

# AVIATION

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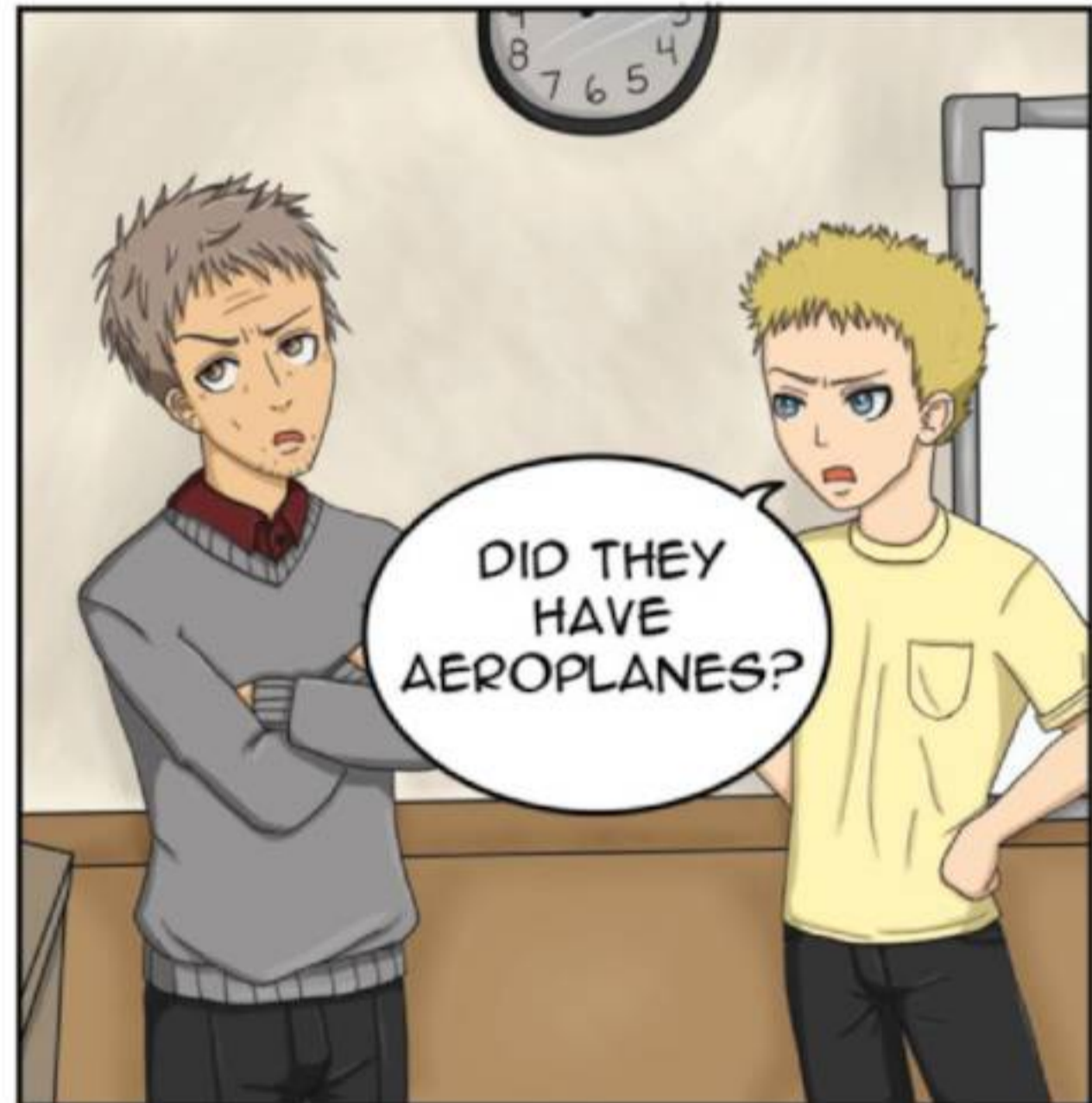
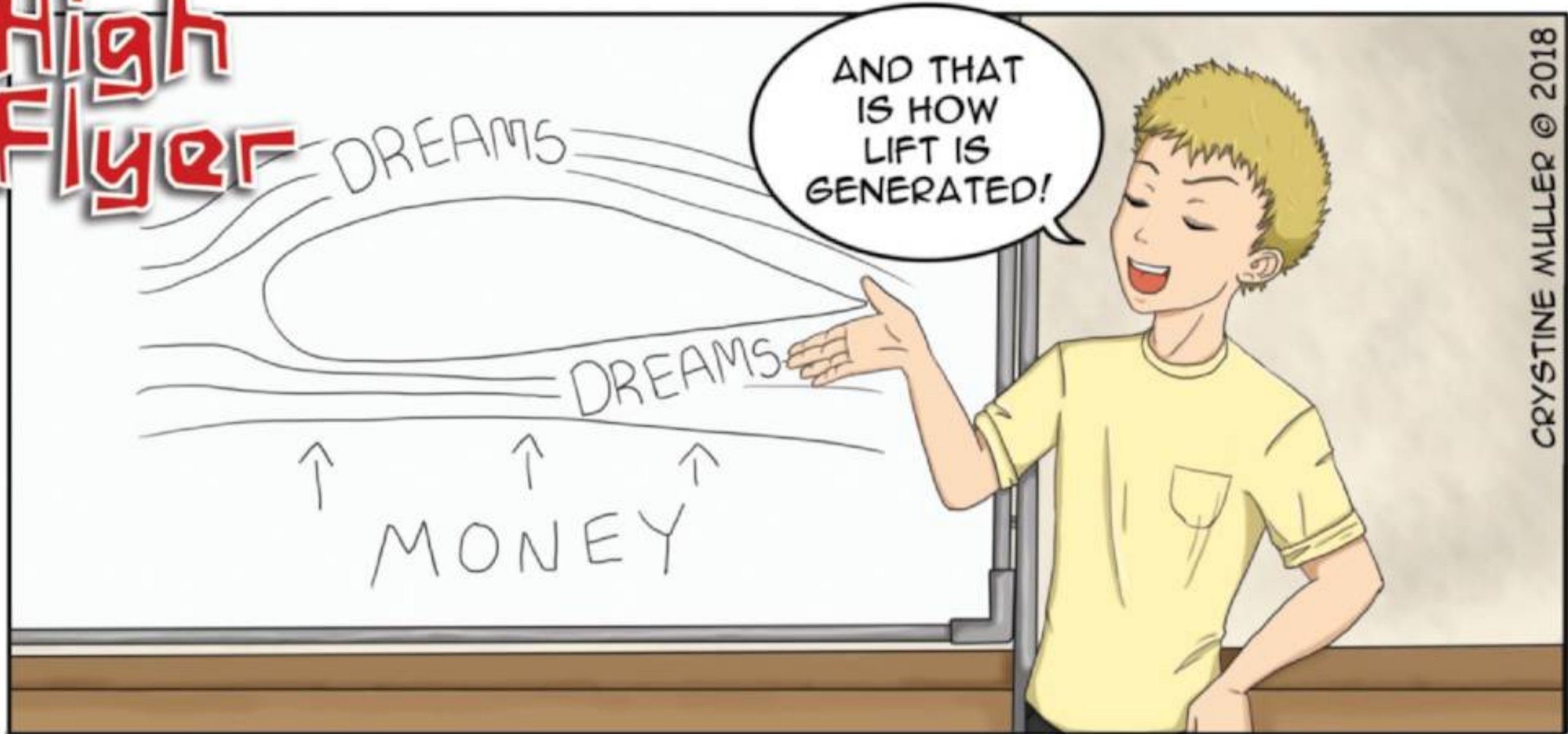
May-June 2018



## De Havilland's LEGENDS

**AVIONICS**  
and  
Aircraft Values

Time for a  
**PROPELLER  
OVERHAUL?**



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**Low Flying Media**

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## Cover: De Havilland Vampire

This month's cover features a De Havilland Vampire. The photograph was taken by Divan Muller at last year's Abbotsford International Airshow.

