about the quality of the PMA part. The PMA part may be less expensive to purchase, but it for sure cannot be categorized as "cheaper." The PMA part is at minimum the same quality as the OEM part. Often, the PMA is of a higher quality than the OEM part it replaces. Better you ask? How can that be? Well, the PMA provider has the advantage of evaluating the OEM part, discovering and improving upon any weakness exposed during the evaluation process. Also, the PMA manufacturer needs to address any product difficulties the OEM might have experienced and demonstrate how they will not be duplicated in the PMA part.

Until recently, the OEMs were on a campaign to discredit PMA installed parts with statements of warranty violations and safety concerns. In 2008, after an extensive investigation by the FAA, Transport Canada, and the European Aviation Safety Agency (EASA) which was requested by the OEMs, these regulatory agencies could find no statistical evidence that PMA parts are a safety concern. Nor could these regulatory agencies find any fault with their approval processes of PMA parts. The FAA issued SAIB #NE-08-40, publishing these facts and extolling the quality of the PMA parts, thereby validating that the real reason for the OEM objections

is based on economics, not safety. Regulatory agencies also denounced the use of "anti-PMA" language in their maintenance instructions.

This language put the installing technician between a rock and a hard place because, per Advisory Circular (AC) 43-13-1A, as the maintainer, you are to follow the OEM's instructions. However, as most technicians discovered, AC43-13-1B states that, as a maintainer, you can use a part or practice that will safely return the aircraft or appliance to its original condition. So, until all the OEM "anti-PMA" language is removed from their documents, technicians can install a PMA part knowing they covered the precepts of AC43-13-1B.

During the last 12 years, requests for PMA approvals to the FAA have soared. While the ramp-up for new aircraft production has increased lead times on OEM spare parts, an estimated 550,000 PMA parts have been brought to the marketplace. There are industry estimates that the FAA is approving about 1,500 applications a month from over 2,600 companies. OEM apathy to the operators' complaints about increasing prices — coupled with poor parts support and topped off with the support of the FAA — has fueled this increase in PMA parts usage. PMA has enjoyed such growth that one of the biggest opponents to the PMA, Pratt & Whitney Engine Company, has decided "If you can't beat 'em, join 'em!" P&W has placed one manufacturing foot square into the PMA bucket via an ongoing program to produce and market PMA parts for the General Electric CFM 56-3 engine. And with over 12,000 CFM 56 variants in service, this is a heck of a good market in which to jump. P&W made the decision not to develop an engine in competition to the CFM 56 series, but rather redirected their resources from developing a competitive engine to developing PMA parts for the competitor's engine. P&W has targeted the parts most often replaced during maintenance and overhaul, studying the reasons for the parts replacement as well as the rate at which they are replaced. Armed with these statistics, they can devise structural improvements for the parts they are manufacturing under PMA. This research is also used to improve their own parts, which helps defend against a PMA assault on their product. A great use of capital and manpower I would say.

The fact is that PMA has become a globally accepted alternative. As competition heats up for the operator, the distance between their cost of doing business and the profit from that business is shrinking. And one of the costs that owners/operators have found they can control, somewhat anyway, is the cost of the parts for maintenance through the use of PMA. The stigma of PMA = UNSAFE has been challenged and refuted, much to the annoyance of the OEM. And this has happened not by anecdotal journalism but through safe operation as well as the regulatory agencies' endorsement.

The OEM is in a tough economic situation. Competition between OEMs for market share is intensifying, and they too are watching the erosion of their profits. They need the revenue of aftermarket parts sales to help support research and development as well as the cost of producing and bringing to the marketplace a new type certificated component. And the winner for sure in this PMA vs. OEM is the operator. PMA has caused the OEM to take a second look at its parts and production costs and improve where they can. Also, as we have just seen, one manufacturer has become creative and has taken a second look at the PMA product, and is using it as a unique opportunity to remain profitable.

PMA vs. OEM: time will tell how this will all sort out, but one thing is certain: the marketplace will continue to keep both sides on their economic toes.

Well, we have reached the end of our review of PMA. And as always, I appreciate your attention and feedback. Let me know your thoughts on this. Now, as a famous orator once said about a presentation, "I hope today's discussion has fit the definition of a woman's skirt: long enough to cover the subject and short enough to be interesting."

Take care, my faithful students; and let's hope that 2014 is the best year ever for us all.

MIKE BRODERICK *is Vice President of Business Development at Helicopter Engine Repair Overhaul Services (HEROS). Over the past 35 years, he has served as a shop technician, engine shop supervisor, Engine Program Director, Director of Maintenance, Director of Operations, and owner of a Rolls-Royce engine overhaul and MD Helicopter component overhaul shop. He is a certified A&P, and holds a Bachelor of Science degree in Aviation Administration. As well, Mike has been appointed as an FAA representative for the FAA Safety Team (FAAST) and is a member of the HAI Tech Committee. Mike is a regular contributor to Air Maintenance Update.* ■

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The Science Fiction of Avionics

BY GORDON WALKER, AME 'E'
Professor of Avionics, Centennial College

Here we are, 2014, well into the second decade of the 21st century, and a full 30 years beyond a time when we were darkly tantalized by the realization that George Orwell's ominous date of 1984 would soon be upon us! As an avid reader and casual collector of sci-fi novels, I find it fascinating to read books which, when written, were set in the "near-future", but now, like "1984", are actually in our past. So much of the post-World War II sci-fi writing postulates on transportation and electronic visions of the future, that, as one who has spent his life in the field of avionics, I cannot help but muse about how much they got right. From a technical perspective, one must also ponder the possibility that perhaps it was a fictional notion of a future technology that led to the actual development and creation of such wondrous devices we now take for granted.

In the 1860s, author Jules Verne wrote of men travelling to the moon, as did H.G. Wells in 1901. Although Verne's concept of launching the astronauts by means of a giant cannon was not employed (NASA preferring to go with the Saturn V rocket), by 1969, manned flight to the moon was a reality. It's interesting to note, in terms of technological developments, that the astronauts aboard

Apollo 11 used slide rules, paper charts, and a sextant to guide them to their landing at Tranquility Base on the moon. Many of us now can't imagine driving to a friend's cottage without the aid of a GPS (Global Positioning System) navigation system, let alone flying to the moon.

And what of the GPS? It has become such a common part of the aviation and avionics world, and indeed the world at large. Used extensively by everyone from car rental agencies, to police and fire departments, to golfers and fishermen, GPS technology has become an integral part of life in the 21st century. GPS allows friends to find each other in crowded dance clubs, and couples to reconnect while shopping in a busy Costco store. (I first saw this conceptualized on Gene Roddenberry's "Star Trek" when often a crew member would ask the computer the location of another person aboard the ship/station). Not only does this allow us to hook up in jam-packed bars, but it also means that traditional avionics approach aids such as localizer and glideslope are being rendered obsolete by GPS, which allows greater flexibility and more efficient multiple approach paths.

The entire operation of the GPS is, of course, based upon receiving radio signals from orbiting satellites. Orbiting GPS satellites circle the earth at a speed of approximately 14,000 kmh. Orbiting satellites can often be seen by the naked eye, as they appear to be stars moving at very high speed. The invention of the other type of satellite, the "geosynchronous" satellite is often (erroneously) credited to sci-fi author Arthur C. Clarke. Unlike orbiting satellites, geosynchronous satel-

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lites remain in a fixed position above the earth's surface, and are used extensively for telecommunications purposes. Although he didn't actually "invent" the geosynchronous satellite, Clarke did popularize the concept, which undoubtedly led to its development. Clarke's first published mention of the geosynchronous satellite concept appeared in 1945, in a magazine called Wireless World.

Now THERE is word that has taken on a whole new life — wireless. As a kid, my friends would snicker when my Scottish parents would shout, "Turn that wireless down, it's too bloody loud!" Wireless was their word for radio. Now, "wireless" is used extensively with a vast array of electronics, such as microphones, speakers, headsets and so on, but chiefly it is used to describe wireless internet connectivity, or "WiFi" which is actually a trademark name but, like Kleenex and Aspirin, it has become a generic term meaning wireless internet connection. Wireless Local Area Networks (WLAN) are beginning to weave themselves into the fabric of modern avionics systems. Many airlines, including Air Canada, are moving away from hard-wired passenger entertainment systems in favour of wireless networks, offering on-demand audio and video entertainment. Servers aboard the aircraft allow passengers to access music, movies and various other forms of entertainment on their own video display devices. I recently watched Stanley Kubrick's Vietnam War classic "Full Metal Jacket" on my iPhone, while winging my way to Europe aboard an Air Canada Rouge flight.

> . . . rather than storing cockpit voice recordings and flight data information on board the aircraft, digitize the information and transmit it to satellite receivers, which send the data to internet servers on the ground, eliminating the need for costly and sometimes futile searches for CVRs and FDRs . . .

