RCAF TODAY

CANADA'S AIR FORCE REVIEW

AN MHM PUBLISHING MAGAZINE

2018 EDITION

RCAF TODAY

CANADA'S AIR FORCE REVIEW

[INSIDE]

NORAD AT 60
SUB HUNTER RETURNS
FUTURE FIGHTERS
YEAR OF THE CYCLONE
BIRTH OF SWIFT DEATH
DAWN OF SHEARWATER
MED EVAC FOR MALI

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Mike Reyno Photo

After 100 years, 401 Squadron remains on high readiness duty.

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2018 CF-18 Demo Hornet pilot, Capt Stefan Porteous, rolls the jet to show off this year's paint scheme in honour of the 60th anniversary of NORAD while two CF-18s from 401 TFS split, showing their NORAD-type air-to-air missile armament load.
Mike Reyno Photo

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FACEBOOK PHOTO PICK

A unique shot of Capt Stefan "Porcelain" Porteous in the 2018 CF-18 Demonstration Hornet.
Victor Juliet Aeroimaging Photo

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From the Editor

BY CHRIS THATCHER

In July, three CH-147 Chinook and five CH-146 Griffon helicopters, transported in CC-177 Globemasters, will arrive in Bamako, the capital of Mali, to begin a one-year operation from a United Nations base in the city of Gao. The eight helicopters—one of each will serve as a spare—are replacing German NH-90 transport and Tiger combat aircraft and will provide transport, convoy escort and medical evacuation for UN forces.

Though the threat of ground-based munitions to aircraft is considered minimal, the mission is nonetheless one of the UN's most complex and dangerous. Meeting its mandate will be a challenge for the 250 Canadian Armed Forces (CAF) personnel about to arrive in theatre. The importance of helicopter support to logistics and humanitarian convoys is especially critical to UN; many convoys won't roll out without that overwatch.

The mission is yet another reminder of what the Royal Canadian Air Force (RCAF) refers to as "no fail" missions. Whether it is supporting Canadian Special Operations Forces in Iraq with a tactical aviation detachment of CH-146 Griffons, respond to Russian incursion near sovereign airspace on NORAD Quick Alert Reaction (QRA) duty, transporting materiel to CAF personnel around the world, or conducting search and rescue operations, the RCAF has rarely been busier.

That high operational tempo is reflected in this 2018 edition of *RCAF Today*. From interviews with staff officers in Ottawa, to Wing commanders in Greenwood, N.S., squadron leaders in Cold Lake, Alta., air task force personnel in Erbil, Iraq, and maintenance technicians in Petawawa, Ont., all described a flurry of activity that is challenging the modest Air Force of about 15,000 military and civilian personnel.

We begin with a look back of RCAF activity over the past 12 months. It's a broad sweep of events that will affect operations, training and procurement for years to come. We also recognize several major milestones: 401 Tactical Fighter Squadron commemorates its 100th anniversary in November and 12 Wing Shearwater is marking 100 years of maritime aviation. Though 401 "Rams" are honouring their past, they squadron was also on QRA duty when we visited in April and is maintaining a posture of high readiness for deployment anywhere in the world.

450 Tactical Helicopter Squadron is celebrating its 50th year. We spoke with commander LCol Darryl Adams about the training and trials with Health Services physicians, nurses and med-techs and Canadian Army force protection teams to develop forward aeromedical evacuation capability for the CH-147 Chinook in advance of its deployment to Mali.

450 THS will led the first rotation, under the overall command of its former commanding officer, Col Chris McKenna. The second rotation will be led by 430 Escadron tactique d'hélicoptères of Valcartier, Que., which in May assumed command from 408 Tactical Helicopter Squadron of the tactical aviation detachment in Iraq. Despite the defeat of ISIS in the northern city of Mosul, the flying tempo for the Griffons remains high, Maj Sylvain Lapierre of 408 THS explained.

Perhaps the most significant anniversary, however, belongs to the remarkable binational NORAD agreement signed 60 years ago in May between Canada and the United States. Even as it faces old foes, the unique defence command is adapting to counter new threats.

This issue also features wide-ranging interviews with BGen Michel Lalumiere, the director general of Air Force Development on the complications created by the many transitions from legacy to new or upgraded fleets; with BGen Kevin Whale about the RCAF's new responsibility for the defence space program; and with MGen Alain Pelletier—in his first interview since becoming chief of fighter capability—about the mandate of the Fighter Capability Office.

No RCAF program, though, is more relieved to be marking a critical milestone that the Maritime Helicopter Project. Once maligned as the "worst procurement in the history of Canada" by a former minister of National Defence, in June the RCAF declared initial operating capability for the CH-148 Cyclone, which will embark on its first deployment this summer.

It has been a pleasure to help put this issue together. I hope you enjoy the read.

COMMEMORATING AN ALLIANCE

BY CHRIS THATCHER

Like two kids on Christmas morning, Capt Stefan "Porcelain" Porteous and Reserve Capt Jeff Chester extruded nervous energy as they waited for the hangar doors of the Aerospace Engineering Test Establishment at 4 Wing Cold Lake, Alta., to open.

The Royal Canadian Air Force (RCAF) fighter pilot and paint scheme designer of the 2018 Demonstration CF-188 Hornet had been intimately involved in the design process, but neither had seen the final paint job. And the anticipation was getting to them.

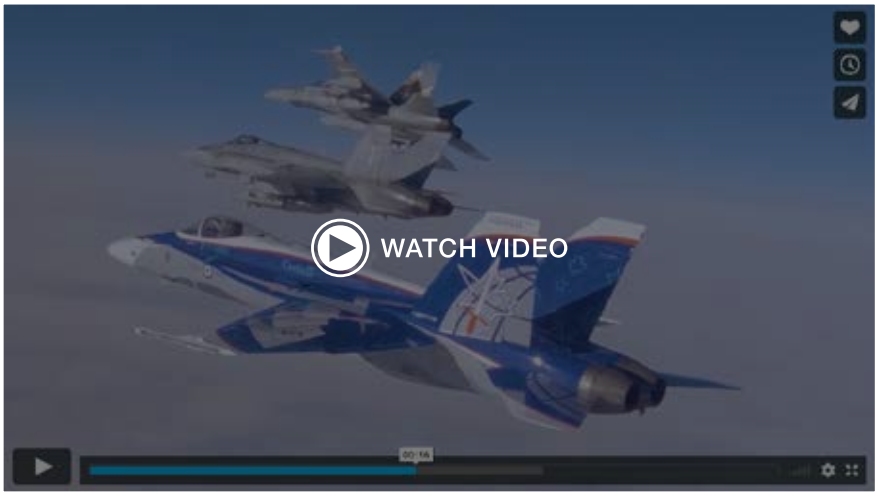
"Wow…oh wow," said Porteous when the giant doors finally rolled back to reveal a brilliant blue, white and red Hornet in the sun of the sub-zero early April morning. Though he'd had opportunities to see the jet as it was being painted, "I didn't peek," he said, moments later. "I think the contrasts are going to look incredible airborne."

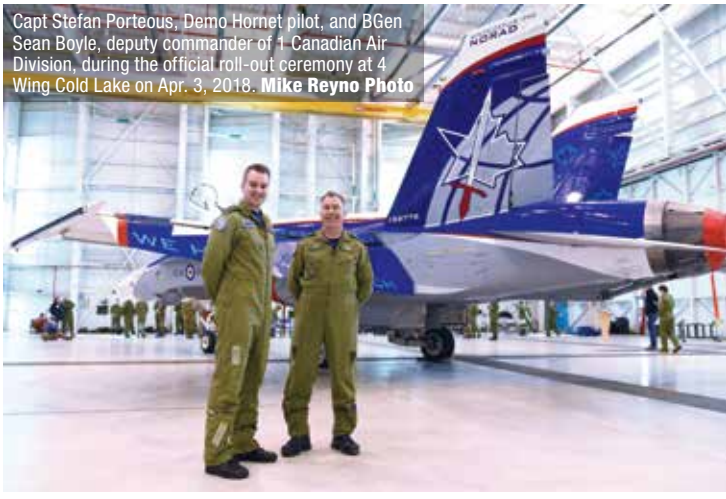
"I'm impressed," said Chester as he stepped down after viewing the design from the wing. "I saw it about a month ago and helped do some of the masking. It's actually way better than I thought when we finalized the design. It has surpassed what I was hoping for."

Together with the Canadian Forces Snowbirds of 431 Air Demonstration Squadron, the CF-18 Demo Hornet team serves as ambassadors for the Forces and a visible symbol of the skill, teamwork and professionalism of those in uniform. The Hornet is currently in the midst of a 2018 schedule that has it appearing at more than 25 airshows

Demo Hornet pilot, Capt Stefan "Porcelain" Porteous, was born and raised in Comox, B.C. and is normally assigned to 433 Squadron in Bagotville, Que. **Heath Moffatt Photo**

Members of the 2018 CF-18 Demonstration Team in training for the a busy airshow season in Canada, the United States and the United Kingdom. **Heath Moffatt Photo**





Capt Stefan Porteous, Demo Hornet pilot, and BGen Sean Boyle, deputy commander of 1 Canadian Air Division, during the official roll-out ceremony at 4 Wing Cold Lake on Apr. 3, 2018. **Mike Reyno Photo**

Seen from above or below, the Demo Hornet is a visible reminder of the importance of the NORAD partnership. **Mike Reyno Photo**

across Canada and the United States, as well as in the United Kingdom at NAS Yeovilton and at the Royal International Air Tattoo at RAF Fairford.

Consequently, the theme for the Hornet paint scheme is an important decision for the RCAF. BGen Sean Boyle, the deputy commander of 1 Canadian Air Division, admitted several major events were on the table, including the 100th anniversaries of the Royal Air Force and 401 Tactical Fighter Squadron, but in the end the 60th anniversary of the North American Aerospace Defense Command (NORAD) "just made sense."

The unique NORAD paint scheme "will allow us to speak with Canadians and Americans across North America about the importance of the NORAD mission and its successes," he said.

The paint scheme went through numerous design changes before a final version was approved, capturing elements across the wings of a sweeping radar and the Northern Lights in the colours of both national flags.

"I just think that's brilliant," said Boyle, who observed the selection process for the demonstration team, the pilot and the theme. "[It] fuses the Canadian and American piece on the jet."

The Demo Hornet and a CF-188 from 401 Tactical Fighter Squadron over Cold Lake, Alta. As a significant contribution to NORAD, the RCAF's CF-188s maintain a constant state of alert at several locations in Canada. **Mike Reyno Photo**

All told, the design and painting of the Hornet took hundreds of hours, Boyle said. While that might lead some to question the value of so much effort to take an operational jet out of service for almost a year, he said the demo jet provides an "immeasurable" public relations benefit to the Forces and RCAF.

A radar control operator who has spent much of his career immersed in the binational command, Boyle believes the commemorative Hornet can serve as a reminder to both Canadian and American airshow audiences "that [NORAD] really is the longest standing defence agreement on the planet."

Though the two countries had been cooperating for a decade on mutual air defence in response to the threat posed by Soviet long-range aviation, the exchange of notes on May 12, 1958, formalized a unique binational command structure that has yet to be replicated by any other defence alliance.

Command is shared by both countries. At NORAD headquarters in Colorado Springs, the commander has been an American military officer while the deputy commander is a Canadian. In the regional commands such as Canadian NORAD Region (CANR) located at 1 Canadian Air Division in Winnipeg, Man., command is under the host country, but the deputy commander is from the other nation.

Part of the responsibility of CANR is to provide combat-ready aircraft and aircrews to defend and maintain the sovereignty of North American airspace, a quick reaction force rotated among the RCAF's tactical fighter squadrons and equipped with the CF-188 Hornet.

"This aircraft and its stunning paint job will no doubt serve as a fitting reminder that 24/7, 365 days a year, there are Canadian and American service members ready to respond to any situation at a moment's notice," said Porteous during his formal remarks to a largely Air Force audience as the demo jet was unveiled.

Born and raised in Comox, B.C., Porteous said he applied for the role when the opportunity arose, but "kind of forgot about it" while the selection process was underway. Much like the reveal of the jet itself, he was thrilled when he learned he'd been chosen. "I'm very excited and motivated, and looking forward to flying," he said as he walked around the freshly painted jet for the first time.

Porteous is a member of 433 Tactical Fighter Squadron at 3 Wing Bagotville, Que., with over 600 hours on the Hornet since receiving his wings in 2013. He said safety would be his top priority during the airshows, but with so many cameras and smartphones focused on the jet, it would also be a special "opportunity to demo the capabilities of the RCAF."

During the six months of airshows, he will be supported by eight technicians split into two teams of four. The East crew from 3 Wing Bagotville will care for the jet during May and June before handing off to the West crew from 4 Wing Cold Lake as the road show moves through B.C. and Alberta from July to mid-August. The tour resumes an eastern sweep in August until early October. The technicians drive to each show with a trailer containing all the tools and parts to maintain the demo jet.

The Demo Hornet, seen with a fully armed CF-188 from 401 Tactical Fighter Squadron, is a "fitting reminder that 24/7, 365 days a year, there are Canadian and American service members ready to respond to any situation at a moment's notice." **Mike Reyno Photo**

Public affairs officer Capt Jennifer Howell is the voice of the Demo Hornet Team at every airshow. **Heath Moffatt Photo**

A thumbs up from the technicians for takeoff for the 2018 demonstration season. **Heath Moffatt Photo**

Chester admitted he went through 65 different drawings in his basement before achieving the final concept. The inspiration came from the NORAD crest and logo, "We have the watch," as well as the red, white and blue colours from the national flags. He originally began with a rock ptarmigan wing and feathers across the wingspan of the jet. But with each drawing, that bird concept gradually morphed to include elements of the Northern Lights and a radar sweep. The brilliant colours were chosen to be both eye-catching from the ground and the air.

"I hope this design can be a badge of honour for all those men and women who stand on the watch...in NORAD," he said.

The design was created under the mentorship of Jim Belliveau, renowned for designing many of the commemorative paint schemes of previous Demo Hornets and other RCAF aircraft. Belliveau, who was recently recognized by the International Council of Air Shows for his many designs with the Platinum Pinnacle Award, had high praise for both Chester and the paint and support team.

"It was a joy to be the bridge between Jeff's incredible talent and their incredible talent," he said.

AIR COMMAND COLOURS laid up at Air Canada Centre

BY JOANNA CALDER

On Feb. 10, 2018, the Royal Canadian Air Force (RCAF) entrusted its retired Air Command Colours to the guardianship of the Toronto Maple Leafs.

The retired Colours—unique, consecrated ceremonial flags enclosed in a specially built case—were unveiled beside Gate 6 of the Air Canada Centre on Feb. 27, where they are visible from both inside and outside the building.

More than 3.5 million visitors and fans will have the opportunity to view the Colours every year, according to Michael Friisdahl, president and CEO of Maple Leaf Sports & Entertainment, making them, in all likelihood, the most publicly visible Colours in the history of the Canadian Armed Forces.

"This is a great honour for our organization," said Friisdahl. "We will display these retired Colours with great pride and honour and remind our visitors and fans, present and future, of their importance."

The Colours have been entrusted to the Maple Leafs under an agreement that meets regulations. They "remain Crown property in perpetuity, and are controlled by the Department of National Defence on behalf of the Canadian government … Custodians shall ensure that laid-up and deposited Colours are kept on display to the general public … If the custodian can no longer preserve them, they must be returned."

The Colours were retired, and new ones presented, at a ceremony in Toronto on Sept. 1, 2017. The city was awash in RCAF blue, from the parade of uniforms in Nathan Phillips Square, to the lights on the CN Tower and the TORONTO sign in the Square. Even the sky was a clear Air Force blue.

Governor General and then Commander-in-Chief of Canada, David Johnston, also attired in Air Force blue, presented the new Colours. With the restoration of the RCAF's historical name in 2011, and the subsequent creation of a new badge, it was time to create a new stand of Colours.

In the morning, LGen Mike Hood, then the RCAF Commander, and Toronto Councillor Norm Kelly raised the RCAF flag at City Hall. Kelly then presented Hood with the document, signed by Mayor John Tory, proclaiming Sept. 1 as "Royal Canadian Air Force Day."

"We are thankful for the service and sacrifice of every member of the Royal Canadian Air Force," said Kelly. "We thank you for your commitment, dedication and courage. It is an honour to raise this flag and have it fly in front of City Hall today."

At mid-day, personnel from the Canadian Forces School of Aerospace Technology and Engineering, 16 Wing headquarters, and the RCAF Academy (all located in Borden, Ont.) accompanied by the Central Band of the Canadian Armed Forces and the RCAF Pipes and Drums, marched on to Nathan Phillips Square. MWO Kimberly Jones carried the Eagle

Members of the RCAF Pipes and Drums march off after piling their drums for the consecration service. **Cpl Alana Morin Photo**

Staff, which represents all Aboriginal members of the Canadian Armed Forces past, present and future.

After the inspection of the Guard of Honour, the retiring Air Command Colours, presented in 1982, were "trooped"—or marched past the military personnel on parade—for the last time. They were carried and escorted by members of 402 Squadron, located in Winnipeg, Man.

Although Colours are no longer carried into battle, these personnel would have been responsible for defending the Colours against the enemy in a past era.

As vintage aircraft—a P-51 Mustang from Vintage Wings of Canada in Gatineau, Que., and a B-25 Mitchell bomber and a CC-129 (DC-3) Dakota from the Canadian Warplane Heritage Museum in Hamilton, Ont.—flew overhead, members of the RCAF Pipes and Drums piled their drums as an altar. The new Queen's Colour and RCAF Colours were carefully draped across them and the senior RCAF chaplain, LCol Martine Bélanger, accompanied by Rabbi Capt Lazer Danzinger and Imam Capt Ryan Carter, conducted the service of consecration.

The Colours were thus sanctified and devoted to service as symbols of honour and duty, and all members of the RCAF, through those on parade, rededicated themselves to the ideals the Colours represent. After their consecration, the Governor General presented them to the kneeling Colour bearers who were from 430 Tactical Helicopter Squadron in Valcartier, Que.

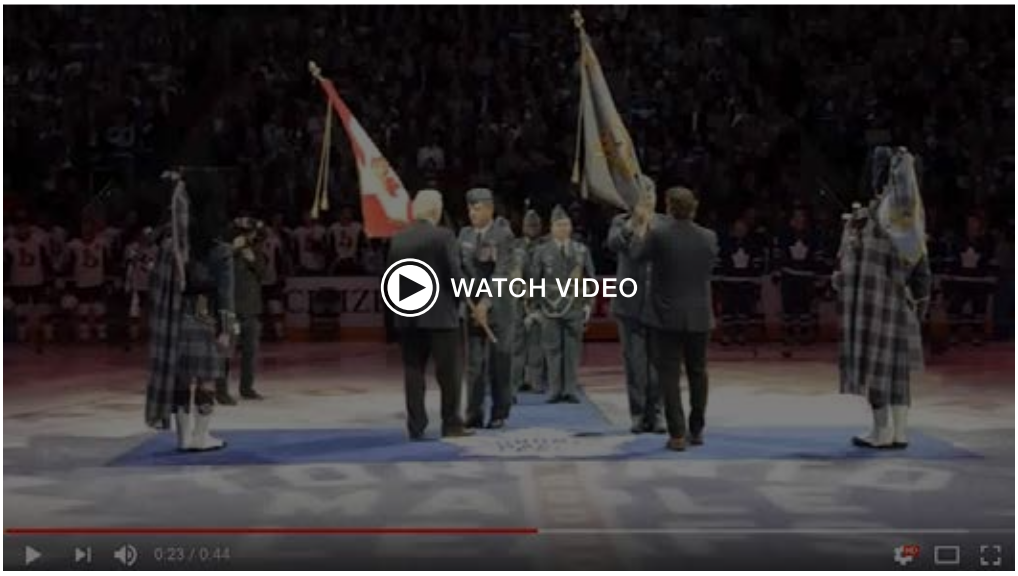
"Your distinguished service is reflected in the Colours you will display," he said. "They continue to be visible symbols of pride, honour and devotion to Canada."

"To the men and women of the Royal Canadian Air Force … I am so proud of the tireless work you carry out every day for this great country, Canada, and Canadians," said Hood. "People of Toronto, thank you for welcoming us back to your city and for your enthusiasm and support."

As the commander concluded his remarks, a representative of nearly every aircraft flown by the RCAF roared through the sky above Toronto, to the delight of spectators young and old. Finally, the new Colours were "marched past."

The RCAF now has new Colours reflecting its restored name and new insignia, and the proud airmen and airwomen of Canada's Air Force have written another chapter in their history and heritage.

Retiring the Command Colours LCol (Ret'd) Kenneth J. Mackenzie of the RCAF Pipes and Drums, CWO Gérard Poitras, Darryl Sittler, holding the Queen's Colour, Darcy Tucker, holding the Air Command Colour, LGen Mike Hood, and Maj Allan MacKenzie of the RCAF Pipes and Drums. **Cpl Alana Morin Photo**



Councilor Norm Kelly presents a RCAF Day Proclamation signed by Toronto Mayor John Tory to RCAF commander LGen Mike Hood and CWO Gérard Poitras. **Cpl Alana Morin Photo**

MWO Kimberly Jones carries the Eagle Staff, representing Aboriginal members of the Canadian Armed Forces. **Cpl Alana Morin Photo**

Governor General Johnston presents the consecrated RCAF Command Colour to Capt Ryan Prashad. **DND Photo**

The Canadian government intends to negotiate a sole-source agreement with Leonardo to upgrade the RCAF's fleet of CH-149 Cormorant helicopters to the latest version of the AW101. **Mike Reyno Photo**

COMMITTED TO THE CORMORANT

BY CHRIS THATCHER

The federal government intends to move forward with a plan to extend the life of the CH-149 Cormorant helicopter fleet to at least 2040.

Public Services and Procurement Canada (PSPC) on April 24 posted a letter of notification (LoN) outlining its intent to conduct a sole-source negotiation with Leonardo, formerly AgustaWestland, to replace, modify or upgrade current and projected obsolete systems on the Royal Canadian Air Force (RCAF) search and rescue (SAR) aircraft, a variant of the AW101.

"The CH-149 has proven to be an excellent search and rescue asset for the [RCAF]. The fleet has been outstanding in covering the required range and providing the cabin capacity necessary to successfully deliver search and rescue in a country the size of Canada, often flying in very harsh environments which include demanding icing conditions," the department said in the letter.

The Air Force has been analyzing options for the Cormorant Mid-Life Upgrade (CMLU) project for several years, but recently secured funding and project approvals with the government's defence policy of June 2017.

As part of the analysis, the RCAF surveyed other manufacturers to gauge whether an alternative helicopter might be better than the 16-year-old Cormorants, which have had problems with obsolete components in recent years. Two manufacturers, Sikorsky and Airbus, requested an open competition, arguing their SAR helicopters could provide the same service more effectively and efficiently.

In opting to proceed with a non-competitive process with Leonardo, PSPC stated that the CMLU project team had "conducted a market survey and an options analysis which determined that the Cormorant is the only solution to meet the rotary-wing search and rescue capability requirements."

The analysis found that, "based on projected flying rates, the CH-149 will remain a viable [SAR] asset until at least 2040" and augmenting it with a different make or model of helicopter could, among other concerns, increase "pressures on [RCAF] aircrew flight training."

The LoN also noted that a CAE-designed and built commercial off-the-shelf (COTS) flight simulator is already available and certified for use and could immediately meet the project's training requirements.

It added that any potential solution would need "to maximize the use of [COTS] aircraft and subsystems that have already been certified in accordance with airworthiness regulations." Leonardo has proposed an upgrade program based on the Norwegian AW101-612 All-Weather Search and Rescue Helicopter (NAWSARH) model, which began entering service in December 2017.

The AW101-612 standard includes a Leonardo Osprey multi-panel 360-degree AESA surveillance radar system, four-axis digital Automatic Flight Control System (AFCS), two rescue hoists, searchlight, a cellphone detection system, electro optical/infrared device, and a fully integrated avionics and mission system. It also features a new 3,000 horsepower CT7-8E engine.

"Based on current information, Leonardo is the sole worldwide provider of AW101 aircraft and exclusively holds the necessary level of intellectual property to conduct a project of this scope," the letter stated.

Among the upgrades the RCAF would like in a modernized platform are enhanced aircraft flight management, communications, navigation and safety systems to meet current and pending airspace regulatory requirements. Also on the list are better SAR sensor capability and communication systems to improve interoperability with other SAR assets, such as the newly acquired fixed-wing Airbus CC-295 aircraft, and with the three Joint Rescue Coordination Centres and civilian agencies like the Civil Air Search and Rescue Association.

The LoN also stated that the government would proceed with a plan to "augment" the current fleet of 14 Cormorants by as many as seven and return the Cormorant capability to a fourth main operating base in Trenton, Ont. The department acquired nine VH-71 aircraft, variants of the AW 101 that do not have valid airworthiness certificates, from the U.S. government in 2011 for $164 million when the presidential fleet replacement program was cancelled. Leonardo had been proposing for several years to convert seven to the same standard as the Norwegian model.

"This augmentation will allow the [RCAF] to re-establish a rotary-wing search and rescue presence at Canadian Forces Base Trenton and will provide additional support to all of Canada's [SAR] regions," the department said. The RCAF currently operates 14 CH-149 Cormorants from three bases in Gander, N.L., Greenwood, N.S., and Comox, B.C., and augments that with five yellow-painted smaller CH-146 Griffon helicopters from Trenton.

While the LoN was welcomed by Leonardo—the company recently reassembled its Team Cormorant of IMP Aerospace, CAE, Rockwell Collins Canada, and GE Canada for the project—it was undoubtedly a setback for both Sikorsky, a division of Lockheed Martin, and Airbus. In recent defence industry forums, the RCAF had indicated it was assessing "all options to address the current and future operational requirements for the Cormorant fleet," and looking for input from other potential suppliers to meet the CMLU mandate. Although the Air Force had yet to release a statement of requirements for the project, both believed they could provide competitive offers.

"We looked at this understanding that the defence department has put out a mandate where they are looking really hard at efficiencies and commonality going forward," said Glenn Copeland, business development director for Lockheed Martin Canada's rotary and mission systems. "Knowing that they have challenges with existing cost structures associated with the [AW]101 … we saw a very good opportunity."

Sikorsky planned to offer the S-92 in a SAR configuration, an off-the-shelf platform currently used by Ireland, the United Kingdom and other SAR providers.

"The S-92 is the 'go to' SAR helicopter, operating in the harshest environments around the world," said Raffi Fattal, Sikorsky's regional sales director for the United States and Canada. "The S-92 platform is reliable and robust—it's a workhorse. In Canada, S-92s have flown over 100,000 hours since 2006 and demonstrated the endurance and range requirements needed to operate effectively in Canada's large maritime and interior areas. It's conducting missions … in the North Sea area [for UK SAR] over long distances, harsh environments, and low visibility, so the aircraft has proven itself in that regard."

Airbus, on the other hand, was proposing the H225, part of the Super Puma family in service with multiple search and rescue providers. Airbus calls the helicopter "a reference in SAR operations" due in part to a quick takeoff sequence of less than five minutes, all-weather capability, and extra long-range with auxiliary fuel tanks.

"We strongly believe it is premature to rule out all other non-Cormorant based options and hope we will have the opportunity to offer alternatives," said Mark Conroe, director of government and military sales for Airbus Helicopters Canada.

Both companies argued their availability rate would greatly exceed the current rate of the Cormorant fleet and their cost per flight hour would be less than the CH-149 as presently configured. They also suggested that, based on their availability rates, they could meet the RCAF's high operational tempo with similar or even fewer SAR helicopters per base than the Air Force has today.

Airbus and Sikorsky were also hoping to find savings by leveraging the relationships they have today with the RCAF. Airbus won the fixed-wing search and rescue competition in 2016 with the CC-295 and, together with CAE and a joint venture with PAL Aerospace called AirPro, will build, maintain and deliver the courses for a SAR training centre in Comox.

Sikorsky is delivering the CH-148 Cyclone, a militarized variant of the S-92 that will see its first operational deployment on a Royal Canadian Navy frigate later this year. Compatibility with a new SAR aircraft could allow for common aircrew and technician training and improve fleet management.

While CMLU negotiations will now likely be for a sole-source arrangement, the department could compete future in-service support (ISS). The LoN said the government would complete a sustainment business case analysis to "inform options for future [ISS], including the option to compete future support."

The CMLU project is still in what the military calls the options analysis phase and a schedule for the project has not been set. The letter of notification is intended to inform industry of the proposed process and does not commit the government to a non-competitive contract. Companies had until June 7 to respond.

KING AIR 350ER IDENTIFIED AS SOLUTION FOR SPECIAL FORCES ISR

BY BEN FORREST

After years of considering a manned airborne intelligence, surveillance and reconnaissance (MAISR) platform to support Special Operations Forces, Canada is moving forward with a plan to acquire three new Beechcraft King Air 350ER turboprops through a foreign military sales case with the U.S. government.

The procurement is expected to include advanced, military-grade ISR mission equipment.

The U.S. government was "identified as the only source of supply capable of providing the fully-integrated solution," said Jessica Lamirande, a spokesperson for the Department of National Defence (DND).

It's expected to take up to 12 months to put the foreign military sale agreement in place, and DND does not have a timeframe for aircraft delivery or their entry into service, said Lamirande.

"We will be in contested areas with this aircraft and sometimes adversaries have a vote," said BGen Michel Lalumiere, director general of Air Force Development. "This aircraft needs to bring, definitely, a set of capabilities to be able to operate in those types of environments."

In addition to the aircraft and mission equipment, the federal government is looking to procure the necessary in-service support (ISS)—estimated at 20 years—through a competitive process. A letter of interest related to ISS procurement was issued April 26, 2018, and industry engagement activities are expected to continue until the spring of 2019, said Lamirande.

The government is expected to release a formal request for proposals at that point.

Over 15 companies registered to attend an ISS industry day in June. Lamirande could not provide the names of the companies, but Textron Aviation, for one, is listed on the federal procurement website as an interested party for ISS.

"Aircraft such as these will help enhance the ability of our Special Operations Forces to improve their understanding of the operational environment," said Lamirande. "The aircraft will be configured with military grade advanced sensors, and secure communications equipment. MAISR will have the capacity to be deployed on short notice and will provide the CAF [Canadian Armed Forces] with better situational awareness on the ground and thus positively affect the ability of CAF leaders to make decisions leading to mission success.

"The project will help to improve future CAF operations at home and abroad," she added.

The government committed to acquire an airborne ISR capability under *Strong, Secure, Engaged*, the defence policy it released in 2017. The policy allocates $6.5 billion in new funding for DND over the next six years, and $62.3 billion over the next 20 years.

Canada had been seeking a King Air-type platform for MAISR but settled on the King Air itself after consulting industry through a letter of interest in September 2015, said Lamirande.

"It was decided that the best approach is to combine the aircraft and integration together, in order to mitigate technical, integration and schedule risks," she said.

It's expected Canada's MAISR capability will complement services provided by remotely-piloted aircraft systems (RPAS), the CP-140 Aurora long-range patrol aircraft, and its future replacement, the Canadian Multi-Mission Aircraft (CMMA).

Canada has announced a plan to acquire three new Beechcraft King Air 350ER turboprop to support Special Operations Forces. **Textron Photo**

A Royal Canadian Air Force technician guides a CP-140 Aurora to its parking area during Operation Impact in Kuwait. **DND Photo**

CANADA JOINS ALLIANCE SEEKING NEW MARITIME SURVEILLANCE AIRCRAFT

BY KEN POLE

Canada has joined an international program that is expected to yield a new generation of maritime surveillance aircraft that will eventually replace platforms such as the extensively-upgraded CP-140 Auroras first deployed by the Royal Canadian Air Force (RCAF) in the early 1980s.

The Department of National Defence confirmed in a statement that Defence Minister Harjit Sajjan, in Brussels for the North Atlantic Treaty Organization (NATO) defence ministerial meeting in February, signed a letter signalling Canada's intent to join the Maritime Multi-Mission Aircraft (M3A) forum, where the allies would "share force development resources and knowledge, in the pursuit of maritime patrol aircraft recapitalization."

Poland also confirmed plans to join France, Germany, Greece, Italy, Spain and Turkey in developing follow-on solutions for aging fleets of maritime anti-submarine and intelligence, surveillance and reconnaissance aircraft that are becoming increasingly costly to maintain.

The original six began collaborating last June, hoping that a common approach could help to contain the cost of developing new aircraft.

"This joint effort recognizes the fact that the majority of allies' maritime patrol aircraft fleets will be reaching the end of their operational lives between 2025 and 2035," said NATO Deputy Secretary General Rose Gottemoeller during the signing ceremony.

Gottemoeller, a United States career diplomat, said the eight countries now needed to push on to the implementation phase for the M3A.

"The goal here isn't just a drawing board design," she said. "We need a new generation of aircraft … fulfilling what is an increasingly important mission."

RCAF ENHANCES AIR INTER-OPERABILITY WITH ALLIES

Canada recently became the 26th member of a multinational air services agreement that includes North Atlantic Treaty Organization (NATO) and European Union (EU) countries.

In December, Canada signed the Air Transport and Air-to-Air Refuelling and other Exchange of Services (ATARES) arrangement, which provides a multinational framework to exchange services in the realm of air force activities. It is managed by the Movement Coordination Centre Europe (MCCE), based in Eindhoven, The Netherlands.

The MCCE was established in 2007 through a technical arrangement between nations who had begun to work together to coordinate strategic lift capacity and assets. While participants include NATO and EU members, the MCCE has no command and control of the assets it coordinates. It provides the best support possible based on each nation's ability to share their capabilities and capacity.

As outlined in the 2017 defence policy, the Royal Canadian Air Force (RCAF) must increase interoperability with its key partners and core allies to continue to meet Canada's defence needs. ATARES is a prime opportunity to develop this interoperability. While the RCAF is an enabler for the Canadian Armed Forces (CAF) global expeditionary operations, ATARES enhances this capacity, allowing for additional surveillance and reconnaissance, air mobility and air-to-air refuelling. The Canadian presence also allows Canada to aid other ATARES partners when they need assistance.

ATARES is a clear demonstration of 26 participating nations coming together to leverage each other's assets and capabilities for the common good. The system works on an exchange of credits. This enables nations to leverage spare capacity on current missions to gain access to future capacity from their partners and allies.

Canada intends to first explore the use of air transport capabilities as an entry point into the arrangement. Participation is voluntary; capability is offered up when it is available and used when a demand can be matched to a providing nation. The Strategic Joint Staff (SJS), RCAF and Central Joint Operations Command (CJOC) are working closely to begin participation as soon as possible.

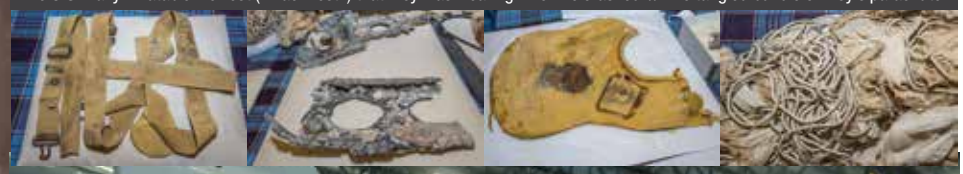
– *From The Maple Leaf newspaper*

LOST CANADIAN BANSHEE PILOT REMEMBERED

BY JOANNA CALDER | PHOTOS BY CPL ALANA MORIN

Lt Barry Troy, a Royal Canadian Navy Banshee fighter pilot, was 29 when he disappeared off the coast of Florida during a training exercise in 1958.

Troy's name, written on the straps of his life vest, helped identify the origin of the materials. // Fragments of Troy's Banshee. // The U.S. Navy inflatable life vest ("Mae West") that Troy was wearing when he crashed. // The tangled bundle of Troy's parachute.



Bruce Baker was a Royal Canadian Navy Tracker pilot and a friend of Troy's.

On Feb. 25, 1958, Lt Barry Troy, a pilot with the Royal Canadian Navy's VF-871 Squadron, was part of a group of four RCN F2H-3 Banshees flying along the Florida coast from United States Naval Station Mayport. They were en route to a point south of Jacksonville Beach, where they would turn and head back to the aircraft carrier HMCS *Bonaventure*, which was about 64 kilometres offshore.

Unexpectedly, a fog bank loomed ahead. The leader of the formation of fighters and the next two pilots turned right—westward towards land—and flew out of the fog bank within moments. Troy turned left—eastward, over the Atlantic Ocean—presumably because he wanted to avoid colliding with the aircraft in front of him in the blinding fog. He was flying low and fast, probably only 500 feet (152 metres) above the water.

He was never seen again.

At the time, a few items were recovered from the Atlantic Ocean about two miles (3.2 kilometres) east of Jacksonville Beach: some paper, his helmet, his shaving kit and some fragments of wreckage. For six decades, nothing more was found.

Last autumn, fierce hurricanes swept through the area. Following the storms, a Jacksonville park ranger, Zachary Johnson, investigated a bundle of debris near the high water line on the city beach. From the NATO stock number on one of the items, he realized the bundle contained military items. "I knew I had found something special when I saw the lieutenant's [name stencilled on one of the items]," he told a Jacksonville reporter.

The discovered items include an oxygen tank, a parachute, parachute cover and parachute harness, an inflatable life vest and life vest straps, and small pieces of the aircraft. Troy's name is written on a life vest strap. Given the condition of the items, it is thought that the items may have been washed ashore at some point after the crash and buried beneath the dunes for years before being uncovered by the 2017 storms.

MAYPORT COMMEMORATION

Sixty years and one day after Troy vanished, representatives of the Royal Canadian Air Force took custody of the historic items at Mayport on Feb. 26, 2018. Members of the RCAF, the Royal Canadian Navy and the United States Navy attended the event, held only a few kilometres north of the location where Troy disappeared.