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# From the Editor

The past few weeks in aviation have been quite eventful, with several incidents and accidents making news headlines in mainstream media. The most notable was the Puerto Rico Air National Guard WC-130 Hercules which crashed near the Savannah Hilton Head International Airport in Savannah, Georgia, during a training mission. Our thoughts are certainly with the friends and families of the nine airmen who died in the crash.

Here in Calgary, a Piper Navajo caused quite a stir by making an emergency landing on what is normally a busy road, near Calgary International Airport. Amazingly, no cars were hit and thankfully nobody was injured during the landing. This happened just a few days after a Bushby Mustang II safely completed an emergency landing on the Coquihalla Highway, south of Merritt in British Columbia.

Meanwhile, the Royal Canadian Air Force has unveiled the new paint scheme for its demonstration CF-18 Hornet, which commemorates the 60th anniversary of NORAD (North American Aerospace Defense Command). The aircraft looks

absolutely stunning and we look forward to seeing it at Canadian airshows this summer. Read more about it on page 8 of this issue of ANJ.

In Europe, Dassault Aviation and Airbus have announced that they will join forces in developing a new combat aircraft, which will replace the Eurofighter Typhoon and Dassault Rafale. Both of these are highly capable generation 4.5 fighters, so we have high expectations for the results of this collaboration. A significant spinoff benefit will be that the programme itself will no doubt strengthen the European aerospace industry. We reported on this news on our website, [www.aviationnewsjournal.com](http://www.aviationnewsjournal.com), where we will continue to publish topical news. This frees up magazine space for educational articles and high quality photographs. As a side note, be sure to turn to page 30, where you'll be able to read the first of a new series of short articles, in which we remember the pioneers of the aviation industry.

Until next time, fly safely.

Divan Muller

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# Aviation News

## BOMBARDIER'S GLOBAL 7000 BREAKS WORLD RECORDS AND WINS AWARD

The Global 7000 is now the largest and the longest range business jet ever built, and is able to fly a full 300 nautical miles farther than initial commitment. This highly anticipated aircraft is on track for its first delivery during the second half of 2018, with more than 1,800 hours of flight testing accomplished and interior completions well under way at Bombardier's facilities in Montreal.

The Global 7000 features four distinct living spaces, a complete kitchen and a full-size crew suite. Having completed multiple long-range flights around the world, the Global 7000 now boasts a tremendous range of 7,700 nautical miles, connecting more city pairs than any other business aircraft.

"We are thrilled to offer this extended range to our loyal customers, who are the driving force behind our engineering feats and who will soon own an aircraft that simply has no

peer," said David Coleal, President, Bombardier Business Aircraft. "Not only are we standing by our commitment to begin delivering Global 7000 aircraft this year, we are exceeding expectations along the way."

The new 7,700-nautical-mile baseline range will be a feature on the Global 7000 for all existing and future customers. The flight test programme is progressing according to plan, with all five test vehicles in flight. The flight test programme, which began in November 2016, has completed more than 1,800 hours of flight testing and is currently finalizing certification for the aircraft.

With a maximum operating range of 7,700 nautical miles, the Global 7000 can fly farther than any other business jet. The aircraft was widely publicized as being able to connect some of the world's most expansive city pairings, including such routes as New York to Shanghai, and Singapore to Seattle. Today, Bombardier can confirm that with its extended range, the Global 7000 aircraft is the only business aircraft that can connect New York to Hong Kong, and Singapore to San Francisco.

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*Global 7000 - Images courtesy of Bombardier Inc.*



Just five months into testing, this high-speed aircraft set a record as the largest business jet to operate so close to the sound barrier, reaching a milestone top speed of Mach 0.995.

The Global 7000 has recently earned a Red Dot in the *2018 Red Dot Award: Product Design*. Established in 1955, the Red Dot Design Award is a prestigious international design competition and one of the most sought-after recognitions for design and innovation excellence worldwide. This year's winners were announced on April 9 in Essen, Germany.

Bombardier's Global 7000 business jet was selected by the 39-person jury from among a crowded field, with more than 6,300 submissions from close to 60 countries competing in

several categories. The state-of-the-art aircraft received the Red Dot in the *2018 Red Dot Award: Product Design* in the ships, trains and planes category. The strict judging criteria focused on the level of innovation, functionality, formal quality, ergonomics and durability, among others.

"Success in the competition is proof of the good design quality of the products and once again shows that companies are on the right path. When I speak about good design, I am referring to more than just an attractive product. All of the products are characterized by outstanding functionality. This demonstrates that the designers have understood their clients and their needs," said Professor Dr. Peter Zec, founder and CEO of the Red Dot Award.

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*Global 7000 test aircraft*

## VIKING CL-415EAF CONVERSION PROGRAMME LAUNCHED

Longview Aviation Asset Management (LAAM) of Calgary, Alberta, in cooperation with Viking Air Limited of Victoria, British Columbia, has launched the Viking CL-415EAF (Enhanced Aerial Firefighter) Conversion Programme.

The collaboration between the two sister-companies on the CL-415EAF Enhanced Aerial Firefighter Conversion Programme will provide an economic boost throughout Western Canada derived from job creation, aerospace manufacturing innovation, supply chain development, academic partnerships, and global export opportunities.

To initiate the programme, LAAM will be hiring up to 150 technical and support staff members at its Calgary facilities, where eleven specially selected CL-215 aerial firefighting aircraft owned by LAAM will undergo the modification process utilizing Viking-supplied conversion kits.

To support development of the conversion kits, Viking has hired 50 employees to date and has launched a recruitment campaign to hire an additional 50 staff at its Victoria, BC location. Viking will also be reinstating its very effective 'Viking Academy' paid-training programme to provide successful applicants with



the targeted technical training required for these positions. Both LAAM and Viking are working with local post-secondary institutions to develop innovative technologies and provide training assistance in support of this programme.

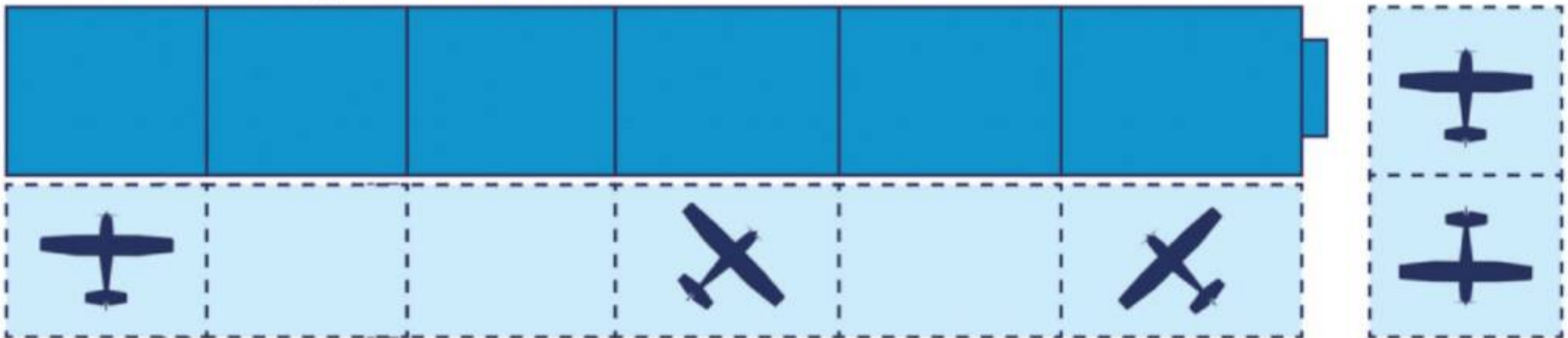
The Southern Alberta Institute of Technology (SAIT) has been engaged for personnel training in Alberta, and Viking is actively developing partnerships with companies participating in the British Columbia Technology Super Cluster initiative.

The Viking CL-415EAF Conversion Programme forms part of a staged approach to utilize the advancements

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*Photograph by Corporal Justin Roy - RCAF*

made with the LAAM converted aircraft as the basis for the proposed Viking CL-515 new-production amphibious aerial firefighting aircraft.