The blending of digitized information storage and retrieval with wireless transmission techniques is enabling avionics developments that could have only been conceptualized by science fiction writers a few short years ago. The difficulty in locating the flight data recorder (FDR) and cockpit voice recorder (CVR) after the Air France flight 447 crash ignited a drive toward the concept of transmission and remote storage of data rather than keeping it aboard the aircraft. The concept is simple: rather than storing cockpit voice recordings and flight data information on board the aircraft, digitize all of that information, and then transmit it to satellite receivers, which can send the data to internet servers on the ground. This would eliminate the need for costly and sometimes futile searches for CVRs and

FDRs, should an aircraft crash over water or in remote/hostile environments. The information could be encrypted to ensure privacy and confidentiality, and updated/deleted on an ongoing and frequent basis.

Early arguments against such a concept centred on bandwidth and data storage limitations. However, both these issues have been largely overcome. One can now purchase a memory card no larger than a postage stamp, which is capable of storing 128 megabytes of data, so storing a few hours worth of data from an aircraft hardly seems like an insurmountable computer problem.

Of course the greatest and most relevant example of avionics science fiction probably was that troublesome computer HAL from "2001: A Space Odyssey". According to Wikipedia, in addition to controlling the systems aboard the Discovery Spacecraft, "HAL is capable of speech, speech recognition, facial recognition, natural language processing, lip reading, art appreciation, interpreting and reproducing emotional behaviours, reasoning, and playing chess."

When one considers the extent to which computers control today's aircraft engines and systems, the fact that we are now employing retina scanning for identification purposes, and the degree to which computer gaming has flourished, Arthur C. Clarke was pretty much right on the money.

As we comfortably settle into the new millennium, and reflect upon the flights of fancy penned by inspired writers such as Heinlein, Asimov, Clarke, et al, whose ideas have become commonplace in our present reality, it's hard to believe that we are not capable of creating virtually anything our minds are capable of envisioning. What science fiction visionaries of today will turn out to be the harbingers of avionics developments tomorrow? A brave new world, indeed.

And now, I must return to my workshop, as I strive to perfect my Woody Allen inspired "Orgasmatron".

Q: What type of satellites are used to transmit GPS data?

Answer to previous question:

Q: How is an air traffic controller using NextGen technology able to verbally communicate with an aircraft hundreds or even thousands of miles away?

A: Verbal and data communications are digitized and distributed through an electronic networking system

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).* ■

Aging Aircraft? Check Those Records!

What is your first step in determining the condition of an aging aircraft? It should be records research! The records will help you determine the degree of inspection necessary as well as what items may have already been inspected.

Your research will help to identify certain maintenance and usage characteristics of a particular aircraft as well as expose potential areas of attention pertinent to a model type or class. Inspection and overhaul recommendations contained in older GA aircraft maintenance instructions may not provide adequate guidance regarding aging issues.

Therefore, assessing the quality of maintenance and inspections during an aircraft's life is important to determine which parts have been replaced, if corrosion was ever a problem, and other maintenance factors that could lead to a concern with aging. If you are going to work on an older aircraft, ask the owner for all available information so you can establish the maintenance history.

Your knowledge and experience will help to reveal if there are voids or missing information. Advise the owner about these discrepancies and offer to assist getting the information. You can compare research from more general model type issues with individual aircraft information to identify similarities and differences. In effect, this helps answer the question: "Does the information I am seeing on this particular aircraft match the history of the aircraft and type, per available records?"

Once collected, the information will help you and the owner establish a baseline to determine what maintenance, repairs, and alterations have been done and how well the aircraft has been cared for. We encourage you to review, as well as share with the aircraft owner, the publication titled Best Practices Guide for Maintaining Aging General Aviation Airplanes, which can be found at www.faa.gov

This FAASafety.gov maintenance safety tip brought to you by SoCal PAMA. www.socalpama.org

Don't Bother Me With the Facts!

Notice Number: NOTC5112
AKA...Confirmation Bias

An Aviation Maintenance Technician (AMT) hears their radio crackle. Maintenance Control wants them to evaluate damage to an aileron the crew of a departing aircraft detected. After reporting the extent of the damage to Maintenance Control they conclude the aileron damage is allowable, and the AMT defers it according to the company's procedures. The aircraft departs on time. Later the AMT takes a second look at the structural repair manual and learns the focus had only been on the allowable damage table. The team had not noticed the damage was, in fact, in a critical area that required them to consult the aircraft manufacturer. The AMT then realized they had inadvertently released the aircraft to fly with a potentially dangerous flaw. This was a team of very responsible, experienced, people. How can professionals make such a mistake?

Well, when the plan is to get an airplane out on time, human beings will use every tool at their disposal, including mental shortcuts. Mental shortcuts are not bad. They lead to success nearly all the time, the key word here being "nearly". In this case, the people making the decision relied on good judgment, but did not consider a mental bias called Confirmation Bias.

Confirmation Bias refers to a type of mental shortcut whereby an AMT, or any human, may tend to notice facts supporting their decision rather than information contradicting it. People are less likely to accept facts not lining up nicely with what is already "known" or "believed". As the strength of our mental model increases, we tend to ignore or undervalue the relevance of facts contradicting our established beliefs.

A mental bias can lead to unconscious behavior, and it is difficult to prevent what you don't intend to do. So, work as a team. Two heads are better than one, and many better than two. Try to disprove the decision. No one likes a contrary person, but they are happy to have someone keep them from making a big mistake. Listen to the new guy. They have not had the opportunity to become familiar with the operation "norms", and might be able to point out problems more experienced people won't notice. Adhere to a plan to strictly follow procedures. This will help you avoid cherry picking data to support a risky plan.

— National FAA Safety Team

From FAASafety.gov:

New Design for Mechanic & Repairman Certificates Notice Number: NOTC4498

On January 1, 2013, the Airmen Certification branch of the FAA will begin issuing Mechanic and Repairman certificates with a new design on the back of the certificate honoring Charles Taylor.

Since the introduction of the updated airman certificate in 2003, the Mechanic and Repairman community have requested that FAA issue a certificate that represents the contributions of Mr. Charles E. Taylor, who served as the Wright brothers' mechanic and was credited with building the engine for the 1903 Wright Flyer.

The new design will be printed on all original and replacement airman certificates issued after January 1, 2013, to Mechanics, Repairmen, Repairmen (Experimental Aircraft Builder), and Repairmen (Light Sport Aircraft). Mechanic and Repairman certificate holders are not required to replace their current plastic certificate.

An airman may, if they wish, obtain the new style Mechanic / Repairman certificate with Mr.Taylor's likeness by submitting a $2.00 replacement fee by visiting the Registry's website: **http://www.faa.gov/licenses_certificates/airmen_certification/** by mailing a signed replacement request, or by completing an application for an added rating or other change. Instructions are on the Registry's website.

You can see a picture here: **http://www.faa.gov/licenses_certificates/airmen_certification/Charles_taylor/**

We appreciate your contribution to aviation safety. Have a safe New Year!

— Warmest regards, Dan Ramos

Job Opening to Post?

Get the word out through SoCal PAMA. Send your postings to SoCalPAMA@gmail.com and include company name, logo, position title, location of position, and contact information. The SoCal chapter offers employment & educational opportunity postings free of charge to the aviation maintenance community worldwide.

Volunteers Welcome

Contact Greg Potter or Gail Erwin to get more involved with SoCal PAMA: greglpotter@verizon.net, gailjerwin@verizon.net

SoCal PAMA Website

Advertise your company at SoCalPAMA.org and support SoCal PAMA. It's only $50 for 12 months. Contact Nikki King or Gail Erwin for posting a new ad, renewal fees, or artwork updates: nikki@extraordnair.com, gailjerwin@verizon.net.

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PAMA Mission Statement

The mission of PAMA is to promote continuous improvement in professionalism and recognition of the Aviation Maintenance Technician through communication, education, representation, and support.

SoCal PAMA News

Dan Ramos, Publisher; Gail Erwin, Editor

Central Ohio PAMA

Ohio Governor Proclaims GA Appreciation Month

Ohio state governor John Kasich declared December 2013 to be General Aviation (GA) Appreciation Month in Ohio, which is widely known as the "Birthplace of Aviation."

This was the third consecutive year Kasich had issued a formal recognition of the vital role of general aviation — including business aviation — in the state. Former Gov. Ted Strickland issued a similar declaration in 2010.

In his proclamation, Kasich recognized the impact of all 98 of Ohio's GA-only airports, which provide 17,352 direct and indirect jobs paying a total of $498 million annually. The total employment impact of all airports in Ohio is 142,800 jobs, with an annual payroll of nearly $3.2 billion.

In total, Ohio's GA airports annually contribute nearly $5.56 billion, or $478 per capita, to the state's economy, while the total aviation impact within the state is $10.5 billion.

The governor also noted the "vital role (of GA) in the state's response to emergencies and natural disasters," and praised the industry's contribution to "the continued flow of commerce, tourists and visitors to our state."

Ohio is home to 60 charter flight companies, 131 FAA aircraft repair stations, two fractional aircraft operators and 13 flight schools, which operate 95 aircraft and provide 251 jobs. There are also 124 fixed base operators serving the state's 84 public-use airports. Additionally, Ohio has more than 10,000 GA aircraft and nearly 25,000 pilots.

National Business Aviation Association Midwest Regional Representative Bob Quinn noted that Ohio is considered by many the 'Birthplace of Aviation," since Wilbur and Orville Wright grew up in Dayton, Ohio, and conducted the majority of their experiments and flights in a field just south of the city.