Dick Troy, Lt Troy's brother, and his wife, Pauline, came from California to attend. "We've grieved all these years," said Troy. "We were a very close-knit family, and this settles in our mind exactly what happened. I'm amazed at what they did find and the fact that his name was on that [strap] after 60 years… which brought us to this day.

"When I touched that 'chute and harness… knowing it was his body that last wore that 'chute, it's some kind of connection. It sends chills through me, but it's a good feeling."

Col Tom Dunne, Canadian air attaché at the Embassy of Canada in Washington, thanked

Johnson and Officer Nolan Kea, of the Jacksonville Police Office (who held the items in secure custody after their discovery) for their commitment to ensuring the safety of the artifacts. "Zach and Nolan, you've both been very generous with your time, and you've ensured the items have been treated with true dignity," he said.

After the ceremony, Kea signed over the items, which he had secured in the Jacksonville Police evidence lockup, to Richard Mayne, senior historian for the RCAF. Christine Hines, curator of the Shearwater Aviation Museum in Nova Scotia, where the artifacts will find a permanent home, carefully packed the items for shipment back to Canada.

OTTAWA CEREMONY

A second ceremony was held in Ottawa on April 27, 2018, at the Canada Aviation and Space Museum. More than 25 members of the Troy family gathered beside a Banshee aircraft in the museum's Annex to honour and remember Lt Troy. Dick Troy and his wife Pauline were again honoured guests.

Some of the family members had never met before. "Barry, you've done something for us that maybe no one could have done except a magician!" remarked Troy.

He explained that when he received a telephone call in September 2017 from a Jacksonville reporter, wanting to know if he was Lt Troy's brother, it was the first he'd heard of the discovery. "This can't be," he said. "My knees buckled; I just couldn't believe it.

"It was really a miracle that these things were found, so out of a tragedy like the fury of a hurricane, there was a good result."

LGen Mike Hood, commander of the RCAF, presented Dick Troy a piece of Lt Troy's Banshee (part of the wing fold mechanism), which was recovered on the Florida beach. Troy's name and the words "lost at sea" are inscribed on his parents' gravestone but, although a memorial service was held at the time he died, there were no remains to inter. The Troy family plan to bury the artifact in their parents' grave plot.

"My Mum and Dad grieved for years," said Troy in Mayport. "He was our hero, our big brother. We lost him, and now we have him back in a way. So there's some finality, a closure, to what happened 60 years ago."

At the time of Lt Troy's death, maritime air was the responsibility of the Royal Canadian Navy. Now, all Canadian Armed Forces aviation assets and missions, including Shearwater, fall under the RCAF. Both the Air Force and the Navy, therefore, consider Troy to be "one of their own."

As the artifacts will eventually be displayed by the museum in Shearwater, which was Troy's last posting, they have finally returned home.

RCAF-TESTED SOFTWARE SIMPLIFIES PROCUREMENT PROCESS

BY BEN FORREST

Jordan Kyriakidis, co-founder and CEO of the Halifax-based software company QRA Corp, thinks of himself as an "accidental entrepreneur."

A theoretical physicist by training, he entered the business world after a successful career in academia that included multiple publications and 15 years on the faculty at Dalhousie University.

But he and QRA co-founder Dean Tsaltas, a software engineer who studied at Oxford University in the U.K., made the leap when they recognized a critical but easy-to-ignore flaw in the engineering design process.

"There's a fairly high level of rigour at the end, but not in the beginning," said Kyriakidis. "And that is where our focus is."

QRA launched in 2013 and established its signature QVscribe software suite three years later, using sophisticated algorithms to identify poorly-written, ambiguous and inconsistent phrasing in engineering project requirements.

Their belief was, if the requirements set out at the beginning of a project were clear, engineers would avoid larger problems further down the line.

"A huge amount of project cost overruns, in terms of time and in terms of money, is due to poor requirements," said Kyriakidis. "What happens in many projects is, you get scope creep or requirements creep—the requirements evolve as the system is being built. A tool like ours will help you spot what are downstream problems that can be caused by changing requirements on the fly."

Medical technology, aerospace and automotive companies all use QVscribe, he said. But the company's next frontier may be military procurement, thanks to an ongoing partnership with the Royal Canadian Air Force (RCAF).

QRA recently completed a $645,000 testing contract with the RCAF to evaluate QVscribe 2.0, a significant update that could vastly simplify the procurement process for militaries around the world.

QVscribe 2.0 identifies vague phrasing in procurement requirements—such as air-to-air combat capability in a fighter jet, or fuel capacity in a refuelling aircraft—so they can be clarified before the request for proposal process.

It also helps clarify requirements after a contract is awarded, ensuring the military and original equipment manufacturers (OEMs) stay on the same page.

"The software is not to replace humans," said Kyriakidis. "It's to replace some of the drudgery that humans do."

Manually validating and verifying requirements in a 700-page procurement document can be mind-numbing, time-consuming work.

"It's easy to overlook certain things," he said. "Making matters worse, in order to verify and validate your requirements usually requires an experienced engineer. So it's also the most experienced, most senior engineer doing a lot of work that is drudgery."

QRA's goal is to alleviate some of the burden by providing a simpler, more efficient system.

"Our guiding principle ... is really that things that can be automated, oftentimes they should be automated, and save the humans for the more important things," said Kyriakidis.

QRA secured a testing contract with the RCAF through the Build-in-Canada Innovation Program (BCIP), a federal government initiative that helps entrepreneurs bring products out of laboratory-type environments and into the marketplace.

RCAF personnel began a two-and-a-half-month testing period in January, running project documents through QRA software and providing feedback that will inform how the product develops. QRA hopes the RCAF will use its software for several key procurements as part of the government's *Strong, Secure and Engaged* defence policy.

"The information we got from them has been absolutely invaluable—and has the quality and calibre of the people involved, and the quality engineering," said Kyriakidis. "They've been a pleasure to work with ... [B]y the end it was very good exposure, and a very solid understanding of how this tool could be used within the RCAF specifically, but also within DND more generally."

QVscribe launched in the spring of 2016 and has been available in 27 countries since 2017, with early adopters that include Ultra Electronics and Honeywell, according to a news release. But the RCAF testing contract is the company's first sale to the Canadian government.

It's hoped many more will follow.

"I feel very strongly that the early stages of engineering design is where the most important breakthroughs in engineering are going to come through in the next, say, five to 10 years," said Kyriakidis.

"The more complex your system is, the more quickly [you need] to get these things right, earlier on."

QVscribe 2.0, currently being tested by the RCAF, could vastly simplify the procurement process. **QRA Photo**

TRAINING SQUADRONS ADD INSTRUCTORS, STUDENTS **TO GENERATE MORE FIGHTER PILOTS**

BY CHRIS THATCHER

At a ceremony at 2 Canadian Forces Flying Training School (2 CFFTS) in March, the NATO Flying Training in Canada (NFTC) program presented 14 student fighter pilots, including one from Hungary, with their coveted pilot wings, the largest graduating class in NFTC's 18-year history.

Eleven will make the journey from 15 Wing Moose Jaw, Sask., to 4 Wing Cold Lake, Alta., where they will conclude the fourth phase of their pilot training with 419 Tactical Fighter Training Squadron. Two will remain at 2 CFFTS as instructor pilots.

"This hallmark achievement was made possible by the dedication and professionalism of 2 CFFTS instructors, supported by 15 Wing and our industry partner, CAE," said Col Denis O'Reilly, commander of 15 Wing.

Pilot wings are the culmination of years of challenging training through phase one on the Grob 120A, and phases two and three on the CT-156 Harvard III. In 2017, 2 CFFTS flew more than 16,000 sorties, representing more than 20,000 flying hours, making it the busiest flying unit in the Royal Canadian Air Force (RCAF) in terms of sheer number of sorties.

More instructors and student pilots will be finning the seats of CT-55 Hawks at 419 Tactical Fighter Training Squadron. **Mike Reyno Photo**

"For most pilots, the achievement of wings is a childhood dream come true. It is humbling to see student pilots realize their dreams, and it is an honour for us to train the future of the RCAF," said LCol David Smith, commandant of 2 CFFTS.

The increase in newly-winged pilots is part of a concerted effort to meet a high demand for fighter pilots. Attrition has taken its toll in recent years as some opt for careers with commercial carriers or other opportunities.

But the RCAF is also preparing to accept the first of 18 Australian F/A-18 A/B Hornets in 2019 and could see the first of the eventual future fighters, a replacement for its entire fleet of CF-188 Hornets, as early as 2025.

"We are going to be ramping up in the short term," said Major Ryan Kean, operations officer for 419 Tactical Fighter Training Squadron, increasing the number of both students and instructor pilots.

The current serial of courses comprises 24 students, including one from Hungary and three from Singapore, a noticeable jump from the 16 student pilots typically in the four to six courses delivered by the schoolhouse at any time.

419 Squadron provides the RCAF's fighter lead-in training (FLIT) program, a selection program for the frontline squadrons that serves as phase four of NFTC. Those who pass then begin training with 410 Tactical Fighter (Operational Training) Squadron before being assigned to a CF-188 Hornet operational fighter unit.

"We are increasing our production to meet an increased demand from the [operational squadrons]," said Kean, a pilot with over 1,600 hours on the Hornet.

With an influx of instructor pilots (IP)—419 Squadron is expected to grow from approximately 13 to 17 over the summer—plans are underway to ensure each can complete the necessary upgrade course.

"[It] takes them from what they know to what we are going to teach here at 419," explained Kean. "We have a certain number of instructors within our current instructional cadre who can teach the instructor pilot upgrade syllabus. We use a phased approach to get our instructors up to speed and get more instructors on the line, which will in turn help us produce more students."

The NFTC program was established in 2000 to provide fighter lead-in training (FLIT) geared to the collective needs of a multinational student population of Canadian, Danish, Italian, British, Singaporean and Hungarian pilots, with an equally diverse mix of instructors. Britain, Denmark and Italy departed the program in 2010, as per the original NFTC contract, prompting a change in the course syllabus in 2012 that is more responsive to Canadian frontline needs, thought it still retains an international dimension for the remaining Singapore and Hungary clients.

"It has flown really well with the re-write. Things are a little more streamlined in terms of how we are getting the students from A to B, and it has proven to provide great results," said Kean.

One of the objectives with the syllabus change was to improve the pass rate at 410 Squadron by challenging students more at 419 Squadron before they step into a CF-188 Hornet. "I think the change in the required levels here has provided a stronger student to send across the way," said Kean.

The NFTC contract, currently operated by CAE Canada, is set to expire in 2023. Although the Air Force is analyzing options for both future aircrew training and fighter lead-in training, as well as a more modern replacement for the squadron's fleet of BAE Systems CT-55 Hawks, what comes next is still being assessed.

Whether a new program with more advanced simulation systems can generate fighter pilots faster will be among the many questions to answer. The current four-month FLIT course, which can extend as long as eight months due to Cold Lake's winter weather, consists of 37 sorties or approximately 45 flight hours per student. To meet the demand by 410 Squadron and avoid weather delays, 419 Squadron is conducting more frequent training at Naval Air Facility El Centro in California.

Kean added that course start dates can be shifted to "the left or right" to coincide with incoming pilots from 2 CFFTS and the pull from 410 Squadron, which in turn is facing higher demand from the four RCAF operational fighter squadrons.

434 SQUADRON REFORMED AS TEST AND EVALUATION CENTRE

BY CHRIS THATCHER

A CF-5 Freedom Fighter, from 434 "Bluenose" Squadron, flying over the Bluenose II in 1975. **DND Photo**

When your squadron lineage includes bomber, strike, fighter, operational training, and combat support roles, and your predecessors have flown everything from the Handley Page Halifax bomber to the Avro Lancaster, Canadair F-86 Sabre, Lockheed CF-104 Starfighter, Canadair CC-144 Challenger, and CT-133 Silver Star, it's perhaps fitting that you get reborn as an operational test and evaluation squadron.

At a ceremony at 8 Wing Trenton, Ont., on May 31, the Royal Canadian Air Force reformed the 434 "Bluenose" Squadron as 434 Operational Test & Evaluation (OT&E) Squadron, under command of the RCAF Aerospace Warfare Centre (RAWC).

The squadron last served as a combat support squadron in the 1990s, based at 14 Wing Greenwood, N.S. It was disbanded in 2002 and its colours placed in the All Saints Cathedral in Halifax.

"The fact that [the squadron] has flown so many different aircraft is [appropriate], in that we have now taken on OT&E for every single aircraft within the RCAF," said LCol Graham Edwards, a long-range patrol navigator and the new commanding officer.

434 Squadron is being reformed and re-branded in response to the government's 2017 defence policy. With 13 initiatives specific to the RCAF and many aircraft due to be replaced or modernized, the workload for operational test and evaluation is going to increase.

By amalgamating five existing test and evaluation flights (TEFs)—helicopter, long-range patrol, transport, land aviation, and fighter—with two new flights for search and rescue and aerospace systems under one command, the Air Force hopes to better manage its limited resources as more platforms and systems require testing and evaluation.

"It was deemed that the status quo won't work if we are to achieve success with those initiatives," said Edwards.

Historically, test and evaluation has been managed within each fleet of aircraft, but it has often drawn people from the operational squadrons and into the testing seats to conduct a trial of a new aircraft or aircraft system. Each community will continue to develop its own testing expertise, but by centralizing decisions about how those people are assigned, 434 Squadron hopes to manage the strain when capabilities are being introduced at the same time that the aircraft are being deployed. Search and rescue aircraft, the CP-140 Aurora or the strategic transport CC-177 Globemaster, for example, rarely have a dip in operational tempo.

"They can keep the structure of their operational force together," Edwards said of the operational squadrons. "As the fleets convert back to operations with the new platform, we'll take the people from the test and evaluation chairs and move them back to the operational chairs. And then I can reallocate those test and evaluation [positions] to the next fleet that is undergoing the next transition."

The two new flights are intended to address the arrival of the new CC-295W search and rescue aircraft into service in 2019 and the many ground-based and airborne systems that support all the fleets being introduced in the coming years, such as navigation aids, communication systems, ground-based radars, data link systems, and even simulators

"The new Aero TEF is going to provide that body of expertise and create a body that is responsible to deliver that ground capability," said Edwards, noting that a coordinated process will ensure interoperability between all systems during the OT&E phase. "There's no sense modifying the fleet with data link systems when we have not done the ground support with it."

By including 434 Squadron under the RAWC, which has been transformed in recent years as one of the RCAF's core pillars with 1 Canadian Air Division (operations) and 2 Canadian Air Division (training), lessons acquired during the test and evaluation phase should be more readily incorporated into the development of doctrine and tactics, techniques and procedures (TTPs) that shape training and operations.

Among Edwards' immediate priorities are the amalgamation of the TEFs and establishing a new governance structure, what he called an "air test and evaluation master plan."

But the process won't be completely new. As an exchange officer with RAF Waddington in 2008, he was part of the transformation of 56 Squadron into an OT&E unit for C4ISR (Command, Control, Computers, Communications and Intelligence, Surveillances and Reconnaissance), conducting trials on unmanned aerial systems, Airborne Warning and Control System aircraft, and Hawker Siddeley Nimrod maritime patrol aircraft.

The return of the squadron's colours was a proud moment and the members are keen to carry on its Bluenose traditions. No. 434 Squadron, adopted by the Rotary Club of Halifax, was the RCAF's 13th overseas bomber squadron, formed on June 13, 1943, at RCAF Station Tholthorpe in England. It was reformed as 434 Strike/Attack Squadron in 1963 and as 434 Operational Training Squadron in 1968. It was then re-designated 434 Tactical Fighter Operational Training Squadron in 1970, as 434 Composite Squadron in 1992, and finally as 434 Combat Support Squadron in 1993.

In its first two years of operations, the squadron accomplished eight significant battle honours, reflective of what it is trying to do now in a brief period, said Edwards. But he's hoping to break with at least one 434 Squadron tradition.

"The squadron would stand down every time it switched to a new aircraft. Now that we have all the aircraft of the RCAF under the remit of 434, I hope to see a bit more longevity in the squadron."

- Helicopter Operational Test & Evaluation Flight at 12 Wing Shearwater, N.S., is responsible for the operationalization of the CH-148 Cyclone Maritime Helicopter.
- Long Range Patrol Operational Test & Evaluation Flight in 14 Wing Greenwood, N.S., is focused primarily on the CP-140 Aurora.
- Transport Operational Test and Evaluation Flight, located at 8 Wing Trenton, Ont., deals with all air mobility fleets like the CC-130J Hercules, CC-177 Globemaster, and CC-150 Airbus.
- Land Aviation Test and Evaluation Flight is in St Hubert, Que., and supports tactical aviation helicopters like the CH-147 Chinooks and CH-146 Griffons.
- Fighter Operational Test & Evaluation Flight is in 4 Wing Cold Lake, Alta. and deals with fighter aircraft.
- (new) Search and Rescue Test & Evaluation Flight will be stood-up at 19 Wing Comox, B.C., and will be responsible for the new Fixed-Wing Search and Rescue, CH-149 Cormorant, and the CC-130H Hercules and CH-146 Griffon SAR fleets.
- (new) The Aerospace Systems Test & Evaluation Flight will be co-located with 434 Squadron headquarters in 8 Wing Trenton and will deal with ground-based aeronautical systems such as radars, navigational aids, meteorological systems and data links.

WIND TUNNEL TEST VALIDATES NEW SNIPER POD PLACEMENT

BY CHRIS THATCHER

The CF-188 Hornet will see its sniper pod moved from the left side of the fuselage to the centreline station on the underbelly of the jet, if ongoing testing validates the new placement.

In May, aerospace engineers with the National Research Council of Canada's (NRC) aerospace research centre in Ottawa conducted a series of trials in a two-by-three metre wind tunnel to gather supporting data for the Royal Canadian Air Force (RCAF) to understand the aerodynamics of the new placement.

"For this configuration, we are running at close to takeoff and landing speeds to simulate the takeoff and landing of the F-18, about 100 metres per second or almost 200 knots," explained Melissa Richardson, an aerodynamics research officer and the project manager for the testing process, as wind whipped over the inverted nose landing gear and sniper pod.

The CF-188 fighter jet has carried a certified sniper pod on the left side of the fuselage, below the engine intake, since the aircraft were upgraded in the early 2000s. But lessons from recent operations over Libya in 2011 and Iraq and Syria between October 2014 and March 2016 convinced pilots they would have a better view of possible targets with the centerline placement.

"We found a lot of our missions revolved around looking at the ground, monitoring areas of interest and targets for missions that are four to five hours long," said Capt Tom Lawrence, a CF-188 pilot and the project officer for fighter weapons and equipment. "When [pilots] are manoeuvring their aircraft, there is a chance of the aircraft actually masking the targeting pod. Putting [it] on the centre of the aircraft allows a larger field of regard."

Rather than bank left to maintain focus on a target, the new placement should ensure an uninterrupted view of the ground or target aircraft, "taking that frustration out of the pilot's mind," he said. "They can just focus on the imagery and the task at hand."

Lawrence said it could also make it easier for pilots to employ weapons and assess battle damage effects.

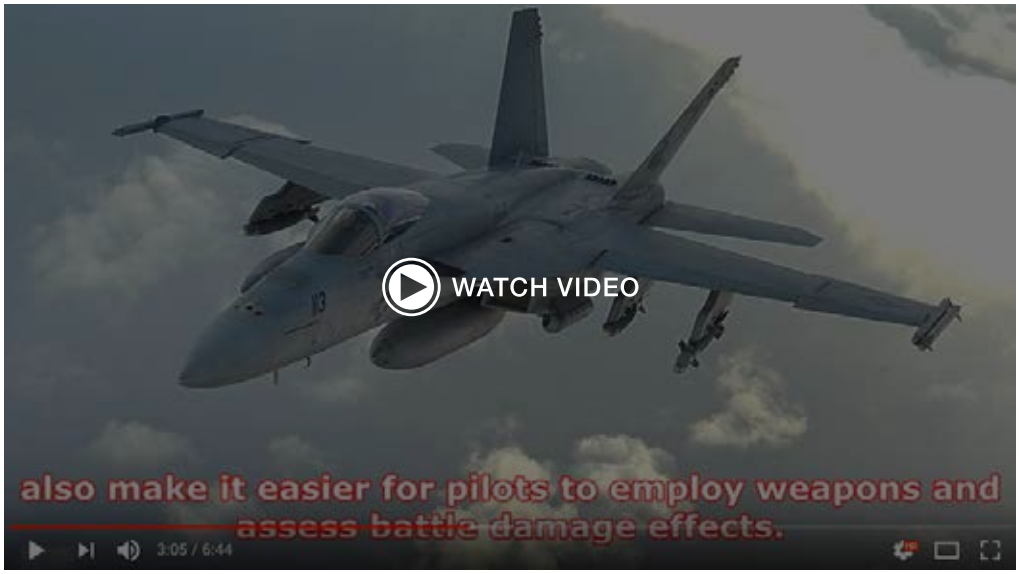
The purpose of the wind tunnel tests is to measure the aerodynamics created by the nose landing gear on the sniper pod mounted behind it at times when it is most exposed to turbulence, said Richardson. Among concerns before the tests began were the effect of significant vibration on the pod and the possibility of debris being kicked up by the wheels and striking its protective glass shield.

"[We need to] make sure the aircraft is safe to operate with the sniper pod on this new location. That means it can take off and land without excessive vibration, that the loads are still within acceptable limits," explained Capt David Demel, the certification authority with the RCAF's Technical Airworthiness Authority. "This is the goal of the current wind tunnel test, to confirm that before we move to the flight test phase in Cold Lake in the September timeframe."

A second high-speed equivalent test will be conducted by the NRC at its high speed trisonic wind tunnel, using a six per cent scale model, that will include ensuring engine intake airflow is not affected. Test pilots with the Operational Test and Evaluation Unit in Cold Lake will then recertify operational airworthiness of the sniper pod in its new placement.

While the testing facilities are being provided by the NRC, the vibration data is being gathered and analyzed by Bombardier, which has provided some of the instrumentation. The sniper pod and landing gear were installed in the wind tunnel by L-3 MAS, which will have the task of mounting the pods in the new location on the entire CF-188 fleet—including the 18 F/A-18 Hornets the government is negotiating to buy from the Royal Australian Air Force—once approved.

"We're all collaborating on the project as it goes through each phase, from technical airworthiness to operational airworthiness," said Lawrence.



A jet stream is positioned in front of a sniper pod behind the nose landing gear of a CF-188 to test aerodynamics. **Chris Thatcher Photo**

An RCAF CF-188 Hornet refuels from a CC-130HT Hercules during Exercise Puma Strike in 2016. This year marks the 25th anniversary that 435 Transport and Rescue Squadron has been providing air-to-air refueling with its Hercules tankers. **Cpl Manuela Berger Photo**

435 SQUADRON DELIVERS AIR-TO-AIR REFUELLING FOR A QUARTER CENTURY

BY CAPT MIKE WOLTER

This is a milestone year for 435 Transport and Rescue Squadron, whose members are celebrating 25 years of operational air-to-air refuelling (AAR) with the CC-130HT Hercules tanker aircraft.

435 "Chinthe" Squadron is located in Winnipeg, Man., but reports to 19 Wing Comox, B.C.

As proud refuellers for a quarter century, 435 AAR crews have seen the world through myriad different exercises and operations, delivering a critical enabling capability for Canadian and allied fighter jets.

By the end of 1992, the Royal Canadian Air Force (RCAF) had taken delivery of five new CC-130H Hercules aircraft. At Northwest Industries Limited in Edmonton, Alta., they were converted to the CC-130HT tanker configuration.

Combining a fuselage tank capable of carrying 24,000 pounds of jet fuel, new fuel lines and drogue-style air refuelling pods, CC-130HTs provided the RCAF with a flexible AAR asset for its probe-equipped fighters.

The first aircraft modified was tail number 130339 and the initial aircrew course was completed in 1993. Shortly thereafter, the squadron carried out its first operational AAR mission.

On Feb. 11, 1993, 435 Squadron assisted in the intercept of a highjacked Lufthansa Airbus A310 off the East Coast of North America in conjunction with the United States Air Force.

During their first few years of operations, AAR crews from 435 Squadron participated in numerous operations and exercises as aircrew and technicians alike quickly became educated on their new equipment and role.

In these early years, AAR operations were conducted in Europe and northern Canada and AAR exercises took place in the Netherlands and the United States.

In 1998, 435 Squadron deployed to Kuwait as part of Operation Southern Watch. There, the squadron's tankers helped allied fighters enforce Iraqi compliance with the United Nations Security Council Resolution following the Gulf War.

In 1999, 435 Squadron participated in a 79-day NATO operation named Operation Allied Force, an air campaign conducted over the former republic of Yugoslavia.

CC-130HT aircraft provided refuelling to CF-188 Hornet fighters flying air strike missions from Aviano, Italy.

Since the terrorist attacks on Sept. 11, 2001, the squadron has been continuously engaged in Operation Noble Eagle, providing AAR support in the defence of North American airspace, often from forward operating locations in Canada's far North.

Crews also deployed to Sicily, Italy, in 2011 as part of Operation Mobile, helping fighter jets tasked to enforce the no-fly zone over Libya.

435's AAR crews and technicians continue to support yearly exercises with Canadian Hornets and fighter jets from allied countries around the world.

In recent years, the squadron has played a small but critical role at such exercises as Maple Flag in Cold Lake, Alta.; Red Flag in Alaska and Nevada; Cougar South in California; and Alouette Mobile in Louisiana.

More globally, the squadron has supported Exercise Pitch Black in Australia and Arctic Challenge in Finland as the sole RCAF envoy.

As Canada's only tactical aerial refuelling aircraft, the CC-130HT provides the RCAF with a flexible and global AAR capacity that has been extensively used since its operational introduction in 1993.

With the CC-130HT AAR capability slated for retirement in 2020, this anniversary year provides an opportunity to reflect on a proud history earned during more than 25 years "fuelling the fire."

There is no doubt that 435 Squadron's professional and flexible AAR crews will continue to accomplish their missions, striving to uphold the squadron's motto of Certi Provehendi–"Determined on Delivery"–until the last successful AAR "poke" is complete.

MUSEUM EXHIBIT

As part of their 25th anniversary celebrations, 435 Transport and Rescue Squadron, in collaboration with the Royal Aviation Museum of Western Canada, proudly unveiled an educational air-to-air refuelling exhibit on May 31, 2018.

For the foreseeable future, museum guests will have the opportunity to learn about AAR, and 435 Squadron's role."

The exhibit centrepiece is a CC-130HT AAR refuelling pod that is on loan.

Weighing almost 3,000 pounds and measuring more than 14 feet long, the Cobham Mk 32B-751 air refuelling pod, developed by Cobham in the United Kingdom, is attached under the CC-130's wing to deliver fuel from the aircraft fuel system to a receiver aircraft.

Incorporating a hose and drogue that at full trail extends 78 feet, the refuelling pod is designed to transfer fuel at rates up to 1,136 litres per minute, permitting the timely provision of airborne fuel from tanker to receiving fighter.

REELING IN THE YEAR

OVER THE PAST 12 MONTHS, THE RCAF HAS RESPONDED TO A NEW DEFENCE POLICY WITH AN INCREASE IN OPERATIONS, INVESTMENTS IN NEW CAPABILITY, CHANGES TO THE TRAINING SYSTEM, AND NEW WAYS TO ENCOURAGE INNOVATIVE THINKING. **BY JOANNA CALDER**

OPPOSITE: In July, the RCAF will deploy a task force of two CH-147F Chinooks from 450 THS and four CH-146 Griffons from 408 THS (plus one spare aircraft each) to Mali to support a UN mission.
Mike Reyno Photo

TOP LEFT: RCAF members on board HMCS *St. John's* perform maintenance on a CH-124 Sea King helicopter on the flight deck in the Mediterranean Sea.
Cpl Tony Chand Photo

TOP RIGHT: A RCAF CF-188 Hornet from 433 Tactical Fighter Squadron and an Icelandic Coast Guard Dash-8 patrol aircraft fly over Iceland on May 31, 2017 during an interception exercise.
Cpl Gary Calvé Photo

On May 4, 2018, LGen Al Meinzinger assumed command of the Royal Canadian Air Force (RCAF). He inherits an Air Force that has seen substantial developments over the past months, including the crucial release of *Strong, Secure, Engaged: Canada's Defence Policy* (SSE) in June 2017.

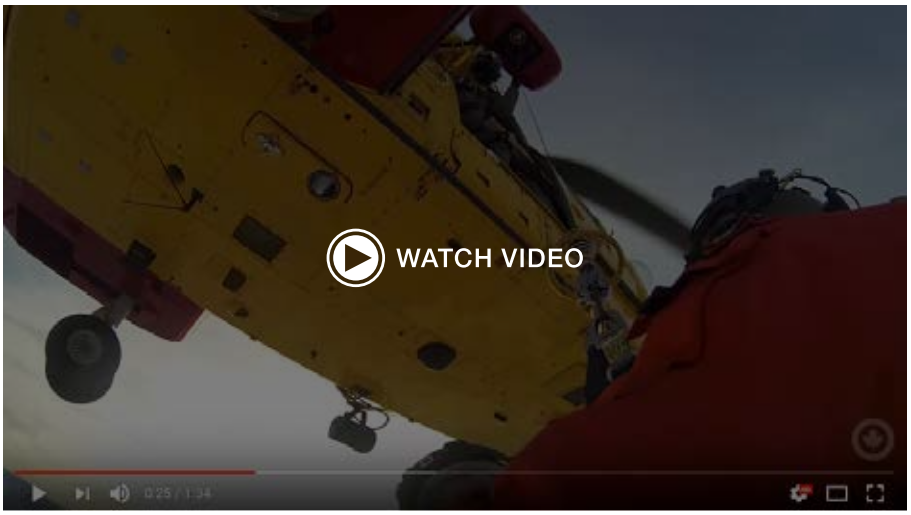
"I am extremely optimistic as I look to the future," he said during the change of command ceremony. "Our defence policy acknowledges the importance of air and space power to this great country. The policy commits significant new resources to supporting our personnel, introducing new capabilities to enable operations, including our critical sovereignty, search and rescue, and NORAD roles, to name a few."

OPERATIONAL IMPACT

On the operational front, the RCAF is preparing to deploy a task force this summer to support the UN Multidimensional Integrated Stabilization Mission in Mali (MINUSMA) for a period of 12 months. Task Force-Mali will include CH-147F Chinook helicopters to provide transport and logistics capacity, as well as CH-146 Griffon helicopters for armed escort. In addition, Canadian Armed Forces (CAF) personnel will provide a forward aeromedical evacuation capability for United Nations forces on the ground.

"We look forward to joining 57 MINUSMA partner countries in our collective efforts to bring sustainable peace and stability to Mali and the Sahel," Defence Minister Harjit Sajjan told the United Nations Security Council in March 2018. He also noted that "last November, we committed a CC-130 Hercules aircraft to provide tactical airlift support for the UN's Regional Support Centre in Entebbe [Uganda].

Canada awarded a contract to Airbus Defence and Space in December 2016 for 16 C295W transport aircraft to replace the CC-115 Buffalo and CC-130H Hercules that are currently used for search and rescue operations. The new CC-295W, though primarily a SAR asset, will be able to provide airlift support when needed. **Airbus Image**



Firefighters from the MRC de Autray unload sandbags from a Royal Canadian Air Force Chinook CH-147F helicopter during Operation Lentus in Berthierville, Que., May 10, 2017. **Sgt Marc-André Gaudreault Photo**

Preparations for deployment are currently underway. This contribution speaks to our support in helping to enable the UN's rapid deployment capacities and effective delivery in the field."

Meanwhile, the RCAF's contribution to Operation Impact, the CAF's support to the Global Coalition against Daesh in Iraq and Syria, continues with deployed air assets, aircrew and support crews. Air Task Force-Iraq (ATF-I) currently comprises a CC-150T Polaris air-to-air refueller, and two CC-130J Hercules tactical airlift aircraft supporting the movement of coalition personnel and cargo in the region. The ATF-I also includes an aviation detachment of up to four CH-146 Griffon helicopters that carry Canadian troops, equipment, and supplies in theatre. The Griffons can provide casualty evacuation as required, and they are fitted with a variety of self-defence weapons. The CP-140 Auroras were part of ATF-I from October 2014 to December 2017.

The RCAF periodically deploys assets on Operation Reassurance, the CAF contribution to NATO assurance and deterrence measures in Central and Eastern Europe, to help keep NATO air space safe. Most recently, from September to December 2017, four CF-188 Hornets and associated personnel took part in Block 45 of NATO enhanced air policing in Romania.

Also in 2017, from May 18 to June 16, Air Task Force-Iceland contributed to the NATO – Airborne Surveillance and Interception Capabilities to meet Iceland's Peacetime Preparedness Needs mission. Six Hornets patrolled Iceland's airspace, providing a continuous air surveillance and interception capability. The deployment also included aerospace controllers and aerospace control operators who analyzed information from various sources to develop a common picture of the situation in Iceland's airspace at any one time. They also served as air intercept controllers, communicating with and directing pilots.

The RCAF regularly contributes CP-140 Aurora aircraft to Operation Caribbe, along with CH-124 Sea King helicopters that are embarked onboard Canadian naval ships. The operation is Canada's support to the U.S.-led Operation Martillo, aimed at stopping illegal trafficking in the Caribbean Ocean, Eastern Pacific Ocean and international waters off the coast of Central America. In 2017, Operation Caribbe contributed to seizing or disrupting approximately 11.5 metric tonnes of illicit drugs.

In addition, RCAF assets often deploy on Operation Renaissance, the CAF's mission to respond to another nation's request for humanitarian assistance. Last year, an air task force, as well as embarked Sea Kings, provided assistance and support to partner nations in the Caribbean region following the devastation of Hurricanes Irma and Maria.

May 12, 2018, marked the 60th anniversary of the signing of the NORAD agreement, which created the most successful binational alliance the world has ever seen, aimed at ensuring the common defence of Canada and the United States. NORAD has three missions: aerospace warning, aerospace control, and maritime warning. The defence policy notes that Canada will "meet its NORAD obligations, with new capacity in some areas" and "work with the United States to ensure that NORAD is modernized to meet existing and future challenges."

"I have … pledged to the deputy-commander of NORAD that my vision moving forward is to work in lockstep with this key command," said Meinzinger.

NORAD maintains the North Warning System, a series of 11 long-range and 36 short-range radars that lie along the entire Arctic coast of North America and are tied in with other NORAD radars. The SSE further notes that Canada will "collaborate with the United States on the development of new technologies to improve Arctic surveillance and control, including the renewal of the North Warning System" and that "studies are ongoing to determine how best to replace this important capability as part of the overall NORAD modernization."

The RCAF took over as functional authority for the Joint Space Defence mission in 2016. This new leadership role includes space domain awareness, and the development, delivery and assurance of space-based capabilities in support of joint warfighters at home and abroad. Recently, the Canadian

Space Operations Centre assisted international partners in the tracking of the Chinese space station Tiangong-1, which re-entered earth's atmosphere on April 1, 2018. Last year also saw the selection of LCol Joshua Kutryk to join Col Jeremy Hansen as Canada's second active astronaut from the RCAF.

At home, the RCAF is a regular contributor to Operation Lentus, the name given to the CAF's support to provincial or territorial authorities in response to natural disasters in Canada: forest fires, floods, ice storms or hurricanes. Operation Lentus was put into action several times in 2017, with the RCAF responding to forest fires in Manitoba and British Columbia as well as floods in Quebec and Newfoundland and Labrador. In April of this year, the RCAF assisted in the evacuation of residents of Kashechewan First Nation in Ontario, which was threatened by rising flood waters.

Of course, no survey of RCAF operational missions would be complete without making mention of aerial search and rescue operations. This dynamic, ongoing and vital mission operates around the clock to assist Canadians in danger. Alongside the Canadian Coast Guard, the CAF responds to more than 9,000 search and rescue calls annually, approximately 1,000 of which result in the launching of search and rescue air assets. In April 2018 alone, the three Joint Rescue Coordination Centres issued taskings to conduct SAR operations 63 times.

PROCUREMENT PROGRESS

A major procurement project took a giant leap forward in December 2016, when Canada awarded a contract to Airbus Defence and Space to provide a new fixed-wing search and rescue (SAR) fleet to replace Canada's Buffalo and Hercules SAR aircraft. The initial contract is for a period of 11 years and includes the acquisition of 16 CC-295W aircraft with associated training systems, the construction of a new simulator-equipped training centre in Comox, B.C., and the first five years of maintenance and support. The first aircraft is scheduled for delivery late next year.

Construction is underway for the state-of-the-art training centre, which includes 10 classrooms as well as sophisticated training devices such as a full-flight simulator, a cockpit procedures trainer, a sensor station simulator and an aircraft maintenance trainer. In addition, SSE pledges to "sustain domestic search and rescue capability, to include life extension of existing systems, acquisition of new platforms, and greater integration with internal and external partners." That's all great news for the search and rescue community.

Reaffirmed in the policy, the Department of National Defence and its partners continue to work on procuring a fighter capability of 88 jets, along with associated equipment, weapons, and sustainment set-up and services, to replace the Hornet fleet. The first aircraft is anticipated in 2025 with the fleet continuing in service beyond 2060. The competition was launched in December 2017 and, in February 2018, the suppliers' list was published. Supplier engagement began in March with meetings to discuss the procurement approach, sustainment requirements, infrastructure requirements, aircraft and associated system requirements, and industrial and technological benefits, among other topics.

Also in December 2017, the government announced that the RCAF's Hornets would be supplemented with Australian F/A-18s until the future fighter fleet is procured. The Australian fighters, which are of a similar age and design, can be integrated quickly into the existing fleet with minimal modifications, training and infrastructure changes.