To facilitate the launch of the proposed CL-515 amphibious aircraft manufacturing programme, Viking has applied to the Strategic Innovation Fund (SIF) from the federal Department of Innovation, Science and Economic Development (ISED) for funding support.

The SIF funding would be invested between British Columbia and Alberta's aerospace manufacturing, supply chain, academic, and skills training sectors, and provide programme benefits to both provinces in Western Canada.

## **2018 DEMONSTRATION HORNET CELEBRATES NORAD'S 60TH ANNIVERSARY**

*Text by Captain Jennifer Howell, courtesy of the RCAF*

The freshly-painted 2018 CF-18 Demonstration Team jet was towed into a 4 Wing Cold Lake, Alberta, hangar on a sunny April 3 afternoon in front of an eager crowd.

"Wow... oh wow," said Captain Stefan Porteous. This was the first time he'd seen the finished CF-18 Hornet that he'll spend the summer flying for air show audiences across North America and the United Kingdom.

"I'd only seen the teaser photos we posted about a month ago," he said, smiling, with the bright blue, white, red and grey jet behind him.

During his address to the crowd, Captain Porteous introduced his maintenance and safety pilot team and thanked the army of people it took to get ready for the 2018 season.

"I realize that a staggering amount of work has gone into completing the paint job and preparing the aircraft for the show season," he said. "I think that everyone here today, as well as those following this unveil live online, would agree with me when I say that you have done an outstanding job!"

Brigadier-General Sean Boyle, the deputy commander of 1 Canadian Air Division, also attended the much-anticipated unveiling of the 'NORAD 60' paint scheme, which honours this year's 60th anniversary of the NORAD agreement.





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“NORAD is a unique example of the depth and breadth of the Canadian and U.S. partnership in the common defense of our continent,” he said. “It is a relationship built on trust, mutual benefit, and a mutual respect for sovereignty. Our collaborative relationship is one of the closest and most extensive in history.”

Brigadier-General Boyle went on to thank the team at 1 Air Maintenance Squadron who, under the direction of designers Captain Jeff Chester and Mr. Jim Beliveau, brought the design to life.



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# DE HAVILLAND'S LEGENDS

Text and photography by Divan Muller

September this year will mark the 75th anniversary of the De Havilland Vampire's maiden flight. This pioneering jet was a remarkable aircraft, yet it was not the only noteworthy product of Sir Geoffrey de Havilland's prolific aircraft manufacturing company.



*Geoffrey de Havilland*



*Tiger Moth*



The De Havilland Aircraft Company Limited was founded by Geoffrey de Havilland in 1920 near London, England. By then, he had already designed more than a dozen aircraft while working for Airco, which at the time was one of the world's largest aircraft companies. Over the next several decades, aircraft developed by De Havilland's company would make their mark in history, from impacting the course of World War II, to revolutionizing air transport. Geoffrey De Havilland was knighted in 1944 and remained in control of his company until 1959, when it was sold to Hawker Siddeley. Let us look at some of De Havilland's most notable aircraft, as well as the impact they had on history and the aviation industry.

## **Airco Aircraft**

Although he had experience as a Royal Aircraft Factory engineer, De Havilland designed his first successful aircraft,

the DH.1, while working for the Aircraft Manufacturing Company Limited, better known simply as Airco.

De Havilland himself was at the controls of the DH.1 during its maiden flight in 1915. The little fighter was powered by a 70 hp Renault engine, although most of the production aircraft had 120 hp Beardmore engines. Exactly 100 examples were built and the type saw combat in the Middle East. This was only the beginning for De Havilland, as his DH.4 of 1916 was considerably more successful. Almost 6 300 examples of this combat aircraft were produced, most of which were built under licence in the USA. These aircraft were particularly popular with American pilots during World War I. No less than four Medals of Honour were won by DH.4 pilots over the course of the war.

The DH.9 effectively succeeded the DH.4 as a capable World War I era fighter. More than 4 000 DH.9s were built and



*De Havilland Vampire*

numerous pilots became aces while flying the aircraft type. Bermudian ace Arthur Spurling and his observer Frank Bell, for example, were flying a sole DH.9 when they attacked a formation of thirty German Fokker D.VII fighters, shooting down five of them.

### **From Light Aircraft to Fighters and Bombers**

As mentioned, De Havilland founded his own company in 1920, with which he developed numerous successful civil aircraft during the interwar years. The list of commercially successful aircraft of this period is too long for a single article, but several are worth mentioning. The DH.60 Moth series of biplanes, which included the much loved Gypsy Moth variant, were extremely popular with flying clubs from the mid-1920s until World War II began in 1939. The DH.60 led to the development of the DH.82 Tiger Moth, which first flew

in 1931. The Tiger Moth would later become one of the most important training aircraft of World War II. Almost 9 000 examples were built.

Despite the fact that only five examples were built, it is certainly worth mentioning the DH.88 Comet of the mid-1930s. The Comet was specifically built to win air races and break records, bringing prestige to the company. In 1934, the DH.88 'Grosvenor House' famously won the epic MacRobertson Air Race from London, England to Melbourne, Australia.

Also in 1934, the DH.89 Dragon Rapide completed its maiden flight. More than 700 of these biplane airliners, with seating for up to eight passengers, were built. Hillman Airways, which later became part of British Airways, was the first airline to purchase Dragon Rapides. When World War II

*Dragon Rapide*



broke out, the military version of the Dragon Rapide saw service as the DH.89 Dominie.

De Havilland's greatest contribution to winning World War II was arguably in producing the Tiger Moth, with which tens of thousands of Allied pilots were trained. However, in terms of combat, its most significant aircraft was no doubt the DH.98 Mosquito. When it entered production in 1941, the Mosquito was the fastest operational aircraft in the world. Twin engine Mosquitos served in various roles, such as reconnaissance platforms, night fighters, low level strike aircraft and interceptors, to name a few. Almost 7 800 examples were produced.

### The Jet Age

De Havilland entered the jet age with its DH.100 Vampire. Although it first flew in 1943, the Vampire was too late to be of use in World War II, entering service in 1946, one year after the war had ended. The fighter jet, with its distinctive twin-boom configuration, ultimately saw service with about a dozen operators and more than 3 000 examples were built. During the 1960s, the Royal Navy Fleet Air Arm (FAA) relied on another twin-boom fighter, the DH.110 Sea Vixen, to provide

carrier-based fleet air defence. Meanwhile, the DH.112 Venom and Sea Venom, which were based on the Vampire, saw service with the Royal Air Force and FAA respectively.

At the same time, De Havilland made its mark in civil aviation history, with the introduction of the world's first commercial jetliner. Although the DH.106 Comet will sadly probably be remembered for a series of air disasters, it nevertheless pioneered high speed jet air transport, paving the way into uncharted territory, making the world a smaller place in the process.

### Canadian Aircraft

De Havilland Canada (DHC) was originally founded as a subsidiary of the De Havilland Aircraft Company in 1928, with the initial intention of building aircraft for the training of Canadian pilots. As it happened, most of the British Commonwealth Air Training Plan aircrews were trained in Canada. No less than 104 000 Canadians were employed to train Commonwealth aircrews. The programme included 107 schools and 184 ancillary units, as well as almost 11 000 aircraft. From 1940 to 1945, about 132 000 Commonwealth pilots and other aircrew members were trained in Canada.



*Caribou*



*Beaver*

More than 1 700 Tiger Moths were built in Canada, most of which had closed cockpits to protect pilots from cold temperatures in winter. These aircraft were a vital resource during the Second World War, but once the war had ended, DHC began producing aircraft specifically suited to operating in Canada. By then, DHC had been separated from De Havilland in England and had been made into a crown corporation of the Government of Canada.

The first aircraft was the DHC-1 Chipmunk, which first flew in 1946. Intended to replace the Tiger Moth, almost 1 300 examples were built.

