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VANGUARD
GAME
CHANGERS

PEOPLE FIRST:

Rethinking
Personnel
Policy



INSIDE:

**A NEED FOR A COMPREHENSIVE
AEROSPACE STRATEGY**

**FINGERPRINTING: 131 YEARS
OLD AND JUST GETTING
WARMED UP**



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28 Back to the Future? The Creation of a Foreign Human Intelligence Service in Canada

FEATURES

14 Fingerprinting: 131 Years Old and Just Getting Warmed Up

By Vanguard Staff

18 People First: Rethinking Personnel Policy

By Charlotte Duval-Lantoiné

28 Back to the Future? The Creation of a Foreign Human Intelligence Service in Canada

By Marco Munier

PERSPECTIVE

13 *Silver Linings in the Stormy Present* by RaceRocks

23 *The Revolutionary Impact of Mixed Reality: Training at the Point of Need* by Charles Richer

24 *UNB Digital Expertise Provides Secure and Seamless Interaction Around the Globe*

26 *How AI and Resilient Sustainment will Help the CAF Train and Maintain Mission Readiness* by Lockheed Martin

33 *The Future Integrated Training Environment* by Pietro Mazzei

DEPARTMENTS

8 SIT REP

\$7.7M Subcontract Awarded to Arcfield Canada by L3Harris to Offer Supply Chain Services to CF-18 Fleet; Maritime Security Challenges 2022 – Pacific Seapower: Strategic Competition in the Indo-Pacific; Government of Canada Awards \$36.14 Million Contract to Dry-Dock and Extend Life of the CCGS Geroge R. Pearkes; Worldwide Exercise RIMPAC 2022 Successfully Concludes with Extensive Participation from Canada; CCGS La Poile Bay Dedicated into Service, Strengthening the Canadian Coast Guard Fleet

37 THE LAST WORD

In 2022 and Beyond, There's a Need for a Comprehensive Aerospace Strategy

By Mike Mueller

VANGUARD ONLINE:



It's in the Archives

Missed an issue? Misplaced an article? You'll find them all online at www.vanguardcanada.com in the MAGAZINE tab on the menu bar.

Letters

We welcome feedback on articles and story ideas. Email marcello@promotivemedia.ca.

About the Cover

People First: Rethinking Personnel Policy

CONTENTS

14



7 Game Changer

Glenn Copeland

General Manager, Rotary and Mission Systems (RMS)
Lockheed Martin Canada

9 Game Changer

David Hill

Director of Commercial Operations
Hexagon Manufacturing Intelligence

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EDITOR'S NOTE



It's hard to believe the summer has already passed us by, but here we are with the August/September issue of Vanguard magazine. It feels as though everyone is making up for lost pandemic time because the world is swirling like a hurricane. The Ukraine-Russia conflict is now in its sixth month, and with no end in sight, other world governments and militaries are trying to plan for an uncertain future. As if this wasn't enough disruption, the world is now reeling from the death of Queen Elizabeth II as we go to print.

On a positive note, in-person events are still on the post-COVID upswing, and you'll see several mentioned in this very issue, including the 3rd annual Deep Blue Forum taking place on November 1 and 2, 2022 and the 9th annual C4ISR and Beyond Conference on January 25 and 26, 2023. Registration for these events is now open. Just find the advertisements elsewhere in this issue and scan the QR codes. You can also save the date, February 27-28, 2023, for the 10th annual ShipTech Forum.

As always, we have two amazing Game Changers to introduce you to. The first is Glenn Copeland, General Manager, Rotary and Mission Systems (RMS) Lockheed Martin Canada. Mr. Copeland offers up some sage advice that he has accumulated along his career path at Lockheed Martin as well as an inside look at the innovation that drives the storied global security and aerospace giant.

Dovetailing out of our interview with Mr. Copeland, you will not want to miss our Lockheed Martin article, "How AI and Resilient Sustainment will help the CAF Train and Maintain Mission Readiness." One way the Canadian Armed Forces are preparing for the future is by ensuring a well-trained military force is sustained.