On the maritime helicopter front, 423 Maritime Helicopter Squadron, based at Shearwater, N.S., conducted its final operational flight of CH-124 Sea King helicopters in January. Squadron personnel are now fully engaged in transitioning to the CH-148 Cyclone maritime helicopter. 443 Maritime Helicopter Squadron, based at Patricia Bay, B.C., will conduct Sea King operations on the West Coast until the Sea King retires at the end of this year. The first Cyclone detachments are scheduled to be onboard Royal Canadian Navy ships by this summer.

Col Jeremy Hansen (left) with new astronauts Jennifer Sidey and LCol Joshua Kutryk (left), as well as astronaut Col (Ret'd) Chris Hadfield. **Canadian Space Agency Photo**

443 Maritime Helicopter Squadron will be the last squadron to fly the Sea King. To mark the occasion, a Sea King has been painted in the original markings its first wore when it was assigned to the RCN. **Cpl Jennifer Chiasson Photo**

Canada will procure up to 88 fighter aircraft, along with associated equipment, weapons, and sustainment, to replace the CF-188. Delivery of the first aircraft is anticipated in 2025. **Stuart Sanders Photo**

402 Squadron recently introduced a procedural crew trainer to improve training for the air combat systems officers (ACSOs) and airborne electronic sensor operators (AESOPs). **DND Photo**

A new Bell 206 helicopter simulator is being installed at 3 Canadian Forces Flying Training School to improve training efficiency. **Frasca Photo**

Co-op students work in the "RCAF Flight Deck" at Communitech, an innovation hub in Kitchener-Waterloo, Ont. **DND Photo**

MODERNIZED TRAINING

As the RCAF's training authority, 2 Canadian Air Division (2 CAD) is committed to delivering RCAF training and education, responsible for executing foundational individual training and education for RCAF personnel, including *ab initio* training for most Air Force occupations. The division seeks to advance professional air power mastery and enhance air power mindedness.

Since reaching steady state operations in 2010, 2 CAD has continued to advance the yardsticks in the quality of training for Air Force personnel.

Recent initiatives include the Airpower Operations Course, which was established in late 2016 and has run through five iterations to date. The course develops airpower-mindedness in Regular and Reserve Force officers in air occupations or occupations that directly support air operations. Students learn about aerospace warfare fundamentals, theories, functions, capabilities and doctrine in addition to the operations planning process. They also learn how to plan, task, execute, assess and brief integrated air operations in various levels of conflict, including non-combatant evacuation operations, disaster response and full-spectrum warfare.

The past year also saw greater agility built into the five blocks of the Air Force Officer Development program that broadens knowledge of RCAF roles at the tactical, operational and strategic levels. Students acquired the ability to self-enrol in the first of the five training blocks of the program and they can complete the course online. In addition, the time it takes to complete the first four blocks was significantly reduced—from 240 to 135 hours. Beginning this summer, completion of the program will be mandatory for officers in air-managed occupations in order to be promoted to major.

2 CAD is also exploring and exploiting synergies between officer and non-commissioned member (NCM) professional development (PD), ensuring that NCM PD incorporates similar initiatives as the officer PD in areas such as integrated air force operations, operational planning, and staff and writing skills—to lead to similar professional airpower mastery and enhanced airpower-mindedness.

Several initiatives have been undertaken to modernize training delivery, notably under the Modernization of Basic Air Technician Training project, which began in 2016 and is scheduled to be completed by 2020. For instance, under this project, computer-based training is now being implemented on aircraft technician Level 3 courses, thereby saving classroom time and providing additional opportunities for technicians to learn hands-on skills.

There have been other advances in the use of simulation tools. For example, 402 Squadron recently acquired a procedural crew trainer. With the new equipment up and running, the squadron can cover more training at the school for the air combat systems officers (ACSOs) and airborne electronic sensor operators (AESOPs), thereby making the training more efficient, reducing the instruction burden and time at the operational training units, and producing more proficient ACSOs and AESOPs.

A new Bell 206 helicopter simulator at 3 Canadian Forces Flying Training School (3 CFFTS) will have similar effects as the device enters service in the near-term as part of the training curriculum.

There has been a renewed focus on validating the training delivery standardization across all technician and aircrew training at both 1 CAD and 2 CAD units. This involves the implementation of a five-year review cycle of all qualifications standards under the RCAF training authority umbrella, as well as bi-annual visits by 2 CAD staff.

In 2017, 17 Wing Winnipeg, Man., was transferred from 1 CAD to 2 CAD, bringing schools in Winnipeg under the Wing's command. In addition, "while 15 Wing [Moose Jaw] flying training units worked diligently

A CH-147F Chinook from 450 Tactical Helicopter Squadron flies over the Canadian National Vimy Memorial in France on July 21, 2017. **Lloyd Horgan Photo**

LGen Al Meinzinger (left) assumed command of the RCAF from LGen Mike Hood (right) on May 4, 2018. Gen Jonathan Vance, Chief of the Defence Staff, presided over the ceremony. **OS Alexandra Proulx Photo**

to increase pilot production safely and effectively, they transitioned 419 Tactical Fighter Training Squadron to 4 Wing Cold Lake, A.B., and welcomed the Canadian Forces Snowbirds, 431 Air Demonstration Squadron, to their chain of command," said 2 CAD's commander, BGen Dave Cochrane, at the end of 2017.

As part of increasing pilot production, 2 CFFTS has continued to deploy for short periods to Lake Havasu, Ariz. The last 2018 winter detachments flew close to 800 sorties during their two two-and-a-half week deployments, which enabled on-time completion of the largest single Phase III jet class in the history of the NATO Flying Training in Canada program—14 students.

Cochrane also noted that 2 CAD stood up a dedicated "basic training list" management section to provide *ab initio* students with better oversight, meaningful employment, and professional development opportunities while they await occupation training.

A CAF-wide comprehensive plan was previously implemented to streamline and modernize the Individual Training and Education (IT&E) system. The goal is to provide the ability to learn anywhere, anytime, on any device. A key enabler to the success of the IT&E modernization agenda was the establishment of the RCAF Learning Support Centre (LSC) this year under 2 CAD, linked to all 40 RCAF training establishments and a pan-CAF learning support centre network. This will promote a collaborative approach to performance improvement, training development and delivery, and education initiatives.

In April 2018, the Canadian Forces School of Aerospace Studies in Winnipeg, which trains nearly 2,000 RCAF personnel annually, became the W/C William G. Barker VC Aerospace College. The College teaches a variety of courses including the year-long Aerospace Studies Program, the Operational Test and Evaluation Course, and many more. In 2018, the College took responsibility for delivering the modelling and simulation course as well as instrument check pilot and human performance in military aviation training.

HISTORIC MILESTONES

Over the past year or so, the RCAF has celebrated several major historical milestones. The most significant was the consecration and presentation of new RCAF Colours—Queen's Colour and RCAF Colour—on Sept. 1, 2017, in Toronto. The new Colours reflect the Air Force's restored identity as the Royal Canadian Air Force and its new badge. The retired Air Command Colours are laid up at the Air Canada Centre in Toronto, where they are visible from both the interior and exterior of the building. They are, in all likelihood, the most publicly visible laid-up Colours in the history of the Canadian Armed Forces.

The RCAF has also marked the 100th anniversaries of the Battle of Vimy Ridge (April 2017) and the establishment of the Royal Flying Corps Canada (RFCC) (January 2017). The RFCC was set up to recruit and train Canadian aircrew for service in the RFC (later the Royal Air Force) during the First World War. It represented the first pilot training conducted by the military, for the military in Canada. The legacy of the RFCC provided a foundation for the establishment of a Canadian air force and influenced the organization and function of the British Commonwealth Air Training Plan in the Second World War.

Later this year, archaeological work is scheduled to take place in Deseronto, Ont., the site of an RFCC airfield. On another archaeological front, the search for nine 1/8th scale models of the famed CF-105 Avro Arrow, which were launched over Lake Ontario during testing of the aircraft's design in the 1950s, will continue this summer. At least two models have been identified on the lake bottom and the expedition leaders, with support from the RCAF and RCN, anticipate finding more and raising some or all of them.

INNOVATING FOR THE FUTURE

Innovation has become a keystone concept over the past months, both for the RCAF and the Government of Canada writ large. In 2017, the RCAF established an innovation hub—dubbed the Flight Deck—at Communitech, which is dedicated to "world-leading collaboration and innovation," near Waterloo, Ont. The goal isn't necessarily to solve the Air Force's technology challenges, but to immerse non-commissioned and junior officers for a three-month period in an entrepreneurial environment where they can learn best practices and develop "an innovation mindset."

In addition, the RCAF negotiated fellowship programs at Canadian universities, and secondments at several technology companies, to give mid-career officers and non-commissioned members educational and work experiences that could return more creative thinking to the Air Force.

"We will continue to focus on innovation as we look to the future," affirmed Meinzinger. "We often say that 'good ideas have no rank', so we look to get ideas from the coalface of our squadrons where there's great work happening day in and day out. Often, that's where the nugget of an innovative idea comes from, and we, as the senior leadership, need to create the space for those ideas to take root so we can capitalize on them."

Linked to and supporting the innovation agenda, the RCAF Aerospace Warfare Centre (RAWC)—formerly the Canadian Forces Aerospace Warfare Centre—has been confirmed as the third pillar of the RCAF construct, as an L2-level organization side by side with 1 Canadian Air Division (operations) and 2 Canadian Air Division (training). The RAWC's expansion will pay dividends beyond the RCAF in terms of air-land and maritime-air integration, better focusing on joint needs as the RCAF is heavily implicated in support to other environments' defence policy mandates.

CONCLUSION

In his change of command speech, Meinzinger said he intends to "maintain our sterling reputation for delivering operational excellence at home and abroad—the true hallmark of who we are… [O]ur success leading to the future and looking at the Air Force of 2030 and beyond will be achieved by focusing on a few things: amazing people, our new defence policy, our program and our posture. [These] will be anchor points for us as we move ahead."

He affirmed that the RCAF's outstanding men and women continue to be the RCAF's greatest strength and the foundation upon which the institution's future is built.

Looking to the future, he said that the RCAF "must deliver on the defence policy and capital programs with discipline and determination [and] we must enhance our posture and readiness such that the RCAF remains agile and able to deliver against the heightened operational output that is expected of us moving forward."

To successfully deliver air and space power, he added, the RCAF must have well-led, robust, healthy and inclusive squadrons and tactical units.

"I firmly believe that if we can get it right within our 39 flying units and our 85 tactical units, our future will be all the brighter. I pledge that, as your commander, as I guide the organization in the years ahead, my decisions will be rooted in the understanding that the men and women in our squadrons, with their rich and vibrant history, remain the lifeblood of the RCAF."

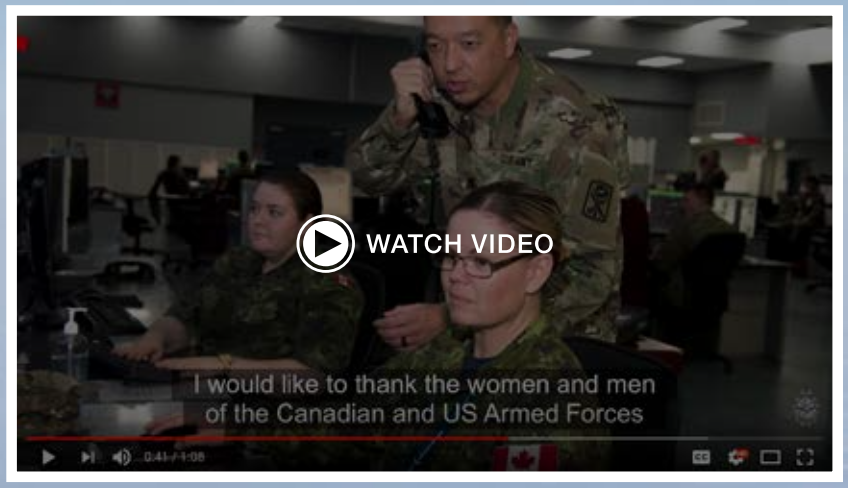
Joanna Calder *is a public affairs advisor with RCAF Headquarters in Ottawa.*

"We Have the Watch." This year's 2018 CF-18 Demo Hornet, painted to commemorate the 60th anniversary of NORAD, is joined by two CF-188s from 401 TFS carrying a typical NORAD armament load. **Mike Reyno Photo**

NORAD AT 60

A BINATIONAL DEFENCE PARTNERSHIP FORMED 60 YEARS AGO IS STILL RESPONDING TO RUSSIAN BEARS AS IT CONSIDERS CHANGES TO COUNTER NEW THREATS.

BY KEN POLE



What do Canada's CF-188 Hornets have in common with the United States' F-15 Eagles, F-16 Fighting Falcons and F-22 Raptors? Other than the fact that they are fighter aircraft, the only true commonality is their tasking by the North American Aerospace Defense Command (NORAD) to respond to foreign bogeys that come too close to our continental airspace.

The intruders have been mostly Russian Tupolev Tu-95 "Bear" long-range turboprop bombers, occasionally with a fighter escort, which entered service in 1958 and are expected to continue flying until at least 2040. While approaches tapered off sharply with the end of the Cold War, recent years have seen a resurgence, albeit not to previous levels.

Even so, Royal Canadian Air Force (RCAF) crews and their U.S. counterparts remain continuously ready to scramble within minutes after Russian or, indeed, any other potentially problematic military or civilian aircraft are detected by a global network of space-, air- or ground-based sensors. It's a big job, considering that more than 200,000 flights a year are tracked.

All traffic entering a NORAD air defence identification zone (ADIZ), which extend up to 320 kilometres offshore, must radio their planned course, destination and other details about their transit of the continental envelope to air traffic controllers at Nav Canada or their Federal Aviation Administration counterparts. Transponders also facilitate tracking; any aircraft not squawking data warrants a combat-ready interception.

Canada's NORAD mission within this globally unique military partnership is headquartered at 1 Canadian Air Division (1 CAD) in Winnipeg, Man. However, an underground facility at CFB North Bay, Ont., is the operational heart, where RCAF 22 Wing monitors and identifies all aircraft entering Canadian airspace.

22 Wing, which has no aircraft of its own, also plays a key role in protecting important visitors such as U.S. President Donald Trump on Air Force One, who flew to the G7 Summit in Quebec in June.

The U.S. has two ADIZ, encompassing Alaska's coastal regions and the southern continental states, except along the Canadian and Mexican borders. The former is controlled from Joint Base Elmendorf-Richardson just outside Anchorage, home to U.S. Air Force and Air National Guard squadrons. The latter, coordinated by Tyndall AFB in Florida, includes the Western Defense Sector, headquartered at McChord AFB near Tacoma, Wash., and the Eastern Defense Sector, headquartered at Rome, N.Y.—each a short hop from the Canadian border.

The location that understandably comes most to mind when NORAD is mentioned, thanks to countless portrayals in apocalyptic films and TV shows, is the Cheyenne Mountain Complex near Colorado Springs, Colo., with its massive facilities deep underground in solid granite designed to survive a nuclear strike. The main centre, since NORAD's role was broadened in 2006, is at nearby Peterson AFB, also home to the U.S. Northern Command (USNORTHCOM), the primary defender against any mainland invasion.

RETURN OF THE BEAR

NORAD as an entity was born in August 1957 when the two federal governments unveiled plans for a joint response to attack by Russian nuclear bombers. The politically-contentious initiative was formalized the following May and, despite occasional controversy, has been a technical success that has been continually refined to address new threats such as cruise missiles.

When a threat is brought to the attention of the NORAD command, it provides an integrated tactical warning and attack assessment to both governments. Its mission also includes detection and monitoring of narcotics traffickers' aircraft, with information passed on for action by civilian law enforcement agencies such as the Royal Canadian Mounted Police and, in the U.S., the Federal Bureau of Investigation and the Drug Enforcement Agency.

The latest but ostensibly sporadic uptick in Russian activity began in April 2017, when two CF-188s were scrambled by NORAD as two Tu-95s approached U.S. and Canadian airspace in the western Arctic. The Canadian aircraft, whose crews practice interceptions regularly, were joined by two F-22s. It was the first such reported activity since December 2014, when the Russians grounded their aircraft for safety reasons.

A NORAD official stressed that the Tu-95s "professionally and safely" did not enter either country's airspace. But it also was the fourth time in as many days that the big bombers, along with Ilyushin IL-38 maritime patrol aircraft, had been detected.

"It's not unprecedented," said a NORAD official, attributing the increased frequency to a need to refresh and train aircrews after being grounded for so long. The official said the intercepts had shown "the value of NORAD and [the] binational U.S. and Canada relationship."

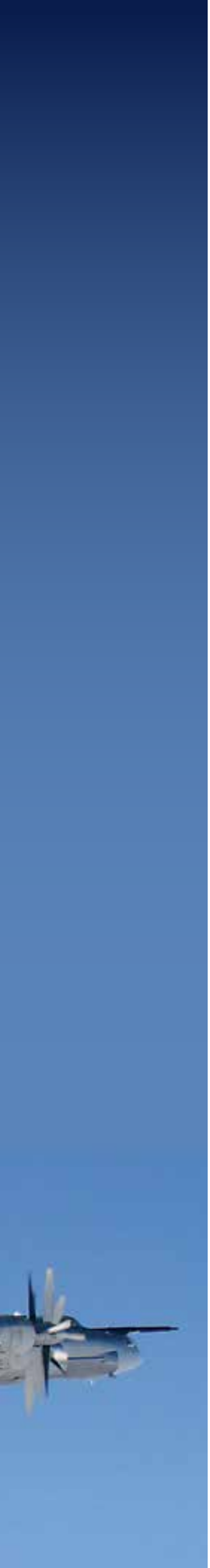
The following month, two F-22s closed on another pair of Tu-95s—this time with formidable Sukoi Su-35 "Frogfoot" fighter escorts, the first such formation since 2015—as they flew to within 80 kilometres of the state's northwestern tip. A loitering Beriev A-50 "Mainstay" airborne early warning and control aircraft remained in international airspace.

The most recent reported interception occurred in May 2018 when yet another Tu-95 duo, again off western Alaska, were met by F-22s shortly after entering the ADIZ north of the Aleutian Islands, which reaches almost to the Russian mainland on the other side of the Bering Strait. However, they left a short while later without actually entering U.S. airspace, having apparently completed what is once more becoming a regular training exercise.

While the main NORAD focus is military, civil traffic also comes under its wing. There was a high-profile interception of a Montreal-based Sunwing daily charter flight to Cuba in July 2017 after the crew reported a situation which had begun with "an unruly customer making nonspecific threats." The Boeing 737-800 with 170 passengers was met in U.S. airspace by two F-15s, scrambled out of Massachusetts, while two CF-188s from Bagotville, Que., and two F-16s out of New Jersey monitored the situation at a distance.

(Cont'd on p.38)

There has been a recent increase in the number of intercepts by Canadian and American fighters of Russia aircraft as they approach North American airspace. **DND Photo**



Cpl-chef Louis Brunet Photo

Q DUTY

TWENTY-FOUR HOURS A DAY, 365 DAYS A YEAR, FIGHTER PILOTS AND SUPPORT PERSONNEL STAND ON QUICK REACTION ALERT TO DEFEND CANADIAN AIRSPACE.

BY CHRIS THATCHER

What does it take to man the Q, more formally known to CF-188 Hornet pilots as the NORAD quick reaction alert? Lots of coffee.

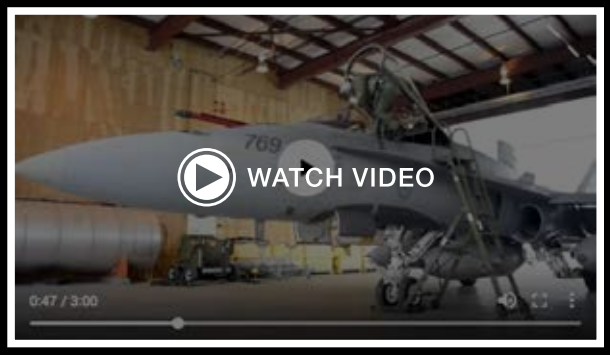
It is probably the most important mission of the Royal Canadian Air Force (RCAF), defending and deterring threats from Canadian sovereign airspace. Though much of how it is conducted is highly classified, pilots and support personnel from 401 Tactical Fighter Squadron (TFS) were willing to share a little about a typical day in the Q that involves copious amounts of coffee and most describe as the epitome of hurry up and wait.

The RCAF's four fighter squadrons alternate the responsibility from various locations across Canada, including their main operating bases at 4 Wing Cold Lake, Alta., and 3 Wing Bagotville, Que., providing a round-the-clock, short-notice response to foreign military aircraft skirting the edge of North American airspace, civilian airliners not responding to air traffic control, and ships transiting into NORAD's area of operations.

"It is exciting because you just don't know what is going to happen. We carry this huge bag of publications for pretty much the whole of western Canada and the U.S. because often, we don't know where we will be going," said Capt Christopher Mileusnic, a former Royal Air Force fighter pilot now in his sixth year with 401 TFS. "Typically, when we're scrambled we have an idea if we're going north, south, east or west, but that's pretty much it."

"There's always a lot of mystery behind it because you don't always train for the NORAD mission at 410 (Tactical Fighter Operational Training Squadron), and when you get to the Q, there is a lot of unknown," added Capt Patrick Shaver, a recent arrival to the squadron.

That can mean a certain level of tension as crews wait for the alarm to send them into action. But in between those calls, each day or night shift involves coffee to remain alert and offers "a good place to catch up on studying and reading



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A CF-188 Hornet lands in Iqaluit during a Vigilant Shield exercise. CF-188s can be deployed to a number of forward operating locations in the Canadian North. **MCpl Pat Blanchard Photo**

U.S. Air Force Gen Lori Robinson, commander of NORAD and U.S. Northern Command, and Canadian LGen Pierre St-Amand, NORAD deputy commander, during the unveiling ceremony for a memorial cairn honouring the Canadian service men and women who passed away while serving at NORAD in Colorado Springs. **N&NC Public Affairs Photo**

When CF-188s are scrambled to head North into the Canadian Arctic, they are often supported by U.S. Air Force KC-135 Stratotankers that provide air refueling to the CF-188s. **USAF Tech Sgt Gregory Brook Photo**

(Cont'd from p.36)

(The passenger, who evidently had been threatening other passengers and cabin crew, was arrested and charged with multiple offences, including assault and posing a threat to aviation security. He eventually was sentenced in April 2018 to time served in custody, put on probation for three years, and ordered to compensate Sunwing for more than $17,000 in costs.)

It was a minor incident in the overall picture of NORAD air traffic, but it could have been more serious and was a valuable exercise for the Canadian and U.S. fighter crews, who train regularly and usually unnoticed.

COMPLEXITY IS YOUR COMPANION

NORAD is under the command of USAF Gen Terrence O'Shaughnessy and his deputy commander, RCAF LGen Pierre St-Amand. O'Shaugnessy is the former Hawaii-based commander of U.S. Pacific Air Forces, while St-Amand has been at Peterson AFB since July 2015. A former CF-188 pilot, St-Amand has served in 3 Wing Bagotville and 4 Wing Cold Lake, where he commanded 441 Tactical Fighter Squadron and 4 Wing. He also was deputy commander and then commander at 1 CAD.

O'Shaughessy succeeded NORAD's first female commander, Gen Lori Robinson, at a ceremony in May 2018, presided over by U.S. Secretary of Defense Jim Mattis and Canadian Chief of the Defence Staff Gen Jonathan Vance and attended by, among others, Defence Minister Harjit Sajjan and the chairman of the U.S. Joint Chiefs of Staff, Gen Joseph Dunford.

Mattis said threats today are sophisticated and less predictable than those NORAD faced in the early years. "As your team deters adversaries and defends us from these threats in the days to come, complexity will be your constant

(Cont'd from p.37)

the volumes of manuals you need to know for NORAD duties and our various mission sets," Shaver admitted.

NORAD's long-standing role of early warning and air control since the binational partnership was formed in 1958 remains the primary mission. Though Canadian fighter pilots saw a pause following the end of the Cold War in 1992, Russia in 2007 resumed strategic long-range flights of Tupolev Tu-95/-142 four-engine turboprop bombers, better know as Bears, and various fighter jets along North American, Scandinavian and European airspace.

In response to the terrorist attack of Sept. 11, 2001, in which four airliners were hijacked and turned into weapons, NORAD turned inward, adopting another mission called Operation Noble Eagle to monitor and respond to aircraft posing a threat to either Canada or the U.S. And in 2006, NORAD added maritime warning, collaborating with other government agencies to identify ocean traffic transiting or entering NORAD's area of operations.

The RCAF has both CC-130 Hercules and CC-150 Polaris air-to-air refuelling tankers to support the CF-188 Hornets on long flights over the Arctic Ocean, but much of the airborne tanking comes from U.S.-based aircraft on alert.

Exact numbers of sorties are considered classified. LCol Forrest Rock, commander of 401 TFS, said the tempo of operations "ebbs and flows" throughout the year, but "the frequency of operations has remained relatively constant."

When missions do occur, however, they generate a jolt of adrenaline. Mileusnic has twice intercepted Bears over the Arctic and said that while the flying itself is relatively simple, "the potential for something to go wrong persists. Flying in the Arctic is hazardous. If you end up in the Arctic Ocean, which even at the warmest time of the year is frigid, your chances of survival are very low regardless of survival gear."

Some pilots wait weeks or even months to encounter a Bear; Mileusnic made contact on his very first shift, a lengthy flight that involved several hours of flying over the Arctic without success, an overnight stay at a northern base, and finally an intercept of two Bears the next morning. His second came a few months later at two o'clock in the morning in poor weather conditions.

"It's big," he said of the Tupolev. "There is some strange turbulence that comes off those counter-rotating propellers."

The objective of each encounter, which can last for over 45 minutes, is not confrontation but rather a show of capability.

"The intent is to be seen. They know each time they come they are going to get met by fully armed Hornets," Mileusnic explained. "We issue various warnings, letting them know we know where they are, and that they are approaching our territory. In essence, we shadow them overtly, making sure they can see we are watching them."

Though less frequent, Operation Noble Eagle, too,is a demonstration of the RCAF's rapid response capability. "Anytime an airborne entity doesn't respond to communications or deviates without cause from its flight plan, we adopt a heightened posture," said Mileusnic. "It is normally completely innocent."

For the squadron's maintainers, being on quick reaction alert provides a greater sense of urgency. While technicians strive to keep the squad's CF-188s flying every day, knowing what's at stake while on Q duty provides a different sense of priority, 401 TFS maintainers told *RCAF Today*.

"The Q is our priority," said Sgt Glen Jefferson, an air weapons specialist. "If we hear anything go wrong, anything breaks, immediately the sense of urgency in this building spools right up, and technicians bend over backwards to get that jet out the door. Everyone here knows the Q is a national priority and everyone feels that pressure to get it ready. No one wants to fail."

Deployments like the Q and international operations help bring into focus the hours of maintenance and the search for parts to keep the Hornets performing, said Aviator Brett Carr, an aviation systems technician. "The Q definitely adds more of a workload, but it does provide a significant sense of accomplishment because you know your efforts are important to national security."

There's also a feeling of reward when pilots intercept an aircraft bordering Canadian sovereign airspace. "The squadron did that. It wasn't one person, it was all of us—supply/logistics, maintenance and the pilots [flying the mission]. We did our job," said Jefferson.

A CF-188 pilot boards his aircraft during a scramble exercise at a forward operating location (FOL) in Inuvik, N.W.T. **Cpl JF Lauzé Photo**

A CF-188 practices intercept and escort procedures with a U.S. Air Force B-52H. **USAF Tech Sgt Gregory Brook Photo**

companion," he told O'Shaughnessy. "You must embrace it and master it."

O'Shaughnessy acknowledged the responsibility and said, "I am joining a combined team that has safeguarded our nations amidst one of the most diverse and challenging security atmospheres in our history."

Sajjan agreed. "Threats to North America have changed and we need to change along with it," he said. "To be effective in the 21st century we have to continue to work together to modernize NORAD in support of our strategic commands. As part of Canada's new defence policy … we are committed to our working partnership. For decades to come, we will continue to collaborate in innovative ways to keep North America safe."

All were essentially echoing a statement by Prime Minister Justin Trudeau and President Trump after their first official meeting, in Washington, in February 2017.

"NORAD … illustrates the strength of our mutual commitment," they said. "United States and Canadian forces jointly conduct aerospace warning, aerospace control, and maritime warning in defence of North America. We will work to modernize and broaden our NORAD partnership in these key domains, as well as in cyber and space."

Even though Russia is still seen as the key potential aggressor, given its recent activities in Eastern Europe and Syria, how NORAD will evolve to meet its historic adversary's new strategic doctrine is uncertain. There also is the prospect of attack by "non-state" entities such as terrorist groups.

"The 'new' threat or strategic environment is the primary driver behind both modernization and evolution," wrote Andre Charron and James Fergusson, two of Canada's leading experts on NORAD, in a policy paper released by the Centre for Defence and Security Studies (CDSS) at the University of Manitoba in May 2017. "There are major gaps related to NORAD's aerospace and maritime warning missions, and its air defence control mission. Essentially, the requirements to fill these gaps dictate a response beyond simply modernizing the NWS (North Warning System) and replacing aged radars, jets and ships."

Charron, director of the CDSS and a member of the Department of National Defence's advisory board, and Fergusson, CDSS deputy director, argued that, related to new threats, "is the need for evolved command and control arrangements as well as potentially expanded delegations of authorities, and the potential acquisition of new missions, especially maritime control, to NORAD. In effect, the NORAD of tomorrow may be appreciably different from NORAD today, which also means that the defence of North America will be different, assuming, of course, both governments agree to taking the necessary steps forward."

The university hosted a conference in May, attended by current and past senior leaders of NORAD, to mark the 60th anniversary and debate many of the proposed changes.

THE NEXT 60 YEARS

When the government unveiled its new defence policy, *Strong, Secure, Engaged,* in June 2017, it committed to significant spending increases in all commands over the next decade, including NORAD.

"We are active players in a modern, continental defence partnership," said Sajjan at the time. "We will enter discussions with our U.S. counterparts on NORAD modernization. That will include replacing the North Warning System with new technology. And it will include an all-perils approach to protecting against the full range of threats including air, maritime and underwater."

Charron pointed out in an analysis for the Conference of Defence Associations Institute that that there was really nothing new about NORAD or the Arctic in the government's plan. She reiterated her concerns about new threats such as cruise missiles and "drones," which she said the NWS is not designed to detect. "Furthermore, the NWS is located deep into Canadian territory, which means it cannot give the type of advanced warning it was once designed to provide given the new threats Canada faces."

The earlier paper with Fergusson had suggested that the evolving environment could influence the government's choice of new fighters to replace its upgraded but aging fleet of CF-188s. Charron returned to that in her analysis. "Ensuring Canada can meet its NORAD commitments is one of the impetuses for the replacement," she said, pointing out that through its annual fall exercise, Vigilant Shield, NORAD had been testing different command and control arrangements, including a dedicated in-theatre commander responding to the NORAD commander so that there would be only one "button" to push for all tasking of NORAD-assigned Canadian and U.S. aircraft.

"Canada needs to think through the ramification of this potential change for its forces and operations before moving ahead with any changes," she warned, clearly signalling that Canada and NORAD face potentially more daunting bogeys than Russian bombers.

Ken Pole *has had a life-long passion for aerospace, writing about all its aspects for nearly 40 years. The longest-serving continuous member of the Canadian Parliamentary Press Gallery, he's also an avid sailor.*

An F-16, F-22 and F-15 from the USAF, and a CF-188 from the RCAF perform a flyover during the command's 60th anniversary ceremony at Peterson Air Force Base on May 12, 2018. **Dennis Carlyle Photo**

SUBMARINE Hunter

AFTER A DECADE OF PREDOMINANTLY PERFORMING AN OVERLAND ROLE, THE FORMIDABLE CP-140 AURORA IS GETTING BACK UP TO SPEED FOR ITS ORIGINAL ANTI-SUBMARINE WARFARE TASK.

BY CHRIS THATCHER

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The CP-140 Aurora remains a highly capable aircraft for a number of missions, thanks to a series of upgrades. **Michael Durning Photo**

Since the end of the Cold War, the Aurora's expeditionary role has more often been tied to counterinsurgency, counter-terrorism, counterpiracy and peace support operations than hunting for submarines. **Michael Durning Photo**

When Col Mike Adamson accepted command of 14 Wing Greenwood, N.S., in July 2017, the job came with an additional though less visible role to base commander: be the voice for the long-range patrol community and chair of an Air Force advisory group.

His first assignment from the commander of 1 Canadian Air Division was to assess and map the status of anti-submarine warfare (ASW) capabilities in the Air Force. What shape were ASW skills in? And what training was required to bring them back up to speed?

"If you can do ASW, you can do anything. It is probably the most difficult mission set that we have," Adamson, a navigator by trade, told *RCAF Today*.

The CP-140 Aurora was originally acquired in 1980 as a submarine hunter to patrol the oceans of the North Atlantic and Pacific. Over the past two decades, however, the long-range patrol aircraft has become better known as a maritime and overland strike coordination and intelligence, surveillance and reconnaissance (ISR) platform, flying in support of operations in the former Yugoslavia, the Persian Gulf, Libya, and Iraq and Syria.

On Operation Impact in Iraq, for example, the two Auroras deployed between October 2014 and December 2017 conducted 881 sorties, working with coalition fighter jets, remotely piloted aircraft, and special operations forces on the ground to provide target information, ISR data and battle damage assessments.

While the experience gained from such missions has been invaluable to CP-140 aircrews, there has been growing recognition in recent years that the task for which the Auroras were initially procured is re-surfacing. More nations and non-state actors are acquiring submarine capabilities, and the skill set needed to combat those threats is a perishable one.

So, although the Aurora continues to deliver ISR missions—one CP-140 is currently deployed to Japan to collaborate with allies countering smuggling by North Korea around the Korean Peninsula—the long-range patrol community is returning to its traditional anti-submarine warfare roots.

It's a considerable transition. For the three-and-a-half years that the Auroras served in Iraq, most of the community's efforts, from the operational aircrews to the training system, maintenance and logistics, were concentrated on meeting the requirements of that mission.

"[It's been] a whole-of-community effort to support that, to generate crews, to run the [operational training units], the pre- and post-deployment piece," said Adamson. "And some of those other skills had atrophied and fallen by the wayside."

As a first step in the assessment process, the Wing has conducted a series of simulator-based exercises in Greenwood over the past year to establish a skills baseline and identify what areas need a refresh.

"That has been highly successful. It's identified where our rusty spots are … and allowed us to do targeted training," he said. "It's allowed us to concentrate our force-generation efforts on those ASW pieces. [And] we are seeking out exercises, both domestically and internationally, to work on that."

Where in recent years the RCAF might have sent a single crew that happened to be available to a binational or multinational exercise, now it has the funding to send more than one for specific training purposes.

Crewmembers of a CP-140 Aurora control the mission from their workstations during an Op Impact mission. **DND Photo**

SUB-STANTIAL INCREASE

Since the end of the Cold War, the Aurora's expeditionary role has more often been tied to counterinsurgency, counter-terrorism, counterpiracy and peace support operations than hunting for submarines. But the demand for ASW capabilities has never really faded.

To ask about RCAF knowledge of adversary submarine capabilities is to cross into the realm of classified information, but Adamson noted the number of both traditional and non-traditional actors has grown, and even a small submersible can play havoc in the global shipping lanes that move much of the world's economy.

"The proliferation of submarines has become a lot greater in the last 20 years, and that has to be a concern for any nation that relies on maritime shipping routes and lines of communication," he said. "If you are going to be involved in that space, you need to be able to interject in that space."

That means having the sensors and skills to not only find and track subs in blue water, but also to identify and monitor vessels in the congested littorals. ASW is a deterring capability, Adamson observed, that has implications for global and continental defence, especially as the Arctic warms and NORAD considers an evolution to more than maritime warning.

"It's highlighted that this is a skill set that we don't want to let waste away because it would be tough to grow it back from scratch," he said. "So, our efforts are on … conducting the training and getting the crews back up to speed."

LEADING-EDGE SYSTEMS

When the CP-140 was acquired to replace the Canadair CP-107 Argus, the four-engine turboprop variant of the Lockheed Martin P-3 Orion was among the most advanced ASW platforms of its time. Though it is now marking its fourth decade of service and is expected to continue operating until the 2030s, a series of block upgrades have ensured the aircraft remains a highly sophisticated platform.

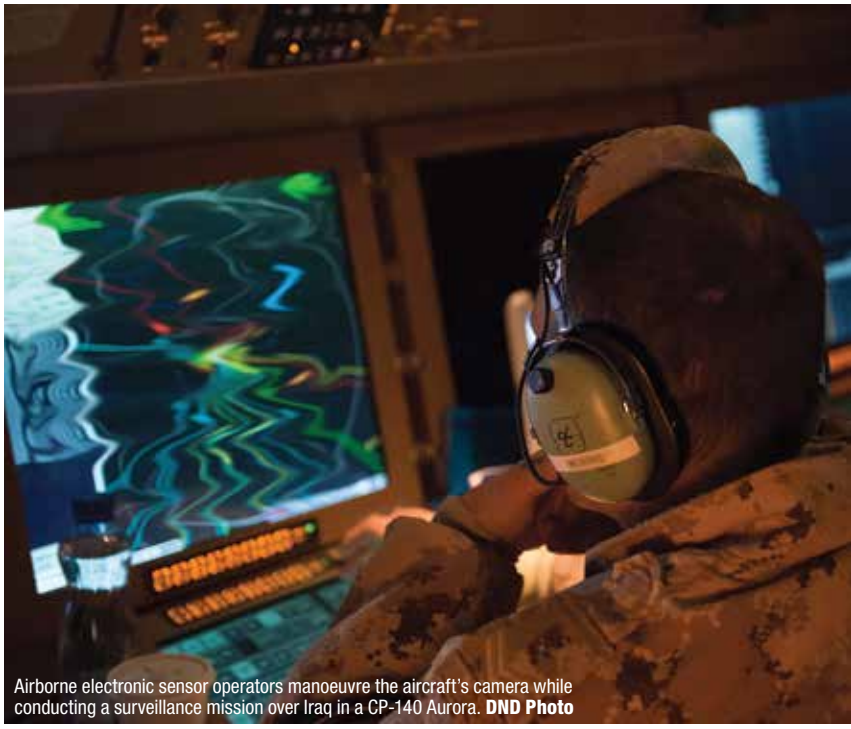
Under what is known as the Aurora Incremental Modernization Program (AIMP), block one replaced high frequency radios and standardized several obsolete systems across the entire fleet; block two upgraded navigation, flight instruments, communications management and radar systems, rewiring much of the aircraft for block three; which delivered new mission system architecture, including an array of sensors and data management systems, as well as tactical displays.