DHC then developed a series of highly successful, rugged STOL (Short Take-Off and Landing) aircraft, such as the DHC-2 Beaver and the DHC-3 Otter. Both aircraft types remain popular in Canada and are often seen operating with floats or skis. A turbine conversion has also proven to be popular with Otter operators.

The large DHC-4 Caribou STOL transport aircraft was built in response to a US Army requirement and saw considerable combat in the Vietnam War during the 1960s. The DHC-4 was

replaced with the DHC-5 Buffalo, a slightly larger transport aircraft with turboprop engines, instead of the Caribou's radial engines. Developed during the 1960s, the versatile DHC-6 Twin Otter STOL aircraft became one of the company's most loved and utilized commercial aircraft, with almost 1 000 examples built. In terms of regional airliners, DHC developed the DHC-7 'Dash 7' and DHC-8 'Dash 8'. The latter aircraft proved to be extremely popular and is now produced as the Bombardier Q-Series.

During the 1980s, the Canadian government privatized DHC and sold it to Boeing, based in the USA, in 1986. Six years later, Boeing sold the company to Bombardier in Canada. Then, in 2005, Viking Air acquired the type certificates of all DHC aircraft, excluding the DHC-8. In 2007, Viking announced that it would bring the Twin Otter back into production. The western Canadian company delivered the first Twin Otter Series 400 in 2010.

Sir Geoffrey de Havilland's company may no longer be around, but the sheer number of De Havilland aircraft still gracing the skies, either as airshow attractions or workhorses, are a fitting tribute to one of the greatest aircraft designers of all time. 🇨🇦



*Twin Otter*

# THE AMERICAN AIRSHOW SEASON HAS BEGUN



Text and photography by Patrick Dirksen and Frank Mink of Tristar Aviation



*An F-35B transitioning to hover over Yuma - Patrick Dirksen*



*AV-8B of VMA-214 Black Sheep Squadron breaks during short field take off demo at Yuma - Patrick Dirksen*

With airshows at NAF El Centro, MCAS Yuma and Luke AFB in March, the US Air Force, Navy and Marines kicked off a summer of aviation excitement. While the show at El Centro had to cope with clouds and even some rain (apparently the first time in more than fourteen years of airshows!), the shows at Yuma and Luke were blessed with sun and blue skies. But the crowds didn't mind, and certainly enjoyed all three.

It should come as no surprise that the US Navy showed off its newest Super Hornets at El Centro, with no less than sixteen examples present. The VFA-106 Gladiators performed a tactical demonstration with the F/A-18F Super Hornet. Two new EA-18G Growlers of NAS Whidbey Island-based VAQ-129 and two

F/A-18E Hornets of VFA-97 from NAS Lemoore were present in the static display. Of course the world famous Blue Angels closed the flying programme with their six F/A-18Cs, their first public display of 2018.

The main attraction at Yuma was the F-35B Lightning II which opened the flying display. Seeing a jet hanging still in the air remains a strange and impressive sight. After this modern hardware, a fourship of venerable F-5E in attractive 'aggressor' colours completed two passes in close formation. The F-5Es are part of Yuma based Marine Fighter Training Squadron 401 (VMFT-401). This squadron serves as an opposing force during simulated air combat. As a change from the jet noise, a UH-1Y



*Old but agile, F-5 formation break over Yuma - Frank Mink*



*UH-1Y Venom demonstration at Yuma - Patrick Dirksen*

*An MV-22B of VMX-1 demonstrates a vertical landing at MCAS Yuma - Frank Mink*

Venom and AH-1Z Viper flew a tactical demonstration, working closely together. The older cousin of the Venom, a Yuma-based HH-1H Huey, showed off its search and rescue capabilities. The wife of the airshow commentator was hoisted from the ground and safely taken away while hanging in the air.

Luke is the home of dozens of F-16s and F-35s, so many of those could be seen in the air and on the ground. For the Joint Airfield Assault Demonstration, Luke was temporarily transformed into an enemy airfield. In a spectacle of jets, helicopters and transport aircraft, assisted by ground forces, this enemy airfield was quickly taken over by the US forces.

Next, showing history should not be forgotten, the well-known 'Tora! Tora! Tora!' display included nine Japanese fighters recreating the attack on Pearl Harbour, a show with plenty of action, explosions and smoke. A B-17 Flying Fortress heavy bomber managed a safe landing on the 'heavily damaged' airfield, while it was under attack. Back to modern times, an F-22A Raptor and still-going-strong A-10C Thunderbolt II flew their demonstrations, with the USAF Heritage Flight closing this part of the show.

If these three shows are anything to go by, US citizens and visiting foreigners alike will have much to enjoy during the coming season.

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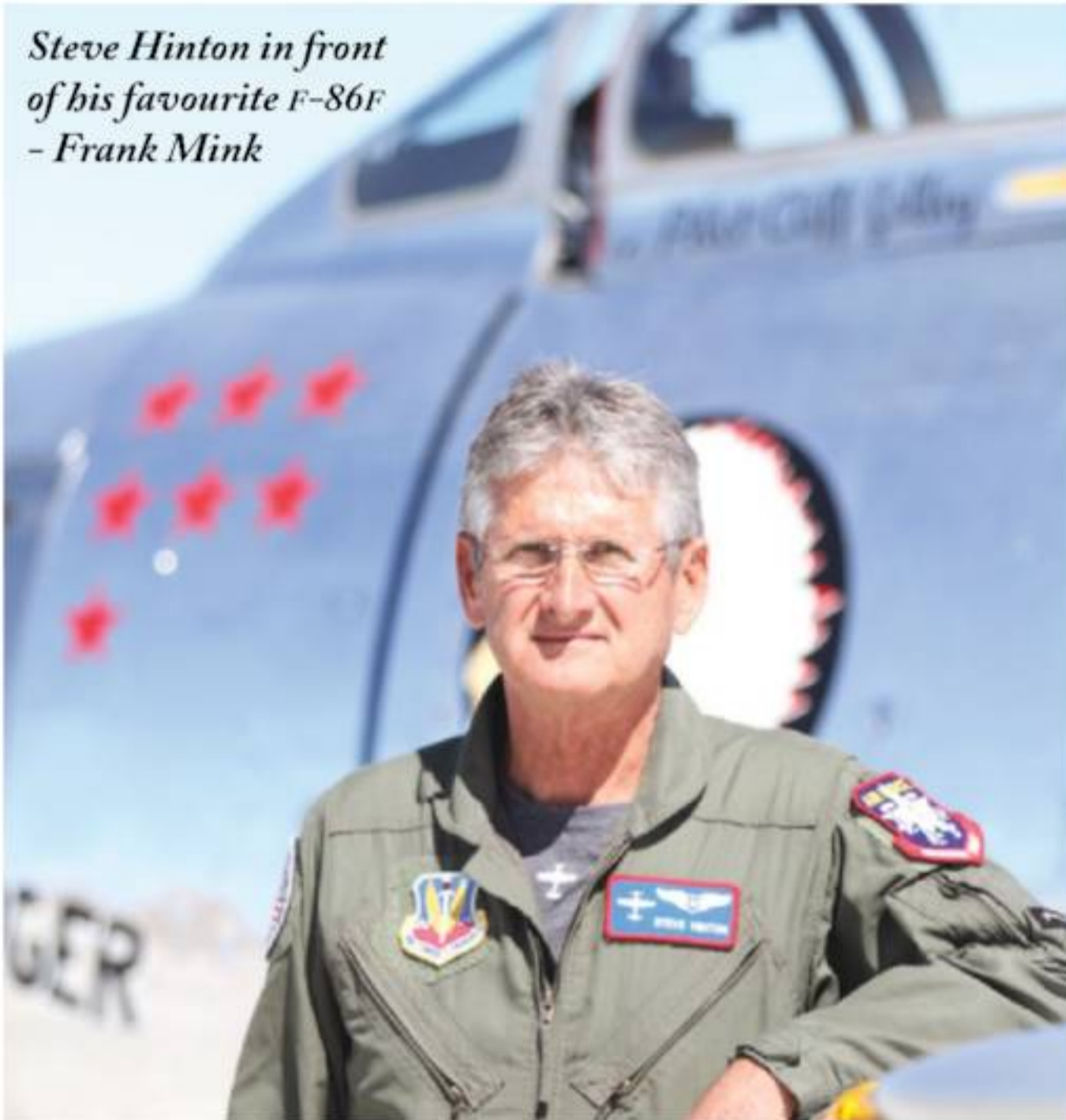


*Honouring the past and the present, an F-22 Raptor and F-86 Sabre fly as part of a heritage flight formation over MCAS Yuma - Frank Mink of Tristar Aviation*

## USAF Heritage Flight

During 50th anniversary of the United States Air Force celebrations at Nellis AFB in 1997, the first Heritage Flight took place. Now twenty years later, the Air Force Heritage Flight is firmly embedded in many airshow programmes. The heritage flight formation is formed with active USAF fighter aircraft and privately owned veteran aircraft, such as the P-51D Mustang, P-38M Lightning and the F-86F Sabre. The heritage flight association was formed in 2010 to support and coordinate all these heritage flights within the United States and worldwide.