To date, 49 states have officially recognized the value of GA and business aviation, with all proclamations including at least some of the basic tenets of the No Plane No Gain campaign. Launched in early 2009 by NBAA and the General Aviation Manufacturers Association, the campaign is a joint public awareness initiative to educate Americans about the importance of business aviation to our country and its communities, companies and citizens.

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Atlantic AME Association

News and Notes from the CFAMEA AGM

The Canadian Federation of Air Maintenance Engineers Association (CFAMEA) annual general meeting (AGM) was held this past September 2013 in Calgary, with all five associations represented, including Atlantic AME, at a meeting with Transport Canada. Two items remained from the previous AGM including Navtech Flight Plan (NFP) changes still to be made, and aspects of the Red Seal Program still being worked on.

There was also discussion regarding CFAMEA's function, raison d'etre, services for members, and representation in Ottawa. No consensus was reached and further discussion was deferred. It was agreed that the emphasis of our associations is to AMEs rather than AMOs; however we need to discuss how AMOs, "technicians" and others relate to us.

Only one Hall of Fame nomination was received. The Atlantic nominated Randy Calvin Ross, and his nomination was accepted.

The delegates were updated about the display of the AME Hall of Fame at the National Aviation Museum. The display boards require a maximum 120-word synopsis per person. We are responsible for the costs to make the display (we would have to find a sponsor), but installation would be made by the museum. Discussions with the museum staff are continuing.

There was a discussion on whether Canadian colleges will produce sufficient AME replacements going forward and the use of the Red Seal program. Further discussion is required with Transport Canada and the outdated requirements of 566. Each province has its own education requirements, while industry with advice from our associations must continue to push for changes to ensure adequate personnel in the aircraft maintenance field.

The financial review indicated a positive bank balance of approximately $15,000. Expect that there will be approximately $8,000 in expenses for the remainder of the year. The budget for 2014 was approved based on 2013 budget and expenses, with monies used on website development this year being used for legal and NFP corporate registration next year (total amount $19,000), which will result in an expected assessment of about $13.74 per member. Due to the Pacific Association's inability to pay their 2013 assessment, it was decided to write off their outstanding contribution as a bad debt. Due to the non-payment of their assessment, in accordance with the bylaws, the Pacific Association was not allowed to vote at the AGM. A motion was passed to allow Pacific voting status upon their payment of the 2014 assessment in January. For the last two years, Pacific had serious financial losses due to poor attendance at their annual workshops.

The 2014 CFAMEA AGM will be held September 14-15 in Halifax at the Westin Hotel.

Also of note, the 2014 ARAMS will span three days, April 23-25, 2014 and will be held in St. John's, Newfoundland at the Sheraton Hotel.

For more information visit www.atlanticame.ca

ARAMC to Meet with Feds in April Panel

The Atlantic Region Aircraft Maintenance Conference (ARAMC) is scheduled to hold a Transport Canada Panel, April 24, 2014. We have not had a TC panel for the last few years, primarily because of lack of audience participation, but this can be a very effective means of communicating with TC at the regional and federal level, and I'm sure there are many concerns and questions that should be asked. This is an excellent opportunity to clarify grey areas and possibly improve the level of service within the region.

If you have any concerns, questions or complaints regarding industry and government issues please let me know and I will make sure they are all addressed at the panel. If your identity is a concern, there is no need to provide your name if you would rather not.

I know there have been concerns regarding the level of service and the wait times for replies from some TCCA offices. Examples of these would be beneficial in trying to solve the problem. TC will be made aware of any concerns or questions that will be presented, which will allow for well-prepared responses.

The questions from the floor are very valuable and open some great discussions. There is no concern that is trivial; if it affects you performing your jobs, it warrants discussion.

Hopefully we will have a lively panel and get some problems out of the dark and solved, or at least discussed. Some senior people from the headquarters and regional level have been invited to participate in the 2014 Panel, and your input in these discussions is valuable.

— Ben McCarty, Atlantic AME President
mccartyb@nb.sympatico.ca

News from the Rock

By Mel Crewe

While vacationing with my family in P.E.I. this past summer, I took time to visit Vector Aerospace in Summerside and 3 Points Manufacturing and Aerospace in West Royalty outside Charlottetown. Vector has about 450 employees and the main scope of their business is the repair and overhaul of Pratt and Whitney series engines. From the receiving to the component over-haul, NDT testing, engine run-ins and calibration, to the shipping section, these dedicated and conscientious employees turn out a great product.

Over at 3 Points Manufacturing and Aerospace, Eric Richard walked my son Stephen and I through the operation, from the receiving bay to the final certification and shipping. They manufacture parts for some Pratt and Whitney engines as well as parts for just about every De Havilland Dash 8 series aircraft in the world. From a flat piece of metal laying in a box to a certified lever for a door assembly, it passes through a number of computerized milling machines and various stages of testing before final certification.

Since I returned home from holidays in late August, I have been busy. On October 9, I attended the Regional Aviation Safety Council

meeting as a representative of the AME Association (Atlantic) Inc. and ARAMC 2014. I had the opportunity to address some concerns and promote ARAMC 2014. One item addressed by Dr. Heather Langille, Regional Aviation Medical Officer, was the medical requirements of pilots and air traffic controllers. My question was, "Do you see medical requirements for AMEs in the future?" There are no talks at present and they cannot foresee any in the near future. I am sure this may be an issue in years to come.

Recently, I visited a few operators around the airport to get the latest news. Over at Universal Helicopters Newfoundland Limited, things are pretty quiet. The Bell 407 normally based in St. John's has returned to Gander for a 1,200-hour inspection, and a Bell 206L is replacing it on a term basis. Once the inspection by Keith Bauld and his maintenance staff in Gander is completed, it will return to St. John's.

My next stop was at the Canadian Coast Guard Helicopter Section where I spoke to the maintenance staff. Senior Engineer Tim Sheppard was away attending a seminar at Bell Helicopters in Calgary and was expected home in a few days. Engineer Guy Beazley had just returned from the Arctic after spending six weeks on a ship, and Dan Ennis, Chris Hann and Brian Osmond were at the base maintaining the Bell 212 and a BO-105. Not long ago, the Canadian Coast Guard lost a helicopter in the Arctic, claiming the lives of its pilot, ship's captain and a research scientist. The aircraft was based on CCGS Amundsen and was conducting ice research at the time of the accident. Autopsies revealed the three died of hypothermia. The aircraft was recovered and is currently en route to the Transportation Safety Board facilities in Ottawa for investigation. On behalf of the Association, I would like to extend deepest condolences to the families of the victims.

Over at Provincial Air Maintenance Services Inc. (PAMSI), modifications had been completed to the fleet of Canadair CL-415Ts owned by the Government of Newfoundland and Labrador. Staff at PAMSI also completed mods on CL-415Ts (six thus far, one currently in the hangar and one to come) for operators based in the Far East. The identification of the countries owning these aircraft is confidential. The maintenance staff recently completed an overhaul of a King Air 200 as well as Medevac mods to a King Air 200 owned by the Nova Scotia Emergency Medical Service. During the late summer and fall, PAMSI had a maintenance crew working on a CL-415T which had crashed in a lake in Western Labrador. The crew had to remove the aircraft from the lake, remove the large components, and assess the damages for the insurance company. The aircraft was a write-off and sold for scrap. The crews had to endure some rough conditions as winter sets in early in western Labrador. Kudos for a job well done.

When I stopped by the Transport Canada Service Centre, Technical Team Leader Charlie Warren and his team of inspectors, Larry Drover, Gary Perry, and Keith Parsons were busy adjusting to the new SMS, which is still being implemented by Transport Canada. The team of inspectors have been continually busy doing Program Validation Inspections (PVIs) and PIs (Process Inspections) on operators around the island. Since our last newsletter, inspectors Peter Quan and Sandy Hayward have left Transport Canada seeking employment in the commercial sector. We wish them well in their future endeavors.

A visit to Newfoundland and Labrador Government Air Services found Maintenance Supervisor Jeff Pollett and his team of engineers based at St. John's maintaining two Beech King Air 350s which are on medevac standby for the province. Another Beech King Air 350 is based at Goose Bay, Labrador. Engineers Ralph Roberts, Peter Snow, David Walsh and Avionics Engineer Chris Morris are kept busy keeping these aircraft operational on a 24/7 basis.

I also found Bob Whittle (Maintenance Training Engineer and Base Aviation Safety Officer for the St. John's base) who said the company remains extremely busy at the main hangar as well as the recently constructed Search and Rescue facility located on the airport. Cougar Helicopters Inc. currently operates eight Sikorsky S-92As from its St. John's base locations and two Sikorsky S-92As from its base at Halifax. These aircraft support the oil drilling platforms as well as the production platforms at the Hibernia field, White Rose and Terra Nova oilfields. With the new Ben Nevis field and Hebron fields under exploration, it is a common headline to see in the local papers of another significant oil discovery of wells being tested in the ocean off our coast. The future looks bright for the company.

mdcrewe@gmail.com

PACIFIC AME ASSN

Pacific AME Association

Back to the Drawing Board

The Canadian Business Aircraft Association held a very successful convention this year at west coast-based London Air. With almost 600 delegates and an overcapacity venue, CBAA 2013 in Vancouver was one of the association's most successful conventions in years. IS-BAO – IBAC Standards training on Wednesday and IBAC Auditor training was provided on the Friday, in addition to the many other good seminars provided throughout the three-day conference. Exhibitors included Bombardier, Cessna, Falcon Jet, and Phenom, to name a few, while trade show booths included Aviall, Kadex Aero from Calgary, Maxcraft Avionics, Westar Aviation, Training Port.net and others. Check out the **www.cbaa-acaa.ca** for more information.