A fourth block is scheduled to begin installation this fall and will include beyond line-of-sight (BLOS) wideband satellite communications, Link 16 data exchange network access, and infrared counter measures. It is scheduled to be completed by 2022-23.

In parallel, an Aurora Structural Life Extension Project (ASLEP) has replaced the outer wings, the lower section of the centre wing, and the horizontal stabilizers. Related components subject to fatigue have been replaced with enhanced design and corrosion-resistant materials intended to reduce maintenance costs. The project is expected to extend the life of the airframe life by about 15,000 flight hours.

Before the two Auroras deployed in December 2014 as part

An aircraft technician from Air Task Force – Iraq marshals a CP-140 Aurora during Operation Impact. **DND Photo**



Airborne electronic sensor operators manoeuvre the aircraft's camera while conducting a surveillance mission over Iraq in a CP-140 Aurora. **DND Photo**

The updated Lockheed CP-140 Aurora has been recognized as one of the most capable platforms for ASW and ISR missions. **Stuart Sanders Photo**

of Joint Task Force-Iraq, the Air Force, in collaboration with industry, rapidly introduced an interim BLOS SATCOM system to support secure high-speed data streaming. The expanded sensor capability included ground mapping radar and electro-optical systems with heat-sensitive infrared cameras, as well as electronic emissions collection and onboard analytical capacity, prompting one task force commander to suggest "we are one of the best equipped assets here to do a surveillance mission."

The end result is a platform with an enhanced mission system and suite of sensors that should transition between surface, subsurface and ISR roles with ease. While some have argued for fast-tracking the Canadian multi-mission aircraft replacement program, even suggesting the acquisition of the Boeing P-8 Poseidon, Adamson said "the Canadian model, what we've got with an upgraded Aurora, [is] on par or better with any other aircraft out there."

The missions themselves and the individual crew skills might differ significantly when hunting subs versus tracking land-based targets, but the Aurora is now well-equipped for myriad roles. "I think at the moment it is state-of-the-art and capable of doing anything the newer P-8s are able to do and, to my way of thinking, even better."

LCol Jeff Davis served as deputy commander of the air task force in Iraq during the final rotation of the CP-140, and said while it's easy to become fixated on the new sensor and streaming capabilities of the aircraft, the strength of the Aurora is its crew.

"The advantage the Aurora has in any role it plays is the crew concept," he said, suggesting the transition back to an ASW role will be eased by the knowledge crews have gained working with different tasking authorities and interacting with different aircraft and ground forces. "The crew is always working and figuring things out. Even if it is a simple task in a different environment … they have worked together solving problems of one sort and it is going to aid them in solving problems of another sort."

Going back to the future will also be aided by the wealth of ASW experience in the operational squadrons and the training squadron. Both 405 Long Range Patrol Squadron at 14 Wing and 407 LRPS at 19 Wing Comox, B.C., have members with years of ASW history and 404 Long Range Patrol and Training Squadron has instructors—former pilots, navigators, and sensor operators—with a decade or more of experience who "stay abreast of recent developments and [are] an invaluable asset in keeping our current crews up to speed," said Adamson, a former commanding officer of 405 LRPS.

SCRATCHING THE SURFACE

As much as interim BLOS and other mission systems have transformed the platform, which exceeded all expectations on Op Impact, Davis admitted the Aurora community has only just begun to scratch the surface. "I'm not sure we fully tapped into the capability."

Because the aircraft deployed to Iraq within days of receiving its enhanced systems, Adamson said one of the objectives of the transition process is to understanding fully what the aircraft can deliver. He has tasked both the training schoolhouse and 415 Squadron, an operational test and

Whether performing ASW or overland ISR missions, it's not hard to understand why the CP-140 has become a platform in high demand. **Richard Cooper Photo**

evaluation unit stood up in June 2015 to oversee how best to develop aircrews and optimize command, control and ISR capabilities for the aircraft, to make that a priority.

"What are the new ranges? What are the new capabilities? We need to understand what the radar will do for us, what the acoustic system will give us. That will affect tactics development and our recommended employment. All of that has changed because of the capabilities we now have on board the aircraft," he said. "It provides a whole lot more information than we were used to having. Part and parcel of training up the crews is maximizing the new capabilities of the aircraft."

"It would be a shame if we found ourselves 10 years from now flying the aircraft like we did back in 2000 with new equipment," he added. "We really need to learn to fight the new aircraft to the best of its abilities. And I'm extremely keen on pushing the crews at 14 Wing and 19 Wing to understand what those are."

Every exercise and operation, including a late 2017 reconnaissance flight over Puerto Rico to gather a damage assessment following Hurricane Maria, is an opportunity to collect data about the aircraft that can be fed back into the training system and the operational training unit to ensure realistic training scenarios, and into future tactics development, he said.

Davis, a tactical navigator who previously served as commanding officer of 415 Squadron, said the volume of information now being generated by the sensor systems means operators need to "understand how do I change my tactics based on this flow of information? It is a crawl, walk, run type of process. We're still at the initial stages. It's the same skill set, essentially, for which we need to develop new tactics … based on what the new technology can give us."

While many of the skills for ASW and ISR missions might be similar, there are nuances to how operations are planned and conducted in the maritime and land environments, which often involve interacting with different agencies, coalition partners and headquarters, as well as with different platforms, said Adamson.

The CP-140 has yet to begin working with the incoming CH-148 Cyclone maritime helicopters, which have been undergoing shipborne testing on the Halifax-class frigates and reached initial operating capability and first deployment this summer. Once both fleets have completed their final block upgrades, however, the Aurora and Cyclone will share a formidable ASW capability.

"There is a significant amount of effort and resources being put into making sure ASW capability, whether it be rotary- or fixed-wing, is maintained," observed Adamson.

Whether it's ASW, overland ISR, supporting other government agencies, it's not hard to understand why the CP-140 has become a platform in high demand. Its data streaming capability alone is reason enough for commanders to carve out a role on missions.

"It's highlighted the fact that the capability of the aircraft runs the gamut of what we can do across the Canadian Armed Forces (CAF)," said Adamson. "It's not just maritime surveillance as it traditionally was. With things like BLOS, the appetite has been whetted across the CAF.

Canadian Joint Operations Command would love to have an Aurora in place in every operation. It provides a great communications platform, a great ISR platform. It can support the Army, the Navy, the Air Force, and Special Forces. As a result of things like BLOS, we have become a much sought-after asset."

Chris Thatcher *is editor of* RCAF Today *and a contributing editor to* Skies.

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THINKING FORWARD ON FIGHTERS

TO BETTER UNDERSTAND ALL OF THE "INTERDEPENDENCIES" THAT COULD AFFECT THE FUTURE FIGHTER JET, ALL PROJECTS FIGHTER-RELATED HAVE BEEN BROUGHT UNDER ONE OFFICE, HEADED BY A TWO-STAR GENERAL.

BY CHRIS THATCHER

Ask MGen Alain Pelletier how the Fighter Capability Office (FCO) is approaching the integration of next-generation fighter jet technology and you'll quickly appreciate why the Royal Canadian Air Force has placed all its fighter-related projects under one umbrella and adopted a much broader perspective than simply the replacement of an aging fleet of CF-188 Hornets with newer aircraft.

"Our tendency is to focus on the bright shiny object, the capability itself, and we forget about other things that would enable us to do the job in a joint, interoperable manner. I've learned from my operator past that we tend to field an aircraft, but what I want is a weapon system I'm able to operate, not as we do today, but as we will need to operate for the next 30 years," he said.

As chief of fighter capability, Pelletier has amassed a growing team of expertise from across the Air Force to understand the capability required to operate in a highly networked future security environment that is marked by the exploitation of big data, artificial intelligence, autonomous systems, and electronic warfare (EW) against an array of threats, many yet unknown. And he's challenged himself and the team to "think visionary," to see beyond today's operating concepts and imagine how that weapon system might be employed tomorrow.

"The fighter operator of aircraft that gets delivered in 2025 will not be the same as (today); they will be a coordinator of assets and manager of information," he said. "I'm encouraging my staff to think forward. If we can think forward, we can shape it."

The FCO was transformed in 2017 after the Liberal government announced at the end of 2016 a three-pronged approach to replace the legacy CF-188A/B model fleet of 76

DOWNLOAD WALLPAPER

The CF-188 first entered Canadian service in 1982. A series of upgrades ensures that the fighter jet remains relevant today and into the near future. **Mike Reyno Photo**

The Lockheed Martin F-35A stealth fighter has already been selected by a number of NATO and allied nations as their next generation fighter aircraft to replace aging F-16 and F/A-18 fighter aircraft. **Derek Heyes Photo**

Hornets operated by the RCAF's tactical fighter squadrons: an open competition for a future fighter; an interim solution to address a gap in the RCAF's ability to simultaneously fulfil its NORAD and NATO obligations; and a sustainment package for the existing fleet to extend their service life to 2032.

That interim aircraft has evolved from an initial interest in 18 new Boeing-built F/A-18E/F Super Hornets to 25 legacy Royal Australian Air Force (RAAF) F/A-18A/B Hornets, a deal which the Canadian and Australian governments are currently finalizing.

The $15 to $19 billion replacement program for 88 advanced jets is the largest procurement project in recent Air Force history. And under the new defence policy, *Strong, Secure and Engaged*, it involves far more than fighter aircraft. From air-to-air refuelling tankers, to tactical and space-based communications networks, and future air crew training, much of what the RCAF is acquiring connects in some form to the future fighter.

As a result, the FCO also includes the Future Fighter Lead-In Training (FFLIT) system—a project encompassing both fighter pilot transition training and a new trainer aircraft—short and medium range weapons, and even the CT-114 life extension project, aircraft best known to Canadians as the Snowbirds.

The fighter projects, several of which attract regular media headlines, were initially shifted from the responsibility of Director General Air Force Development to their own office, which was led by the Director General Fighter Capability, a retired RCAF brigadier general.

But as the core projects rapidly gained momentum, a major general was appointed to lead the office to alleviate the time-consuming demand on the RCAF commander and his deputy, both of whom "found they were spending a sizable portion of their time on the interim and future fighter capability" as they shuttled between other government departments answering questions about the program, explained Pelletier.

Beyond the bureaucratic issues, the project office has provided a focal point to ensure that questions about what he calls "interdependencies"—the systems and requirements of the rest of the Air Force, Army, Navy, Special Operations Forces (SOF), United States Air Force NORAD assets, NATO allies, and other government agencies—are all understood and accounted for before the future fighter is selected and fielded.

"It has truly put the right focus, given the cost and magnitude of this effort," he said.

In service with seven air forces (and ordered by two more), the Eurofighter Typhoon has been combat proven during operations in Libya, Iraq and Syria. **Airbus Photo**

Dassault believes that its combat-proven Rafael is ideally suited to replace the CF-188. **Katsuhiko Tokunaga Photo**

RIGHT FOR THE ROLE

The replacement competition for the 88 jets was officially launched in December 2017, followed by confirmation of a suppliers list of interested participants in February 2018. The list of eligible aircraft and supporting governments includes the Lockheed Martin F-35A Joint Strike Fighter and Boeing Super Hornet, both from the United States; the Dassault Aviation Rafale of France, with support from Thales and Safran Aircraft Engines; Sweden's Saab JAS 39 Gripen; and the United Kingdom- and Northern Ireland-backed Eurofighter Typhoon.

The government has since conducted regional forums with interested Canadian defence and aerospace suppliers to explain the high level requirements, acquisition process, and the industrial and technological benefit opportunities. That will continue until a request for proposal is issued in 2019. First deliveries are expected in 2025.

"This process is in the best place it's been in many years," Carla Qualtrough, minister of Public Services and Procurement Canada, told the CANSEC trade show in May.

It would have been hard to find someone more qualified than Pelletier to lead it. Since he received his wings in 1990, Pelletier has accumulated over 2,600 hours on the Hornet and served as both a squadron and Wing commander in Bagotville, Que. He gained operational experience in Kosovo, Bosnia and as the air component command team lead in Libya. More recently, he deployed as the Combined Air Operations Center director at Al Udeid Air Base, Qatar, for U.S. Central Command, overseeing all air activity in Iraq, Syria, Afghanistan and the rest of the volatile region.

He has a firm understanding of the NORAD mission, most recently during a three-year stint as deputy commander for the Continental U.S. NORAD Region, overseeing all air defence activity. And he is well versed in fighter requirements and the politics of acquisition, first as section head for fighter capability within the Directorate of Air Requirements, and then as Director Air Requirements from 2011-2013, a period during which the Conservative government altered course on the planned acquisition of 65 F-35 Joint Strike Fighters and the fighter portfolio went from 20 to "80 per cent of my RCAF acquisition file."

More important, he has an appreciation for all the aircraft in the competition. In various coalition operations, he has worked with or employed the fifth-generation F-22 Raptor, a forerunner of the F-35, the U.S. Navy and RAAF Super Hornets, the Typhoon, the Rafale, and the Gripen, as well as

Saab is confident that its single-engine Gripen E remains a viable contender for Canada's next generation fighter aircraft. **Linus Svensson Photo**

AWACS (Airborne Warning and Control System) aircraft and the other supporting assets with which fighter aircraft must be interoperable.

"I'm confident each of the aircraft expected to be proposed by the suppliers should be capable of performing the tasks expected of them. But I'm really interested in seeing how [they] not only contribute to the fight, but also to the common operating picture, to the electronic warfare battlespace awareness, to the whole understanding of the environment in which we operate," said Pelletier, a graduate of the Fighter Weapons Instructor Course, the RCAF equivalent of the U.S. Navy's Top Gun.

COMMONALITY AND INTEROPERABILITY

Resolving concerns about those interdependencies is a lengthy and comprehensive process. Over the past several months, Pelletier has met with counterparts in the Army, Navy and SOF, and on a regular basis with the directors of Air Development and Space, to understand the implications and contribution of incoming enabling systems such as EW, joint fires, and target detection and identification, as well as weapons systems of the future surface combatant, and the networks linking them all.

He's also travelling to the Pentagon to discuss U.S. Air Force and Navy systems, and to NATO and other European allies to understand the full spectrum of training and capabilities of their fighter platforms to advance the FCO projects.

"No matter what aircraft we procure, we need to be able to plug in and work with other allied assets," he said. Though he has received briefings on each contender, the meetings are to ensure "we have not missed anything and that we understand how each foreign user intends to train for, sustain and operate their respective systems in the future."

The RCAF has a well-defined statement of requirements for the fighter and is now finalizing its concept of operations and the statement of operating intent. So, another aim of the meetings is to "assess how [others] plan to operate in the future, the commonality and interoperability of equipment and armament, the integration of information," Pelletier explained.

In public and industry presentations, he and the project team have emphasised the necessity of intelligence usage from and sharing with 2 Eyes (U.S) and 5 Eyes (U.S., U.K., Australia and New Zealand) partners. While that is also a requirement of the current CF-188, it does raise questions about the ability of a non-5 Eyes-developed jet to participate.

Pelletier said the process is not expected to preclude any of the contenders. He noted the success of the Eurofighter Typhoon on coalition operations, an aircraft designed and produced by a consortium of four countries, three of which are not in the 5 Eyes community, and three OEMs. He also noted the effort of NATO partners through its interoperability working group and the Atlantic Trident 17 exercise in which the U.S. Air Force F-22 Raptor, Royal Air Force Typhoon and Armée de l'Air Rafale flew together to advance interoperability between different types of fighter aircraft.

The RCAF currently derives from the 2 Eyes and 5 Eyes information sharing agreement "mission data files that inform our systems … [and] are key to mission success in some scenarios," he said. "The project team is working with the suppliers through consultative engagements to assist with the frameworks, structures and approval processes to enable them to identify what is necessary to ensure critical data access, information integrity and mission success.

"Going away from those two elements—5 Eyes/2 Eyes and interoperability—may put at risk our ability to actually do the mission laid out in SSE," he added. "This is why we need to understand where the investment will be required, how do we mitigate the risk, and what it means in terms of acquisition and sustainment efforts as well."

Canada is acquiring 25 surplus F/A-18s from Australia to augment the RCAF's fleet of CF-188s, which could remain in service until 2032. **Senior Airman Matthew Bruch / RAAF Photo**

Canada had initially announced intentions to acquire 18 Boeing F/A-18 Super Hornets to augment the aging fleet of CF-188s until it is replaced with a new fighter aircraft. However, Canada canceled the order due to a trade dispute between Bombardier and Boeing. Boeing has since returned to the table as it believes that the Super Hornet is still the best fighter for Canada. **Dave Mills Photo**

Given the back and forth between the Air Force and industry since the F-35A acquisition was put on pause in 2012, it might be reasonable to assume the RCAF has most of what it needs to move immediately to a competition. That's not the case, Pelletier cautioned. In fact, the discussion is now advancing to the classified level and an assessment of each aircraft across the full operational spectrum.

"We're buying a very technical piece of kit which has many interdependencies, which are derived from multiple sub-capabilities. And some of those capabilities are at the classified level," he said. "We are interested in what each aircraft can do in a multitude of scenarios. So the next [round of industry engagement] is going through the mission performance analysis tools … challenging each of the capabilities represented by each of the aircraft to actually be able to deliver in specific scenarios aligned with the *SSE* missions."

That will also include an assessment of the proposed sustainment approach for the fleet. Pelletier said a draft of the mission performance would be shared with industry once it is complete.

"What we are trying to deliver is a statement of work based on a concept of operations that is sound, that is reflective of our current requirements and the way we see the Canadian Armed Forces and the RCAF operating in the future," he said. "It is not going to be left up to industry to say, this is what we believe you should be doing as a fighter force in 2030—that's the role of our defence policy."

FUTURE FIGHTER TRAINING

The next fighter jet might be the central focus of the FCO, but a critical element to its success will be the future fighter lead-in training system (FLIT). At present, FLIT is delivered through phase four of the NATO Flying Training in Canada (NFTC) program, a contractor-supported service to Canada and allied nations at 419 Tactical Fighter Training Squadron in Cold Lake, Alta.

With NFTC scheduled to expire in 2023, the FCO is analyzing options as part of a larger assessment of the entire aircrew training system that could include a replacement training jet for the CT-155 Hawk and capitalize on greater use of advanced simulation to produce pilots for the tactical squadrons.

Pelletier is monitoring closely how allies have adapted their FLIT programs to their fighter aircraft. Some, he noted, have transitioned seamlessly and have even abandoned the use of dual seat aircraft in their operational training units (OTU).

"Do we need an OTU and to what extent? What product are we seeking at the end of future FLIT (FFLIT)? That's why we are engaging with other air forces," he said. "Other countries are ahead of us and [this] allows us to leverage the experience they will have."

Australia, for example, plans to use the Pilatus PC-21, a non-jet trainer, for its future FLIT. Italy is considered at the leading edge of live, virtual and constructive training. And the U.S. is developing a lead-in system to feed four different fighter jets. The key, he said, is the ability to replicate as closely as possible—on a cheaper platform to acquire and operate—most of the capabilities of the future fighter aircraft to reduce the transition gap.

"We will be able to look at the two or three years of their implementation cycle and ask, 'what have you learned and has that delivered the output you've been looking for to get to your OTU?" That could include flying with allies to "test drive" their aircraft, course syllabus and simulation centres to shape the Canadian solution.

It might also help identify a bridging option between when NFTC expires and the future FLIT program is introduced. Among the many considerations in the RCAF's larger Future Aircrew Training (FAcT) project is the replacement of the CT-156 Harvard II. Since that project is expected to be implemented before FFLIT, it could provide "a complete or partial solution for FFLIT, depending on our requirements," said Pelletier.

Above all, the FCO aims to deliver a future fighter jet and a fighter pilot training system that can achieve operational advantage.

"Mission success and survivability is the key outcome we are looking for," he said. "Operational advantage is not only a matter of the system, it's also a matter of the aircrew that you shape. We impart onto the syllabus and the candidates as much flexibility and agility in their thinking so that they can later leverage these aptitudes in their mission planning, in the air, and in the way they use their system. We need creative and critical thinking to contribute to operational advantage."

For Pelletier's office, that means a thorough understanding before the next fighter is selected of all the surrounding systems that will ultimately support that pilot and aircraft.

A critical element to the success of the next generation fighter will be the future fighter lead-in training system (FLIT). **Mike Reyno Photo**

A CH-148 Cyclone and HMCS *Montreal* conduct vertical replenishment training during Exercise Spartan Warrior 16 in the Atlantic Ocean. **MCpl Jennifer Kusche Photo**

THE YEAR OF THE Cyclone

IT'S BEEN SLOW GOING SINCE THE CH-148 CYCLONE MARITIME HELICOPTER PROCUREMENT WAS ANNOUNCED IN 2004, BUT 12 WING SHEARWATER'S HARD WORK IS PAYING OFF. INITIAL OPERATING CAPABILITY HAS BEEN DECLARED, WITH THE CYCLONE'S FIRST OPERATIONAL DEPLOYMENT SCHEDULED FOR THIS SUMMER.

BY LISA GORDON

Canada's fleet of CH-148 Cyclone maritime helicopters achieved initial operating capability (IOC) on June 7, 2018, paving the way for the new helicopter's first operational deployment in early July.

Meanwhile, the Royal Canadian Air Force (RCAF) is rapidly phasing out the CH-124 Sea King, with one of the 1960s-era helicopters currently serving out the type's last operational mission at sea with the Royal Canadian Navy (RCN).

As Col Sid Connor said, this is the year of the Cyclone.

"At the beginning of 2018, everything we were doing was about finishing off operational testing to enable us to conduct operations, and to transition both aircrew and maintainers," said Connor, who assumed the role of Wing Commander at 12 Wing Shearwater, N.S., in July 2017.

"We've flown about 1,200 hours over the last year, split between testing hours and training hours, with some of those on the ship."

He told *RCAF Today* that ship helicopter operating limit (SHOL) testing has been completed. Those evaluations have cleared the Cyclone to operate from an RCN frigate in very rough conditions up to Sea State 6, which is characterized by waves of between 12 and 20 feet (four and six metres) high, and winds of up to 55 knots (100 kilometres per hour).

Though the procurement process has been painstakingly slow since Canada first announced it would purchase 28 Cyclones from Sikorsky in 2004, the pace of progress has picked up significantly in recent years as 12 Wing and Sikorsky work to bring the Cyclone into service.

This year, in particular, has been eventful.

On Jan. 26, 2018, the last Sea King squadron on the East Coast stood down—and within 30 days it was reactivated as a Cyclone unit.

"By the end of 2018, we'll be completely out of the Sea King business," confirmed Connor. "We've got aircraft moving back and forth from East Coast to West Coast, and we have roughly 10 aircraft [on the West Coast] now, although that number fluctuates."

While 443 Maritime Helicopter (MH) Squadron in Patricia Bay, B.C., is still flying the Sea King operationally, numbers are being "drawn down" as both aircrew and maintainers enter conversion training for the new helicopter.

Currently, a Sea King helicopter air detachment (HELAIRDET) from 443 Squadron is serving on board the frigate HMCS *St. John's* in the Mediterranean Sea, as part of

A CH-148 Cyclone and HMCS *Montreal* conduct vertical replenishment training during Exercise Spartan Warrior 16 in the Atlantic Ocean.
MCpl Jennifer Kusche Photo

Crews conduct rescue hoist training in Halifax Harbour.
MCpl Jennifer Kusche Photo

the NATO-led Operation Reassurance. The mission marks the final operational deployment for the CH-124 Sea King, which began flying for Canada in 1963.

With the ship expected home in early July, Connor said it will be replaced by HMCS *Ville de Quebec*, which will carry the first operationally deployed Cyclone HELAIRDET from 423 (MH) Squadron at 12 Wing.

But before that mission could take place, the Cyclone program had to reach IOC.

That milestone was achieved in early June and signed off by the new commander of the RCAF, LGen Al Meinzinger.

Connor said 12 Wing had to demonstrate that "we have trained enough people and that we have enough materiel, and we are sustainable, to go out on actual operations.

"Most of what we've done at 12 Wing up to this point has been all about generating that capability."

BUILDING CREW CAPABILITY

Inside the "schoolhouse" at 12 Wing—officially known as 406 Maritime Operational Training Squadron—it's a beehive of activity.

While the building itself is still officially owned by Sikorsky, Canada is expected to assume possession in the coming months.

In June 2017, the facility was officially named The Fumerton and Bing Training Centre in honour of pilot Robert "Moose" Fumerton and navigator Leslie Patrick Bing, a legendary RCAF crew who achieved the Air Force's first "night kill" of the Second World War.

"Quite often we name buildings after individuals; but in this case, at the training unit, we train crews," said Col Peter Saunders, director of operational implementation, Maritime Helicopter Project in Ottawa, and former commanding officer of 406 Squadron.

"We build crews here; we build HELAIRDETs. That's what Moose and Leslie did back in World War II. We wanted that to be an inspiration to the members of the squadron and the crews coming through there."

As of late May 2018, more than 120 maintenance personnel and 23 aircrew had completed their conversion training to the CH-148 Cyclone platform at the 12 Wing schoolhouse. [Another dozen pilots were scheduled to finish within the month.]

On the maintenance side, the transition takes between two and four months and involves several different courses of varying lengths. In January, 12 Wing had one maintenance unit; but by September, Connor said there will be three.

"We have generated enough maintainers now that we're maintaining 12 Air Maintenance Squadron (AMS) Cyclones, but we also have a maintenance capability at 423 MH Squadron and we are already training several who will be part of 443 Squadron on the West Coast."

On the aircrew side, the Cyclone is crewed by two pilots, a tactical coordinator (TACCO), and a sensor operator (SENSO).

Connor explained that pilot conversion training takes four to five months, while TACCO and SENSO courses are about six months long.

"We are taking normal Sea King crews into the schoolhouse and converting them into operational crews, now that initial cadre training is complete."

But regardless of whether they fly in or maintain the CH-148 Cyclone, simulation figures prominently in the curriculum. Connor estimated that perhaps as much as one third of the program is supported by simulators that can "fly" no matter the weather.

"There has been direction for all the fleets to get into using simulation as much as they can," said Connor. "I think the reality of it is there are a lot of things you can train much better in simulation versus in an aircraft. For example, a pilot can work an emergency cockpit fire much more realistically, because you can push beyond what would be safe in an aircraft. Similarly, you can create a warfare environment at a much greater intensity than you would on an actual helicopter, so it's more efficient and better training."

406 Squadron has two simulators used for pilot training and two mission sims used for TACCO/SENSO instruction. Both types of simulators can be linked so pilots and TACCO/SENSOs can train in the same environment.

In addition, noted Connor, the schoolhouse also features maintenance simulators that feature portions of the aircraft with actual parts.

While virtual reality is not currently employed in the schoolhouse, Connor did mention a CH-148 rescue hoist simulator developed by St. John's, N.L.-headquartered Bluedrop Training & Simulation. That device is expected to be delivered to 12 Wing shortly and will be used for proficiency training.

By the end of 2018, the RCAF will have phased out the CH-124 Sea King fleet after 55 years of service! **Heath Moffatt Photo**

By September, Cyclones will be flying with all three Maritime Helicopter Squadrons. The last Sea King operations will officially cease in December. **Mike Reyno Photo**

THE FLEET BY THE NUMBERS

So far, Canada has taken delivery of 15 of the 28 CH-148 Cyclone helicopters ordered.

"If you were to walk around 12 Wing today, you'd count 10 or 11 tails," said Saunders. "We're in the process of continual delivery."

By the end of June, he expects Shearwater to be home to six Block II helicopters, which are being used by the operational squadrons. The earlier Block I models are being cycled back to Sikorsky for upgrades; in the interim, those still at 12 Wing are being used for training purposes.

"The main difference between blocks was that the maintenance length in Block I components was not as long as what we're getting on Block II," explained Saunders. "The time between inspections has increased. No one else in the world flies Cyclones, so as we gain experience with the Block I, the system as a whole learns how the components stand up."

One of those lessons was revealed during ship-helicopter trials, when crews realized the external sonar equipment clearance was not as great as it should be when the helicopter was landing on deck. Consequently, the Block II model was modified with a new, contained sonar system.

The first Cyclone will be stationed at Patricia Bay this summer and the West Coast squadron will transition rapidly. Flying will commence by early September, with all Sea King operations ending in December.

"They will be standing up a HELAIRDET and deploying operationally in January," said Connor, who noted that lessons learned from the first operational deployment in July will be folded into the CH-148 program in "real time."

As for the Sea King fleet, the airframes that have ceased flying are being stored in Shearwater and Patricia Bay pending a disposal plan from Ottawa. At least one is destined to be displayed at the Shearwater Aviation Museum, the birthplace of maritime aviation in Canada. It's a fitting tribute to an aircraft that provided yeoman's service to the country for an astonishing 55 years.

But while it honours the past, 12 Wing is very much about the future.

Connor said Cyclone HELAIRDETs will bring tremendous capability to the field, which may prompt an expansion of their mission portfolio.

"It will get us conducting some operations we haven't conducted very often; now, the Cyclone will be the first choice [among allied aircraft]. We may find we're doing a different mixture of operations at sea."

While the Sea King had sonar and raw radar, the Cyclone offers capabilities that are "an order of magnitude better," including sonar, sonobuoy processing, and imaging radar. Its modern electro-optical/infrared (EO/IR) system is several times better in range in both visual and infrared modes.

But the modern equipment brings its own challenges, too.

"On the aircraft side, the crew had to work hard to get information on the Sea King. On the Cyclone, the aircraft is collecting a vast amount of info, so now it's about managing and interpreting that information and using it and distributing it," said Connor.

The simple fact is that transitioning to the new helicopters has presented a steep learning curve for all involved.

Luckily, said Connor, the maritime helicopter community has always been adaptable—and he's eagerly anticipating the future.

"I think all of us at the Wing are feeling especially lucky that we happen to be the ones here during this exciting year."

***Lisa Gordon** is editor-in-chief of* Skies *magazine. Prior to joining MHM Publishing in 2011, Lisa worked in association publishing for more than a decade, overseeing the production of custom-crafted trade magazines. Lisa is a graduate of the Ryerson University Journalism program.*

A door gunner with the Tactical Aviation Detachment watches out of a CH-146 Griffon helicopter during Operation Impact. **DND Photo**

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Shakedown OVER IRAQ

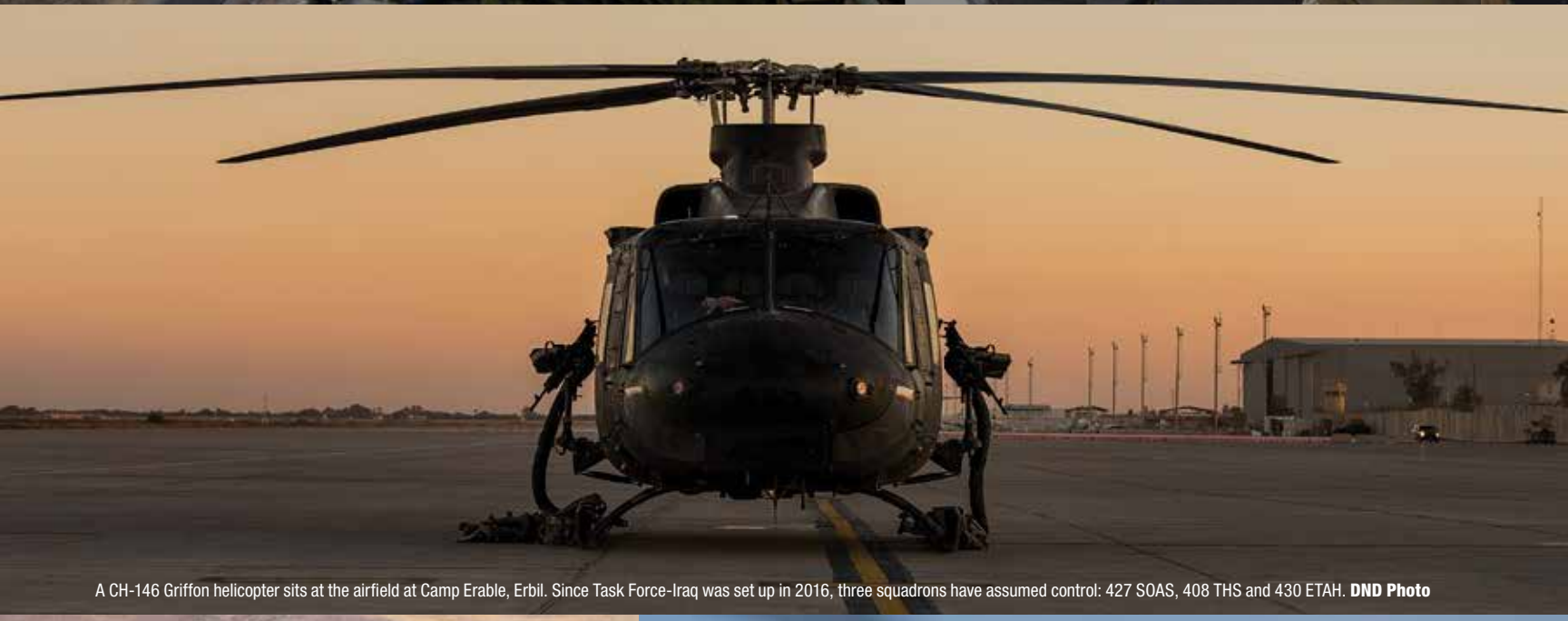
THE SCOPE OF THE MISSION MAY HAVE CHANGED, BUT RCAF CH-146 GRIFFON AIRCREWS CONTINUE TO SUPPORT SPECIAL OPERATIONS FORCES IN IRAQ.

BY CHRIS THATCHER


WATCH VIDEO
0:19 / 1:16

A door gunner on a CH-146 Griffon watches vigilantly as the helicopter flies over a village during Operation Impact. **DND Photo**

Harjit Sajjan, Minister of National Defence, boards a CH-146 Griffon helicopter during a visit to CAF personnel based in Erbil in July 2016. **DND Photo**



A CH-146 Griffon helicopter sits at the airfield at Camp Erable, Erbil. Since Task Force-Iraq was set up in 2016, three squadrons have assumed control: 427 SOAS, 408 THS and 430 ETAH. **DND Photo**

Aircrews routinely change flight profiles and rely on well-honed tactics, techniques and procedures to transit potentially risky airspace and to protect the aircraft from ground-based threats. **DND Photo**

Members of the Tactical Aviation Detachment prepare to take off for a mission in 2017 from their base in Erbil, Iraq. **DND Photo**

The battle for the northern Iraqi city of Mosul and an offensive in the Hawija pocket further south may have concluded in the summer and fall of 2017, but the whirl of Canadian helicopters continues to resound over the region.

Iraqi security forces, with the assistance of a coalition of international partners, broke the four-year siege of Mosul by the Islamic State of Iraq and Syria (ISIS) in July and have continued a sporadic fight against pockets of ISIS, also known by its Arabic name, Daesh, and its supporters across Iraq's northern provinces.

Though the scope of the conflict has changed, Canadian Special Operations Forces (SOF) continue to train, advise and assist the Iraqi forces as part of Operation Impact. In support of that effort, a tactical aviation detachment comprised of four CH-146 Griffon helicopters and around 50 aircrew, maintenance, logistics and headquarters personnel continues to provide tactical transport from an airbase near Erbil, carry Canadian and coalition SOF, equipment and ammunition between forward locations.

"There is really no change to that part," said Maj Sylvain Lapierre, commanding officer of the fifth rotation of the detachment. "We still provide them with liaison, reconnaissance, and materiel support, and we are on standby for casualty evacuation if it were to be required."

Canadian SOF initially began training and advising the Kurdish Peshmerga of northern Iraq. In June, however, Gen Jonathan Vance, chief of the defence staff, confirmed a change that will see them work solely with Iraqi security forces to set the conditions for the return of the population to Mosul.

In the months following the ouster of Daesh from Mosul, Iraq's second largest city, the aviation detachment saw what Lapierre calls a "tactical pause" in coalition SOF operations.

But it was only a brief respite. As winter turned to spring, Griffon aircrews—call sign Shakedown—have resumed conducting four to five missions per day, seven days a week, a pace similar to the height of the pre-Mosul campaign when special forces helped Iraqi troops establish blocking positions around the city.

"We are task-tailored for 12 hours a day and we routinely do about 16," said Lapierre of what remains, despite the disintegrating enemy force, a remarkably high operational tempo. In fiscal 2017, the detachment flew over 3,000 hours. "We would have no difficulties surging to 24 hours a day if we needed to."

As with all commanders since the tactical aviation detachment was first deployed in October 2016, risk management remains the biggest concern. Lapierre, a helicopter pilot with two tours in Bosnia and one in Afghanistan, as well as two years as a liaison officer with the U.S. Army Aviation Center of Excellence in Fort Rucker, Ala., said enemy rocket, mortar and small arms fire is still a threat. But the variable weather, which can quickly reduce visibility, and man-made obstacles also have to be mitigated.