*Steve Hinton in front of his favourite F-86F - Frank Mink*



For two years, Steve Hinton has flown the F-86F for the heritage flight: "We display the past and present for veterans. Every time we want to put on a display that is memorable for them." At the MCAS Yuma airshow, Hinton flew his F-86F in formation with the F-22A Raptor from the Air Combat Command F-22 Raptor demo team. Prior to every show season Hinton and the eight other selected heritage pilots fly and train together with US Air Force pilots in a formal training environment at Davis-Monthan AFB. Here they set the boundaries and standard for the display. "I enjoy training, pulling Gs, lofting and zooming through the air with this 1952 jet. I am lucky to do this. But most important is honouring the past and the present," said Hinton.

The North American F-86F Sabre that Hinton flies is former USAF serial 52-5012 and *Fuearza Aérea Argentina* (Argentinian Air Force) serial C-127. The aircraft is now civil registered as NX186AM. It is painted in the colours of 335th Fighter-Interceptor Squadron, part of the 4th Fighter-Interceptor Wing with serial 12834 coded FU-834. It is to represent the aircraft that was flown by Korean war ace Captain Clifford D. Jolley and includes the nose art 'Jolley Roger' and the seven kill markings Jolley earned during the Korean war. The aircraft is now owned and operated by the Planes of Fame Museum at Chino, California.

Steve Hinton is President of the Planes of Fame Museum. He is a civilian trained pilot and had already flown a P-51D Mustang at the age of 19. He has flown the F-86F from the age of 22. It has been his favourite airplane since the age of six. "I like the looks", says Hinton. Next to flying displays, Hinton also is well known for his aerial work for the film industry. For example, he flew the Spitfire for the film *Dunkirk*, released in 2017. 🌐

*Heritage Flight at Luke AFB, consisting of a P-51D, F-35A, F-22A and A-10C - Frank Mink*





# Pacific Aircraft Maintenance Engineers Association

## Message from Rod Hayward, President of PAMEA

Here is a little update as to what we have been up to out here on the 'wet coast'. I was elected as the president of PAMEA at our AGM in February. In addition to continuing on the work of my predecessor Bob Rorison, we look forward to a couple key initiatives:

- Professional development for AMEs
- Explore options for collaborative relationships with our sister AME associations across Canada
- Continued work with employers - helping them to connect their employment needs with our membership

To this end we continue to offer workshops for our members. Our most recent workshop was held on April 11th at the RCMP hangar at ZBB. We held a wide variety training sessions, topics included management skills for AMEs, composites, pitot static testing, aircraft importation, as well as a few others. In addition to the professional development, we also had a small recruitment event where we connected Jazz, KF Aero, and Conair with students from BCIT and the University of the Fraser Valley.

PAMEA would like to work towards strengthening of the voice of AMEs in Canada. To that end we believe collaboration must increase between the regions in Canada with the ultimate goal of having a common voice. Perhaps moving from small



*Photographs taken at a workshop held in April.*

regional based volunteer organizations to become more of a real 'professional organization', much as other professional groups have.

Upcoming events include a planned professional development workshop day in Campbell River in July. We are also working on enhancing our online presence. Our biggest challenge is spreading the word about PAMEA and encouraging all AMEs to get out and join the association.

As the new president of PAMEA, I would challenge every AME to get out and renew your membership in your local professional association. It is only with your membership, that we can present a strong common voice that speaks to your concerns.

We are the people who ensure that the aircraft that the public fly on are airworthy - our voice and our professionalism needs to be heard and recognized!

Sincerely,  
Rod Hayward, CPL, AME, MBA  
President, Pacific Aircraft Maintenance Engineers Association



PAMEA is a non-profit association comprised of aircraft maintenance engineers, aircraft maintenance personnel and aviation industry corporate members. As an active member of the Canadian Federation of AME Associations, its mission is to promote and protect the professionalism of the AME, while developing, maintaining and improving relations with regulatory bodies affecting our industry.

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# PROPELLER OVERHAULS

Text and photography by Divan Muller

**Propellers have been used on aircraft for almost 115 years and have evolved to become more efficient and reliable, but do we really understand the tremendous forces and corrosion to which propellers are exposed? How frequently should an aircraft propeller be overhauled? Is the process absolutely necessary? What happens during an overhaul? To find answers to these questions, we paid a visit to Aero Propeller of Calgary.**

Located near Calgary International Airport in Alberta, Aero Propeller of Calgary was founded in 1979. Two of its owners, Gord Thompson and Nash Javer, have been with the company since it first opened its doors nearly forty years ago. In 2008, they were joined by Kevin Samuel, an experienced aircraft maintenance engineer and structural technician. Combined, they have more than a century of experience in propeller maintenance. Most of the propellers that enter their workshop belong to general aviation and light commercial aircraft, but the team occasionally works on more interesting examples, such as that of a Hawker Hurricane and Douglas DC-6. When it comes to propeller maintenance, these men have seen it all and were happy to talk about overhauls in the context of aviation safety.

It is easy to underestimate the importance of overhauling a propeller, especially when a quick visual inspection makes it appear to be in excellent condition. But consider the bending, pulling, twisting and vibratory forces to which propellers and hubs are subjected during every flight. Propellers are among the highest stressed components of an entire aircraft. Centrifugal forces, which could be described as forces which try to pull propeller blades out of the hub, can be greater than 7 500 times the weight of the blades, amounting to thousands of tonnes per blade. To make matters worse, the extreme stresses imposed on the blades are concentrated on the weakest areas, which exist as a result of corrosion or seemingly insignificant cracks or damage. Gord Thompson mentioned that in recent years, he has seen considerably higher levels of

corrosion in propeller hubs, as a result of deteriorating air quality. Therefore, more frequent inspections than those recommended by manufacturers and Transport Canada, may save aircraft owners money in the long run. As an example, Thompson pointed at a hub which had been rendered useless by corrosion. If the problem had been detected earlier, the component could have been saved. When determining the when a propeller, or related