CBAA has the same problem as that of other AME Associations: "What do they do for me?" is always on the mind of its members. "In a nutshell, CBAA works to make sure that the rules and regulations are fair and that governments in Canada and around the world understand the importance – and needs – of business aviation."

CBAA has very strong leadership with fingers in the International Civil Aviation Organization (ICA), and lobbyists in Ottawa—all the things we would like to have in the AME Associations. But they have one thing we do not have, and that is money. Their resources are plenty compared to ours, and they have power in numbers. The businesses that belong know that the bigger the membership, the better the results. So contact us, and get involved.

— Bob Rorison , President PAMEA
pamea@telus.net

That's Another Hit!

During the past few months, PAMEA members have been accessing the new website **www.pamea.org** in good numbers. Between July 1st and September 24th, over 500 hits were recorded. Payment online has been very successful, with over 70 percent of members paid by PayPal and the remainder by cheque. Our future-networking model will give all members access to training, tech support and safety alerts anywhere, anytime, where data links are available. We will reach AMEs throughout British Columbia and Canada. PAMEA's goal is to continue to develop the new website, which will be interactive with today's AME and the "Next AME Generation".

Highlights of what you will be able to load on your desktop PCs, Notepads, iPads and smart phones include networking through a live forum, online training modules, advertising space for corporate members and AME Members, a jobsite for resumes, and the online newsletter.

See You at the Show

The Pacific Air Maintenance Engineers Association tradeshow "For the Love of Aviation" (Rekindle the Passion) will be held February 13-14 in Richmond, BC, with the Sheraton Hotel on Westminster Highway as the host venue. Plan on attending! For more information visit www.pamea.org

WESTERN AME

Western AME Association

The Fly in the Ointment

I recently attended a Transport Canada-approved Canadian Air Regulations (CARS) and a Safety Management Systems (SMS) course. However, there is, in my view, a fly in the ointment in the CARS and SMS for the flying public — particularly dealing with some general aviation operators.

I understand the CARs have no means of empowering responsible Aircraft Maintenance Engineers (AMEs) to remove an aircraft from public service, knowing it does not conform to the standards consistent with the issue of its Type Certificate. From the a/m courses, it's apparent that any decision to use (or not use) an aircraft "beyond" its Type Certificate approval is now the prerogative of the Accountable Executive (AE) by way of the CARs and implementation of the SMS. The problem, as I see it, is summarized by Dave Dueck (Canadian Aviation Safety Management Dave Dueck chapter A.5-3, line 16).
"There are no qualification requirements to become an AE!"

The CARs, combined with the SMS ideal, create a disturbing parallel to the conditions of Aviation in Northwestern Ontario prior to the "accident that was allowed to happen" (Moshanski Inquiry into the 1989 Air Ontario crash in Dryden, Ontario). In other words, there was little or no regulatory presence in NWO when that crash killed 24 people from Thunder Bay.

— Martin Doyle, WAMEA Board member

2014 WAMEA Symposium to Focus on Human Role

The Western AME Association's 2014 annual symposium will examine the human role in events that cause an aviation occurrence and develop ways to prevent or lessen the seriousness of the occurrence. The 2014 Symposium will be held March 19-21 at the Calgary Coast Plaza Hotel and Conference Centre with 50-plus industry trade show exhibitors, seminars for fixed and rotary wing, in-depth mini courses, a banquet, and Max Ward Award. **For info, visit www.wamea.com**

AME Association of Ontario

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AME Workshop and AGM

Our annual AME Workshop is scheduled for September 24-26, 2014, so please save the dates to your calendar. Again this year, we will have two days filled with educational sessions as well as a full house of displays from industries supporting aircraft maintenance. Should you have any suggestions for any particular courses, or if your company would like to contribute to any displays, please contact the Workshop Committee. We expect that the Association's AGM will be held on the Thursday morning. Currently, we are seeking nominations for our annual awards as well as suggestions for Hall of Fame nominations. Please visit www.ame-ont.com for details or contact your area director.

Training for the Aviation Community

In addition to the seminars offered at our annual workshop, the AME Association of Ontario supports the effort to offer training opportunities to the aviation community. We have developed several courses that we offer to our individual members and corporate sponsors, and we are always willing to develop additional courses on demand.

For more information, or to participate in a course, please contact our Director of Training, John Longo: association@ame-ont.com

New Mailing Address

Please note that we have a new mailing address. Phone and fax numbers remain the same.

Our association has been, and continues to be, fortunate to receive the support of many corporations with whom we are involved in the aircraft maintenance industry. These involvements allow us to keep operating costs down and we are able to integrate our operational requirements within the physical properties of these businesses. For many years we have been using Hope Aero's address as our own to receive postal and couriered items. However, the recent move of Hope Aero has required us to obtain a new mailing address. Thank you to Hope Aero for your support, and we wish you much success in your new expanded location!

We also thank Skyservice for arranging for and supplying us with our new postal box:

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Submitted by Stephen Farnworth
For the Board of Directors

Someone in your shop definitely needs to know "the regs" if the plan is to sub-contract work this year. Yes, there are TC rules for that, and yes, they can be confusing. But Norm Chalmers is here with translations.

Deep inside CAR 573

BY NORM CHALMERS
Pacific Airworthiness Consulting

I am writing this in late December, but by the time you get this, the Christmas and New Year holiday period will be a distant memory. I hope that you, our treasured readers, have had a safe holiday and are reading this in good health.

Speaking of the Canadian Aviation Regulations (CARs), here we go again. Let's talk about subbing out work by Approved Maintenance Organizations (AMOs). CAR 573, which governs the operation of AMOs, allows the AMO to consign work to other AMOs. This consignment of work is often referred to as "contracting out" or "sub-contracting" even though there is no written contract other than a purchase order and often a quote approval record. The CAR also allows consignment of work to be performed by non-AMO organizations, and therein lays the problem we explore here. As an AMO subbing out work, you will need to consider many kinds of requirements. To begin, we look at the CAR 573 and Transport Canada Approved Standard (STD) 573 requirements.

Regarding your AMO's TC approved manual, STD 573.10-(1), paragraph (v) requires that your Maintenance Control Manual/Maintenance Policy Manual (MCM/MPM) contain this: *Details of the procedures used to approve maintenance arrangements entered into pursuant to section 573.11 of the CARs, and a list of all such arrangements. Where such maintenance arrangements are made, the information provided in the MPM shall include details concerning the assignment of responsibilities for the certification of the work performed, and for the extension of the AMO quality system to address work performed under the arrangement. Where no such arrangements exist no approval procedures are required.* (Continued on page 28)

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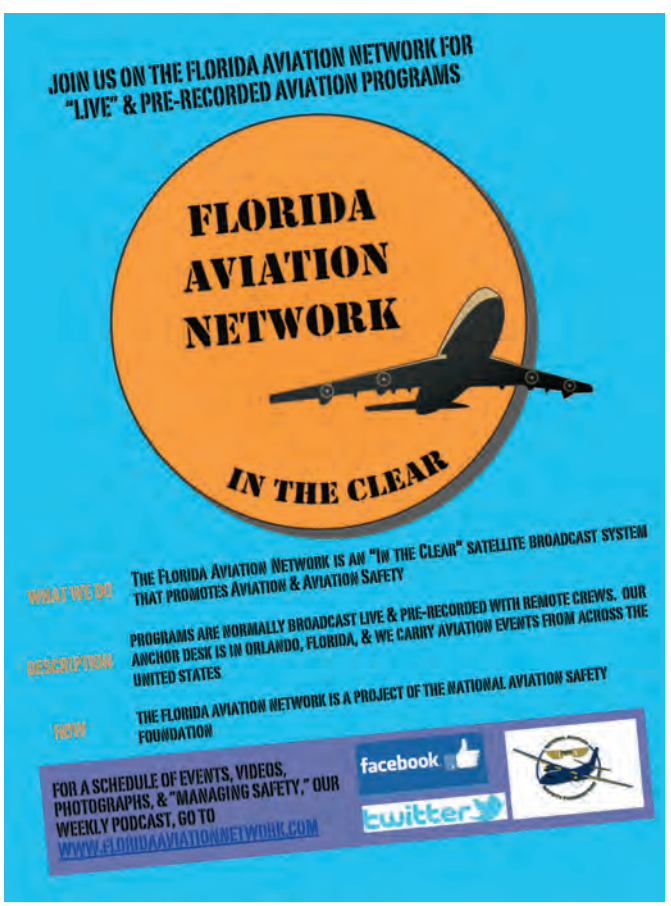


You must specify how you deal with the certification of the work. I usually recommend that companies require a Form One. It also requires you to specify how you extend your quality system to include your non-AMO suppliers. TC has largely ignored this topic in the past, providing little guidance material.