"Lots of towers, lots of power lines—they are everywhere," he said. "And they are not necessarily marked to the same standards that we are used to in Canada."

Still, "rogue actors" in the form of Daesh or their sympathizers remain present in the region and a possible threat to both helicopters and special forces. Aircrews routinely change flight profiles and rely on well-honed tactics, techniques and procedures to transit potentially risky airspace and to protect the aircraft.

Potentially complicating matters further, Turkey, a NATO ally, has been conducting offensive operations across its southern border against Syrian Kurdish militia. While the fighting has not affected the detachment's missions, it nonetheless is one more issue to keep an eye on.

"We obviously monitor everything that happens in the region from an intelligence perspective," he said. "But nothing has really changed the way we are flying or how the [detachment] is operating in the area."

MANAGING RISKY BUSINESS

However, before granting mission acceptance and launch authority, air task force commanders routinely use a risk assessment scorecard that has its origins in the helicopter missions of Afghanistan. The evolving tool forces leaders to deliberately evaluate the level of risk they are being asked to accept by assigning a score to the nature of the mission, how it is organized, the number and type of aircraft involved, the types of passengers, the degree of reliable intelligence, the availability of supporting enablers, and the environmental conditions.

"When we are looking at communicating the aspects of flight safety, it has become a very important supervision tool," said Lapierre.

Many of those risks are mitigated by the fact that, although most of the tactical aviation detachment are on their first operational tour, all of the aircraft commanders (AC) are veteran pilots of multiple tours.

"I find myself in a privileged situation," acknowledged Lapierre. "It makes the risk management aspect a little easier. The ACs have become outstanding mentors for the newer generation of aircrew that are rotating through theatre that may not have [served] in Afghanistan or on a previous mission. There is great sharing of information, not just among the aircrews but also within the maintenance organization."

Exercises might train and validate the competency of an air task force, but the repetition of missions on an operation can make it easier to absorb instruction in a way that isn't always possible in complex exercise scenarios, he observed.

"Sometimes coming to a theatre where the focus is different brings new opportunities to learn. Here we have the opportunity to train our younger aircrew in a real theatre, with real tasks and real control measures, with real users. In some ways it caps everything. What you have learned before as a young aviator, this is the sum of it."

Despite temperature swings that have ranged between 35 degrees Celsius and below zero since the rotation began, the CH-146 Griffon has exceeded expectations. The detachment, which slimmed down from around 60 to 50 personnel last fall, is largely self-sufficient, managing most aspects of maintenance and logistics, and yet has had little trouble keeping the almost 20-year-old helicopters flying.

"I have outstanding serviceability here," said Lapierre. "We haven't seen any loss of performance. Like any other helicopter, there comes a point in the very high heat of the summer where we have to get into the books, look at the performance charts and find efficiencies, which we can do by managing the missions and the timings for the tasks. I think we are doing very well with this aircraft."

THE SUM OF ALL WING ASSETS

Since the detachment was first stood up in 2016, three squadrons have assumed the leadership, beginning with 427 Special Operations Aviation Squadron from Petawawa, Ont., and then 430 Tactical Helicopter Squadron (THS) from Valcartier, Que. Like Lapierre, many of the current detachment are from 408 THS in Edmonton. But over the course of his more than seven-month tour, he has seen members from every tactical aviation squadron in 1 Wing, as well as 417 Combat Support Squadron from Cold Lake, Alta. deployed to Camp Erable, home to Joint Task Force-Iraq Detachment Erbil, a headquarters staff of approximately 30 personnel and a Canadian-led Coalition Role 2 medical facility.

The commander admits he wasn't sure how well a diverse group would gel without a lot of pre-deployment training. To their credit, the different helicopter organizations clicked together almost immediately, proving the flexibility of the Royal Canadian Air Force tactical aviation detachment concept.

"It's one of those cases where one plus one equals three," he said. "We've got a lot of synergies with different units. Everybody brought something, and it made the sum of everything greater.

"It proves that we have a great deal of interoperability. Regardless of which unit people were coming from, it was easy to integrate them," he observed as he prepared to hand over command to 430 THS in late May. "[It's also] a testament to our level of readiness and how strong and mature our SOPs (standard operating procedures) are. That is one thing I'll be passing on, that we maintain our solid SOPs and work practices back home – they transfer well into theatre."

If anything, he's realized how difficult it can be to deliver such a high level of service for such an intense period. "One of my challenges is going to be to go back home and maintain the 100 per cent focus people have here," he said. "Whether it's maintenance, flying, logistical support—everyone has worked hand-in-hand to make these missions happen."

THE BIRTH OF *Swift Death*

IN ONE OF MANY "FIRSTS" OVER ITS COLOURFUL HISTORY, 401 SQUADRON IS CELEBRATING ITS CENTENNIAL A FULL FIVE YEARS BEFORE THE RCAF MARKS ITS 100TH ANNIVERSARY.

BY DR. RICHARD MAYNE

They promise "very swift death for the enemy," and this motto is something that 401 Squadron has dutifully delivered when its country needed it the most. More to point, however, 401, who are known as the "Rams," have reached a milestone as it becomes the first Canadian squadron to celebrate its centennial in November of this year.

This is a unique feat, the more so since this celebration even proceeds the RCAF's own 100th anniversary, which will be celebrated in 2024.

It is not surprising, therefore, if some people wonder how this is possible; particularly since various histories claim that this squadron was born in 1937, while others date its formation to three years earlier. Yet, after careful and deliberate research, the Canadian Armed Forces' official publication on Lineages determined that 401 can, in fact, trace its heritage back to No. 81 (Canadian) Squadron that then became the Canadian Air Force's No.1 Squadron on, or about, Nov. 20, 1918.

That particular incarnation of a Canadian Air Force would not survive, but the squadron incubated during its existence would. As such, to understand the significance of the squadron's centennial, it is important to take a close look at its birth and how it became 401, followed by a quick summary of its remarkable achievements after that point. Doing so will show why it has a history that is well worth commemorating.

The birth of 401 Squadron was actually the product of pressure that the Canadian public and press placed on

Their motto called for a "very swift death for the enemy," and it was one that No. 1 Sqn practiced frequently during the Battle of Britain. A total of 27 RCAF pilots flew in this squadron during the 53 days that it was operational over the skies of southern England in 1940. **National Air Force Museum of Canada Photo**

the government during the First World War. With numerous Canadians gaining fame and recognition while serving with the British flying services, the press, responding to a notable perception within the country, began asking why their nation did not have its own air force. The government responded by creating two Canadian squadrons; one of which was No.1. With Maj AE McKeever — a celebrated and highly decorated ace — as the first commanding officer, the squadron operated Sopwith Dolphins and SE5a fighters out of Upper Heyford and then later Shoreham. With the war over, however, government interest in maintaining a Canadian Air Force waned, and, as a result, No.1 was disbanded on Jan. 28, 1920.

No. 1 continued to have a staggered existence throughout the interwar period as it was stood up again on Apr. 1, 1925 as an "operations" squadron, then converted to training exactly two years later before being disbanded as a military unit on July 1, 1927. It was reformed as No. 1 (Fighter) Squadron on Nov. 1, 1935 after which it became a fighter flight as part of No. 3 Bomber Squadron. Less than two years later it was re-designated as "1 Fighter Squadron."

In the immediate period before the Second World War, No. 1 Squadron was a regular force unit flying Siskin aircraft out of Trenton, Ont. In August 1938, it was transferred to Calgary, Alta., where they eventually replaced their antiquated bi-planes for more modern mono-wing Hurricane fighters. The start of the war saw the squadron transferred, first to Saint Hubert, Que., and then to Dartmouth, N.S., where, in addition to more training, it conducted convoy and maritime reconnaissance patrols.

With the Germans poised to overrun France, the squadron prepared to head overseas to assist in the fighting. The problem was that it was undermanned.

To bring the unit up to combat strength, the RCAF decided that No. 1 would absorb No. 115 Squadron, which was an auxiliary reserve unit operating out of Montreal. Unfortunately, while 115 is an essential part of 401's heritage, it is not possible to explore its history here. What is important to note is that this was a noteworthy milestone in 401's history as it not only gave it ties to the reserves, but also a major Canadian city, as 115's link to a Montreal district would later translate into it becoming the "City of Westmont" Squadron.

With the addition of more airmen drawn from three bomber-reconnaissance squadrons as well as others from a Toronto manning depot, No.1 arrived in Great Britain in June 1940 where it achieved a number of significant firsts for the RCAF.

Perhaps the most obvious of these achievements was the fact that this was the first time that a Canadian squadron was engaging in combat as an independent national unit. Before this moment all Canadians who had fought in the air had done so as a member of one of the British Imperial services.

Like many squadrons, it took some time before No.1 became operational, but once it did so several other "firsts" followed. Not all of these were good news for the squadron, however. For instance, its first member to come under enemy fire was Sgt Leslie A. Burke, who also had the misfortune of being the first to die; albeit in a separate incident. There was also the death of R.L. Edwards who, in late August 1940, became the first member of the RCAF to die in aerial combat while serving in a squadron that belonged to Canada.

In all, a total of 27 RCAF pilots flew with No. 1 Squadron over the 53 days it was operational during the Battle of Britain. After the commanding officer, Ernie McNab, drew first blood for an RCAF squadron by shooting down a Dornier Do 215 on

No. 1 Sqn flew Sopwith fighters when it was first established in 1918. **DND Photo**

Battle of Britain pilots on 24 October 1940: (left to right) flying officer W.P. Sprenger, flying officer O.J. Peterson, flying lieutenant W.R. Polloch), flying officer P.B. Pitcher, squadron leader E.A. McNab, flying officer P.W. Locknan, flying lieutenant E.M. Reyno, flying officer Beardmore, flying officer S.T. Blaihloch (intelligence officer) and flying officer R.W. Norris. **DND Photo**

On Nov. 1, 1939, Squadron Leader Ernest McNab took command of No. 1 Sqn and was instrumental in guiding the squadron through its growing pains and baptism by fire. **DND Photo**

Aug. 15, 1940 over Kent, the squadron would go on to achieve impressive results as No. 1's pilots would claim 30 enemy aircraft destroyed, eight probably destroyed, and 35 damaged.

While they had played an import role in denying the Germans the opportunity of gaining air superiority over Britain, they were exhausted. As a result, they were sent to Prestwick, Scotland, where they would conduct comparatively less intensive coastal patrol work. This was then followed by a move to Digby, where, in March 1941, they were renumbered 401 as part of the birth of the RCAF's "400 series" squadrons.

401 Squadron continued to impress throughout the war. Having replaced its Hurricanes for Spitfires, the squadron flew numerous missions over enemy-held territory and played a key role in support of significant operations such as Jubilee (Dieppe), and Overlord (Normandy), as well as Market Garden, which was the attempt to capture key bridges during the Allies' advance into Germany in September 1944.

By the time of Germany's defeat, the squadron had achieved an impressive tally. While exact numbers vary from account to account, the squadron had racked up anywhere between 180 to just under 200 enemy aircraft destroyed. It was also a well decorated unit, as the squadron's history noted that "in individual honours 19 pilots were awarded the Distinguished Flying Cross, one a Distinguished Flying Medal, and one a Distinguished Flying Order."

Soon after the war, 401 became an auxiliary (reserve) fighter squadron as part of the downsizing to accommodate a peacetime air force. However, to help in its new role of ensuring

During the Battle of Britain, No 1 Sqn was equipped with Hawker Hurricanes, which is seen here wearing the unit's "YO" designator. **DND Photo**

LGen Richard Rohmer (Ret'd) attending the Royal Canadian Air Force Change of Command Parade held at the Canadian Aviation and Space Museum in Ottawa, Ont. on May 4, 2018. **OS Alexandra Proulx Photo**

that part-time and veteran pilots of the reserves maintained their skills, 401 was equipped with Harvard trainers.

With the RCAF acquiring jet aircraft in the late 1940s, 401 was soon flying Vampires which operated out of its home in Saint Hubert.

Another significant moment occurred in 1951, when, following a larger RCAF effort, the squadron created its own Women's Division section which saw 12 airwomen join 401 during the first year of the program.

After acquiring Shooting Star jet trainers in 1953, the squadron would see its Vampires replaced with Sabres three years later. For various reasons, mostly dealing with the complexity of operating jet aircraft within the reserves, the squadron was re-rolled into a light transport and search and rescue unit, which was done with the acquisition of Expeditor aircraft. This did not come without resistance, however, as the squadron history observed that "the problems involved in changing the mentality of pilots from fighter jockeys to range riders were many and varied and a strong hand was required to the exuberance… although the gripes lingered on."

From this point, 401's history continued to mirror its existence during the interwar period as from 1964 onwards it was re-designated three times, including 1991, when it became a helicopter operational training squadron, before it was disbanded in 1998.

The re-activation of 401 in 2015 has shown that it not only has returned to its original roots as a fighter squadron, but also when one looks at the aircraft they flew then and compares them to the CF-188s in their inventory today, it is clear how far the unit, and the Air Force (and aviation for that matter), has come over the last 100 years of the squadron's history.

The unit clearly has much for which it should be proud and has the right to brag about a number of "first" achievements for the RCAF. The fact that it is getting to celebrate its centennial before any other squadron, and even the RCAF, is now yet another accomplishment to add to its already impressive list.

Dr. Richard Mayne *is the Director, RCAF History and Heritage.*

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Despite being disbanded and reformed on multiple occasions, the 401 "Rams" have remained a tactical fighting force for 100 years.
Mike Reyno / National Air Force Museum of Canada Photo

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RAM TOUGH

EVEN AS 401 TACTICAL FIGHTER SQUADRON MARKS ITS 100TH ANNIVERSARY, IT IS ALSO ON HIGH READINESS, MANNING THE NORAD MISSION AND TRAINING FOR GLOBAL DEPLOYMENT.

BY CHRIS THATCHER

CF-188 Hornets are refueled by a KC-135 Stratotanker assigned to the 340th Expeditionary Air Refuelling Squadron over Iraq in October 2014 supporting Operation Inherent Resolve. **SSgt Perry Aston Photo**

RCAF ground crew align a bomb as they mount munitions on a CF-188 fighter jet prior to the first combat mission over Iraq in support of Operation Impact in October 2014. **DND Photo**

CF-188 Hornet aircraft conduct a fly past at 4 Wing Cold Lake, Alta., prior to deploying to Kuwait in October 2014. **Cpl Audrey Solomon Photo**

Within three months of being reactivated in June 2015, 401 Tactical Fighter Squadron (TFS) was on the ground at an airbase in Kuwait, ready to conduct and support strike missions against ISIS targets in Iraq and Syria as part of the Canadian Armed Forces (CAF) Operation Impact.

For those with a sense of history, the rapid deployment hearkened back to the squadron's experience in the Second World War. Less than 24 hours after the Allied landings in Normandy on June 6, 1944, No. 401 Squadron (renumbered from No. 1 Squadron in 1941) had set up an airfield in France and was defending the skies against German aircraft and attacking targets of opportunity.

"When you think of the logistics required to set up an airfield in a day—and the place was still crawling with Germans—that is outstanding," said Capt Christopher Mileusnic, a CF-188 fighter pilot and 401 TFS's unofficial historian. "Then the ability of our squadron to move eight or nine bases in the space of about three months; when we think today about how much effort it takes to go on a deployment—we need significant time to plan that—to be able to pick up everything you need, find a grass field and start not just flying, but fighting from there, it is just incredible."

By comparison, the three months of planning and preparation for Op Impact might seem like a luxury. But for commanding officer LCol Joseph "Scotty" Mullins and the newly formed squadron, nicknamed the Rams, it was nothing short of remarkable to deploy almost the entire team from 4 Wing Cold Lake, Alta., into a theatre around the world and operate for six months.

The feat was just another in a litany of extraordinary accomplishments for the Royal Canadian Air Force's oldest squadron. Though there is some debate among historians, 401 TFS traces its roots back to Canadian Air Force No. 1 Squadron, formed in November 1918 in Upper Heyford, England.

"When No. 1 Squadron was stood up, it was essentially every Canadian pilot who had flown in the Great War. So the history of 401 TFS, or No. 1 Squadron, is the history of the RCAF," said Mileusnic. "Some of the battles of the First World War defined the Canadian Army as an independent, capable force, no longer just a division of the British Armed Forces. I think that is what No. 1 Squadron represents for the Air Force."

To commemorate the 100th anniversary, 401 TFS has been planning a series of events that will hopefully culminate with a mess dinner on Nov. 20 near the ground where the squadron was originally formed.

The centennial is also a unique opportunity to reconnect with the squadron's veterans and their families and to engage more broadly with Canadians, reminding them of the linkages between current operations and those formative years.

"We want to make the anniversary something all of us are proud to be a part of," said commanding officer LCol Forrest

RCAF ground crew perform post flight checks on a CF-188 Hornet in Kuwait after a sortie over Iraq during Operation Impact. **DND Photo**

Rock, who has been using social and print media campaigns to engage widely.

The squadron formed a committee to manage its own planning, but the outreach has triggered a cavalcade of boxes, envelops and crates containing rare artifacts: photo albums, scrap books, guest books, paintings, videos of scramble drills before the Battle of Britain, even the bomber jacket of Ernest A. McNab, the squadron's first wartime commander, and the bar bill of a squadron leader shot down over France who, with help of the Resistance, made it back to the White Hart Hotel in Bromley, Kent to celebrate with a tab that included seven bottles of whiskey, six bottles of rum, 24 brown ale, 32 pints of beer, 26 ports, and 50 cigars.

"Everything you can imagine is in those boxes," said Rock as he displayed a few prized possessions.

Some will eventually adorn the walls and displays of the squadron, others will find their way to Air Force museums. All of it, however, will be on display during the Cold Lake Air Show in July, along with Hurricane and Spitfire aircraft, the former once flown by No. 1 Squadron.

"We're all secretly history and aeroplane geeks, although we don't admit it," said Mileusnic, a member of the anniversary committee. "When we started planning this last summer, there was so much interest from around the squadron, but everyone was going in different directions.

ABOVE: Maj A.E. McKeever, commanding officer of No. 1 Squadron, with a captured Fokker D. VII aircraft of the German Air Force. **DND Photo**

401 TFS load crew chief, Cpl Francis Beaudin, arms an inert laser guided training round on a CF-188 Hornet at Holloman Air Force Base, New Mexico. **Cpl Manuela Berger Photo**

Avr Jason Spek, an aviation systems tech with 401 TFS (left) and United States Air Force members refuel a CF-188 Hornet during Exercise Sandy Fleece. **Cpl Manuela Berger Photo**

Cpl Smile Pimentel Burgos, an aviation systems tech from 401 TFS, watches as the wings unfold on a CF-188 Hornet at Holloman Air Force Base in February 2018. **Cpl Manuela Berger Photo**

We set up the 100th anniversary committee to ensure that anniversary-themed items and events were appropriately identified and executed."

The squadron has produced a commemorative patch and coin as well as a painting by the father of a U.S. Marine Corps exchange officer, and even found a local brewer to develop a special edition 100th anniversary beer.

For Capt Patrick Shaver, who designed the anniversary patch, there is a very personal connection to the squadron's lineage. His brother, father and both grandfathers all flew with the RCAF. But his great granduncle, Andrew "Hawkeye" McKeever, served as the first commanding officer of No. 1 Squadron. A picture in the squadron bar shows McKeever standing next to a German Fokker D.VII that he captured.

"With the 100th coming up, it's almost too good to be true," said Shaver. Though he admitted his great relative's call sign might not have been for his bird-like vision. "I don't think [it] was necessarily a compliment. I think it was a snide remark on his generous claims on all his kills."

Among the historical vignettes Mileusnic has collected are the fact No. 1 Squadron was the first to shoot down a Messerschmitt Me 262 and the squadron's 186.5 kills were the highest in the Second Allied Tactical Air Force. More ignominiously, four of the squadron's commanding officers were shot down during the war.

Many of the squadron's greatest honours, though, were accumulated during the Battle of Britain and Rock has requested that 401 TFS be part of the National Battle of Britain parade in September. "I can't think of a better unit to represent the Air Force at the national parade than the only squadron with battle honours, on their 100th anniversary," he said.

LCol Forrest Rock, commanding officer of 401 Tactical Fighter Squadron, prepares for flight during Exercise Sandy Fleece. **Cpl Manuela Berger Photo**

READY FOR GLOBAL DEPLOYMENT

At the same time as the squadron looks back over it's history, 401 TFS is also focused on its core responsibilities today. As the RCAF squadron on high readiness, it is alternating NORAD Quick Reaction Alert duty with 409 TFS, also at 4 Wing Cold Lake, and training to conduct operations around the world should the government decide to deploy a fighter detachment.

The squadron began the year with a three-week exercise at Holloman Air Force Base in New Mexico, deploying 135 personnel and all 13 CF-188 Hornets. Although the squadron had deployed to Iraq shortly after being stood up following the division of 409 TFS, much of the infrastructure and other necessities to support it were already in place.

"We had never really exercised deploying as a unit ourselves," said Rock. "Holloman was a fantastic confirmation exercise. It was the way I would envision the squadron moving out the door" if called upon by the government.

In addition to allowing pilots to accumulate significant flying hours at a time of year when flying can be limited in Cold Lake, it also provided the squadron an opportunity to fly with U.S. counterparts and "achieve multiple tactical evaluations … and complete multiple upgrades for pilots on the unit," said Rock.

"We put a lot of focus on making sure all of our folks had all of their personal verification checklists complete, all the required training complete, to the point where we have the squadron 95 per cent ready to go out the door if we are asked."

Holloman also validated the capabilities of the maintenance technicians and logistics specialists, who had to ensure parts, tools and all other needs where available and delivered before the exercise began.

"You asked for volunteers and everyone was in, no questions," said MCpl James Ferris, an avionics technician.

"The number of technicians who came in on that last weekend before we deployed was incredible," added Sgt Glen Jefferson, an air weapons specialist. "We had eight to 10 technicians working on one particular plane to ensure it was ready to leave on time."

Pilots might get the glory, but no squadron would function without logistics. From parts to finance, IT equipment to human resources, "everything falls into logistics," said Sgt Joanne Bedard, a supply technician. "If you want to move from point A to point B you have to start with logistics. That jet can't get up in the air without us."

While the workload will often find a steady rhythm during an exercise, logisticians see a high operational tempo before and after it begins as they scramble for parts and sort paperwork, said MCpl Katherine Temple, senior financial services administrator.

The entire squadron will experience the challenge of a large move again later this year when they deploy to Norway in October for Exercise Trident Juncture 18, NATO's largest exercise since the end of the Cold War that will include both day and night scenarios.

A BRIDGE TO THE NEXT FIGHTER

As one might expect with a 30-year-old platform, finding parts for the CF-188 can be one of the toughest challenges. Technicians quickly develop the scrounging skills of M*A*S*H character Radar O'Reilly, admitted MCpl Kim Rehberg, a supply technician. "Usually we can find it somewhere, but sometimes we have to go to other squadrons."

As the RCAF fighter squadron currently on high readiness, 401 TFS is alternating NORAD Quick Reaction Alert duty with 409 TFS and training to conduct operations around the world. **Mike Reyno Photo**

Led by the Rams' colour bird that had its tail painted to commemorate Operation Impact, the squadron was granted permission to apply the same "YO" codes on the tail fin of its CF-188s as it did on its Hurricanes and Spitfires during WW II. **Mike Reyno Photo**

MCpl Dave Porter, an 401 TFS avionics systems tech, performs a pre-flight check on a CF-188 Hornet. **Cpl Manuela Berger Photo**

CF-188 Hornet 729 from 401 TFS refuels over New Mexico during Exercise Sandy Fleece in February 2018. **Cpl Manuela Berger Photo**

The load crew of air weapons systems technicians from 401 TFS arm a CF-188 Hornet with an inert laser guided training round. **Cpl Manuela Berger Photo**


Pilots and ground crew from 401 TFS prepare for the final training mission of Exercise Sandy Fleece. **Cpl Manuela Berger Photo**

"A lot of the manufacturers don't make parts anymore," said Bedard. 'But us and the technicians are very resilient. If a jet needs a part, we will find it. I don't always know how it gets found, but it gets found."

"It's a big team effort to make every jet fly every day," added Jefferson. Repair tools and other components can be in short supply. And on an exercise where the supply chain can be slow due to geographic location, problems are often resolved by picking apart a "hangar queen," the first jet to seriously breakdown. "When parts come in, we'll bring it back up to speed."

Rock, who has been flying various iterations of the legacy Hornet since 2005, acknowledged the aircraft is starting to show its age and he credited the maintenance and supply technicians with resolving any and all problems that have emerged.

But he said the aircraft systems have evolved over the years, to the point where the "average wingman these days can be responsible for a lot more based on the amount of information that they have available." Rather than waiting to be told what to target and shoot, "wingmen are now capable of doing much more independently before being told, because of the amount of situational awareness everyone is afforded based on the systems in the aircraft … [In] terms of the avionics and the sensor suite, it's exceptional."

As an example, he noted that on NATO's Operation Unified Protector over Libya in 2011, Canadian pilots had cockpit delegated release authority. "There was no way for us to reach back to a CAOC [Combined Air Operations Centre] and get every target vetted, so if the targets met certain criteria in terms of collateral damage and national restrictions, then individual pilots in the cockpit could choose whether or not to engage, which is a tremendous responsibility, one that I don't think would have been afforded" with previous targeting pods and situational information, he said.

That sensor capabilities integral to the current CF-188 are providing today's young pilots with a bridge to whatever fighter jet replaces the Hornet, he added: "We are at a good spot to transition to the next level of fighter."

WELL-OILED MACHINE

When 401 TFS deployed on Op Impact, "I think the paint was still drying on the walls as they were walking out the door," said Rock. But the experience of building a new unit on the fly had a galvanizing effect on the squadron. "Morale was incredibly high" when they returned from Kuwait, he noted. "The unit had gelled. Everybody is on the same page, working like a well-oiled machine."

His team would agree. "We went from a super squadron where no one really knew you, because it was such a mass of people, to a family," said Jefferson. "When we came back [from deployment], the amount of corporate knowledge and skill sets we had gained … and the relationships was amazing."

Whether it's ancient or recent history, the members of 401 TFS are justifiably proud of all that they have accomplished.


The load crew of 401 TFS work on a CF-188 Hornet at Holloman Air Force Base, New Mexico. **Cpl Manuela Berger Photo**


After 55 years of operation, 401 Sqn was stood down in 1996. At the time, it was equipped with the CH-136 Kiowa helicopter. It wasn't until June 30, 2015 when 401 Sqn was stood up again, that it returned to its roots as a fighter squadron. **Mike Reyno Photo**

The transition from a legacy aircraft to a new or upgraded one can quickly strain the training and operational squadrons. **Mike Reyno Photo**

TROUBLE WITH TRANSITIONS

AS THE RCAF ACQUIRES NEW AIRCRAFT AND UPGRADES LEGACY FLEETS, MANAGING THE DEMAND ON ITS PERSONNEL DURING THE TRANSITION WILL BE CRITICAL TO SUCCESS.

BY CHRIS THATCHER

Forgive BGen Michel Lalumiere if he begins to sound like a broken record. But his answer to any question about Air Force development and new capabilities—a new information network, fifth-generation fighter jet data fusion, remotely-piloted aircraft surveillance systems, enhanced search and rescue sensors, or the future of anti-submarine warfare systems—always begins with one word: people.

The Liberal government's defence policy of 2017 put some much-needed funding and a "lot of clarity" behind a lengthy list of Royal Canadian Air Force (RCAF) major and minor capital projects, everything from space-based maritime domain awareness and satellite communications, to air-to-air refuelling tankers, multi-mission aircraft and modernized helicopters.

But in an Air Force of just over 15,000 personnel, military and civilians, the transition from a legacy aircraft to a new one—or even the modernization of an existing platform with improved systems—can quickly strain the training and operational squadrons. Temporarily surging a capability as the RCAF did with unmanned aerial systems in Afghanistan is one thing; sustaining it for a longer period is another.

And as much as Lalumiere, the director general of Air Force Development, might wish to hit a pause button to allow aircrews, maintainers and logistics specialists the time to bring a new platform into service, the reality is that RCAF Wings have never been busier. And ensuring a level of high readiness for operations trumps all.

So, the first question when weighing the merits of any acquisition or upgrade project, which average around seven years to complete, is always the same: How will it impact people? Automation and artificial intelligence may one day lighten the workload, but for now every platform, even unmanned systems, remains people intensive. Any transition fraught with additional personnel requirements presents a problem.

"It's always about people because we're definitely not that automated yet," Lalumiere told *RCAF Today* in a recent wide-ranging interview. "We think about people first … and we have to prepare well in advance for all of these transitions."

The RCAF views existing platforms and acquisition projects through a lens of AIR Power: Agility, integration, reach and power. That translates as an ability to perform a variety of missions with a single platform over great distance while integrating seamlessly with allies, other agencies and sister services.

But it equally applies to maintenance, logistics, procurement, data architecture, information management, and other enabling systems—even government policy. An advanced fighter jet will not achieve its expected performance if what the military calls key "enablers" and supporting systems are not equally advanced.

"What does it mean to build a fifth-generation air force? It quickly goes beyond the fighters," acknowledged Lalumiere. "A lot of what the fighter needs to operate at that level actually comes from the rest of the Air Force. It's a very fundamental question from an organization perspective, because it means important investment: People and money. We think money is the hard part; it's actually people."

Daunting as that might seem, the Air Force has been here before, he noted. In previous eras of change, it has made decisions about the capabilities in which it would invest. "We have tough choices to make," he said about the list of projects. "But we don't have all the capabilities today that we might have described a decade or 20 years ago because we [recognized] we would have to pick and choose."

FUTURE AIRCREW TRAINING

Near the top of the project list is Future Aircrew Training (FAcT), a program that has evolved in recent years to encompass not only pilot training but also air combat systems officers (ACSO) and airborne electronic sensor operators (AESOPs).

Pilot training is currently delivered under two contracted programs, NATO Flying Training in Canada (NFTC) and Contracted Flying Training and Support (CFTS), while ACSOs and AESOPs are developed at 402 Squadron at 17 Wing Winnipeg, Man. NFTC and CFTS are scheduled to phase out in 2023 and 2027, respectively.

The key to any new or upgraded aircraft are the people. **Pte Hugo Montpetit Photo**

The transition of aircrews from the CH-124 Sea King to the CH-148 Cyclone has been a key part of the maritime helicopter project. **Mike Reyno Photo**

The RCAF plans to retire its four CC-130HT Hercules tankers, operated by 435 Transport and Rescue Squadron in 2020/2021. **DND Photo**

Team SkyGuardian is combining the best of Canadian industry with the advanced medium-altitude, long-endurance MQ-9B to fulfill Canada's RPAS project requirements. **General Atomics Photo**

A Royal Canadian Air Force CC-150 Polaris from 437 Transport Squadron takes off to conduct an air-to-air refueling mission during Exercise Maple Flag. **OS Erica Seymour Photo**

The Grob G-120A is currently being used for primary and basic training at the Southport Aerospace Centre in Portage la Prairie, Man. **Cpl Vicky Lefrancois Photo**

Future Aircrew Training has evolved to encompass not only pilot training but also air combat systems officers (ACSO) and airborne electronic sensor operators (AESOPs). **Mike Reyno Photo**

BGen Michel Lalumiere. **DND Photo**

Incorporating ACSOs and AESOps under the same umbrella as pilot training is a way to better manage available training aircraft, instructors and course standards, and recognition that the current practice of integrating the three trades at the operational training unit is too late in the process and needs to begin much earlier, Lalumiere explained.

The RCAF has sought information from industry at regular intervals since 2013 on how the program should be structured and delivered. In early May, the government hosted a multi-day session with companies to brief on the planned procurement approach, key milestones and core requirements, and hold one-on-one meetings.

One of the objectives, said Lalumiere, is to capitalize on the experience companies have gained in recent years providing training services in Canada and globally. Many are now able to offer solutions that weren't possible when the RCAF first initiated discussions almost a decade ago about future aircrew training.

Of note, CAE and KF Aerospace, the two prime contractors for NFTC and CFTS, in May announced a joint venture called SkyAlyne to develop and deliver military aircrew training in Canada. While the two companies continue to manage the existing programs, the joint venture will focus on building synergies between them.

Among the FAcT requirements is an increase in the throughput of all three trades. But that will create a demand for more trainers. Aircrew training today is primarily provided by serving qualified flight instructors, but the door is open for a greater mix of military and contracted instruction, he said.

The RCAF is also seeking input from industry on the location and quantity of training centres and possible consolidation. To aid industry with their eventual proposals, "we have a few studies ongoing that try to describe the airspace capacity over those training areas and what we can do within that," added Lalumiere.

But what concerns him most is the transition phase. "All of this will have to be seamless," he said, noting that both the legacy and new programs might overlap at the same locations for a period, again creating a huge demand on people.

STRATEGIC TANKER TRANSPORT CAPABILITY

The RCAF had also planned to hold off on a decision on the next air-to-air refuelling tanker until after the next fighter jet was announced. However, as most replacement contenders are capable of fuelling whichever aircraft is acquired and could interoperate easily with allies, the STTC project is now a higher priority.

One of the reasons for that is the lack of agility with the

The CH-146 Griffon will soon go through a limited life extension program that will address several obsolescence issues with its avionics and other onboard systems. **Mike Reyno Photo**

The RCAF will examine manned and unmanned options for the eventual replacement of the CP-140M Aurora. **Derek Heyes Photo**

five CC-150 Polaris aircraft. Just two are fitted for tanking and both are probe and drogue; two more provide passenger and cargo transport, and the fifth is fitted for strategic government transport.

A recent report prepared for the RCAF on the health of the Polaris found the "fleet is doing well, but the [aircraft are] not interchangeable," said Lalumiere. That lack of agility and interoperability with allies is driving requirements for both boom and probe and drogue refuelling systems, and for greater sensor and network interoperability.

The RCAF plans to retire its four H-model CC-130 Hercules tankers, operated by 435 Transport and Rescue Squadron at 17 Wing Winnipeg, in 2020/2021. So, whether the CC-150 replacement requires five, six or more aircraft remains to be seen.

To address Lalumiere's perpetual people challenge, the Air Force would like a jet with the endurance to reach any destination on one fuel stop, though he said a market analysis would inform what's possible. "If we do two [or] three fuel stops, and my crew day is actually over after one fuel stop, we need to put split crews at these stops," he observed. "We need to be more effective."

CANADIAN MULTI-MISSION AIRCRAFT

Arguably one of the more captivating projects on the Air Force Development list is CMMA. Originally billed as a replacement program for the CP-140M Aurora long range patrol aircraft, Air Force officials have now indicated the eventual solution could be a mix of aircraft. Recently retired RCAF commander LGen Mike Hood spoke often at public events and in interviews of transferring much of the world-leading ISR (intelligence, surveillance, reconnaissance) and anti-submarine warfare technology on the Aurora to a Bombardier-built platform.

But at an industry outlook in April, officials suggested rather than a one-for-one platform replacement, CMMA could be a mix of manned and unmanned aircraft.

"It's been pretty amazing what has been accomplished with the CP-140," said Lalumiere. But "I think the [future] challenges will be of such a magnitude that we will have to come to them with a holistic set of capabilities."

Rather than a single project with a start and finish date, he said the more likely scenario is a rolling introduction of platforms and systems with open architecture to match the pace of technology. "We can phase in what we need when it's ready and we can continue phasing in as the next capabilities become ready."

REMOTELY-PILOTED AIRCRAFT SYSTEM

Once known as the Joint Unmanned Surveillance Target Acquisition System, or JUSTAS, the project to acquire a remotely piloted aircraft (RPAS) now has a more accessible name. But the requirements remain largely the same. Today, though, industry is better equipped to meet them.

Lalumiere believes the market has evolved since the RCAF first stood up a project office in 2005 to look at a medium altitude, long endurance unmanned capability, to the point where challenges such as operating in unsegregated air space, that once seemed "like mountains," have now been largely resolved.

But the personnel requirements posed by unmanned systems loom large. Managing the data processing, exploitation and dissemination (PED) generated by the sensor suite in a long range and long endurance capability—which is the true force multiplier aspect, he noted—requires a sizeable force.

"This will be the keystone project that will initiate the delivery of a sustainable PED capability by the RCAF," he said.

"[My staff] have not agreed on how many trades they've been describing to me, but I know we are already into double digits," he added of the number of people required to stand up a squadron and sustain the capability, including the distribution of data, from a main operating base and forward locations in Canada and on international missions.

One key question still to be answered is whether the RPAS solution is one platform capable of ISR and target acquisition and strike missions, or two with distinct domestic and expeditionary configurations and payloads. "The analysis work is looking at that," he said.

But whatever is acquired must be interoperable and able to share data with 5 Eyes (Canada, U.S., U.K, Australia and New Zealand), NATO and coalition allies, a process that likely has defence policy implications, he added.

GRIFFON LIMITED LIFE EXTENSION

Achieving initial operating capability of the CH-148 Cyclone is undoubtedly the most pressing helicopter program for the RCAF—the maritime helicopter will begin

The first of 16 CC-295Ws will be delivered to the RCAF late in 2019. They will operate alongside the CH-149 Cormorant, which will soon begin to go through a mid-life upgrade to bring it up to the latest AW101 standard. **Mike Reyno Photo**

its first deployment with the Royal Canadian Navy onboard HMCS *Ville de Quebec* this summer—but it's far from the only one presenting a significant transition challenge. The CH-147F Chinook continues to develop and acquire new capabilities [see story on page 102] and the government in May released a letter of notification to industry of its intent to proceed with the CH-149 Cormorant midlife upgrade project [see story on page 14].