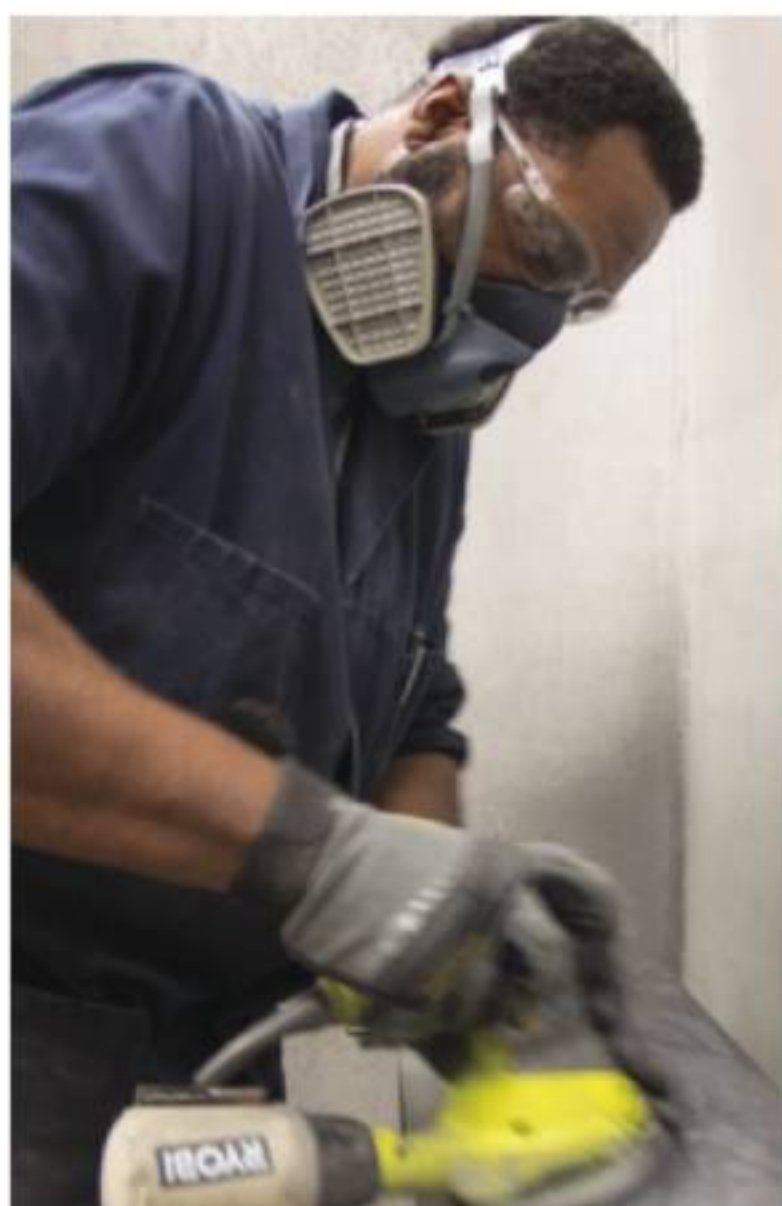
components, need to be overhauled, flight time or calendar dates are not the only factors one should consider. It is important to take operating conditions and the environment into consideration.

That said, what does an overhaul entail? The first step is to mount the propeller and visually inspect it. The paint is removed and blades are examined to see if they had been damaged in any way, and to measure dimensions to determine whether they can be overhauled. Once the propeller has been taken apart, the basic components are cleaned and degreased. The next step is to repair the damage and ensure that the components are within the manufacturer's dimensional limits. All major components are then sent to a certified workshop for non-destructive inspection. Next, components are polished and dipped in a solution for corrosion protection, before being painted and receiving a durable polyurethane coating. Finally, the propeller is reassembled and set according to the manufacturer's overhaul manual.

Internal corrosion is extremely dangerous and can only be detected when all the components have been taken a part and cleaned in a workshop. The importance of propeller inspections and overhauls cannot be overstated. When experiencing an engine failure, for the most part, the aircraft can glide and complete a safe forced landing. If, on the other hand, a propeller blade separates, the remainder of the flight can be considerably more eventful, if not catastrophic.

For further information on propeller maintenance, or advice regarding purchasing or owning a propeller, please contact Aero Propeller of Calgary at 403-291-9400. 📞

Information on how frequently propellers need to be overhauled can be found on Transport Canada's website, [www.tc.gc.ca](http://www.tc.gc.ca), in the Canadian Aviation Regulations (CARs) section.



*Kevin Samuel working on a blade*



*Nash Javer, Kevin Samuel and Gord Thompson*

# THE AFTER SYMPHONY

Text by Mark Fay

All materials have a thermal expansion coefficient (TEC) that measures the minute difference in size of the material at different temperatures. In general, materials expand as temperatures increase. Aluminum changes the most in size; Cast iron and nickel based alloys the least.

When the engines of our aircraft cool on shut down, the heat generated by combustion and friction that has expanded the various metals dissipates at various rates based on the composition of the different materials and their proximity to ambient temperatures, exacerbating the various TECs.

These various metals bolted tightly together shrink as they lose heat, creating surface tension at the point they meet. When the difference in the expansion coefficient between two adjoining components overcomes static friction a momentary slippage occurs between them.

It's that shift we hear every time the engine ticks as the parts become unstuck from each other, change position and then stick together again.

The sound triggered vague thoughts that had been gnawing at the edge of my subconscious for months. After each flight I realized I had heard that sound before in a completely different context, that it was important to me, and I needed to remember where, and why and how.

I positioned the electric tug's pincers over the nose wheel of the 182, clamped down with the lever and began easing the ship into the hanger. Dallas seemed longer than the five hours

ago as I heard the boys in the shed near the museum holler out that the beer was cold. Not wanting to leave my buddy's Piper unprotected, I let the big door come back down, left my aircraft outside and exchanged lies over Blue Ribbons for an hour.

The sound had continued as I walked away. It was gone when I came back, but the feelings that the sound evoked had stayed.

Trying to force the memory to the surface, others kept popping up, getting in the way.

Rolling in the snow with my six-year-old after his first big mountain ski day. Sitting by the fire sipping bourbon as my new son-in-law regaled me with the stories of him and my daughter in London. Feeling happy exhaustion after a day hiking with my too-long-absent son and his girlfriend at Rattlesnake Gulch near Boulder, Colorado. Sailboats near the beach, sleds at the bottom, bride to the altar, toddler's first steps. What did all of these happy memories have to do with surface friction and thermal expansion?

I unlocked the man-door to the hangar, reached inside and turned on the light, punched the green UP button, and walked to the front of the plane.

As the big door slowly rose, light spilling out, I realized where I had heard that sound.

In high school, I was a band geek. I loved playing the trumpet with my fellow nerds. Creating a symphony



with these friends and rivals and other similarly awkward teenagers, I felt a part of something bigger, something more than I could ever be by myself.

Our leader - Gladys Wright (no relation to the brothers) - would stand at the podium with her plastic baton and strike it against her metallic music stand as she implored, cajoled, embarrassed and teased us to our best musical selves by pointing out each sour note, poor tempo, and lapse in concentration.

We worked so hard.

We were good, too. Good enough to win an International Competition in Steenwijk, Holland my freshman year. Music was my refuge in high school; it was where I was happiest, most challenged and most accomplished.

When we were practicing during school hours and the band members were raucous and inattentive, Mrs. Wright would smack the stand in an urgent staccato to gain our attention.

But in the nervous excitement in the most important times before our biggest performances, just before the curtain opened, she held us all rapt by a measured and distinct tap that sounds exactly like the various metals of a Lycoming O-540-D relaxing from its labours at different rates.

I pulled away from the airport and realized the connection - the sound of the engine ticking signaled the beginning of the most important time to my flying that's not airborne.

I have come to know it as the after symphony.

After the winds have been tamed, after the distance travelled; after you have set aside the weather maps and navigational charts and flying's fears. After you have arrived - it's a moment so sublime, there is no other feeling like it. Joy and pride and relief and excitement drenched in the smell of hot oil and the sound of happy strangers and friends who know exactly how you feel - because they have felt it, too.

It is the first movement of the symphony, brisk and lively, a sonata with you as the soloist accompanied by whoever is there to share the muse. When we are true to ourselves we also hear the discordant note of sadness, that the excitement has ended and we have returned to our lesser earth-based existence.

*"the sound of the engine  
ticking signaled the  
beginning of the most  
important time to my  
flying that's not airborne"*

As I stopped to pick up dinner, the strong theme emerged of tonight's opus - it had been a joyous trip across the heartland from bright afternoon to golden dusk exposed and developed with a second darker theme in minor key - the witness of recent raw devastation by tornados in Oklahoma and Missouri.

They had roamed my same air just two days before, and the images of the debris field became a foreboding, haunting second melody.

I turned these notes over again and again, recapitulating the larger images of beauty and serenity with the deep sadness including the deaths in an elementary school just 30 miles off my port wing.