Regarding who you may send work to, CAR 573.11 (1) states: *Except as provided in subsection (2), no approved maintenance organization (AMO) certificate holder shall permit an external agent to perform maintenance on its behalf unless . . .*

This goes on to establish that paragraphs (a), (b) and (c) are complied with. Those three paragraphs relate to "approved" companies and don't relate to this issue.

Regarding the sending of work to the non-AMO, CAR 573.11(2) states: *Subject to subsection (4), an AMO certificate holder may permit work to be performed by an external agent other than an agent described in subsection (1) where the work is performed in accordance with an arrangement that provides for it, under the direct supervision of the person appointed pursuant to Section 573.03 or 573.04 and certified by persons authorized to do so in accordance with the approved procedures set out in the AMO's Maintenance Policy Manual (MPM).*

This is for work done by non-AMOs and requires that your PRM directly supervise the work. It then goes on to require that your Aircraft Certification Authority (ACA) or Shop Certification Authority (SCA) personnel certify the work.

Regarding how you manage usage of non-AMOs we go to CAR 573.11(3) which states: *Arrangements respecting work to be performed by external agents pursuant to subsection (2) shall be made in accordance with procedures governing maintenance arrangements set out in the MPM or, if no such procedures are set out in the MPM, shall be approved by the Minister as ensuring conformity with the requirements of this Subpart.*

This is the regulation that mandates compliance with the STD 573 and with your MPM (or MCM). Regarding how you manage each job sent out to the non-AMO we go to CAR 573.11(4) that states: *An AMO certificate holder that requests an external agent to perform work shall*
(a) *where the work is to be performed pursuant to subsection (1) or (2), be responsible for specifying the tasks to be performed by the agent and ensuring completion of the work; and*
(b) *where the work is to be performed pursuant to subsection (2), be responsible for ensuring the conformity of that work with the requirements of Subpart 71.*

Paragraph (a) above requires your certificate holder to record the work requested, regardless of where or to whom you send the product to get the work done. Paragraph (b) above requires that your certificate holder ensure compliance with all of CAR 571, which is a lot of stuff, including calibration of measuring devices, i.e., gauges.

We read in STD 573.11 *(2) Where an AMO certificate holder requests that an external agent perform work, the AMO is responsible for specifying the tasks to be performed, and, in addition, when that external agent is not the holder of an AMO certificate, or a foreign equivalent, the AMO is also responsible for the completion and certification of the work under Subpart 571 of the CARs.*

This standard reiterates CAR 573.11(4), emphasizing the responsibility for certification of the work.

Continuing on in STD 573.11 paragraph (3): *For the purposes of this section where an AMO has a maintenance arrangement for the performance of work with an organization other than an AMO, "direct supervision" means that the person from the AMO tasked with certifying the work personally ensures compliance with section 571.11 of the CARs.*

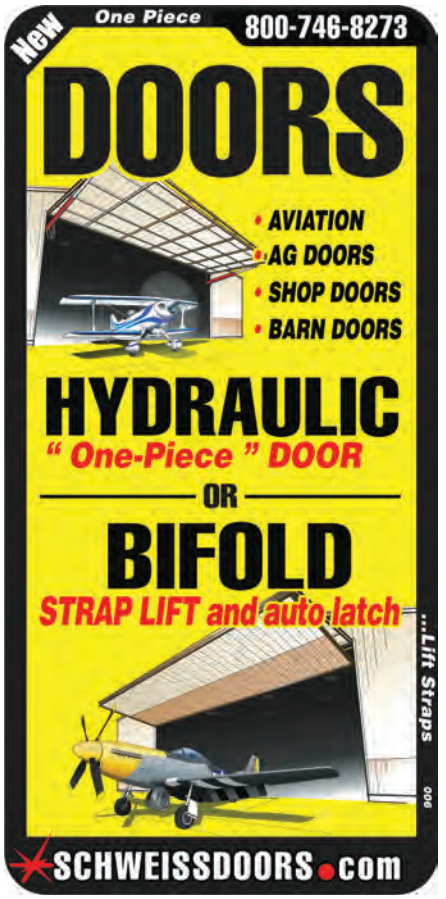
In conjunction with STD 573.11(3), we must read the regulation as follows: CAR 571.11 *Persons Who May Sign a Maintenance Release*
(6) If a maintenance release is signed by a person in respect of work performed by another person, the person signing the maintenance release must personally observe the work to the extent necessary to ensure that it is performed in accordance with the requirements of any applicable standards of airworthiness and, specifically, the requirements of sections 571.02 and 571.10.

The STD 573.11 and the CAR 573.11 together require the ACA or SCA from your AMO to (and I repeat the quotation for emphasis) "personally observe the work to the extent necessary..." The term "to the extent necessary" has been a conundrum of long standing without a satisfactory resolution. This does require that some level of personal observation of the work be accomplished. TC has not provided any guidance regarding the extent of that personal observation. It could be interpreted as meaning whatever personal observation has been required to detect or prevent errors that are otherwise undetectable. They might be discovered through the failure of the part, engine or aircraft in service. In the event of an in-service failure, you will know that the extent of the personal observation of the work was not sufficient. Until then, it seems to have been OK.

To summarize this, the regulations and standards support the supposition that you are managing these non-AMOs as extensions of your own AMO. All the measuring equipment involved in your work is calibrated. All the personnel doing work for you have been trained as per your MPM/MCM, including human factors training.

Now for something completely different. Last issue, I gave you an update on a TC legal action against Mr. B. who was fined. He appealed the fine against him in the Transportation Appeal Tribunal of Canada (TATC). That decision has now been posted on the TATC internet site at: **www.tatc.gc.ca/decision/decision.php?&lang=eng**

TC lists their administrative enforcement actions for both private and commercial people and companies at this



URL: **www.tc.gc.ca/eng/civilaviation/standards/standards-enforcement-publications-menu-2963.htm**

If you are, or have been, on the receiving end of a TC enforcement action, I encourage you to visit these sites. The list of corporate offenders shows the names of the companies and one sentence statement of the allegation. These statements give almost no information. One such statement goes like this: "The Company failed to comply with the policies and procedures contained in its Maintenance Control Manual." This one showed a fine of $3,500.

If you believe that you have been unfairly charged and punished, appeal to the TATC — a member may agree with you. The TATC often agrees with the appellant to some degree and eliminates or reduces the penalty.

The cryptic statements of allegation given by TC on its website normally give no detailed or useful information regarding what the company did, which may have been something minor. Examples of totally unnecessary stuff that I usually see included in MPMs and MCMs are the job descriptions. If some clerical function is specified in your manual and it is not done, or has been done by another person, then you are open to being charged and fined. Another example is the inclusion of form numbers for the procedural forms being used.

Whatever the actual offence, if you are charged, you ought to consider exercising your right to appeal as stated on the TC Notification form. You do not need a lawyer. Most of the information you need is on the Notice form that TC gives you and on the TATC web site given above.

The above quoted charge against the company includes the words "failed to comply with the policies and procedures." Referring to CAR 573.10 (2)(a), the CARs allow you to reduce your MPM and/or MCM contents to include only your policies on what actions you take to comply with the CAR and STD 573.10. Having a separate procedures manual does not relieve you of compliance when those procedures and other documents are referred to in your MPM/MCM.

If you do receive one of these TC enforcement actions and do decide to appeal it, TC often does not fully comply with your request for disclosure of information. You can get this information by applying to the federal government Access to Information and Privacy Office. Visit the following Department Of Justice site to find and submit both applications (the Access to Information Request Form and the Personal Information Request Form): **http://justice.gc.ca/eng/trans/atip-aiprp/**

You may be surprised by what you read. After scanning the TATC files, I note that there are few, if any, appeals of TC enforcement actions for non-compliance with MPM/MCM requirements. The minister has little or no useful guidance material available to airworthiness inspectors in either the approval of MPM/MCM documents or in the area of making value decisions regarding enforcements. The philosophy governing TC is that Civil Aviation Safety Inspector (CASI) will learn through on-the-job training. Note that the trainers also have had no training. That is another example of the disconnect between the Tower and the reality of life. *(Continued on page 32)*

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> . . . SMS is creeping along, but the rest of the TC infrastructure is stagnating . . . Transportation regulations seldom or never get onto the political agenda and are managed by the abecedarian bureaucrats dropped into TC from unrelated fields.

With the tunnel vision displayed by the Tower, SMS is creeping along, but the rest of the TC infrastructure is stagnating and is gradually being turned over to professional bureaucrats who are usually amateurs in all aviation matters except fastening their seat belts as instructed.

Speaking of stagnating, at the time of writing this column, the minister advises us about CARs amendments at this site: **www.tc.gc.ca/eng/civilaviation/regserv/cars/menu.htm,** *"There was no scheduled amendment for December 2012 (2012-2). The next amendment is planned for the end of 2013 (2013-1)."* I might take pleasure in advising the minister that time marches on. However, I realize that the minister does not read, understand or care about this stuff. Transportation regulations seldom or never get onto the political agenda and are being managed by the abecedarian bureaucrats dropped into TC from unrelated fields. As in The Tower on the Thames, many of our civil servants aspire to the position of Royal Executioner (just joking).

Now that we are clear on everything, I think that's enough for this issue. Take care and be good.