But replacement of the CH-146 Griffon may provide the next major helicopter procurement opportunity for industry—and with some intriguing possibilities. The RCAF, National Defence and Bell have been closely monitoring the structure of the 20-year-old utility helicopter and believe it can continue to perform "yeoman's work" in conflict zones from Afghanistan to Haiti, Iraq and Mali until the early 2030s with a limited life extension.

The project would address several obsolescence issues with avionics and other onboard systems, meet new regulatory requirements, and improve connectivity.

But the RCAF is also looking beyond 2030 to the eventual replacement. Like CMMA, the eventual solution might not be a single aircraft but rather a "tactical system," observed Lalumiere, with the agility, integrated weapons and sensors, satellite connectivity, and endurance to fulfil a range of roles from escort and transport to close air support and perhaps attack. "Is it going to be only one aircraft or is it becoming a system? I'm going to be fascinated by the answer."

FIXED-WING SEARCH AND RESCUE

With a new search and rescue airplane selected in the Airbus CC-295W, the RCAF has completed one of the lengthier procurement processes and is now into delivery of the first aircraft in 2019 and construction of a new search and rescue training centre at 19 Wing Comox.

Though the CC-295W is expected to be a game-changing capability, its entry into service underscores Lalumiere's people management challenges. SAR is a 24/7, year-round, high-readiness service that can't be disrupted. Yet over the next few years, fixed-wing and rotary-wing aircrew training, new simulators, the Canadian Forces School of Search and Rescue, and training provided to CC-130H crews in Trenton will all be consolidated into a single, effective and holistic schoolhouse.

"Part of the decision to acquire the CC-295W was also the retirement of the H model Hercs, including the tanker models," he explained. "The plan is to transition [those aircrews] to FWSAR," allowing the RCAF to maintain a high-readiness posture while simultaneously undergoing training on the new and upgraded aircraft. "These crews will help us achieve that success."

TIC3 AIR

Underpinning the success of many of these new and pending platforms is a little-known project called Tactical Integrated Command, Control, Communications - Air (TIC3-Air).

Historically, the RCAF has purpose-built its data links for each expeditionary operation or domestic exercise, forming ad hoc networks to move, process and access the data generated by aircraft mission systems and payload sensors. TIC3 Air aims to build a more durable information highway, including establishing permanent Link-16 ground entry stations at locations across Canada.

The project also involves modernized traffic management and air defence radios and cryptography. The challenge, said Lalumiere, is that no sooner has the project team defined a capability then the technology improves and "new needs start to surface."

TIC 3 Air will "clean up" and optimize the various systems, he said, but it, too, will draw significantly on RCAF professional personnel at its core for success. "We will ensure that this capability will be integrated in the larger enterprise ground IT infrastructure supporting the [Canadian Armed Forces]. This remains a key priority in the Information Management Group."

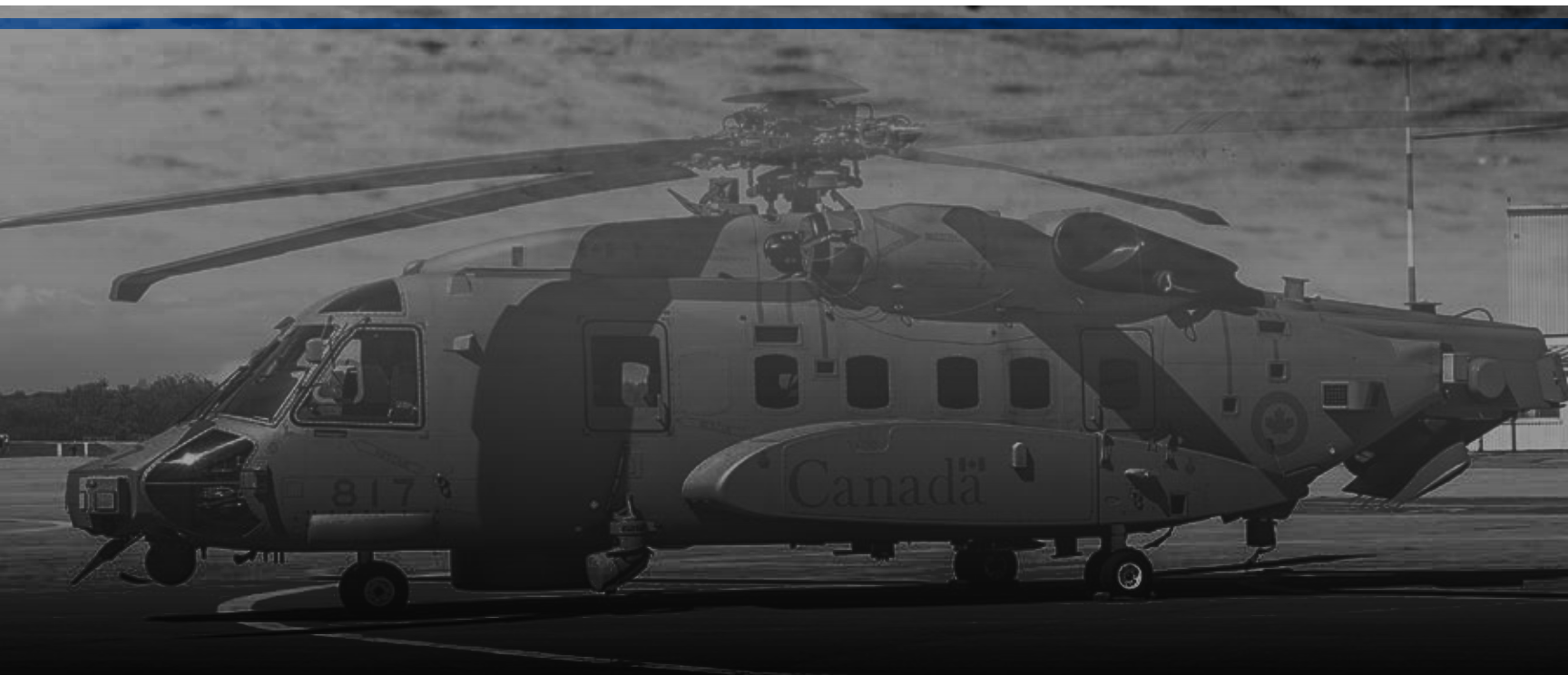
TOP: Curtiss HS-2L with Canadian markings on the Eastern Passage, Dartmouth, N.S. **DND Photo**

BOTTOM: A CH148 Cyclone helicopter (left) is positioned alongside a CH124 Sea King helicopter (right) in this photo captured for historical purposes outside of the Archdale Hangar at 12 Wing Shearwater on June 7, 2018. **LS Laurance Clarke Photo**

DAWN OF *Maritime Aviation*

FORMED IN RESPONSE TO COMBAT THE PRESENCE OF GERMAN SUBMARINES, 12 WING SHEARWATER IS MARKING 100 YEARS OF MARITIME AIR OPERATIONS

BY ERNIE CABLE | PHOTOS COURTESY OF SHEARWATER AVIATION MUSEUM



Founded in 1918, 12 Wing Shearwater will celebrate its 100th anniversary this year. 12 Wing Shearwater, N.S., is one of the oldest military airfields in Canada, second only to 16 Wing Borden, Ont. Shearwater's varied and colourful history reflects the evolution of flying in Canada and indeed the growth of Canada's Air Force.

Shearwater was originally created as a seaplane base in August 1918, when the small promontory in Halifax harbour's Eastern Passage, known as Baker Point, became U.S. Naval Air Station Halifax. It subsequently became an air station for the Canadian Air Force, the Royal Canadian Air Force (RCAF) and the Royal Canadian Navy (RCN) known as HMCS Shearwater.

With the integration of the armed forces in 1968, Shearwater was designated a Canadian Forces Base (CFB), and re-named 12 Wing Shearwater following Air Force restructuring in 1993.

Shearwater has been a home for Canada's air squadrons for the past 100 years, continuously supporting flying operations longer than any other Canadian military air base. By virtue of its coastal location, 12 Wing Shearwater has been inextricably linked to the defence of the air and sea approaches to Atlantic Canada. In fact, it was the threat by sea that provided the original raison d'être for the Wing. Today, Shearwater provides RCAF maritime helicopter detachments to RCN ships in support of UN and NATO naval operations around the world.

A Curtiss HS-2L G-CYGA pulled up on the slipway at RCAF Station Jericho Beach, B.C. on Jan. 6, 1925.

By early 1918, the threat of German submarines was so acute that the Admiralty offered a preliminary plan for aircraft patrols.

Two Curtiss HS-2Ls pulled up on the beach in front of "Y" hangar at RCAF Station Dartmouth, N.S.. using the marine railway. HS-2L G-CYGO is in background.

During the First World War, German submarines operated between Newfoundland and Nova Scotia, particularly in the waters off the eastern and southern shores of Nova Scotia. In peace and even more so in war, the amount of shipping entering and leaving the Gulf of St. Lawrence and using the harbours of Nova Scotia was enormous.

Vessels sailing singly or banded together in convoys were departing in rapid succession from ports in Eastern Canada, especially from Halifax and Sydney, N.S., laden with troops and supplies to support British and Canadian armies in Europe. Moreover, many transatlantic ships bound for or departing from the northeastern United States passed through the outer fringes of these waters. Therefore, both the Canadian and American governments were vitally interested in protecting these shipping lanes.

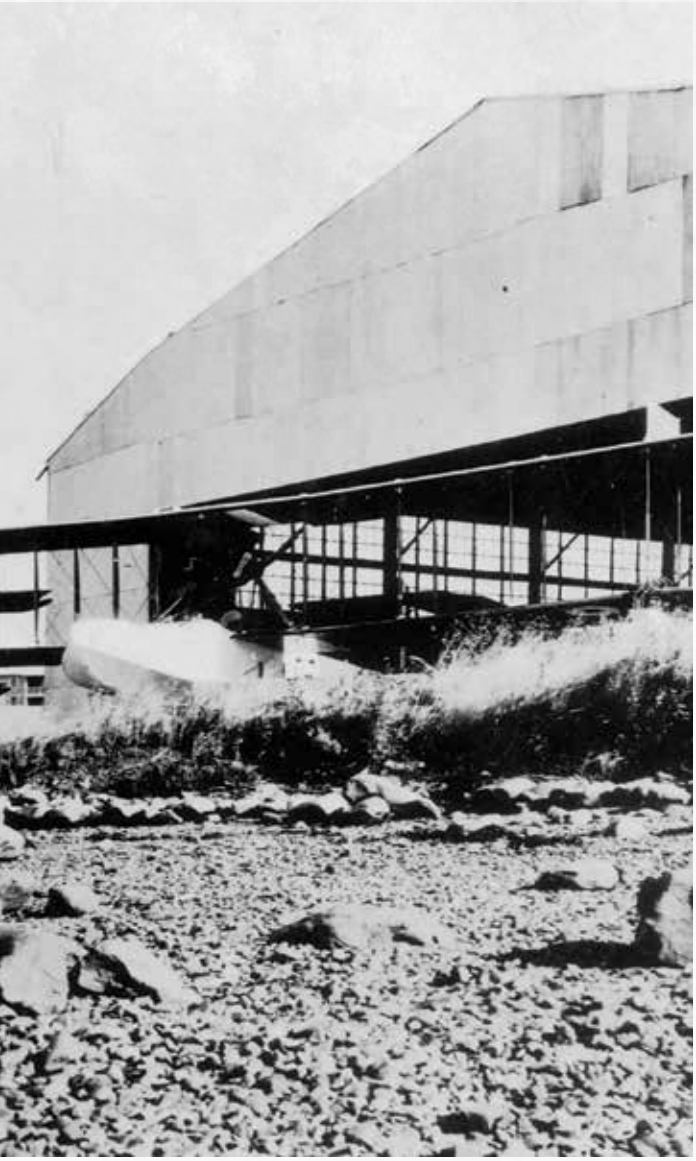
Until 1915, no German submarines operated in Canadian waters. The submarine threat wasn't taken seriously until Oct. 8, 1916 when German submarine U-53 sank five merchantmen off Nantucket. The appearance of U-53 prompted the British Admiralty to warn Canada that anti-submarine patrols off its coast should be strengthened. A subsequent Canadian proposal to base anti-submarine air patrols at Halifax and Cape Breton Island was welcomed by the Admiralty, which sent Cmdr Sneddon, Royal Naval Air Service (RNAS), to Canada to investigate the feasibility of such patrols.

Sneddon recommended that a small seaplane force, divided between Halifax and Sydney, be formed and that required aircraft be built in Toronto by Canadian Aeroplanes Ltd. The Canadian Cabinet rejected Sneddon's report on the grounds of excessive costs ($2.5 million), the diversion of skilled labour from other wartime priorities, and concern over seasonal weather changes limiting the effectiveness.

By 1917 the success of eastbound convoys sailing from Halifax and Sydney compelled the Germans to shift the focus of their operations. About the same time, they had developed large ocean-going submarines, capable of staying at sea for three months or more and mounting six-inch deck guns. Suddenly the Canadian coast became a vulnerable target area.

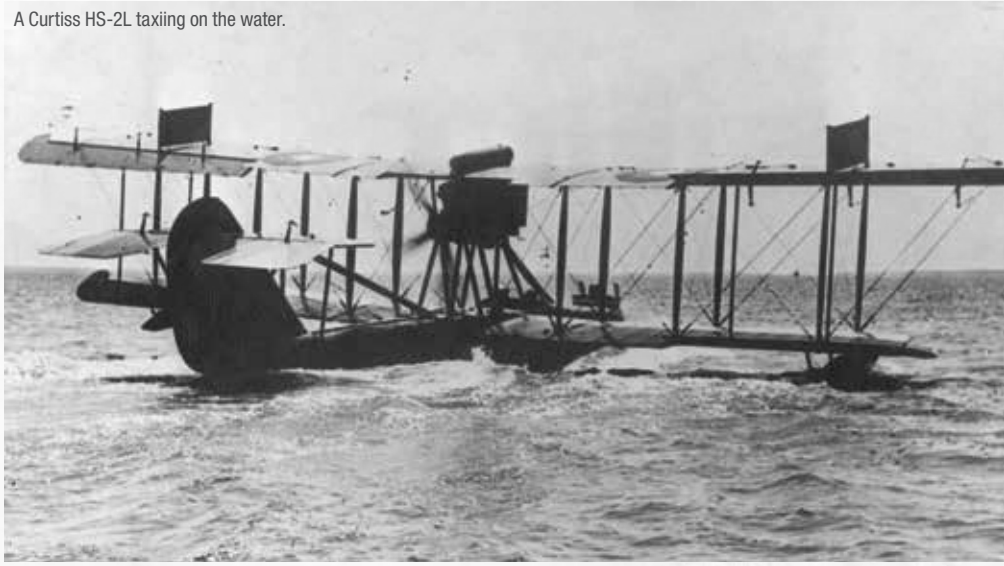
The Admiralty warned Ottawa of these latest developments and the Canadian Naval Service immediately attempted to strengthen its patrol force. However, no additional ships were available and it was decided that aircraft operating from shore bases were the best means to protect merchant shipping in Canadian waters. But where were the aircraft to come from? The Admiralty had no surplus and the only possibility seemed to be the United States Navy (USN).

Meanwhile the German threat was so acute that the Admiralty renewed its warning and offered a preliminary plan for aircraft patrols. Shortly thereafter, British and American Admirals convened a conference in Washington, which included Capt Walter Hose, the Royal Canadian Navy's



RCAF Station Dartmouth was formed on Apr. 1, 1924, a forerunner of today's 12 Wing Shearwater. Twelve reflects 12 Group of the RCAF's Eastern Air Command in Halifax during the Second World War and Shearwater reflects the station's RCN name dating back to 1 Dec 1948.

A Curtiss HS-2L taxiing on the water.



(RCN) captain of patrols on the east coast. The conference settled two points: first, air stations should be established at Halifax and Sydney; and second, that the United States would supply these stations with pilots, seaplanes, airships and kite balloons until the embrionic Royal Canadian Naval Air Service (RCNAS) was trained and ready to take over.

On Apr. 23, 1918, it was also agreed that the United States would take responsibility for coastal patrol and anti-submarine work as far east as western Nova Scotia and that assigned American forces would be placed under operational control of the RCN. Because Canada had no officers experienced in maritime air operations, the Admiralty appointed LCol Cull, Royal Air Force (RAF) (formerly Wing Commander RNAS), to overall command of the air patrols. (On Apr. 1, 1918, the RNAS and the Royal Flying Corps were amalgamated to form the RAF).

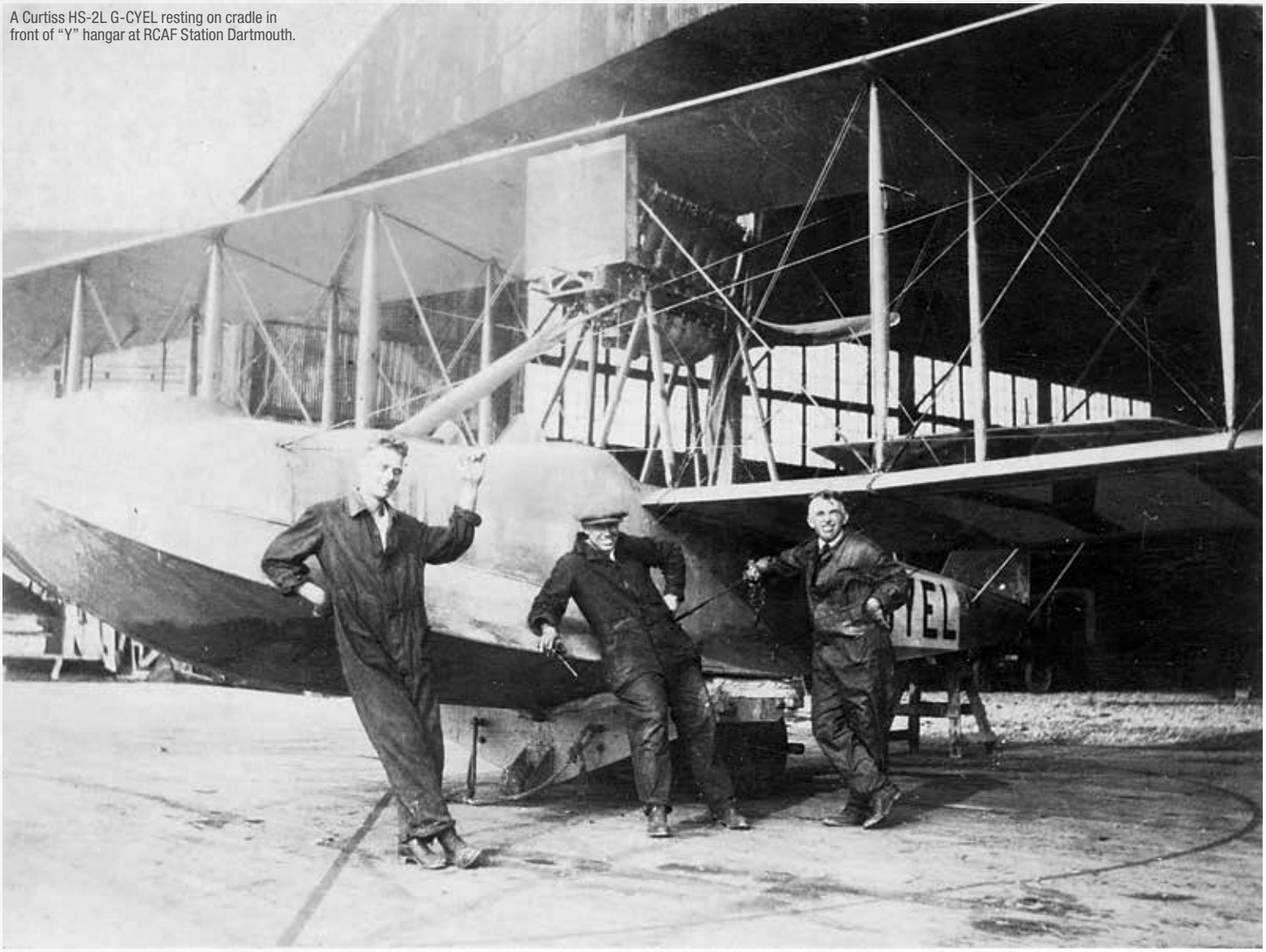
On Jun. 5, 1918, after following rather ineffectually in the wake of the Admiralty and the USN, Canadian authorities finally approved establishment of two air stations. Cull arrived from England in July and approved the seaplane base just south of Dartmouth, N.S., but moved the Sydney seaplane base to the western side of North Sydney.

Despite the lateness of the season, Cull persuaded the USN to implement the April agreement. The Canadian government was to furnish the site and buildings and all ground equipment, while the American government was to provide the aircraft and the personnel to operate them as well as the operating expenses. British and Canadian naval officers were ultimately responsible for control of the stations and for operations; however, supervision and direction of the officers was to be the responsibility of the U.S. Navy.

The Americans created the office of commanding officer, U.S. Naval Air Forces, Canada and detailed Lt R.E. Byrd, USN, later an admiral renowned for his polar exploits, to the new command. Additionally, Byrd was ordered to assume direct command of U.S. Naval Air Station Halifax and to act as liaison officer between the American and Canadian governments in naval aviation matters.

Although progress up to this point in establishing the air patrols was gratifying, it was not rapid enough to meet the alarming situation that developed in the first week of August 1918, when U-156 sank six vessels southeast of Nova Scotia. The submarine also captured a large Canadian fishing boat and mounted a gun on its deck that was used to wreck havoc among Canadian fishermen. At the same time numerous mines, laid by the submarine, were discovered along the Nova Scotia coast.

It was crucial to commission the Canadian air stations into operation as soon as possible. All haste was made in shipping equipment and supplies to Halifax that were essetial for operations. Byrd arrived at his new base Aug. 15, 1918. Crates containing the first two Curtiss HS-2L seaplanes arrived in Halifax by train Aug. 17, and were barged across the harbour



A Curtiss HS-2L G-CYEL resting on cradle in front of "Y" hangar at RCAF Station Dartmouth.

to the Dartmouth air station and hauled up on the beach using logs for rollers. The first aircraft was assembled and successfully test flown two days later and the first operational patrol was flown Aug. 25, 1918; maritime patrol aviation in Canada was born.

During the first few weeks no bombs had yet reached Dartmouth; however, the submarine situation was so serious that depth charges were substituted for bombs with the intention of dropping them by hand on any hostile submarine.

Byrd eventually established a detachment of six HS-2L flying boats and several kite balloons to conduct anti-submarine patrols off the approaches to Halifax harbour, and a second detachment of six HS-2L's at North Sydney. In forming the general operating policy for the aerial patrols, it was agreed not to attempt routine patrols at either Halifax or North Sydney, but to keep two seaplanes solely for escort work and one seaplane at each station for emergency anti-submarine duty. Without interfering with this schedule, as many supplementary patrol flights as possible were also to be flown at each station at the times and locations deemed most likely to produce results.

Operations began in earnest the week of Sept. 7, 1918 during which seven escort flights and 10 patrol and other flights were made. Emergency flights were made whenever circumstances demanded and all convoys were escorted for a distance of 60 to 75 miles (100 to 125 kilometres) to sea. There was a total of 200 patrol and other flights during the USN deployment, accumulating approximately 400 flying hours.

After the First World War ended in November 1918 the RCNAS was disbanded and the U.S. Navy personnel departed the bases at Dartmouth and North Sydney and returned home. Now promoted, Col Cull's final duty was to accompany the Deputy Minister of the Canadian Naval Service to Washington to settle the division of expenses between the two countries. The Canadian government agreed to purchase all American ground equipment at the two stations; in exchange, the United States donated to Canada 12 HS-2L flying boats, 26 Liberty aircraft engines and four kite balloons.

Canada's first venture into maritime patrol aviation had cost a total of $811,168 for bases, equipment and personnel. The American donation was valued at $600,000 and the flying boats were to give much valuable service to Canada in the years to come.

This small fleet of maritime patrol aircraft and the few buildings which had been built by the Canadian government to support Byrd's detachment were the beginning of what became RCAF Station Dartmouth on Apr. 1, 1924, a forerunner of today's 12 Wing Shearwater.

Col (Ret'd) ***Ernest Cable*** *is the Shearwater Aviation Museum Historian.*

Commemorating Bomber Command

ONE RCAF GENERATION CONNECTS WITH ANOTHER AS THEY RECALL THE TRUE NATURE OF A COURAGEOUS FIGHTING SPIRIT.

BY DR. RICHARD MAYNE

As a historian it is rare that I write in the first person. However, after attending the ceremony for the opening of the International Bomber Command Centre (IBCC) in Lincolnshire, England, this past April, I can think of no better way to relate that experience since it was indeed a moving and personal event.

I also should point out that I have a bias, as my father was an air gunner in Bomber Command during the Second World War; so even before the ceremony started it had special meaning for me. That said, my position as the RCAF's chief historian has given me the privilege and honour to partake in many ceremonies of this nature, but there were a few aspects of my IBCC experience that, aside from my family linkage, made it one of the most remarkable that I have attended.

Before describing these experiences, however, it is first necessary to provide context. The IBCC has defined itself as "a world-class facility to serve as a point for recognition, remembrance and reconciliation for Bomber Command. Providing the most comprehensive record of the Command in the world, the IBCC ensures that

During the Second World War, approximately 50,000 Canadians served with the RCAF and RAF in Bomber Command operations, flying mostly in Lancaster and Halifax bombers over occupied Europe. By the end of the war 10,000 Canadians would pay the ultimate sacrifice. **Eric Dumigan Photo**

A photo of the Canadian contingent taken at the Petwood Hotel in a room steeped in history as it was once the officer's mess for the infamous 617 "Dambusters" Squadron. **Richard Mayne Photo**

MGen (now LGen and Commander of the RCAF) Al Meinzinger inscribes a note on a gift presented to RCAF Bomber Command veteran Stuart Vallières shortly after the IBCC Ceremony. **Richard Mayne Photo**

generations to come can learn of their vital role in protecting the freedom we enjoy today."

The IBCC took over eight years to be developed and built at a cost of approximately £10 million. It consists of a memorial spire, a peace garden, and the Chadwick Centre, which helps interpret the history of Bomber Command. The monument itself, which stands at 31 metres, is now the tallest war memorial in Great Britain. And, in partnership with the University of Lincoln, the centre can boast a digital archive of some 190,000 documents, photos and letters.

As for the event, which was held in Lincoln and attended by an estimated 4,000 people, it was designed to celebrate the opening of the IBCC with a ribbon-cutting ceremony. But it was also a commemoration for the almost one million individuals who served and supported Bomber Command. Equally important were the 300 veterans who attended the ceremonies.

It was unfortunate that poor weather prevented an extended flypast by the Royal Air Force; however, in some ways the sullen skies seemed more appropriate. With the monument's apex buried in the low-lying clouds of a cold morning mist, the tributes given to the approximately 55,000 members of Bomber Command who died in the skies over Europe were extremely well done. And in many ways that was what the day was about; those who did not return from missions and whose names are now etched in the panels surrounding the monument, as well as the veterans who survived their time in Bomber Command.

For Canada, that veteran presence was embodied in Stuart Vallières who, on his 33rd mission, was shot down and rescued by the French resistance. This reprieve was short-lived as his injuries were so severe that the Resistance had no choice but to hand him over to the Germans so that they could provide the medical care that he required, which included the amputation of a portion of one of his legs.

While the ceremony was memorable in its own right, it was what happened next that reminded me of why I became a historian so many years ago. First, there was the moment after the ceremony when the now commander of the RCAF, LGen A.D. Meinzinger, presented a copy of a new book on a key Canadian member of Bomber Command to Vallières. I was later informed by one of the assisting RCAF officers that this inscribed gift meant so much to Vallières that he did not want it left out of his sight.

This was followed by Meinzinger, the attending RCAF officers, and civilians, as well as myself, being treated to the opportunity of joining Vallières at the Petwood hotel in a room steeped in history that had once been the officers' mess for 617 Squadron (the infamous unit responsible for the Dambusters raid).

It was almost a surreal experience as I watched this wonderful 95-year-old veteran relate his wartime stories to us all. After his first account I found myself looking around the table at which point I saw every RCAF officer and civilian glued to every word.

The stories themselves were truly wonderful, and it occurred to me that I was witnessing the process of one generation connecting with another; what some might call the "stuff" of history. It was, therefore, a true pleasure that I not only saw this veteran again at Meinzinger's change of command parade, but also had the opportunity to hear the new commander share some of Vallières's stories to the audience at that latter event.

In Meinzinger's words from his speech while taking command of the RCAF:

> *As it is our proud history that inspires us, gives us purpose, and guides us toward the future, I must mention that I recently returned from the opening of the International Bomber Command Memorial in Lincolnshire, England – the heartland of Bomber Command during World War Two.*
>
> *I was reminded powerfully of the courageous contributions that RCAF personnel made during this chapter of the war, noting sadly that we lost some 10,000 RCAF personnel during this difficult campaign.*
>
> *It was an honour to attend with one of our Canadian heroes – 95-year-old Stuart Vallières, who was shot down on his 33rd Halifax bomber mission in the summer of 44.*
>
> *Held by the Germans for 4 months as a POW, Stuart described to a small group of us how he managed to break the nose of an aggressive guard who spat on Stuart while he was lying on a hospital gurney post-surgery.*
>
> *Ladies and gentlemen, if that is not a courageous fighting spirit, then I don't know what is!*
>
> *Stuart, it is great to have you here this morning with your son Dave (the namesake of one of your amazing Canadian crew members).*

Watching such knowledge passed from generation to generation was remarkable and spoke to the value of history to institutions such as the RCAF. It was also an important tribute to our veterans and perhaps this was the most memorable part of the IBCC experience. As one British newspaper reported, the youngest veteran at the ceremony was 92 while the oldest was 100.

It is a disparaging thought and raises the unfortunate fact that we are reaching a point where there soon will be no more Bomber Command veterans to hear from firsthand. Luckily, however, there is now a new centre that will keep the memories of these brave fliers alive.

CRITICAL SPACE

IN 2016, THE RCAF TOOK OVER RESPONSIBILITY FOR THE DEFENCE SPACE PROGRAM AND IS NOW REFINING A FIVE-YEAR ROADMAP, DOCTRINE AND THE TRADES TO MEET MILITARY NEEDS.

BY BEN FORREST, WITH FILES FROM CHRIS THATCHER

In 1962, Canada became the third country to launch a satellite into orbit, signalling to the world that Canada was a space-faring nation. Picture is the Shuttle Remote Manipulator System, also known as Canadarm. **NASA Photo**

Just after 2 a.m. Eastern time on Saturday, Sept. 29, 1962, a two-stage Thor-Agena rocket launched Alouette-I, Canada's first satellite and the first built by a country other than the United States or the U.S.S.R., into a near perfect 1,000-kilometre orbit around Earth.

It was the start of a 10-year mission that was unprecedented at the time, producing more than one million images for studies of the ionosphere—the part of Earth's upper atmosphere that reflects and modifies radio waves used for communication and navigation—and it signalled to the world that Canada was a space-faring nation.

Alouette-I originated in a proposal from the Defence Research Board of Canada, an arm of the Department of National Defence (DND), and was an early step in a long history of military collaboration that is reaching new heights as the Royal Canadian Air Force (RCAF) assumes responsibility for the nation's ambitious defence space program.

"It's about protecting our assets," said BGen Kevin Whale, director general, Space. "We have to wake up to the fact that space has become critical infrastructure. Imagine a day without space?"

The RCAF took over responsibility for the defence space program from Chief of Force Development in 2016 and is still in the early stages of ironing out a five-year roadmap, drafting Air Force-specific doctrine, and coming to terms with the various trades and space- and ground-based systems that will be required to meet Canadian Armed Forces (CAF) and national needs.

But its mandate is laid out in *Strong, Secure and Engaged* (SSE), Canada's new defence policy, which sets an ambitious agenda for future investments in space-based capabilities. And as an environment with the horsepower to generate and develop forces for employment, the Air Force is well-positioned "to take leadership of this capability," said Whale, though he acknowledged it would take "some time" for the institution to fully deliver on its mandate.

Space is an increasingly congested, contested and competitive domain, with dozens of military and civilian players—and the stakes aren't small. Space systems go a long way to enabling the world's economies, and what happens in space impacts the security of nations below.

Whale himself noted that over a 30-year military career, he has benefitted countless times from space-based capabilities and never given them a second thought. Now he is adopting an "air plus space" approach to shape conversations about the RCAF roadmap.

"Space, for a long time, had considered itself special, different, unique—which it is, as a domain," he said. "But there are similarities and there are differences. We are wrapping our heads around that, and we will take care of this capability, just like we do any other one."

POLICY PUSH

SSE identifies space as a critical aspect of Canada's defence, and it prescribes an extended mission to "defend and protect" military space capabilities, while also remaining committed to the peaceful use of space.

The five-year roadmap lays out the framework for the defence space program, focused on three key areas: force employment, force generation, and force deployment. While the resources and personnel allocated to deliver this mission were initially modest—the core of the joint space cadre is about 60 personnel in Canada and 30 on exchange in the U.S.—the defence policy provides an additional 120 civilian and nearly two dozen military positions to the CAF/DND enterprise.

Integration with other agencies, including the Canadian Space Agency (CSA) and Industry, Science and Economic Development Canada, are key requirements of the strategy.

"We know how to do this," said Whale. "We've just got to get our heads around what's different and what's the same about space."

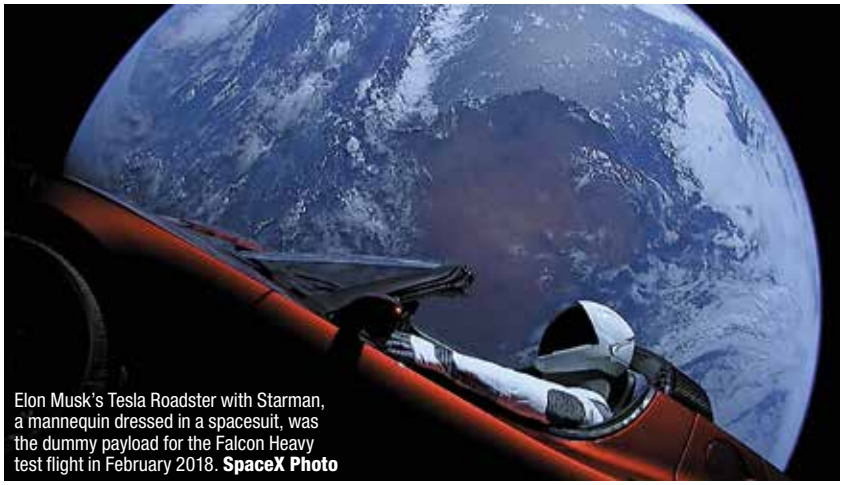
FORCE EMPLOYMENT

The RCAF now provides integrated space capabilities to the commanders of Canadian Joint Operations Command (CJOC) and Canadian Special Operations Forces Command (CANSOFCOM). Whale is dual-hatted as DG Space and as the space component commander, overseeing a director of space operations and readiness, who coordinates defence-related space activities through the Canadian Space Operations Centre (CANSpOC).

CANSpOC launched in 2014 and provides a round-the-clock space watch that is integrated with the Canadian Forces Integrated Command Centre (CFICC). The space watch monitors and reports on space situational awareness (SSA), missile warning (as reported by the U.S. Department of Defence Joint Space Operations Center), space weather and the status of space mission systems.

Whether that remains at CJOC or is relocated to the Combined Air Operations Centre at 1 Canadian Air Division in Winnipeg, Man., or with the Canadian Air Defence Sector at 22 Wing North Bay, Ont., is one of many questions currently under debate.

CANSpOC has the ability to generate a Joint Space Support Team (JSST) to support a deployed joint task force, as was the case for the mission to Latvia in support of Canada's contribution to Operation Reassurance and to Iraq in support of Operation Impact.



Elon Musk's Tesla Roadster with Starman, a mannequin dressed in a spacesuit, was the dummy payload for the Falcon Heavy test flight in February 2018. **SpaceX Photo**

Members of a Canadian Army task force check their satellite-provided coordinates while conducting a navigation exercise. **Cpl Nathan Moulton Photo**

Director general for the RCAF space program, BGen Kevin Whale, explains the RCAF mandate for managing the space program. **DND Photo**

The operations centre is also responsible for the CAF navigation warfare (NAVWAR) program, which is working to provide operational commanders with the tools, training and tactics and procedures to operate in a position, navigation, and timing (PNT)-degraded environment where network access is denied from jamming or spoofing.

Though one of Whale's objectives is educating operational commanders of what a deployed space cell can provide in theatre—"education is a huge piece," he said—the cadre of joint signals technicians available for deployment at the moment is very "lean" and must be expanded "so we can support the wider CAF."

"CANSpOC is only so big, until I can grow it," he said. "This is [a] balance between fixing the car and operating it … [In] some of these areas, we're currently one or two [persons] deep."

FORCE GENERATION

To build up its space force with qualified tradespeople, the RCAF is borrowing an employment model from Canadian Special Operations Forces Command that Whale calls an "ABC approach."

Group A will be made up of individuals who enter the space program and stay there their entire careers; Group B will comprise tradespeople who enter space, leave for other postings, but will eventually return to the space program; and Group C will work in the space program temporarily, before leaving permanently for another division of the RCAF.

"We haven't decided about a [specific space-related] trade yet," said Whale. "But we are absolutely going to look at it." An aerospace engineer, for example, is currently being trained as one of the first permanent space employees.

As the RCAF grapples with recruitment and retention across its operations, Whale acknowledged that finding enough people to populate the space program is a concern. "To grow by a couple hundred folks, [it's] going to take a decade," he said.