After dinner and visiting with my wife, she retired while the song continued for me. The second movement is my time to slowly review the journey, to think of all the mistakes I had made and how I could avoid them the next time. I contemplated every single phase of the flight in great detail and honed in on the dominant strains.

I sat back and thought deeply about my altitude decisions. I had started at 15,000 and, disappointed by the tail winds or lack thereof, had descended too soon in retrospect. While I still had an hour and 10 minutes of fuel at landing, I would have liked more and wondered what would have been the result had I stayed high.

I thought of lesser errors as well: the biggest was forgetting the auto pilot was on 'Heading' not 'Nav' mode and drifting nearly a mile off course as I searched the downed trees and scattered mobile homes; the least was tuning a radio one digit off and immediately catching it myself when Springfield approach failed to answer.

I congratulated myself for good decisions in avoiding buildups, including requesting three way points to use a developing low pressure area to slingshot around Saint Louis instead of just asking for a few right and left deviations.

As I readied for bed, the lighthearted scherzo began. I thought of the lineman at Arlington (KRGY) who told me I had just missed a famous actor whose name I didn't recognize. I had asked him for an encore from the fuel truck – my airplane is so hard to get full – and he found it funny that 2.5 extra gallons really did matter to me, even if he had to spill .1 gallons on the ground to get there. A five spot kept the smile on his face.

The ladies at the front desk told me the actor was Ty Burrell who plays Phil Dunphy on the ABC sitcom Modern Family. They said he was super nice in real life, "Just like you," added

the older woman who had checked me in on arrival. My gratitude included the special note that my adult daughter has said since the show's pilot episode that I AM the real life Phil Dunphy. The kindness of the staff and their response to my reveal – "I don't think that is a compliment!" they chortled – was a counterpointing fugue added to the movement.

I thought of the thorough preflight I had done, a slow trio shared with the lineman and his supervisor. As I touched each panel, checked each door, I ended with sounding the stall horn and bid adieu to the friendly ground bound Texans and said hello to those above in the tower. A waltzing movement using a progressive taxi led to the thrilling takeoff capped by a 'Ya'll come back now' flourish to send me off to departure.

It is when I begin to fall asleep that the after symphony reaches its finale. It always begins with the joyous ode of overwhelming gratitude I have for the opportunity to pilot an aircraft, the realization that I am immensely happy and fulfilled in the air, that nothing could ever take the place of being in that left seat and that I can't wait to get back there again.

This night it continued with a rollicking repetition of all I had before reviewed. The beauty and devastation; the strong and weak tones of my airmanship; the happy people who greet me away and at home.

It always ends with what I call the rondo of responsibility:

I am a good pilot.  
I have a lot to learn.  
I am a good pilot.  
I will be better next time.  
I am a good pilot.  
I must always be vigilant.  
I am a good pilot.  
I will continue to read, to study, to practice and to remember that complacency is the enemy, the after symphony the ally.  
I am a good pilot.

Mrs. Wright would be proud of me.



Three days later on a cold spring morning the process reverses.

The Cessna is pulled from the hangar and the engine instruments catalog the rapid temperature increase. I know under the cowling surface tension is being overcome at a rapid rate but its sound is inaudible among the cacophony. Now is not the time to play the music. It is time for the serious business of composition.

Frost covers the airport grass dusted by the slightest bit of granular snow that streams across the runway, driven by the northwest wind of the recent cold front. I am pleased taxiing south for a north departure turning west. This route will pass





just to the right of my neighbourhood and I will have a great view of my home.

Rich, the airport maintenance head, zooms across the ramp on his green ATV pick up attending to one of the multitude of details that make Clow International (IC5) as perfect as possible. We exchange gloved hand waves.

After liftoff the dawn has risen so the view is bathed in sunlight. I look down upon my street as the yellow school bus waits patiently for a child running on the sidewalk along Princess Lane. All around me the moisture in the trees and on the grass reflect the morning light and the refraction causes a billion pinpoints of brilliance to stream upward to meet my appreciative gaze. My net worth will never be more than a rounding error for the truly wealthy but this morning I am a king in a sea of diamonds.

So often the music writes itself.

A too short seventy minutes passes to find me on the ground at Grinnell, Iowa (KGGI). Over the radio the friendly voice of the lineman tells me to park at the self-serve. He already has the rental car running nearby.

"Just leave it at the pump, I'll take care of it in a few minutes," he says. "We'll worry about the money later."

Exiting the aircraft I am alone, the engine clicking loudly as the chill meets the hot metal. Oil perfumes the air while I load the luggage into the car.

I absorb the stark beauty of the prairie, slowly turning a full 360. To the south the dull roar of Interstate 80 is a mile and a half away and I can see large trucks tracing the route. Just beyond is the purpose of the trip - my insurance company customer. Westward I know from experience the land is flat for miles and then slowly rises until interrupted by the majestic continental divide. Now I can see freshly plowed fields in that direction with tiny rows of struggling corn. North are the structures of the airport, the weather station, the beacon. Behind them I know is the quaint town with a jewel box and famous university, both surprising additions to what many would mistakenly consider the middle of nowhere. And east toward home the endless blue sky with smears of high white cirrus, an unspoken invitation to my anticipated return.

Locking the baggage and pilot doors, I take one last look before I head to the building for the restroom and more coffee. It is impossible to miss: the baton is lightly tapping the music stand.

Inside Ron Lowry and the duster boys are getting ready to spray. Their chorus of greetings - banal, bawdy, bantering at once - are the opening notes.

The next performance of the after symphony has begun. ☘

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# AVIONICS and Aircraft Values

Text by Michael Wilton of Prairie Aircraft Sales Ltd.

ADS-B, HSI, GPSS, Mode S, STEC and VOR. What do all these acronyms have in common? They all relate to avionics. Avionics is one of the most hotly debated topics in aviation today. Do you need this or that? Does it add value or not? Will you get a good return on your investment? Should you even bother? All good questions and we will try to answer them.



The base requirements for aircraft to have to be considered decently equipped has changed over the years. It used to be that dual VORs and maybe an ILS would make you the envy of the other folks on the ramp. Dual flip flop radios... well now you are the big times, up there with the big iron pilots.

In Canada, the basic requirements for most pilots will include a good panel mount 2-way radio, Mode A or C transponder and a couple of navigational aids. The CARs state that for an aircraft to be IFR certified, it requires two separate functioning

navigational aids, along with some additional requirements like Outside Air Temperature and Pitot Heat. The Nav equipment can be a combination of VOR and ADF, certified GPS and back up standalone ILS, or any other combination, so long as both are separate functioning. The CARs have evolved recently to include GPS as more and more aircraft and airports are being equipped with GPS points and GPS approaches.

A quick note, if you intend to fly to an airport and do not have the appropriate navigational equipment, you are in violation



of the CARs. This is especially important as many airports are moving from traditional equipment like VORs to GPS approaches. Nav Canada has stated its intention to phase out certain nav aids moving forward, due to their complexity and high cost of upkeep.

Global Positioning System (GPS) is the most important navigational process to come to the small aircraft market. Prior to its introduction, a major leap forward was the Loran system. Loran used ground-based stations to assist the pilot in determining their position and conducting navigation. Loran was adopted from the marine industry and many small aircraft were outfitted with Loran. Loran worked well, but along came a system that jumped to the forefront of navigation.

GPS was developed by the US Government and is maintained by the US Air Force. It was originally developed for military applications and utilizes over 30 satellites to provide position to aircraft all over the globe. There are other similar systems operated by other countries, but the system was developed by the US Government originally. GPS can be found in both certified and non-certified avionics and is also used in conjunction with the ADS-B System being mandated in the US in 2020.

Automatic Dependant Surveillance - Broadcast (ADS-B) is not a new system. Nav Canada has been using it to monitor areas around Hudson's Bay and the Oceanic Area for several years. This allows ATC to "see" aircraft in remote areas without the need for expensive radar stations located on the ground. According to Nav Canada's website, they are part of a joint venture called Aireon with Iridium Communication, the IAA, ENAV and Naviair. They are hoping this joint venture and the installation of ADS-B receivers on 66 low earth orbit satellites will greatly enhance their ability to manage the high traffic volumes over the Oceanic region.