Please be aware that I am not a lawyer or legal expert. What I write in my column is not legal advice or legal opinion.

If you face a legal issue, you must get specific legal advice from a lawyer and preferably one with experience in the aviation matters in your own country.

NORM CHALMERS *worked with Transport Canada as an Airworthiness Inspector for 25 years. Before this, from 1967 to 1983, he worked in the aircraft maintenance industry in and around Western Canada and in the Arctic. His industry experience includes the operational maintenance of normal and commuter category aircraft and smaller transport category aircraft in the corporate sector as well as several years working in major repairs in the helicopter sector. As an Airworthiness Inspector, he has been responsible for most duties related to the position, including the approval of all aspects of maintenance, manufacturing, training, and responsibilities related to distribution organizations. Norm now operates Pacific Airworthiness Consulting; www.pacificairworthiness.ca.* ■

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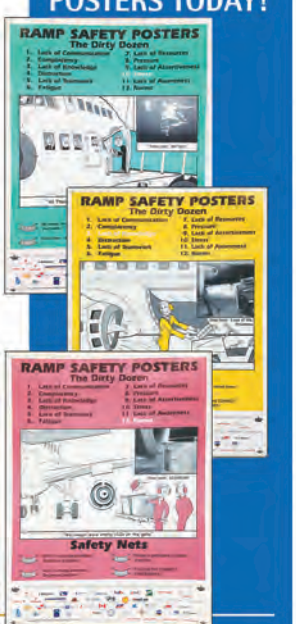

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REMEMBER!
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Engine installation: better stick to the plan

BY STUART McAULAY

Previously, we looked at the standard protocols of piston engine removal. In theory, engine installation is simply the reverse procedure, right?

Last issue, we reviewed some of the considerations in preparing for the removal of a typical piston engine for repair or overhaul. *(Read "Steps to consider when performing a piston engine removal" Dec/Jan. 2013-14.)* The installation of that same engine or an exchange engine after repair or overhaul is theoretically the removal steps in reverse, but with the right preparations to ensure that we have the necessary parts, tooling and equipment on hand. Planning ahead to ensure that all of the requisite resources are available will allow the installers to perform the job with minimal interruptions or delays.

The first step is to review the work order or task card to determine whether there are any other tasks to be done while the engine is out, and to become familiarized with the details for the install itself. For example, the engine may have been serviced with preserving oil, which would need to be drained before servicing with the recommended operating oil. It was suggested in the previous article that engine accessories should be cleaned, inspected and overhauled if necessary according to their instructions for continued airworthiness. Check that these items were already dealt with and are ready to be re-installed with the proper gaskets, mounting hardware, brackets, etc. Sometimes these components are re-installed as removed with no regard to checking the time in service or general condition of the component. All other engine related items such as the carburetor air box, breather tube and exhaust systems should be

thoroughly cleaned, inspected for condition, and repaired as necessary before re-installation.

It is good practice to actually check the maintenance release details for the engine itself just to be sure that the specifics of the engine work were covered and all pertinent documents are available before proceeding. This serves as part of the overall quality control process covering all aspects of the job. Inspect the primary mounting hardware and replace if necessary. Also check on the status of any fluid-carrying hoses that may be due (or coming due) for replacement, SCAT hoses that are worn, torn or oil soaked. The rubber engine shock mounts are usually replaced at this time.

Inspect the engine controls carefully to verify that these items are still in serviceable condition and that they are not due for any special inspections or replacement according to the aircraft maintenance schedule. Don't wait until any of these items are being re-installed to check them, as you want to ensure that they are ready and available as you progress through the installation process.

Once the engine has been lifted and set into place on its mount, be sure to follow any recommended procedures for securing the mounting bolts, mounts and spacers in a manner consistent with the best maintenance practices for that aircraft. Usually the initial placement and securing of the engine requires a few hands and a hoist operator ready at the controls. Some installations are rather straightforward and require minimal fuss while others require a more careful approach where retractable nose gear wells and fixed cowls become an additional challenge. Anybody who has done these before will undoubtedly have a tried-and-true procedure for coercing the engine into place with "a slight lift here and a gentle nudge there" until team success is realized. Good communication is necessary to maintain sufficient clearances as the whole process falls into place while ensuring that engine controls or wiring are not trapped out of position around the fixed engine mount.

Once the engine has been carefully mounted and secured into position, then the process of hooking up all of the necessary attachments can begin. In some cases, certain lines or hoses may be marked to help with orientation or for clarity of "which one goes where". If pictures were taken of the previous installation, they should be referenced at this time to consider the best routing and positioning of engine controls, fluid lines or wiring. Use this installation process as an opportunity to make better choices regarding routing and orientation or to even correct previous methods that may be less than adequate.

Be especially vigilant when clamping or securing fluid- carrying hoses or wiring between the engine and the steel tubular mount. There must be enough slack in the routing of these items to allow for the natural vibration of the engine due to its positioning on the flexible rubber mounts.

The propeller and associated spinner assembly must be installed in the proper orientation and torqued as per the manufacturer's instructions. Be sure to track the propeller after torquing, and

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safety lock the bolts as required. Engine and propeller combinations that have been previously dynamically balanced must be done again once the re-installation is complete. Checking engine and propeller combinations for dynamic balance is an excellent and often under-utilized tool to identify and correct vibrations inherent with the otherwise normal installation. It is also imperative that any installed modifications in the form of engine analyzers, heating elements or other approved installations are not altered in any way or conflict with the conditions of their installation and related instructions for continued airworthiness.

Completion of the engine installation should always be complemented with a good visual inspection from another person in order to identify any concerns resulting from a different set of eyes on the project. This is a highly recommended practice in other areas of aircraft inspection and is no less critical in this instance as well. Ensure that all clamps, gaskets, protective boots and hardware are accounted for by carefully reviewing your work area. Ensure that the top of the engine is looked over for any tools, shop rags or other foreign debris that may have been left behind. The top of the engine is often a convenient place to leave items that were in your hand one moment and gone the next!

All of the attached engine controls must be inspected by another person who has been trained in the performance of independent checks of control systems. This includes freedom and range of movement, binding, routing, attachment and safety locking. This is a critical inspection and must not

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Installing an engine is painstaking work. Another set of eyes can come in handy. A good visual inspection from another person might unveil something that's been missed.

be regarded as a quick formality performed in haste. The theory of the independent (or dual) inspection is to ensure that we do not repeat the mistakes that have been previously documented in relevant human factors studies.

Some repair or overhaul shops may recommend a specific grade of mineral oil for engines that require cylinder break-in. Refer to the log book entry or warranty to verify any type of oil (or fuel) recommended for the break-in or warranty period. Ensure that the engine is serviced with the proper quantity of oil, and pre-oil the engine if required before start-up. The initial ground run procedure should be performed with the cowls off so that an observer can verify that there are no leaks once the engine is running.

The observer may also be responsible for the deployment of a portable fire extinguisher in the remote possibility that there is an engine fire. This person must be acutely aware of the propeller arc and not get too close to the front of the engine. I usually recommend standing away from the engine and within reach of the wing or wing-bracing strut for safety. If it is determined that there are no operating concerns or leaks from the engine, the cowls can be installed and a further run performed as needed. Proper engine cooling is dependent upon the positioning of the baffle seals. These may need to be checked once the cowls have been secured into place. A thorough checklist is a good tool that can be developed and utilized for the installation and ground run process.

The critical job of installing an engine usually requires a test flight to ensure that all engine systems are operating properly in the normal aircraft operating environment. In order to fly the aircraft after the groundwork is done, it is necessary for the AME to first complete a conditional maintenance release in the journey logbook. This includes the maintenance release for the work completed as well as the independent signatures and an attached requirement for test flight.

Any information required for the final release of the aircraft must also be itemized by the AME and discussed with the pilot. The test flight after a conditional maintenance release must not be a normal revenue flight for commercial operators but should involve only essential crew to confirm the safety of the aircraft before it is returned to service. The pilot must enter a successful test flight as such into the logbook in order to finalize the release (that was only conditional upon a satisfactory test flight).

This overview should serve as a basis for considering the more foundational aspects of the engine installation process. Each engine installation job will require some very specific considerations, depending upon the type of aircraft and/or engine being maintained. Getting back to focusing on details should help address the complacent behaviours we tend to develop over time. Following detailed procedures and avoiding distractions remains instrumental throughout the performance of more involved tasks such as engine installation. More importantly, remember to follow the recommendations from the manufacturer as the basis for a well thought-out engine change process. ■

Vector plots a rising flight line

Continued from page 6

Vector's Regional Sales Director for Western Canada, Eric Hicks (left), and Blackcomb's President and COO, Jonathan Burke, shake hands in front of a Eurocopter EC13084. Photo courtesy of Vector Aerospace.

"We are pleased to work with Vector Aerospace and look forward to future opportunities to strengthen our relationship and enhance our support capabilities for Sikorsky's commercial operators throughout Europe."

Vector Aerospace's facility in Gosport, Hampshire, is a long established provider of maintenance for a range of rotary-wing platforms.