"It's going to be measured and paced—unless, a commander decides, 'You know what? Space is so important, Squadron X or capability Y, I'm going to cut you by 20 per cent, and I want to take those people and put them in here. I'll fill you back up, but I need this to move quicker.' "

FORCE DEVELOPMENT

In its force development role, the RCAF will focus on three areas: intelligence, surveillance and reconnaissance (ISR), satellite communications (SATCOM), and position, navigation, and timing (PNT).

ISR capabilities will include systems that provide surveillance *from* space, and others that provide surveillance *of* space. SATCOM initiatives, buttressed by the Assistant Deputy Minister Information Management (ADM IM) SATCOM Operations Centre, will support operations, joint capability development, and research and development.

PNT will focus on electronic support of Canada's military, electronic protection, electronic attack, and direct support to operations. The intended result is a mix of CAF, federal government, allied, and commercial assets and systems that will ultimately help defend Canada's sovereignty.

"We are now wrestling with—just like everyone else—how do we balance the commercial versus uniform versus civilian piece," said Whale.

It's estimated more than 24,000 objects larger than a softball are in motion around Earth. There are countless more objects with a smaller diameter, which could have catastrophic consequences in the event of a collision that creates debris. **European Space Agency Image**

MILSATCOM

In partnership with the U.S. Department of Defense, the Canadian Armed Forces have embarked on two major projects to provide military SATCOM (MILSATCOM) with the level of capability the operational community demands.

The first is the Protected Military SATCOM (PMSC) project, which is currently in the implementation phase. PMSC leverages the U.S. DoD advanced extremely-high frequency constellation to provide survivable and jam-resistant SATCOM in Ka- and Q-band to users around the world. PMSC achieved initial operating capability (IOC) in 2013 and is expected to reach full operational capability (FOC) in 2024.

A second major MILSATCOM initiative, also in the implementation phase, is the Mercury Global (MG) project, which leverages the U.S. DoD wideband global SATCOM constellation to provide high bandwidth SATCOM in X-band and MIL Ka-band to global users. This capability achieved IOC in 2013 and is expected to achieve FOC in 2018.

SSE identifies several challenges that will remain even after the implementation of PMSC and MG, and as a result the military has launched two additional SATCOM projects.

The Tactical Narrowband SATCOM (TNS) project is expected to provide guaranteed, reliable and secure SATCOM in narrowband UHF, transmitting both voice and data and providing coverage from 65 degrees South to 65 degrees North. The current approach to TNS is focused on an effort with the U.S. DoD to gain assured access to the mobile user objective system (MUOS) UHF SATCOM constellation, with planned IOC in 2021 and FOC in 2023.

Another critical project, known as the Enhanced Satellite Communications Project—Polar (ESCP-P), will provide "guaranteed, reliable and secure access" in narrowband and wideband to support operations in the Arctic. IOC is planned for no later than 2029, with FOC by 2031.

As part of its consultation with industry, the RCAF will be asking if projects can be advanced quicker if the resources become available. "ESCP-P is one of the first ones we are trying to accelerate if we can," said Whale.

SURVEILLANCE

Surveillance *of* space is a long-standing capability of the RCAF, demonstrated most recently with the Sapphire satellite, which launched in 2013. SSE identified a need to replace Sapphire through the Surveillance of Space 2 (SofS2) project. The goal of SofS2 is to acquire the ability to identify and track objects in space that could threaten the space-based systems of Canada and its allies, and to defend and protect military space capabilities.

RCAF documents identify surveillance *from* space as the capability with perhaps the greatest growth in the space environment.

Up until now, space-based surveillance has been used mainly for ISR and maritime domain awareness, often in significant cooperation with other government departments. A key next step will be the RADARSAT Constellation Mission (RCM), a whole-of-government project led by the Canadian Space Agency that is expected to deliver better land surveillance and intelligence products. RCM is expected to launch this fall, with an IOC expected in 2019.

Unclassified Remote-Sensing Situational Awareness (USRA) capability, an award-winning system, comprises air-transportable ground stations and small teams that can be deployed anywhere in the world in support of a joint task force. It draws down unclassified satellite imagery, making it an invaluable asset in large coalitions where information sharing is often a challenge. URSA and a six-person team are currently deployed with the Canadian Army forward enhanced presence battlegroup in Latvia. The capability is in the process of being transferred from CJOC to the RCAF.

Other projects include the Defence Enhanced Surveillance from Space—Program (DESS-P), which "will implement a follow-on to RCM for surveillance-from-space capabilities" for the CAF, and the Synthetic Aperture Radar—Data Continuity (SAR-DC), being developed by the Canadian Space Agency to deliver remote-sensing capabilities for civil applications, with capability that is expected to extend beyond 2025.

THE 'NEW SPACE'

As the RCAF assumes responsibility for Canada's defence space program, it must weigh the influence of dozens of military and commercial players. Everyone from NASA to celebrity billionaire Elon Musk is launching products into orbit. It's estimated more than 24,000 objects larger than a softball are already in motion around Earth. There are "countless more" objects with a smaller diameter, which could have catastrophic consequences in the event of a collision that creates debris. Canada alone has 47 satellites in space (both government and commercial), and 42 are active in orbit. Thousands more may be on the way, as private companies crowd into what Whale refers to as, "the new space."

"The cost of entry's going down, and because of industry innovation, the congestion is a concern," he said. "But I think we can eventually manage that … essentially, the Air Force has made a promise: we'll take care of this capability.

"We've taken what's been built, and we're putting our minds to, how are we going to give the same level of attention—like we do to any other capability—to move it forward?

"Of course, we need to sustain the same level of integration with Army, Navy, SOF, because it's a joint thing," he added. "But the Air Force has taken the lead, and we're going to find a way to progress what the defence policy tells us to progress."

It's a clear indication the RCAF is all-in on its new Joint Space leadership role.

***Ben Forrest** is editor of* Insight *Magazine and assistant editor of* RCAF Today, Skies, Vertical, *and* Vertical 911. *He is a graduate of Western University's Master of Arts in Journalism program.*

When 450 THS deploys to Mali this summer, it will be providing forward aeromedical evacuation, treating and then airlifting injured soldiers directly from the battlefield in the CH-147F Chinook. **Skip Robinson Photo**

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Aeromedical EVACUATION

IN PREPARATION FOR DEPLOYMENT TO MALI, THE RCAF HAS VALIDATED FORWARD MEDICAL EVACUATION CAPABILITY ON THE CH-147 CHINOOK.

BY CHRIS THATCHER

Before Canada deploys a task force to Mali this summer, helicopter aircrews, Canadian Forces Health Services personnel and force protection teams from the Canadian Army are validating a new capability with the CH-147F Chinook helicopter to push advanced medical teams as far forward as possible in a theatre of operations to provide early intervention and medical care to injured personnel.

In exercises in Petawawa, Ont., and Wainwright, Alta., this spring, Chinook pilots, loadmasters and flight engineers, together with medical teams and soldiers, trialed, validated and then began training to deliver what is known as forward aeromedical evacuation, treating and then airlifting injured soldiers directly from the battlefield.

The Canadian Armed Forces (CAF) has had strategic air medical evacuation with fixed-wing aircraft for decades, most recently transporting patients from Germany back to Canadian medical facilities during the Afghanistan conflict. But it has traditionally relied on allies and coalition partners for medical evacuation in war zones.

In July 2017, following the release of the government's defence policy, Gen Jon Vance, chief of the defence staff, issued a directive to develop an integral forward aeromedical evacuation capability, ready for deployment by August 2018.

Casualty evacuation was always one of several capabilities to be developed when the Royal Canadian Air Force first took possession of a new fleet of 15 Boeing-built Chinook helicopters in 2015. But the likelihood of a peacekeeping mission undoubtedly kickstarted the process, though the commitment of tactical transport and logistic support to a United Nations mission was not announced until November 2017; confirmation of two Chinook transport and four CH-146 Griffon escort helicopters to the dangerous mission in Mali came in March 2018. (The RCAF has since added one more of each to serve as spares to ensure a helicopter is always available).

"I knew it was something we could do and would be valuable to have in our tool box," said LCol Darryl Adams,

commander of 450 Tactical Helicopter Squadron in Petawawa and a former Chinook and Griffon pilot with experience in Afghanistan who observed firsthand how the British Royal Air Force delivered the service in theatre.

"Helicopters are always in high demand and the ability to evacuate soldiers that have serious injuries quickly, to get them to a medical facility and save lives, is always going to be an in-demand capability. So this is just the continued evolution of the Chinook."

A basic forward air medical evacuation program was developed in 2007 for the Griffon platform when an air task force was deployed to Afghanistan to support Canadian and coalition operations, but the Health Services-led initiative "wasn't suitable for a sustained deployment," said LCol Richard Hannah, 1st Canadian Division Flight Surgeon, noting that allies often had helicopters better-suited for the role.

As part of his 2017 directive, Vance placed responsibility for the capability development in the hands of the Air Force, with support from Health Services. "It's a team event," said Hannah, that will leverage the skill set of personnel already well-trained in fixed-wing aeromedical evacuation. "Our goal is really to do advanced resuscitation right from the point of injury to the first level of care."

Members of the Canadian medical emergency response team validate forward aeromedical evacuation on a CH -147 Chinook during Exercise Maple Resolve in May 2018. **Cpl Andrew Kelly Photo**

Air Force and Health Services personnel test the forward aeromedical evacuation concept in Petawawa, Ont., in February 2018. **SLt Melanie Aqiqi Photo**

SCALABLE MODEL

Before determining the training required for the specialized teams, the RCAF sent aircrews and medical professionals to look at how allies, especially the U.K. in Afghanistan and the Netherlands in Mali, were conducting forward aeromedical evacuation with their Chinooks. Gathering best practices helped shape collective training as well as identify possible equipment changes.

The medical teams will comprise emergency medical and critical care physicians, anesthesia and intensive care unit doctors with "lots of experience in places like Afghanistan or Iraq, or [with] civilian-related experiences in a pre-hospital environment," said Hannah. "We are using those people as our clinical leads, and then supplementing them with our critical care nursing and medical technician capability."

The objective, he explained, is a scalable capability that can be ramped up from a single medical technician, essentially a paramedic, to a critical care team of physicians, nurses and techs. "All those people are aircrew," he added. "They are all air medical evacuation specialists that fall under all the same rules as the pilots, loadmasters and flight engineers.

While the forward air evac capability does not require substantial new training for the Chinook aircrews, there are some nuances to working with medical techs or physicians trying to perform life-saving procedures in the back, Adams acknowledged.

The first phase of collective training began in March and involved familiarizing the medical personnel with the aircraft, including basic safety and crash procedures, day and night flying, and the experience of working in a shuddering cabin at 140 knots. The team then progressed to scenarios such as airborne re-tasking, where the crew is asked to re-role from one assignment to another mid-flight and coordinate with ground and other sources to understand the conditions they are flying into and the nature of the injuries they'll need to treat.

Whether a crew is on standby or re-roled while en route somewhere else, "having that initial jolt to action" is a key moment, explained Adams, as teams struggle to gather information that is often "nebulous or incorrect [at first] and try to build a picture of what's happening on the ground, what kind of a threat [they'll] face, and so on."

Members of the Canadian medical emergency response team sort medical supplies onboard a CH -147 Chinook helicopter during Exercise Maple Resolve in May 2018. **Cpl Andrew Kelly Photo**

COMMUNICATION PROTOCOLS

In addition to identifying some common operating procedures, the two weeks of training also pinpointed the need for wireless communications equipment to allow better movement for medical personnel without tripping over the loadmaster's headset cord, and for better communications gear to connect with the force protection team while on the ground.

"We are reusing some equipment we already had in our possession," explained Adams, "but we had to go out and buy certain equipment that would not disturb the communications devices in the aircraft, for example, the navigation system."

That was also a concern with medical equipment. While Hannah did not anticipate any problems, he said one consideration for any new or novel device would be rapid testing to "make sure it is airworthy on a Chinook helicopter" and does not interfere with the aircraft's electronic systems.

The initial trials also underscored the importance of a communication protocol between the medical professionals and aircrew. While the doctors, nurses and med techs do not want to interfere with how the pilots fly the aircraft, there may be times when they need to alert the aircrew "not to put us into some extreme angle … because we are doing something sensitive at the moment," said Hannah.

"Being able to communicate back and forth in a way that is effective and purposeful is really important. We have some systems we've trialed. They work well in a fixed-wing environment. We are basically going to use the same model, so we don't have six people trying to tell the pilot what to do. The key is to make sure you have one point of contact between the medical team and the front-end team."

Adams noted that the severity of the injuries and the need to reach a medical facility would dictate whether "it is low and slow or as fast as we can."

That decision might also be affected by whether armed escort provided by the Griffon helicopters is required. "If we have to go max speed, then the Griffon might not be able to keep up with us. That's an assessment for the crew," he said.

To bolster the number of medical assets in a life-threatening situation, the Army's force protection team might also beef up their medical training. Soldiers have tactical combat casualty care, an advanced level of first aid, but might receive additional training if it's deemed necessary.

Ultimately, the aircrew, medical crew, and force protection need to be integrated "into one unified team, where we can help one another out," said Hannah.

Adams noted that the force protection personnel will already be highly skilled soldiers "who can make some very good decisions quickly" to secure landing zones and work with the more than 50 different nations participating in the UN Multidimensional Integrated Stabilization Mission Mali (MINUSMA).

Exactly how many medical teams will be required in Mali remains to be determined. But when Adams and Hannah spoke with *RCAF Today*, two teams were prepared and a third was beginning its individual training.

"We have been working on this for a long time and I'm glad to see it going out the door," said Hannah. "It's a great opportunity to use a fantastic aircraft to do some really good work and support the UN, and develop this capability, not just for Mali, but as an enduring capability ... that we haven't really had in the past."

Two CH-147F Chinook helicopters are deployed to Mali to provide transport and forward aeromedical evacuation capability to UN forces. **Cpl Colin Barrie Photo**

The cockpit of the CH-147F is complex, but thanks to the dedication of air force technicians, like Cpl Taylor Hartnell, they will do their best to ensure that the Chinooks will be mission ready. **Mike Reyno Photo**

Avionics technician AT WORK

TWO CH-147F CHINOOKS WILL SOON BE DEPLOYING TO MALI IN SUPPORT OF A UN MISSION. FOR MAINTAINERS LIKE CPL TAYLOR HARTNELL, KEEPING THEM FLYING REQUIRES A WHOLE TEAM EFFORT.

BY KEN POLE

There is a long-running joke to the effect that any helicopter is fundamentally a collection of vibrating parts all trying to fly in the same direction. Turbines are inherently smoother than piston engines, but there's no escaping vibration, something original equipment manufacturers have invested vast sums trying to address over the years.

As for the parts themselves, there are clearly a lot and, in the case of the 15 Boeing CH-147F Chinooks flown by the Royal Canadian Air Force (RCAF), they number well into the tens of thousands. Some parts are obviously huge in an aircraft with a maximum gross weight of 24,494 kilograms, but flying it depends on the myriad small parts.

The multi-mission Chinooks have an extensively upgraded electrical system that provides additional power and redundancy, while a fully integrated Common Avionics Architecture System cockpit and Digital Automatic Flight Control System reduce pilot workload and provide greater situational awareness. The aircraft also has an advanced Aircraft Survivability Equipment suite that includes a Directional Infrared Countermeasures system for increased crew safety in a wide range of threat environments.

Among the newest additions to the RCAF fleet, the Chinooks have been deployed mainly within North America since delivery by Boeing in 2013 and 2014. Prior to the deployment in August of two Chinooks, with four Bell CH-146 Griffon armed escorts, as part of the ongoing United Nations peacekeeping mission in Mali, the RCAF's only overseas Chinook operation was in July 2017 when one was transported in a Boeing CC-177 Globemaster to the Royal International Air Tattoo in England, the world's largest military air show, in support of the Royal Air Force Charitable Trust. The mission also included joint training and a flight with an RAF H2 Chinook to France for a fly-by of the Vimy Memorial.

RCAF deputy commander MGen Tammy Harris said it showcased "the RCAF's ability to provide agile, strategic airlift of essential assets anywhere in the world, demonstrating our strategic reach to support operations … in Canada or abroad."

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HELICOPTERS

Avionics technician Cpl Taylor Hartnell of 450 Tactical Helicopter Squadron in the cockpit of her "baby," a CH-147F Chinook. **Ken Pole Photos**

That's proving to be the case, but sustaining operability is especially challenging in conditions that can range from the tropics and the desert to the intense cold of the High Arctic. It's a challenge Cpl Taylor Hartnell is up for. A member of the 450 Tactical Helicopter Squadron maintenance team at Canadian Forces Base Petawawa, Ont., the avionics technician was clearly enthusiastic during an *RCAF Today* visit.

"I fix different things," said Hartnell, picking up a cyclic stick from the workbench in a space she usually shares with another technician in the sprawling facility. "We do a lot of things you can't possibly do while they're on the aircraft. Different boxes from the aircraft are sent back here, so we fix them and send them back outside."

She was simplifying a career in which there is "not really" a typical day in maintaining optimum readiness. "There are so many aircraft and so many people on the crews. If something does break and the helicopter's going to be down for a while, the days will vary, depending on what's going on, the priorities. It's up and down. Sometimes they're doing night flying."

Hartnell hadn't thought of an RCAF career until after the birth of her daughter. She previously had focused on silversmithing, which she still enjoys as a hobby, but decided that she really needed stable employment. "The military kind of grabbed my eye."

So, both eyes grabbed, the Petawawa native did basic training at Royal Military College Saint-Jean in Quebec before being sent to other bases for increasingly specialized training, and then assigned to 450 Squadron for three months of intensive hands-on work with Chinooks which, after four years, have become "my bird."

Hartnell agreed that her eye for detail and familiarity with such things as soldering, coming from her jewellery work, had helped her gravitate to electronics, in general, and avionics, in particular. It has become increasingly critical in an era of glass cockpits where complex underlying circuitry and technology simplify aircrew operations.

While having "nice shiny screens instead of mechanical dials" doesn't require lengthy additional technical training, she said that "any time we get a new system, it usually comes to the back shelves first." Typical is the Chinook's countermeasures defence system buckets, which house components, including flares and chaff dispensers designed to confuse incoming missiles.

Hartnell and three other technicians spend three to four days installing and testing the countermeasures and the electronics warfare suite at the front of the Chinooks. That said, "it's kind of become my baby, because I've done so much of it. There are five components squished into one. The newest we were testing involved five months on every aircraft. Any time we get a new system, it usually comes to the back first … We have a little course to learn how each piece works and then we install it on the aircraft and test all aspects."

Some jobs are bigger than others. The avionics shop usually has just Hartnell and one colleague on duty. But "when we have a big project, we'll take one or two guys from services to enable us to handle the work." Boeing had several technicians, mostly RCAF retirees, on site in the early stages of the Chinook program, but they now are called in only when an upgrade is being done. Otherwise, it's strictly up to the avionics and services personnel, a challenge they relish.

Maintenance isn't relegated to the shops and hangars; in-flight diagnostics are a critical element. "Depending on what system isn't working, we'll be there to verify what's changed. We try to catch them before they leave servicing to see what they're displaying. Occasionally, something silly will happen."

She recounted ferrying an investigation team to the RCAF base in Cold Lake, Alta., in November 2016 after a Boeing CF-188 had crashed on the Saskatchewan side of the Cold Lake Air Weapons Range during a practice weapons drop. "One of the FEs (flight engineers) asked me what would happen if our GPS system got zeroized."

The Global Positioning System receiver on RCAF aircraft, which can be deployed into a combat zone, have a zeroize toggle. Protected by a guard to prevent accidental activation, it is used to erase any stored cryptographic and/or navigational data to prevent it from falling into enemy hands.

"Zeroize? I asked 'why would you do that?' " said Hartnell. It probably was one of those situations on an otherwise routine flight when the aircrew were chatting about "what if" scenarios they might encounter. She told the FE the solution was to reboot the GPS, a simple solution to what seemed a "silly" but nonetheless serious question. "But major problems? We usually figure them out on the ground."

A key aspect of maintaining aircraft and crew operability is daily training flights, some of which take them over the National Capital Region, where the distinctive rotor thump tends to attract attention. Then there are particularly memorable flights such as ferrying a group of dignitaries to The Citadelle, the official residence in Quebec City for the Queen and the Governor General. "That was pretty cool," said Hartnell, one of two technicians on the flight to what is the oldest active military facility in Canada, on the Cap Diamant escarpment above the St. Lawrence River. She recalled graphically how small the quadrangle seemed during a couple of orbits prior to landing but said it's all part of an interesting job.

In a markedly different way, so too is dealing with the complex electrical systems in the Chinooks. Their internal supply is 28-volt sealed lead-acid batteries but even those can pack a wallop by themselves. However, the risk increases when aircraft are hooked up to huge external power supplies in the service bays. Hence the warnings on manuals and hardware about turning off or disconnecting batteries before any work begins.

"We've had a few incidences of 'frying'," said Hartnell. In one case, one of the two main electrical distribution panels from a supplier displayed "a lot of weird stuff" when it was turned on. "So we turned it off. But when we turned it back on, sparks were everywhere!"

Hopefully no sparks were flying in Mali, where a "theatre activation team" was deployed in June to prepare for the arrival in July of more personnel and equipment. When the operation begins, one escorted Chinook will be flying at any given time as the other crew rests and their aircraft is checked out. Hartnell said that "sorting out any problems" under those conditions "will be a great learning experience" for whomever is deployed.

At the time *RCAF Today* visited Petawawa, details were still being sorted out but, as she put it, "everyone is willing to go wherever the government wants to send them. [I]t's a whole-team approach, no matter what. If the mechanics are having a hard time, we're always there to help; if we're having a hard time here, there's always someone there to help. We do become quite a tight-knit family."

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COMMITTED TO CANADA

LOCKHEED MARTIN CANADA IS AMONG THE NATION'S MOST IMPORTANT MILITARY PARTNERS, INVESTING BILLIONS IN THE ECONOMY AND CREATING TENS OF THOUSANDS OF JOBS.

BY JAMES CARELESS

Headquartered in Ottawa and with 1,000 employees across the country, Lockheed Martin Canada manages more than 1,400 contracts with companies of all sizes, from all sectors, and in every province.

Since 2008, Lockheed Martin's business operations, investments in research and development (R&D) and contracts in Canada have generated $3.8 billion in gross domestic product (GDP), according to an April 2018 study from PricewaterhouseCoopers (PwC).

Lockheed Martin's contributions to the Canadian economy over the past decade have created 36,521 full time jobs, generated $2.5 billion in domestic wages, and resulted in more than $2 billion in exported products and services.

"Our guiding vision is to serve as an innovative and trusted defence and aerospace partner to Canada by providing solutions to complex problems and employing thousands of Canadians in direct and indirect highly skilled jobs," said Charles Bouchard, Lockheed Martin Canada's chief executive officer and a retired RCAF lieutenant-general.

The proof of Lockheed Martin Canada's commitment to the Canadian economy—and to creating well-paying jobs in the country—can be found in domestic innovations such as the company's Combat Management System 330 (CMS 330).

Developed by Lockheed Martin Canada's highly-skilled engineers and technicians, CMS 330 is one of the most modern naval combat management systems in the world.

CMS 330 is being deployed by the Royal Canadian Navy in its fleet of modernized Halifax class ships and will be implemented on the new Arctic and offshore patrol ships currently under construction. The innovative system has also been exported to New Zealand and Chile.

"We have been Canada's trusted industry partner for nearly 80 years, forging deep corporate relations and partnerships," said Bouchard. "We leverage the global reach of Lockheed Martin that has a presence in 52 countries.

"The real success in Canada is being at the point where we are now exporting Canadian-made technology and services to customers around the world, including the U.S., U.K., New Zealand, Chile and the Middle East."

Lockheed Martin Canada is also a reliable, long-term firm partner in Canadian aerospace projects including the F-35 Joint Strike Fighter Program, which has included Canadian suppliers since 2002.

The F-35 program is hitting milestone after milestone, with deliveries to the U.K. in early June. It was also recently deployed operationally by the Israeli Air Force.

There are $2.3 million worth of Canadian components on every F-35 fighter jet, according to the PwC study.

More than 110 Canadian suppliers have been involved in the program, and the total value of contracts to these suppliers is more than $1 billion. This has supported the creation of $889 million in GDP and 9,500 jobs, according to the study.

"Our guiding vision is to serve as an innovative and trusted defence and aerospace partner to Canada. . . ."

— Charles Bouchard, chief executive officer, Lockheed Martin Canada and a retired RCAF lieutenant-general

"Overall, we work closely with 1,400 small and medium-sized Canadian companies in our supply chain; companies of all sizes, from all regions and in all sectors," said Bouchard.

"Working with Lockheed Martin Canada boosts our partners' growth potential and upward trajectory, and their abilities to increase export sales."

The company's partnership with Canada's Department of National Defence (DND) is award-winning and internationally recognized.

In May 2018, AHS International highlighted the DND and Sikorsky, a Lockheed Martin company, for conducting an "extraordinary international effort" to demonstrate the CH-148 Cyclone helicopter's ability to operate in high sea states.

A combined test force sailed five times into the waters off Nova Scotia from 2010 to 2017 between late December and early March, when weather conditions produced six-metre (20-foot) wave heights and winds up to 55 knots (100 kilometres per hour).

An aircrew made up of personnel from RCAF 12 Wing Shearwater, N.S., and Sikorsky, demonstrated full use of the Cyclone's full-authority fly-by-wire flight controls, which can hold the aircraft in a precise hover during high wind states.

These types of conditions are frequently found in the North Atlantic region over winter.

Lockheed Martin Canada also invests heavily in innovation through R&D, and is thoroughly committed to meeting its obligations under Canada's Industrial and Technological Benefits (ITB) policy.

"We also invest millions of dollars in university research projects that have growth potential for commercialization and in small and medium-sized companies," said Bouchard.

Working with Canadian expertise, Lockheed Martin Canada has been able to realize numerous dual military/commercial purpose opportunities.

A case in point: Calgary's Lockheed Martin CDL Systems produces software for unmanned aerial vehicles (UAVs).

"One advantage to CDL of the acquisition by Lockheed Martin [in 2012] is its name recognition, which expands CDL Systems' range of potential clients," noted the PwC study.

Additionally, CDL Systems has access to Lockheed Martin's sales support in several countries, increasing its potential to grow international sales, the study noted. It's expected this will benefit the economies of Calgary, Alberta, and Canada.

"Lockheed Martin has over 100 years of innovations and expertise in building the most advanced aircraft, being a part of every space mission to Mars and customizing solutions for global defence and security needs," concluded retired lieutenant-general Charles Bouchard.

"While we will continue to develop our core capabilities in aircraft delivery and sustainment as well as naval technology and combat systems integration in Canada, we will advance export opportunities and move beyond defence to new areas."

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PLAYING THE LONG GAME

PRATT & WHITNEY CANADA CONTINUES ITS DECADES OF LEADERSHIP IN THE HELICOPTER INDUSTRY WITH THE PT6C-67C ENGINE.

PHOTOS COURTESY OF P&WC

Pratt & Whitney Canada (P&WC) has been in the business of designing, manufacturing and servicing helicopter engines since the early 1970s.

Over the years, the company has delivered more than 16,000 helicopter engines and the entire fleet has flown in excess of 61 million hours.

"It's an understatement to suggest that we have depth in the global aviation industry, because over the years we've truly become an integral part of it," said Nicolas Chabée, vice-president of marketing at P&WC, responsible for helicopter engines. "We are in the business for the long haul and it's with that same perspective we bring all of our products and services to market."

The company is best known for its iconic PT6A turboprop engine, which changed the face of general aviation around the world. P&WC took its PT6A experience and parlayed it into three distinct helicopter engine families, which all share the same PT6 architecture.

"We were able to extend the PT6A's reputation for exceptional reliability to our turboshaft engine programs and we consequently built a major presence for ourselves in the helicopter industry," said Chabée. "We first won over helicopter OEMs by demonstrating how we could collaborate on ensuring the powerplant was fully and seamlessly integrated with the helicopter itself. Then, we won over operators by producing engines with rock-solid reliability, along with the exceptional value that such reliability and availability mean."

He said an excellent case in point is the PT6C-67C engine, which powers the twin-engine AW139 helicopter from Leonardo. The PT6C-67C is a derivative of the PT6A-67 large turboprop engine series, which has accumulated more than 27 million flight hours and has been certified for single-engine instrument flight rules (SEIFR) for the Pilatus PC-12.

"We have delivered more than 2,000 PT6C-67C engines to more than 260 operators in 78 countries," said Chabée. "The fleet has flown more than four million hours and the fleet leader is currently at 10,000 flight hours."

SETTING PERFORMANCE STANDARDS

He said the PT6C-67C engine bears a number of performance metrics that have consistently set it apart from similar engines on the market:

- It has an indisputable availability track record at 99.1 per cent compared to the industry benchmark at 98 per cent;
- The engine's total in-flight shut down (IFSD) rates are six times better than the industry benchmark and basic IFSD rates are seven times better than the industry benchmark at one basic IFSD per 643,000 flight hours; and
- Basic unscheduled removal (BUR) rates are four times better than the industry benchmark at one BUR per 32,000 flight hours.

"You simply won't find this kind of performance and reliability on an engine in this class," said Chabée. "To have an engine that outperforms its competition on so many levels is a tremendous competitive advantage for operators of AW139 helicopters, a fact which we believe to be a key contributing factor to the program's success. Of course, reliability means more time on wing and that means cost savings and high dispatch availability."

Chabée said it's not just the engine's reliability and availability that represents value for operators, it's the economics of the engine as well:

Dan Megna Photo

- Based on third-party data (Conklin & de Decker Associates Inc.), the PT6C-67C engine's direct maintenance costs are exceptionally competitive in its power class;
- The engine generally exhibits performance-margin retention;
- The PT6C-67C engine has accommodated incremental increases in maximum take-off weight that Leonardo has undertaken on the AW139 platform since entering into service; and
- Its already generous 5,000-hour time between overhaul interval can be further escalated based on satisfactory engine sampling; today's fleet leader is currently at 6,000 hours.

AN ENGINE WITH GLOBAL SUPPORT

PT6C-67C customers can rely on some 2,000 employees in P&WC's global customer service organization that never sleeps. It includes two Customer First (CFirst) centres in Longueuil, Que., and Singapore; more than 100 field support representatives; another 100 Mobile Repair Team (MRT) technicians; seven parts distribution centres; and 13 training centres in strategic locales around the globe.

P&WC's FAST (full-flight data acquisition, storage and transmission) engine health management solution, which helps optimize operations, reduce costs and increase helicopter availability, has been certified for the PT6C-67C engine.

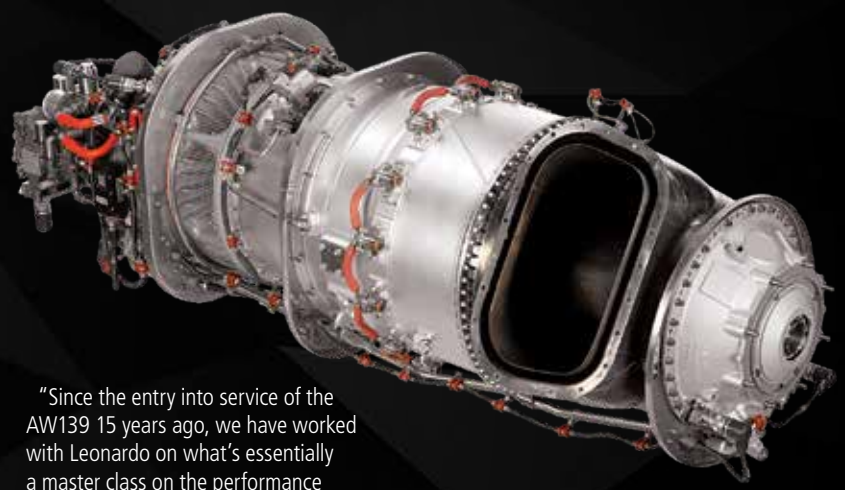
"Our customer support activities are driven by a collaborative model wherein we believe that we succeed only when our customers succeed," said Chabée. "Our customer relationships are intentionally strategic, not merely transactional. For example, we recently introduced platinum-level ESP (pay per hour) maintenance coverage for our PW200 helicopter engine portfolio and we are considering doing the same for other engine programs, including our PT6C-67C."

More than 30 PT6C-67C rental engines are inventoried at facilities in Frankfurt, Montreal, Singapore and Australia.

AIRFRAME INTEGRATION

"P&WC has a long-standing relationship with Leonardo Helicopters and we power a number of their platforms," said Chabée. "One of the reasons that the PT6C-67C has performed so well on the AW139 is because of the way in which we worked with Leonardo throughout the design and certification phases, and finally EIS. It's important to keep in mind that the engine and the helicopter airframe were developed essentially in tandem. We do this to ensure that the engine and helicopter are seamlessly integrated and together work as a single system."

He added that once the helicopter enters into service, the relationship between the two companies continues as teams work to track and analyze the ongoing performance of the engine fleet. This entails weekly—if not daily—dialogue with Leonardo augmented by several face-to-face meetings every year. The relationship is a well-oiled machine that's responsive and predisposed to rapid issue resolution.



"Since the entry into service of the AW139 15 years ago, we have worked with Leonardo on what's essentially a master class on the performance characteristics of the PT6C-67C engine," said Chabée.

"The result is a deep understanding of how the engine operates under different conditions and while performing various missions. Like P&WC itself, the engine plays a long game and yet remains evergreen. That's something that gives our customers the best of both worlds; a competitive advantage that no one else can match."

> "To have an engine that out-performs its competition on so many levels is a tremendous competitive advantage for operators of AW139 helicopters, a fact which we believe to be a key contributing factor to the program's success."
>
> *— Nicolas Chabée, vice-president of marketing*

A COMPLETE training & support SOLUTION

WELL-KNOWN FOR ITS WORLD-CLASS SIMULATORS, CAE PROVIDES COMPLETE TRAINING AND SUPPORT ECOSYSTEMS TO THE RCAF.

BY JAMES CARELESS

CAE founder Ken Patrick was among the thousands of extraordinary men and women who served in the Royal Canadian Air Force (RCAF) during the Second World War, and after the Allied victory in 1945 he sought to capitalize on his military training.

He also wanted to maximize the skills of a war-trained team that was extraordinarily innovative and steeped in the leading-edge aviation technology of the day.

This is what prompted him to create CAE, originally known as Canadian Aviation Electronics Ltd., on St. Patrick's Day in 1947.

What began as a small repair and overhaul company working out of an aircraft hangar at Saint-Hubert Airport in Quebec has become one of the most revered flight training companies in the world, and a vital partner of the RCAF.

"We are a partner of choice who supports the RCAF with complete training and support ecosystems," said Joe Armstrong, vice-president and general manager of CAE Canada.

In co-operation with the Canadian government, CAE guides key initiatives like the NATO Flying Training in Canada (NFTC) program, which provides basic, advanced and lead-in fighter training as part of the comprehensive military pilot training program for the RCAF.

Under the NFTC program, CAE operates the base facilities, delivers the ground-school classroom and simulator training, and supports the live flying training on a fleet of Beechcraft T-6 (CT-156 Harvard II) and BAE Systems Hawk (CT-155 Hawk) aircraft.

CAE also provides comprehensive training services and support for the RCAF's Air Mobility Training Centre in Trenton, Ont., and Medium-to-Heavy-Lift Helicopters Maintenance Training Centre in Petawawa, Ont., as well as systems engineering services and support for Canada's CF-188 fighter jet fleet and its Maritime Helicopter Program (MHP).

Managing end-to-end training and support programs for Canada's military—and particularly for the RCAF—has become CAE's focus in recent years.

"Our proudly Canadian company has been delivering capabilities to the RCAF since we began in 1947," said Armstrong. "As the years have passed, our relationship with Canada's military has shaped our growth and our priorities, allowing CAE to become a true end-to-end defence contractor."

While CAE has become known the world over as the leading provider of training and simulation solutions for the airline industry, the company's close, ongoing relationship with the Canadian military was never forgotten.

As the company pivoted almost a decade ago to focus on being a training systems integrator in the defence market, a program with the Air Force helped pave the way. It was in 2009 that CAE was selected as the Operational Training Systems Provider for the Air Force's new fleets of transport aircraft and helicopters.

"We built and now operate in collaboration with the RCAF the entire training facilities for the CC-130H/CC-130J Hercules as well as the CH-147F Chinook, including training aircrews and maintenance technicians," said Armstrong.

CAE is now developing the same end-to-end training capability for the RCAF's fixed-wing search and rescue (FWSAR) program that will see the addition of Airbus CC-295 aircraft to the RCAF fleet.

"Collectively, these programs represent quite substantial transformations of how CAE perceives ourselves and how we serve our customers," said Armstrong. "We've gone from supplying simulators and training devices to customers like the RCAF to building and operating their entire training facility, including developing, managing and delivering the academic training curriculum. This requires a much higher-level partnership and collaboration with the RCAF, and that is exactly

the type of relationship we are trying to create with our defence customers."

All of this work has given CAE a "full circle perspective," said Armstrong, in understanding the RCAF's training and operational needs. In this respect, being a truly Canadian company matters.

"We need to retain this level of technological capability in Canada both for the sake of our own defence, and to grow our aerospace and defence industry globally," he said.

This perspective also speaks to CAE's sincere and historic commitment to the RCAF, not just in training, but also through the in-service and sustainment program the company has been providing for Canada's CF-188s, in partnership with L3 MAS, for three decades.

This is why CAE's Missions Solutions Group achieved Capability Maturity Model Integration (CMMI) Level 5 certification, the highest quality standard possible for software engineering, to ensure its best possible work on the CF-188s' mission system computers.

"We do similar work on the Maritime Helicopter Program, where we service and support the CH-148 Cyclone helicopter," said Armstrong. "For instance, CAE runs the Integrated Information Environment. This is the information technology centre that manages the life-cycle data for Canada's Cyclones while in Canada, and as that fleet deploys on ships."