Though ADS-B is not currently mandated in Canadian Airspace, the expectation is that due to Canada's vast open space and northern areas, ADS-B will likely become a requirement at sometime in our home and native land.

The US has moved to a different approach. They are mandating all aircraft, regardless of size, operating in Class A through C and Class E above 10,000ft, will be required to be equipped with ADS-B out equipment. Now you may be thinking "well no problem, I live in Canada, don't really need to worry" but the US FAA has stated that not only will this be required for US tail numbers, but also for any aircraft operating in the US Airspace. Think about that quick hop down to take in some shopping or a sporting event, Customs airports tend to be located in Class C airspace and with limited small airports in the US still allowing customs clearance under the eAPIS programme, think you might need to ADS-B for your first trip in 2020?

So what does all this mean for the private pilot and aircraft owner? The answer is, it depends. Many aircraft owners utilize

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*"GPS is the most important navigational process to come to the small aircraft market."*

their aircraft for short local VFR flights. This means no need for ADS-B (yet) or high end avionics required as they are not using the plane to travel long distances or in inclement weather. There is very little expectation that a Super Cub or Tri-pacer would have high end avionics, as these aircraft are the quintessential grass roots type of flying.

For most other aircraft, good avionics can elevate the sell ability of an aircraft. A high quality certified GPS and excellent radios are desirable items in a certified aircraft. Even if you as the current owner has no use for most of these (i.e. VFR only flying), the next owner may be utilizing the aircraft for IFR enroute and approach. This does not mean you should run out and upgrade your avionics just prior to sale though.

We tell clients that on average, a seller can see about 60% return on their avionics investment, even if it was done very recently. This low number is a combination of a couple things. The first is that avionics move very quickly to upgrade. Remember the first Garmin 155XL? Now think about the latest Garmin G750W with remote transponder. That jump took about 10 years, and that was mostly due to certification hurdles, not the actual revision of the equipment. The FAA in the US has just been given a mandate to "fast track" certification on items that increase safety. This has included autopilots and angle of attack indicators, but how soon until we see originally un-certified glass cockpit displays moving to the certified side.

The second thing can be personal preference. As a pilot who flies in rough weather IFR a lot, I prefer the solid buttons of the Garmin 430 to the Garmin 650's touch screen. Avidyne has created a hybrid touch/button system in their 540 and 440 systems, which gives you the best of both worlds. I prefer the G600 to the G1000, but others do not. This is why we advise current owners that if you are going to sell, perhaps dropping

the price to reflect an advantage for the buyer to pick their own avionics, can be a benefit to the sale.

ADS-B is one item we do suggest client's upgrade. Due to our situation as the US' neighbour and the fact that a lot of sales currently are going to the US market, ADS-B upgrading can be worth the money. As most aircraft will need to be ADS-B compliant by the 2020 mandate, our US clients (and a lot of Canadian clients) are inquiring about ADS-B compatibility in the aircraft we have for sale.

As an example, if you have an old transponder that is giving you issues, perhaps upgrading to an ADS-B system like the L3 Lynx or Garmin 345 would be a good idea. You get a new functioning transponder and the added value of being ADS-B out compliant.

If you have a Garmin GTX 330 and a WAAS certified GPS, you can take advantage of the 330 upgrade programme. Your avionics technician can pull the transponder and send it to Garmin. They upgrade the internals and the avionics tech adds and wire to the GPS. Now you are compliant with ADS-B out for about \$1500 or so. Not a bad option or a bad price by aviation standards.

Just like colours, avionics can be very pilot specific. It would be a shame to see someone spend 1000s of dollars on an avionics upgrade, just to have buyers bypass the aircraft because it isn't what they would have preferred. Better to save the upgrade money and the 40% depreciation. But don't forget, a trip to the US in 2020 will be awful tough if you don't have the correct equipment. If you can upgrade now, you can beat the inevitable rush that will happen in late 2019. 🚫

For further information, please visit [www.prairieaircraft.com](http://www.prairieaircraft.com)



# AVIATION TOP 10

## Commercial Airports with the Highest Elevation

1



**Daocheng Yading Airport, China (Tibet) - 14 472 ft**  
This airport was opened in September 2013 in an effort to improve tourism to the Tibetan region. It has been designed to serve 280 000 passengers per year and has a 4 200 m runway.

2



**Changdu Bangda Airport, China (Tibet) - 14 219 ft**  
Also known as Qamdo Bamda, this airport has the world's longest runway, which has a length of 5 500 m. It is served by Air China and Tibet Airlines. The airport is currently being expanded to serve 180 000 passengers per year.

3



**Kangding Airport, China (Tibet) - 14 042 ft**  
Airbus A320 and Boeing 737 series airliners bring about 330 000 passengers to this airport every year. It has a 4 000 m long runway and began operations in 2009.

4



**Ngari Gunsai Airport, China (Tibet) - 14 022 ft**  
This airport serves civil and military aircraft and has a 4 500 m long runway. The airport started operations in 2010. It is served by China Eastern Airlines and Tibet Airlines.

5



**El Alto International Airport, Bolivia - 13 325 ft**  
Formerly known as John F. Kennedy Airport, this is the highest international airport in the world. It is located near La Paz, the world's highest administrative capital city and has two 4 000 m runways.

6



**Uyuni Airport, Bolivia - 12 972 ft**  
This airport connects Bolivians with the cities of La Paz and Sucre, as well as a town called Rurrenabaque.

7



**Captain Nicolas Rojas Airport, Bolivia - 12 913 ft**  
Three airlines use this airport to connect the city of Potosi with La Paz.

8



**Yushu Batang Airport, China - 12 762 ft**  
Another relatively new airport, which began operations in 2009.

9



**Inca Manco Cápac International Airport, Peru - 12 552 ft**  
This airport began operations in 1959 and has a 4 200 m runway.

10



**Golog Maqin Airport, China (Tibet) - 12 428 ft**  
Construction on this airport began as recently as 2014.

★



**Honourable mention:  
Telluride Regional Airport, USA - 9 078 ft**  
Highest commercial airport in North America.



# HARRY HAWKER



Born on 22 January 1889 in Australia, Harry George Hawker was the son of a blacksmith. He left school at the age of eleven and became a bicycle mechanic. Three years later, he was employed by an engineering company as a car mechanic. Hawker had always been interested in flight, but he became set on starting a career in aviation after seeing Harry Houdini demonstrate powered flight in Australia. In 1911, Hawker moved to England. He worked for various automobile companies, such as Mercedes and Austro-Daimler, before finding employment in the aviation industry with the Sopwith Aviation Company. Hawker worked as a technician and eventually became Sopwith's test pilot. In that capacity, he won air races and set several world records with Sopwith aircraft. He also developed aircraft modifications and flying procedures which made aviation a much safer industry. Hawker volunteered for service during World War I which broke out in 1914, but his application was rejected due to the

importance of his work at Sopwith. In 1914 and 1915 he tested almost 300 aircraft before touring Allied air bases to help solve technical problems. In 1919, after World War I ended, Hawker and a Royal Air Force commander attempted to fly from Newfoundland to England. Engine trouble forced Hawker to ditch the aircraft in the Atlantic Ocean, but the two men had become the first pilots to fly over more than 1000 miles of water. The Sopwith Company was liquidated in 1920, so Hawker, with the help of Sir Thomas Sopwith and others, formed a new company called 'Hawker Engineering.' In 1921, while practicing for an air race, Hawker experienced a haemorrhage of a spinal abscess, causing paralysis. As a result Hawker lost control of his aircraft, crashed and died on impact. He was 32 years old. 'Hawker Engineering' was renamed 'Hawker Aircraft Limited' in 1933 and continued to produce many notable aircraft, such as the Hurricane and jet-powered Hunter. 🌐



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