Another milestone for Vector Aerospace UK came in late December 2013 when the firm delivered a repaired French Lynx Mk4 to the end customer. The Lynx is a British multi-purpose military helicopter built by Westland Helicopters at its factory in Yeovil. It was originally intended as a utility craft for both civil and naval usage, but military interest led to the development of both battlefield and naval variants. Now used by at least a dozen nations, the Lynx is said to be the world's first fully aerobatic helicopter, and in 1986 a specially modified version set an official airspeed record for helicopters at 249 miles per hour (400 kmh).

"I am pleased that we have quickly and effectively completed our first international Lynx Depth repair contract in collaboration with Eurocopter," said Ross Powlesland, operations director for helicopters for Vector Aerospace UK. "This contract completion demonstrates that our rotary wing business continues to diversify, in defence and commercial, as we expand into the civil sector and apply our unique knowledge, experience and expertise gained from many years of military MRO provision".

The aircraft arrived at the company's Fleetlands site in early July and was inducted into the facility at the beginning of August. Despite having significant structural repair work, requiring the use of the main build jig, the aircraft was returned to the customer at the beginning of December.

"The completion of this contract is an important milestone for Vector Aersopace UK", said managing director, Michael Tyrrell. "It demonstrated flexibility and agility in meeting our customer's requirements, proving that our technical excellence and lean approach are amongst the best in the MRO industry."

And from Vector's Richmond, BC, headquarters came news that HS-NA had inked a five-year, exclusive MRO support contract with Blackcomb Aviation. This agreement will cover Blackcomb Aviation's fleet of Rolls Royce M250 Engines, Turbomeca Arriel 1 and 2 Engines, and Eurocopter AS350, AS355 and EC130 Dynamic Components.

Blackcomb is a privately owned helicopter and jet charter company, headquartered in Vancouver, BC. The company operates multiple aircraft out of British Columbia bases in Vancouver International Airport (YVR), Squamish, Whistler, Pemberton, Lillooet, Bridge River Valley, Sechelt, Victoria, and also in Arizona.

"Blackcomb Aviation entrusted Vector Aerospace as its Rolls-Royce, Turbomeca and Eurocopter fleet MRO provider because of the superior quality of service and fast turn-times they provide to their customers," said Jonathan Burke, president and COO of Blackcomb Aviation. "We look forward to receiving high quality MRO service from Vector over the next five years through this agreement."

Vector provides nose-to-tail support to more than 3,000 military, commercial and private customers in over 85 nations with MRO services for helicopter operators including engines, components, avionics, structures, parts fabrication and accessories. The company holds designations from four OEMs, including Pratt & Whitney, Rolls-Royce, Airbus, Sikorsky, General Electric and Turbomeca, and employs approximately 2,700 people in 21 locations across Canada, the United States, United Kingdom, France, South Africa, Kenya, Australia and Malaysia.

Vector Aerospace is one of the many major exhibitors attending HAI Heli-Expo 2014, February 25-27, in Anaheim, California. ■

Pictured left — Finishing touch: Holding designations from major OEMs such as Bell and Sikorsky, Vector Aerospace offers nose-to-tail support for helicopter operators, including engines, components, avionics, structures, parts fabrication and even a little detailing after the fact.

Pictured right — Good times: With global expansion on the fixed wing side of operations, and a slew of international service contracts for its helicopter branch, it seems that blue skies and rainbows on the heli-pad are symbolic of the success of Canadian-based Vector Aerospace, which holds designations from four OEMS, including Bell.

Into the Winds of Angel Fire

Mooney M20E, N3484X

Photo: Michael Turri

On March 3, 2013, about 1320 Mountain Standard Time (MST), a Mooney M20E, N3484X, impacted terrain after departing the Angel Fire Airport (KAXX), Angel Fire, New Mexico. The private pilot and three passengers were fatally injured. The airplane was substantially damaged and a post-impact fire ensued. The aircraft was registered to and operated by Verhalen Flyers LLC, Scottsville, Texas, under the provisions of 14 Code of Federal Regulations Part 91 as a personal flight. Visual meteorological conditions prevailed for the flight, which operated without a flight plan. The flight was departing KAXX at the time of the accident, destined to the Dallas-Fort Worth area.

When the pilot arrived at the fixed base operator (FBO), an employee from the FBO questioned the pilot's intent to fly in the windy weather. The pilot indicated that he planned to fly and that the winds would not be a problem. The FBO employee relayed the current wind and altimeter to the pilot when he radioed on universal communications (UNICOM) that he was taxiing to runway 17. The pilot repeated this information.

Due to snow piles on the airfield, the FBO employee could not see the takeoff and next saw the airplane airborne with a significant crab angle into the wind, about 40 degrees right of the runway heading. The airplane rose and fell repeatedly as its wings rocked. Then the employee saw the airplane's right wing rise rapidly. The airplane rolled left, and descended inverted with the airplane's nose pointed straight down.

An eyewitness riding in a car along Highway 434, west of the airport, saw the airplane take off from the runway. The witness perceived that the airplane was struggling to gain altitude. When the airplane climbed between 75 to 150 feet above the ground, the airplane appeared to momentarily hover before the left wing dipped quickly and the airplane descended nose first to the ground.

Personnel Information

The pilot, age 33, held a private pilot certificate for airplane single-engine land. On October 13, 2011, he was issued an unrestricted third class medical certificate. On his medical certificate application, the pilot reported having accumulated 380 total hours. The pilot's logbook was not available for review by the investigator. Paperwork filed with the pilot's insurance company reported that as of October 2012, the pilot accrued 459 hours, with 384 hours in the same make and model as the accident airplane.

The pilot reported to the FBO manager that he had flown the accident airplane for five years. He added that KAXX was the highest airport that he had landed at, although he had flown to some lower-elevation airports in Colorado and Wyoming on previous flights. The pilot's experience flying out of airports with high-density altitude is not known. A cousin of the pilot who lived in the local area reported that the night before the accident he had discussed airplanes and the airplane accidents in the Angel Fire area. The pilot reported to him that flying in wind did not bother him.

Airplane Information

The four-seat, low-wing, single-engine airplane, serial number 1156, was manufactured in 1966. It was powered by a 200-horsepower, fuel-injected, Lycoming IO-360-A1A engine, which drove a two-blade, metal, constant speed Hartzell HC-2YK-1BF propeller. The airplane's logbooks were almost completely consumed in the post-impact fire. Information retrieved showed that the airplane's most recent annual inspection occurred on December 7, 2012, at a tachometer and airframe total time of 4,752.65 hours. The engine had accrued 6,859.85 hours, with 1,736.75 hours since major overhaul. At the accident site, the airplane's tachometer read 4,785.84 hours.

Meterological Information

At 1315, an automated weather reporting facility located at KAXX reported wind from 250 degrees at 33 knots gusting to 47 knots, visibility 10 miles, a clear sky, temperature 47F, dew point 17 F, and a barometric pressure of 29.93 inches of mercury. Utilizing this weather, the density altitude was calculated at 9,549 feet.


Mooney M20E

KAXX and the accident site are located in a basin nearly encompassed by mountainous terrain. Mountains to the west and northwest of the airport have peaks between 10,470 and 13,160 feet. A weather study was compiled for the accident site. An upper air sound for 1400 MST depicted an unstable vertical environment, which would allow mixing of the wind on the lee side of the terrain. Winds as high as 55 knots could occasionally reach the surface. Satellite imagery between 1300 and 1400 MST recorded a large amount of standing lenticular cloud near all of the mountainous terrain around the accident site. These clouds indicated the presence of a mountain wave environment. At 0322 and 1134, the National Weather Service issued wind advisories for the accident area that warned of a west of southwest wind between 25 and 35 miles per hour with gusts to 50 mph.

A Weather Research and Forecasting (MRF) model was created to simulate the accident's weather conditions. The WRF model indicated that the accident site at the accident time was located within a turbulent mountain wave environment, with low-level wind shear, updrafts and downdrafts, downslope winds, and an environment conducive for rotors. The pilot did not receive a weather briefing and it is not known what weather sources the pilot referenced prior to takeoff.

Airport Information

The Angle Fire Airport is located at an elevation of 8,380 feet. It has one asphalt runway, 17-35, which is 8,900 feet long by 100 feet wide. The airfield is nontowered and utilizes a common traffic advisory frequency. The departure runway was runway 17, which has a 0.6 per cent upgrade. An Automated Weather Observing System (AWOS-3) is located on airport property.

Information contained in KAXX's airport/facility directory contains remarks such as "strong gusty crosswinds possible" and "high density altitude probable."

Located in the airport's FBO were posters and literature warning pilots about crosswinds, mountainous terrain, weight and balance, take off performance, density altitude, and runway 17's upgrade.

Wreckage and Impact Information

The airplane came to rest about 0.2 miles south-southwest of the airport. It was located near the intersection of the runway's extended centerline and Highway 434. The initial impact point was a

crater on the highway's shoulder. The crater contained acrylic glass, and near the crater was the airplane's propeller. Fifteen feet east of the crater was the main wreckage, which was inverted. A post-impact fire consumed a majority of the fuselage and empennage. Both wings remained attached to the fuselage and displayed near-symmetric accordion crushing. Both fuel tanks were breached and empty. The left wing's outboard section remained intact, along with its aileron. The inboard portion of the left wing around the area of the fuel tank was consumed by fire to include a majority of the left flap.