A new development at CAE and one that will help shape the future of aircrew training in Canada is the formation of SkyAlyne Canada Inc., a 50/50 joint venture between CAE and KF Aerospace.

SkyAlyne brings together two Canadian companies with unmatched experience and capabilities in the delivery of pilot and aircrew training in Canada. Currently, CAE and KF Aerospace deliver all phases of pilot training to the RCAF through the NFTC program managed by CAE, and the Contracted Flying Training and Support program managed by KF Aerospace.

"This joint venture brings together proven expertise in all phases of pilot training and helps ensure that training—one of the key industrial capabilities identified in the defence policy—can be developed and delivered by Canadian companies for Canada," said Armstrong.

With the formation of SkyAlyne Canada, CAE and KF Aerospace are taking a long-term view of the RCAF's pilot training needs and positioning for the Future Aircrew Training (FAcT) program. The Government of Canada recently held an industry engagement session in Ottawa on the FAcT program.

Looking further ahead, Armstrong sees opportunities such as the Future Fighter Capability Project and CH-149 Cormorant mid-life upgrade for CAE to provide training and in-service support ecosystems that uniquely address Canada and the RCAF's requirements.

In doing so, he is passionate about Canada's need to retain and nurture a strong domestic aerospace and defence capability—one that boosts the Canadian economy and helps the RCAF protect the country's sovereignty and safety.

"Our company has been focused on Canada's well-being since Ken Patrick founded CAE in 1947," said Armstrong. "Now, more than ever, the RCAF needs industry partners who share the same loyalties and concerns that they do, and who are as committed to Canada as the Canadian military is. That is certainly CAE."

> "We are a partner of choice who supports the RCAF with complete training and support ecosystems."
>
> *— Joe Armstrong, vice-president and general manager of CAE Canada*

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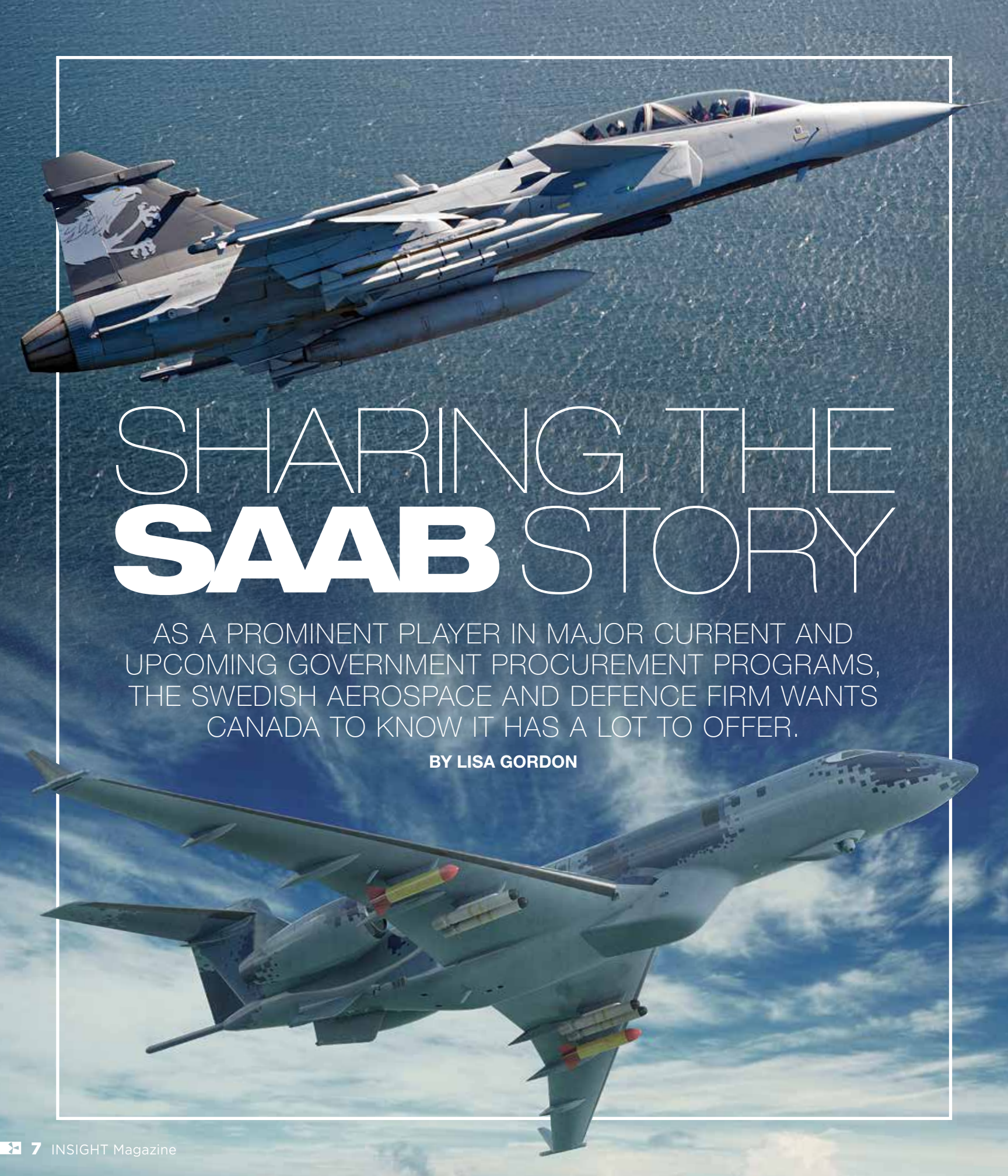

SHARING THE SAAB STORY

AS A PROMINENT PLAYER IN MAJOR CURRENT AND UPCOMING GOVERNMENT PROCUREMENT PROGRAMS, THE SWEDISH AEROSPACE AND DEFENCE FIRM WANTS CANADA TO KNOW IT HAS A LOT TO OFFER.

BY LISA GORDON

While Saab has been doing business in Canada for 25 years, its star may now be on the rise in the Great White North.

For the first time, the Swedish aerospace and defence company is well-positioned to support the Canadian government in two near-term major procurement programs.

First, its single-engine JAS 39 Gripen fighter jet is one of five aircraft that will compete to replace Canada's fleet of aging CF-188 Hornets.

In the Royal Canadian Navy domain, Saab is the combat system provider and integrator on the Navantia-led bid for the new Canadian Surface Combatant procurement, with that decision expected later in 2018.

Further down the road, Saab's Swordfish Maritime Patrol Aircraft—built on a Bombardier Global 6000 platform—is also being advanced as a potential multi-mission successor to the CP-140 Aurora, which specializes in intelligence, surveillance and reconnaissance (ISR) over both land and water.

"From a period of stable, small- to medium-sized business in Canada, we're looking at something that will be a considerable business shift for not only Saab in Canada, but also significant for Saab on a global perspective," said Simon Carroll, who became president of Saab Canada, Inc., on July 1.

DEPTH AND BREADTH

Born in 1937 out of a need to protect Sweden's borders during the lead-up to the Second World War, Saab now employs 16,427 employees worldwide and does business in more than 100 countries. While it has been operating in Canada for a quarter century, it may have flown under the radar in many respects.

"Saab may be slightly less well known as a global supplier than some companies doing business today in Canada. If you compare Saab to some of the major U.S.-based defence companies, such as Lockheed Martin or Boeing, we're smaller in terms of employee numbers and revenue," said Carroll.

"On the other hand, if you compare the portfolios of our respective companies, you find a much different result. In fact, our portfolio stretches across the maritime, land and air domains into the ever-growing civil and cyber security environments. We offer great depth and breadth of product, including submarines, ships, fighter jets, airborne early warning (AEW) systems and ground combat systems, just to name a few."

Saab's existing Canadian offerings include naval radars for the Halifax-class frigates; fire control and combat management systems; manned portable weapons systems; camouflage systems; soldier systems; rugged computers and displays; training and simulation programs; maritime traffic management; and air traffic management solutions.

However, a significant part of the company's overall business portfolio is aeronautics-related, business that primarily includes the Gripen fighter and the GlobalEye AEW and surveillance platform.

Importantly from a Canadian perspective, the GlobalEye and the recently developed Swordfish Maritime Patrol Aircraft incorporate significant Canadian content through the Bombardier Global 6000 platform, as well as other significant products from CAE, Flying Colours Corp. and General Dynamics Mission Systems – Canada.

The Gripen in particular has proven to be of great interest to the Canadian defence community. Saab went "all in" at CANSEC 2018, the country's largest defence show held in Ottawa every May, where the company demonstrated a Gripen E cockpit with wide area display.

The E model is the latest iteration in the Gripen family, a true multi-role "smart fighter" capable of meeting expected threats well beyond 2030.

"Certainly we saw a favourable response at CANSEC," said Patrick Palmer, executive vice-president of Saab Canada.

Palmer said the Swedish fighter presents an attractive option for Canada, considering acquisition cost, in-service support and sustainability. When it comes to the Canadian fighter jet mission portfolio, he believes the Gripen is well-equipped.

"It is essentially developed for an Arctic environment. Sweden and Canada offer a similar climate

and it is designed to work in those harsh conditions."

Touted as a versatile fighter capable of air-to-air, air-to-ground and reconnaissance missions, the Gripen features a state-of-the-art situational awareness capability supported by active and passive systems, including radar, satcom, electronic warfare (EW), infrared search and track (IRST), missile warning, ISR pod, targeting pod, and tactical data links.

Saab says its fighter is capable of serving from remote forward bases and is fully interoperable with NORAD and U.S. weaponry.

In addition, Gripen's open architecture and split avionics allow for easier upgrading. Separation of flight safety and tactical functions within the system architecture enables quick system upgrades as technology advances.

"Basically, what that allows you to do is plug and play upgrades in terms of added functionality and mission capability," explained Palmer.

For Canadian industry, one of the biggest selling points to the Gripen proposal could be Saab's "technology transfer" offer, whereby the jets would be both made and supported by Canadian firms.

"This would enable Canada to support and sustain the jets for the life of the program, with minimal dependencies to other nations," explained Palmer. "Saab would look at establishing existing capability in Canada, creating Canadian-based capability and partnerships, and further leveraging the considerable technologies that Canada currently has to offer. In addition, Canada could work with Sweden on future collaboration and future development

for the benefit of both countries."

Carroll spoke of Saab's inherent agility and commitment to continuous improvement, traits he said will benefit Canada in any future dealings.

"One of Saab's biggest advantages is our ability to be more agile and flexible in our programmatic endeavours," he said. "Our long experience and history as a supplier to the Swedish government and armed forces, with limited budgets for defence acquisition, has taught the company to make every dollar count. It has also driven our efforts to produce highly reliable, robust and affordable products that maximize end users' capabilities and advantages.

"In the case of the Future Fighter Capability Project, if you look at Canadian needs, the Gripen meets them well and at a lifecycle cost that will not break the taxpayers' budget."

STRENGTH THROUGH DIVERSITY

IMP AEROSPACE AND DEFENCE HAS BEEN SUPPORTING CANADA'S MILITARY AIRCRAFT FOR 70 YEARS, BOLSTERED BY A DIVERSE SKILL SET AND UNPARALLELED EXPERTISE. **BY BEN FORREST**

Not long after the Allied victory in the Second World War, as Canada solidified itself as a middle power with a vital role to play in the defence of its allies, IMP Aerospace and Defence (IMP) stepped in to help.

IMP began supporting Canada's military aircraft in 1948, initially the Royal Canadian Navy Air Service (also known as the Navy's Fleet Air Arm) and later the Royal Canadian Air Force (RCAF).

The company has been an essential partner of the RCAF ever since, providing in-service support (ISS) on several key platforms while driving innovation through the design and development of modifications to enhance the capabilities of the aircraft.

"The relationship we have with the Royal Canadian Air Force is a very close one, right from the commanding officer down through the ranks," said Carl Kumpic, vice-president of international marketing at IMP Aerospace and Defence.

"We work closely with the RCAF, providing in-service support, life extensions and mission system upgrades to ensure their fleet is operationally relevant and available. Our success on the Canadian programs is instrumental towards leveraging international business growth. We couldn't be where we are without having a solid relationship with the Royal Canadian Air Force."

STRENGTH THROUGH DIVERSITY

IMP Aerospace and Defence is comprised of six operating units, all of which contribute to the health of Canada's military aircraft. It's a remarkably versatile group with unparalleled expertise, clearly demonstrating a key corporate philosophy: There is strength in diversity.

"There is a broad range of diversity within the group," said Kumpic. "From our specialty of in-depth aircraft maintenance, to engineering design and development, integrated logistics support, electronic publications, supply chain management, parts manufacture and component overhaul … our level of expertise is really the backbone and the differentiator of our organization."

IMP AEROSPACE

IMP's diverse capability set is demonstrated partly through IMP Aerospace, an operating unit that formed in 1970 and has become a leader in ISS for military and commercial aircraft, including the RCAF's CP-140 Aurora, the CH-124 Sea King helicopter,

the CH-149 Cormorant helicopter, the CH-146 Griffon helicopter, and the Canadair CT-114 Tutor (which the Canadian Forces Snowbirds fly).

"What we deliver to Canada is a high-quality service and a high-quality product," said Kumpic. "Maintaining aircraft in operations for over 40 years requires in-depth engineering to address obsolescence, fatigue and corrosion issues. IMP is currently upgrading the CP-140 Aurora fleet through both a structural life-extension as well as a full mission and avionics upgrade to ensure the effective operation of this fleet for another 20 or more years. By that time, the Aurora fleet will have been in operation for over 45 years. We are currently engaged with Leonardo, the OEM of the Cormorant CH-149 search and rescue fleet to execute a similar life-extension, modernization and fleet-augmentation program."

CASCADE AEROSPACE

Another key member of the IMP family is Cascade Aerospace, an Abbotsford, B.C., based operating unit that was acquired in 2013 from Conair, a highly successful aerospace company in its own right.

Cascade is a specialty aerospace defence contractor focused on long-term integrated aircraft support programs in the military, government and commercial sectors. It is a remarkably skilled integrator of avionics and missionized systems, providing upgrades for military aircraft such as the CC-130 Hercules.

Cascade is also adept at adding capabilities to civilian aircraft, including external fuel tanks for the Bombardier Q400 turboprop, which significantly increase the aircraft's range and endurance.

"IMP's role is to design modifications to the aircraft to facilitate the installation of new systems, ensuring those mission systems have both adequate power and cooling, are placed in the appropriate positions, and have antennas installed where necessary and that the aircraft complies with the applicable airworthiness requirements. We then deliver the aircraft with its installed mission system to Canada," said Kumpic.

"We highly value our relationship with the Canadian military and leverage it to assist us in growing our business," said Kumpic. "Not only growth in Canada, but on the international front as well."

SEARCH AND RESCUE

IMP Aerospace and Defence is also the prime contractor for turnkey ISS of Canada's fleet of CH-149 Cormorant search and rescue helicopters, through its Canadian SAR Helicopter operating unit.

The company has been providing total fleet level support to the Cormorant fleet since 2001, with highly trained workers at the main operating bases located in Comox, B.C.; and Greenwood and Gander, N.L.

In addition, the IMP Cormorant Support Centre in Halifax, N.S., oversees program management, airworthiness, maintenance, engineering, logistical support and technical training for the Cormorant, a variant of the Leonardo AW101 helicopter.

"The Cormorant aircraft is a highly utilized fleet for Canada," said Kumpic. "This aircraft is now due for a midlife update, and we are working closely with Leonardo Helicopters on a proposal to keep them flying for another 15 to 20 years."

The Cormorant Mid-Life Upgrade (CMLU) program also looks to augment Canada's existing Cormorant fleet with as many as seven VH-71 helicopters. These aircraft are also variants of the Leonardo AW101 that were previously earmarked for the U.S. presidential fleet and were recently acquired by Canada.

MOVING FORWARD

IMP Aerospace and Defence includes three additional operating units: IMP Electronic Systems, IMP Aerostructures and IMP Naval and Land Services, all of which offer essential services to the Canadian Armed Forces, thanks to the efforts of their expert staff.

It's this diversity and innovation, along with unparalleled expertise, that makes IMP Aerospace and Defence an important contributor to the success of the RCAF.

"We're always behind the scenes, ensuring that these aircraft can fly and perform their mission," said Kumpic. "We're very proud supporters of our Royal Canadian Air Force, and we look forward to supporting them for many years to come."

IMP AEROSPACE & DEFENCE

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EASY DOES IT

MARINVENT'S SYNTHESIS WEB-BASED CERTIFICATION SUITE SIMPLIFIES THE COMPILATION AND PRODUCTION OF COMPLIANCE AND CERTIFICATION DOCUMENTS, WHILE ENHANCING THEIR ACCURACY AND REUSABILITY.

BY JAMES CARELESS

Compiling and then producing compliance and certification documents—either for entire aircraft, or specific aircraft components and systems—has historically been a time-consuming, difficult-to-manage, and sometimes error-prone process.

The reason: There are just so many elements that have to be addressed and recorded in any compliance and certification process, most of it compiled manually using few, if any, integrated tools.

With all this complexity comes too many opportunities for specific tasks to be missed, pertinent data to be misfiled, and requirement revisions to be incompletely tracked and/or applied. In addition to this, there is little or no standardization or optimization applied to the process.

Fortunately, there is a solution: Marinvent's 'Synthesis®' compliance and certification suite of software tools.

Using a web-based interface, Synthesis allows managers to plan out a certification project in detail, starting with a top-level view and then 'drilling down' to create every element that must be addressed in the process in order to demonstrate compliance.

As tasks are addressed, the results are recorded in the Synthesis database (which resides on the user's own servers). The software suite's project management functions keep the users alerted to what tasks, tests and data recording remains to be completed.

Synthesis deftly handles revisions to the project's requirements.

"As these revisions are added to the project structure, Synthesis searches the existing data to ensure that everything already recorded remains in compliance with the revisions," said Phil Cole, Marinvent's vice-president of business development.

"It highlights any data that is out of compliance so that this data can be remedied."

If something prevents a given task from being completed, Synthesis can be asked to provide a workaround, allowing other tasks to be completed in the interim to minimize delays. Once all the tasks have been completed, Synthesis will produce a final report in PDF form, all ready to be filed.

Synthesis is just one of the tools developed by Montreal's Marinvent to aid the aerospace industry. Founded by much-honoured engineer John Maris in 1983, Marinvent provides consulting, intellectual property, services, tools and training to reduce customers' program and product costs, related risks and time requirements.

"With all the projects currently on the RCAF's schedule—the Future Fighter Capability Project being just one of them—a tool like Synthesis can speed up and simplify the compliance process," said Cole. "The final document that the suite produces is accurate, complete and backed with direct connections to all of the data that it is based upon."

Synthesis is designed to support military and civil programs such as aircraft and avionics flight test and acceptance/certification; aircraft program specification and selection; and unmanned aircraft systems specification, selection, test and acceptance/certification.

Licensed to clients on an annual per-seat basis (and backed by support), Synthesis' intuitive, web-based graphical interface makes it easy for users to operate the suite from the outset. Marinvent can customize Synthesis' business rules, checklists, documentation formats and workflows to align to the Royal Canadian Air Force's (RCAF's) individual needs and requirements.

Access to Synthesis is carefully protected, and the system manager can assign or deny access to parts of the database based on each user's role and identity.

All data and certification artifacts entered into the Synthesis project database are collected and stored with unbreakable links, ensuring data never gets lost. Meanwhile, all data entered is stored at every level of access and retained for future reuse, from regulatory guidance to findings of compliance.

Synthesis provides managers with complete visibility into all aspects of the project, so that they can optimize the project and track progress and issues in real time. The suite's checks and balances ensure that only work that has to be done is scheduled to be done.

By using Synthesis, managers can rest assured that all aspects of their project are properly specified, addressed and tracked. This stays true even if project personnel change, as can happen during long compliance and certification processes.

The documentation produced by Synthesis is entirely open to queries. Any questions raised by the certification body can be quickly addressed, just by tracing the relevant detail in the project database.

Using a data management system like Synthesis ensures that project rules are adhered to throughout the life of the initiative, because deviations will be easily identified by user, date and the specific data affected. What is more, all data is now stored electronically to ensure permanent and easy retrieval.

Finally, Synthesis offers a tangible return on investment for the user, saving time and effort during their first project, and further savings for future projects. In many instances, some of the data recorded for the first project may be usable in succeeding projects, saving even more entry and research time.

"The RCAF have some pretty monumental compliance and certification projects ahead of them," said Cole. "With a software suite like Synthesis, they can do this work in less time, with fewer errors and with far better insight into what is happening and how to manage it."

BUILDING ON A STRONG FOUNDATION

PAL AEROSPACE IS GROWING RAPIDLY, THANKS IN LARGE PART TO ITS HISTORY OF HARD WORK, INNOVATION AND COLLABORATION.

BY BEN FORREST

PAL Aerospace began providing intelligence, surveillance and reconnaissance (ISR) capabilities to Canada's Department of Fisheries and Oceans (DFO) nearly three decades ago, launching a critical relationship that endures to this day.

In the beginning, PAL provided ad hoc support to fisheries enforcement officers, using surveillance aircraft to determine if fishing vessels were complying with Canadian regulations.

But the relationship quickly evolved, and the company secured a series of full-time support contracts with the DFO that directly informed and complemented the services it now provides to the Royal Canadian Air Force (RCAF), Royal Canadian Navy (RCN) and many other partners around the world.

Over the last decade, PAL Aerospace also developed special mission aircraft capabilities in the Caribbean region, modifying and operating a small fleet of ISR aircraft for the Dutch Caribbean Coast Guard (DCCG).

The company also modified and now provides in-service support to a small fleet of maritime patrol aircraft in the United Arab Emirates (UAE) armed forces.

"We're very proud of what we have achieved over the years," said Duart Townsend, a senior director of business development for PAL Aerospace. "Also, [we're] proud of the fact it's been a collaborative effort with our numerous clients."

Today, PAL Aerospace is seeing remarkable growth and a rapidly expanding global footprint, largely thanks to its tradition of hard work, innovation and close collaboration with the DFO, RCAF and RCN, as well as continued collaboration with the DCCG and UAE forces.

"We've leveraged our operational experience, and complemented it with our expertise in special missions aircraft design, modification and in-service support … and basically applied that to other regions around the world," said Townsend.

"We're proud of how that expertise and experience has grown from years prior into many of our current programs."

PAL Aerospace's support of the RCAF and RCN flows directly from its relationship with the DFO, thanks to an interdepartmental agreement between the DFO and Canada's Department of National Defence (DND).

This agreement makes PAL Aerospace's fleet of Beechcraft King Air B200 ISR aircraft available to the DND for operational augmentation when RCAF surveillance aircraft are deployed internationally and unavailable for domestic missions

PAL's fleet of five King Air B200s, four of which are dedicated specifically to the support contract with the DFO, fly more than 7,500 hours a year out of bases in Halifax, N.S.; St. John's, N.L.; and Comox, B.C.

Along with providing support to Canada's military, PAL Aerospace's ISR capability also serves the oil and gas industry on Canada's East Coast, and other periodic customers under contract.

"[PAL] provides the RCAF and the RCN with essentially interoperable and seamless augmentation when and where required, when RCAF aircraft themselves are not able to provide the capability," said Townsend.

Another product of PAL Aerospace's innovation and hard work, and another example of its partnership with the RCAF, is its role in Canada's fixed-wing search and rescue (FWSAR) program.

Airbus chose PAL to provide in-service support and maintenance, repair and overhaul services for the RCAF's new fleet of CC-295 FWSAR aircraft.

Canada has ordered 16 aircraft of this type to replace its aging fleet of CC-115 Buffaloes and CC-130 Hercules. Airbus is expected to deliver the first CC-295 in 2019.

PAL Aerospace will work with RCAF technicians to perform first-line maintenance for the CC-295 fleet, and PAL will also be responsible for repairs, second- and third-line maintenance, and future modification work.

"Search and rescue, of course, is very important to Canadians and it is a particularly important mission to the RCAF itself," said Townsend.

"PAL Aerospace is very proud to be a part of that … We also see it as an indicator of confidence the government has, to appreciate the kinds of capabilities that Canadian aerospace can provide."

There are several other key Canadian partners in the CC-295 program, including engine manufacturer Pratt & Whitney Canada, and simulation and training provider CAE.

"PAL is honoured to be one of those aerospace companies the RCAF will depend on as the CC-295 fixed-wing SAR aircraft take to the skies," said Townsend.

Another beneficiary of PAL's collaboration with the RCAF, RCN and DFO, is its own Force Multiplier (FM) program, which uses a highly modified Bombardier Dash 8-300 to provide short-term, pixel-by-the-hour surveillance to nations around the world.

PAL's first FM aircraft, Canadian-registered C-GFMX, debuted at the Dubai Airshow in the fall of 2017, part of a program that embodies the experience PAL has built over decades of surveillance operations.

"If you need short-term or interim support to operations, this pixel-by-the-hour idea of renting an aircraft that conducts surveillance is appealing to many nations around the world," said Townsend.

"I'm confident we'll continue to see the Force Multiplier program expand, based on the initial engagement and successful operations of the program that we have already conducted."

As PAL Aerospace moves forward, the company remains focused on supporting and augmenting the RCAF.

"We see ourselves being quite well-placed to participate in future RCAF capability procurement activities," said Townsend.

He used the example of the Canadian Multirole Aircraft (CMA), which is expected to replace the CP-140 Aurora surveillance aircraft sometime in the 2030s.

"In the last several years, we've seen defence procurement take on a distinctly more collaborative and inclusive tone with industry—a lot more industry days where government seeks input from industry in the earlier phases of acquisition," said Townsend.

"As the RCAF looks towards programs like the Canadian Multirole Aircraft, PAL Aerospace is looking to be an active participant in that collaboration."

> "We see ourselves being quite well-placed to participate in future RCAF capability procurement activities."
>
> *– Duart Townsend, senior director of business development*

A TRU TRAINING SOLUTION

TRU SIMULATION + TRAINING OFFERS TOTAL TRAINING SYSTEMS FOR FIXED-WING AND ROTARY-WING AIRCRAFT.

BY JAMES CARELESS

As the Royal Canadian Air Force (RCAF) prepares for some of its most crucial procurements in a generation, there is a pressing need for trusted, tested partners with a long track record of producing world-class results.

TRU Simulation + Training is exactly this kind of partner.

With strong collaboration with the RCAF and deep roots in other militaries around the world, TRU has an exceptional international reputation for providing total training systems that work.

"TRU provides everything from simulators to courseware to all the services required to support a training centre," said John Hayward, TRU's senior vice-president and general manager of military and business simulation.

"This includes maintaining and updating the training devices and associated aircraft. TRU is all-in: We support the whole system from acquisition through to retirement."

TRU is also a major contributor to the Canadian economy and a provider of well-paying, skilled aerospace jobs. The company has approximately 375 employees at TRU's facility in Montreal, Que.

TRU is part of the Textron family of companies, which also includes pioneering aviation and aerospace manufacturer Bell, a major contributor to the Canadian economy with a workforce of about 950 people in Mirabel, a suburb of Montreal.

As the RCAF moves ahead with its Future Aircrew Training and Future Fighter Capability projects, TRU is positioning itself to meet the standards of these and other advanced programs.

TRU's interests are aligned with those of the RCAF and its requirement for total training systems that meet the highest possible standards, ensuring Canada's military remains one of the best in the world.

So, what makes TRU a good match?

Depth is a good place to start.

The company has provided complex training systems for virtually every important military aircraft used by NATO countries today.

An example would be the CC-177 (C-17) Globemaster: TRU supports 37 maintenance training devices and 70 aircrew training devices configured for this aircraft around the world.

These are not just flight simulators; they include trainers for engine maintenance, fuel systems, flight controls, landing gear and aircraft maintenance systems.

TRU has similarly provided advanced military training solutions for many Bell helicopter models, as well as the CC-130 Hercules, Boeing B-1B Lancer bomber, the Lockheed Martin F-22 Raptor and F-35 Lightning II fighter jets, among others.

"With our proven ability to deliver modern end-to-end training, TRU is a good match to the RCAF's training requirements," said Hayward.

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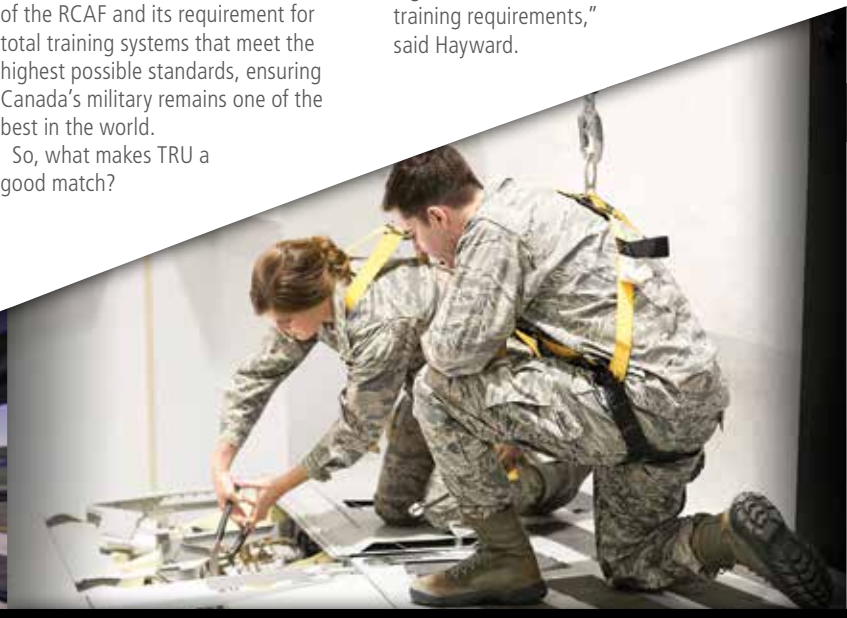

As a Textron company, TRU has close ties with Bell and Textron Aviation, which manufactures the popular Beechcraft T-6C Texan II military turboprop training aircraft.

"Being tied to an OEM [original equipment manufacturer] gives us a competitive advantage over other simulator companies, especially because the OEM is the No. 1 supplier of military training aircraft in the world today," said Gregg Sturdevant, TRU's director of sales and business development.

As a prime supplier to the U.S. Air Force (USAF), TRU is already attuned to the requirements of Canada's closest military ally.

Given how closely the RCAF and USAF work together in NATO and other military operations around the world, TRU is uniquely suited to help both forces achieve compatible training systems and personnel who are comfortable working with each other on deployment.

TRU provides a complete suite of solutions, starting with a diverse group of simulators that range from desktop versions to full-motion, multi-axis immersive environments.

But that's just the beginning.

"We are also moving ahead with virtual reality (VR) and augmented reality (AR) trainers," said Hayward.

"With VR goggles and desktop equipment, a pilot can experience advanced training in economical settings, reducing time on more complex trainers without compromising quality," he explained.

With AR glasses, pilots can sit in real aircraft and be immersed in a simulated flight environment without leaving the ground, using the aircraft's flight interfaces to respond to visual cues in the simulation.

TRU's simulators are supported with seasoned instructors who have solid roots in military aviation. This means that students receive education from elite, qualified instructors with an unparalleled level of expertise.

This knowledge base is bolstered with modern, informative and interesting courseware, including computer-based interactive learning programs.

Rounding out these offerings is TRU's end-to-end support of training products, simulators and Textron aircraft.

"We pride ourselves on TRU simulators and related training systems providing 99.8 per cent readiness to our clients," said Sturdevant. "And if spares are needed, we have them close at hand to keep our students learning, no matter what."

The bottom line: TRU is a proven provider of total training solutions and a trusted military partner. The company has a long history in Canada, investing billions of dollars in the Canadian aerospace economy through its parent company, Textron.

This is a legacy TRU intends to honour and enhance in the years to come, with a particular focus on the RCAF.

"TRU is proud to provide the RCAF and Canada with a real option for its future training needs," said John Hayward. "We are committed to this country, as proven by the hundreds of skilled Canadians who work for us nationwide."

TRU SIMULATION + TRAINING
A Textron Company

trusimulation.com
843-574-5330

HERE TO STAY

AIRBUS HAS BEEN A VITAL PARTNER OF THE ROYAL CANADIAN AIR FORCE FOR DECADES, AND IT WILL REMAIN SO LONG INTO THE FUTURE.

BY BEN FORREST

Canada and its allies rely on the Royal Canadian Air Force (RCAF) to ensure the safety of citizens and the sovereignty of nations, with missions that range from domestic search and rescue to military, humanitarian and peacekeeping support around the world.

In turn, the RCAF relies on a group of committed and reliable aerospace partners whose contributions enable it to fulfill its mandate, meet its obligations and ultimately help build better societies.

Airbus Defence and Space is one such partner, with deep roots in Canada and battle-tested experience across the globe. It's a company that understands the weight of its responsibilities, and one that is committed to both meeting and exceeding them.

"We are adding value to militaries all over the world, and also working with Canadian companies," said Simon Jacques, president of Airbus Defence and Space Canada. "It's part of our values."

A TRUSTED PARTNER

Airbus has been a vital partner of the RCAF for decades, in part as the supplier of the CC-150 Polaris multirole tankers, C295 fixed-wing search and rescue (FWSAR) aircraft, and beyond visual line of sight (BVLOS) satcom systems (as part of the CP-140 Aurora Block IV upgrade).

The company is also committed to helping the RCAF evolve, constantly improving its platforms and developing new ones that can serve Canada's military long into the future.

A major example is the Airbus A330 multi-role tanker transport (MRTT) aircraft, which figures to be a contender to replace the CC-150 Polaris.

Based on the successful A330-200 airliner, the MRTT can carry up to 111 tonnes of fuel—the largest capacity of any tanker aircraft. It is also a remarkably effective transport vehicle, able to carry a maximum payload of up to 45 tonnes, combining the passenger cabin and the lower deck.

The A330 MRTT can carry up to 300 passengers and can be configured with a medevac cabin layout with 40 stretchers, 20 seats for medical staff, 100 passengers and up to 37 tonnes of cargo in the lower deck. It can also support the deployment of four fighter aircraft at a time, plus 50 personnel in one direct flight over 5,200 kilometres—the approximate distance from Europe to Kuwait.

"Canadians need a flexible aircraft," said Jacques. "We have a large country. It's important for long distances, the versatility of the aircraft, and the fact that it can fuel any type of fighter aircraft, as it is equipped for both boom and hose-and-drogue refuelling."

While there has been speculation Canada will wait until it procures its next fighter jets to decide on a refuelling aircraft to replace the CC-150 Polaris, Jacques noted the A330 MRTT is suitable for any fighter platform due to this key advantage.

TYPHOON

As Canada moves to replace its aging fleet of fighter aircraft, Airbus is positioning the Eurofighter Typhoon, a state-of-the-art swing-role fighter, as the ideal suitor.

"We have a platform that can meet the requirements of the DND [Canada's Department of National Defence]," said Jacques. "And we're engaging with the government right at the moment, day to day … we want to make sure that the competition is open and transparent."

Airbus developed the Typhoon in collaboration with other industry leaders as part of a multinational program to modernize European air forces. In the meantime, five additional customers have come on board—Austria, the Kingdom of Saudi Arabia, the Sultanate of Oman, Kuwait and Qatar.

The Eurofighter Typhoon is powered with two EJ200 engines, giving the aircraft an impressive thrust-to-weight ratio and remarkable manoeuvrability. No other fighter aircraft has integrated a comparably high number of European and U.S. weapons, according to Airbus.

"Those engines have been proven, so they're very reliable, and these are swing-role combat aircraft," said Jacques, referring to the Typhoon's ability to engage in air-to-air and ground fights simultaneously.

"That's a big difference when you're in missions around the world."

FWSAR

Airbus is Canada's partner of choice for FWSAR, providing a fleet of 16 new C295 aircraft that will replace a fleet of six CC-115 Buffalo and 12 CC-130 legacy Hercules aircraft. The first C295 aircraft is on track to be delivered in 2019, with the rest of the fleet expected by 2022.

"The fuselage itself is from Europe, but major components of the overall package, like the engines and the training provision and the sensors on board, are Canadian," said Jacques. "It's proven, and it's reliable. We've been selling it all over the world."

Airbus teamed with PAL Aerospace (PAL), Pratt & Whitney Canada, CAE and L3 WESCAM, to fulfill Canada's FWSAR needs. It will provide in-service support throughout the life of the aircraft, in partnership with PAL, through a joint venture called AirPro.

The RCAF "will be getting an aircraft that will be able to do a lot a lot less searching—because the search will be happening faster—and a lot more rescuing," said Jacques.

SPACE

Airbus is known for its aircraft, but it is also the second-largest space company in the world, with a well-established presence in Canada that figures to grow in the years ahead.

"We're building everything from satellite ground stations [to] launching satellites, Earth observation or communications satellites, and science satellites as well," said Jacques. He noted Airbus has Canadian communications customers like Ottawa-based Telesat, a leading global satellite operator.

"We are providing satellite communication systems to them, but also we have a very large interest to work with the Canadian Space Agency and DND as well," said Jacques.

"We would like to do similar things that we did for fixed-wing SAR. We'll bring some core elements of the technology in-country, teaming with Canadian partners, making some key elements of the satellites Canadian."

SUPPORTING CANADA

Airbus' activity in Canada has grown exponentially since it broke ground on its helicopter manufacturing facility in 1984. Today, it sources $1 billion a year from Canadian companies, works with more than 665 Canadian suppliers in nine provinces, and contributes indirectly to the employment of more than 17,000 workers in Canada.

Airbus has repeatedly proven itself as an essential partner to Canada for decades, and it will remain a vital collaborator long into the future, both in civil aviation and with the RCAF.

"There are a lot of activities that we're doing with DND," said Jacques. "I think we're really adding value to what they do."