The left main gear was thermally damaged and buckled. The right wing remained mostly intact, with its aileron and flap still attached at their respective locations. The right flap appeared set to 15 degrees. The right main gear was extended. The vertical stabilizer and horizontal stabilizers were buckled, torn, and thermally damaged. Flight control continuity was established from the ailerons to the cockpit controls. The rudder and elevator rods remained connected to their control surfaces until just forward of the vertical stabilizer where fire had destroyed and melted a majority of the control rods.

The propeller fractured at the propeller flange, with both blades displaying leading-edge nicks and gouges, deep, chord-wise scratches, and leading-edge polishing.

The airspeed indicator read 81 mph. The attitude direction indicator depicted a left wing low, inverted attitude. The tachometer read 2000 rpm. The altimeter's Kohlsman window read 29.93.

Medical and Pathological Information

An autopsy conducted by the Office of the Medical Investigator of the State of New Mexico noted the cause of death as a result of multiple blunt force injuries. The manner of death was ruled an accident. The FAA Bioaeronautical Sciences Research Laboratory in Oklahoma City, Oklahoma, performed forensic toxicology on specimens from the pilot. Testing did not detect ethanol or drugs. Specimens from the pilot were not suitable to test for carbon monoxide. However, specimens from a passenger were tested and did not contain carbon monoxide.

Additional Information

An old copy of the airplane's weight and balance, marked "superseded 6/28/02", was located in the wreckage. Utilizing the data contained on the form and information on file with the Federal Aviation Administration, an estimated weight and balance was calculated for the accident airplane. Postmortem weights of the airplane occupants were obtained from the Office of the Medical Investigator. These weights were not corrected for clothing or water loss due to thermal injuries. Occupant seats were assumed in the forward positions for better forward centre of gravity (CG). The occupants' baggage was consumed in the post-impact fire and could not be weighed.

An estimate of 10 pounds per bag was given to the six bags reported to be on the airplane. Twenty-eight gallons of fuel were reported to be in the tanks prior to flight. The airplane's weight was calculated at 2,518.77 pounds with a moment arm of 123.98 inches.

In chapter seven of the FAA Aeronautical Information Manual, section 7-5-6 ("Safety of Flight, Mountain Flying") deals with hazards to pilots flying in mountainous terrain.

"High density altitude reduces all aircraft performance parameters. To the pilot, this means that normal horsepower output is reduced, propeller efficiency is reduced, and a higher true airspeed is required to sustain the aircraft throughout its operating parameters."

The chapter went on to describe the nature of air movement in mountainous areas.

"Mountain waves occur when air is being blown over a mountain range or even the ridge of a sharp bluff area. As the air hits the upwind side of the range, it starts to climb, thus creating what is generally a smooth updraft, which turns into a turbulent downdraft as the air passes the crest of the ridge. From this point, for many miles downwind, there will be a series of downdrafts and updrafts." ■

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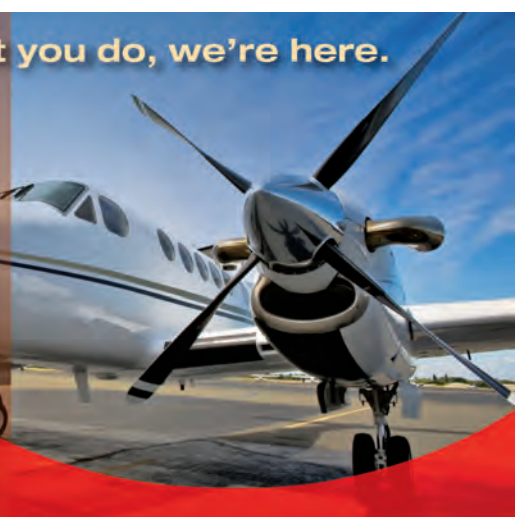

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BY SAM LONGO, AME A&P

Record Radial Reflections

Radial aircraft engines have been droning through the skies since the dawn of powered flight. Despite new technologies that eclipse their early designs, they continue to serve. Two of these engines in particular stand out as milestone motors, forever ensconced in the history of aviation.

In the pre-dawn of July 25, 1909 Louis Blériot readied his fragile monoplane for flight, and after adjusting his helmet and goggles, he tied his crutches to the fuselage, necessary after recent flying misadventures. His mechanic pulled the prop through and the fragile three-cylinder Anzani engine sputtered to life. A small dog barking angrily ran into the whirling six-foot propeller and was killed instantly. Many witnesses felt this to be a bad omen for the precarious flight.

Before his final takeoff roll, the engine was liberally doused with castor oil and his mechanic reminded him to manually pump every three minutes to maintain the pressure. With 17 litres of fuel on board and no navigational instruments he was airborne at 4:41 a.m., just as the sun was breaking the horizon.

Alessandro Anzani was a former Italian bicycle racer who manufactured twin cylinder motorcycles before venturing into aircraft engines. His three-cylinder experimental model in the Blériot monoplane was prone to overheating. Its 206 cubic inches produced 24.5 horsepower at 1600 rpm. Part of the overheating problem was due to the fact that only the top part of the cylinders had cooling fins, and this very nearly ended Mr. Blériot's record-breaking flight. Fortunately, a cooling rain shower saved him from a wet uncertain fate. The 22-mile trip from Calais to Dover was successfully completed in 38 minutes. Many joke that this was the longest any Anzani three-cylinder engine has ever run without catastrophic failure. However in reality, it was considered a state-of-the art engine at the time, and with continuous improvements, remained popular with light aircraft for another 20 years. To put this flight in perspective, it must be remembered that it took place a mere five years after the Wright brothers first coaxed a heavier than air machine skyward for that infamous short hop at Kitty Hawk. Fast forward another 18 years to May 1927 when still another young man decided to tempt fate by crossing a slightly larger body of water. Charles Lindbergh chose his aircraft and engine combination carefully. The Ryan NYP (New York – Paris) was purposely designed for the trans-Atlantic crossing and the engine was a Wright Whirlwind J5 radial.

The Whirlwind was an evolutionary engine. Charles L. Lawrance built his first decent aircraft engine as a three-cylinder radial producing approximately 60 hp. His next development took nine of these same cylinder assemblies and arranged them on a common crankcase to produce the J1 in 1921, a 180-hp radial that would eventually evolve into the Wright Whirlwind.

A merger between Wright and Lawrance produced needed capital to hire more engineers. Samuel D. Heron was at the absolute forefront of air-cooled cylinder design when he was brought on board to improve the efficiency of the J1. His new cylinder head improved breathing and cooling, subsequently boosting overall power, and the J5 Whirlwind was born. At the time it was considered to be the most powerful and reliable radial engine that money could buy. Mr. Lindbergh had seen the 220-hp engine perform in the Bellanca Columbia, an aircraft specifically designed to showcase the new engine, and that combination was his initial choice for the Atlantic crossing. The owner of the Bellanca, Charles Levine, refused to sell the aircraft, causing Lindbergh to seek out the fledgling Ryan Company to build a plane to his specifications. However, there was never any doubt about which engine would pull "The Spirit of St. Louis" aloft, and it was subsequently designed around the venerable Whirlwind J5. The early J5s of that era were designed with rocker arms that required greasing at regular flight intervals. A close inspection of photographs taken of the engine installed in the Ryan NYP reveals one of Lindbergh's necessary modifications. The rocker arm covers have white cylindrical objects attached to their exterior. These were specially designed spring-loaded grease reservoirs for feeding lubrication throughout the long flight. Subsequent models of the J5 eventually incorporated pressure-lubricated rocker arms.

After 33.5 cold, lonely hours Lindbergh's wheels touched down in France on May 21, 1927. That successful flight proved to be of huge significance in the popularity and further development of all radial engines. During the golden age of the piston aircraft, nearly every major manufacturer produced varied models of this tried and true engine design. Its excellent power-to-weight ratio and small crankshaft still lend itself to certain areas of aviation that require quick throttle response and compact simplicity. It often remains the piston engine of choice with crop dusters and floatplane operators worldwide for those same inherent qualities.

They may be greasy, leaky, and bordering on environmental incorrectness with their billowing blue smoke on start-up and raucous racket on takeoff, but like the pioneers that chose them, radial engines have earned our respect for their ability to perform. It is a wonderful thing to realize that in our microchip, touchscreen, throwaway world, old round engines can still occasionally rule the sky! *For more published writing by Sam Longo, please visit www.samlongo.com* ■

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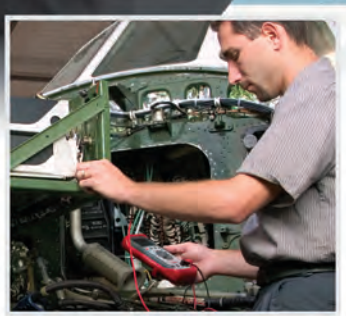

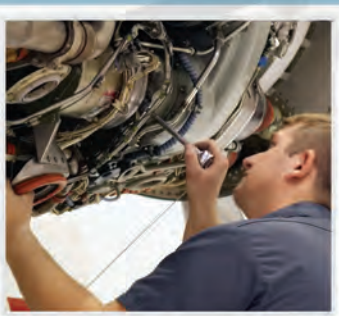

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