Our other Game Changer this month

is David Hill, Director of Commercial Operations, Hexagon Manufacturing Intelligence. Mr. Hill walks us through his role at Hexagon, what led him there, and explains how data is being utilized for predictive quality, predictive maintenance, and autonomous manufacturing.

In our article, "Fingerprinting: 131 Years Old and Just Getting Warmed Up", Paul Guindon, CEO of Commissionaires walks us through a brief history of fingerprinting from its earliest use in China's Qin Dynasty through its adoption by the RCMP and FBI in the early 1900s. While iris and facial recognition technologies look cool in the movies, fingerprinting is still the biometric measure of choice for access control and other needs because it is affordable, predictable, non-intrusive, safe, and easy to catalog.

"People First: Rethinking Personnel Policy", by Charlotte Duval-Lantoine, takes a detailed look at personnel management in Canada's military in light of recruitment and retention issues that have only be compounded by COVID-19, as well as an ongoing and needed culture shift.

The Last Word goes to Mike Mueller with his article, "In 2022 and Beyond, There's a Need for a Comprehensive Aerospace Strategy", where he underscores the importance and uniqueness of the aerospace industry in our home and native land and how it is intrinsically tied to a strong economy and strong communities clear across the nation.

And on that note, I say stay vigilant and keep your eyes on the horizon, ■

Terri Pavelic, Editor-in-Chief

GLENN COPELAND

GENERAL MANAGER, ROTARY AND MISSION SYSTEMS (RMS)
LOCKHEED MARTIN CANADA



WHAT IS THE BEST ADVICE YOU RECEIVED?

We all have blind spots, but you will never see clearly in 360 degrees without help.

WHAT IS A HABIT THAT CONTRIBUTES TO YOUR SUCCESS?

This may sound obvious but make sure the decisions you make are never about you, ever. They are about what is best for everyone around you and what is necessary to drive the best outcome for business. Stand back and let others take credit. You will be rewarded with a highly charged and motivated team that think of themselves as leaders in much the same way.

HOW HAS INNOVATION BECOME INGRAINED IN YOUR ORGANIZATION'S CULTURE AND HOW IS IT BEING OPTIMIZED?

Innovation roadmaps are grand plans to help you get to be market leaders, but innovation can come from anywhere. It's about having the mindset and collective understanding that great ideas can rise to the surface from just about any corner inside your organization.

WHAT IS THE ONE THING THAT HAD YOU MOST FIRED UP TODAY?

This is an unprecedented time of opportunity, domestically and globally. Canadian defence industry has never been better positioned to grow and fascinating advances in technology development are burgeoning from some of the smallest companies.

For the interview, see page 34

\$7.7M Subcontract Awarded to Arcfield Canada by L3Harris to Offer Supply Chain Services to CF-18 Fleet



Arcfield Canada Corp. has been awarded a subcontract valued at \$7.7 million by L3Harris Technologies to provide supply chain management services to the CF-18 fleet based at Canadian Forces Base Cold Lake and Bagotville. The subcontract represents new work for Arcfield and has a period of performance of four years plus six potential option years.

Since the 1980s, Arcfield Canada has provided in-service support and engineering services for the Royal Canadian Air Force's CF-18

fighter aircraft. In 2017, the company won a subcontract to provide similar responsibilities for the F404 propulsion system. With this award, Arcfield Canada now provides direct support to all supply chain services for Canada's CF-18 fighter fleet.

"Arcfield Canada has a strong legacy in servicing CF-18s for the Department of National Defence and the RCAF. We appreciate the opportunity to provide our unique expertise and capabilities with L3Harris to support Canada's fighter fleet," said Jacques Comtois, Director of Arcfield Canada.

With the new 18,000 sq ft expansion of its warehouse facilities in Saguenay, Quebec and an 1,800 sq ft renovation in Calgary, Alberta, Arcfield will hire several new full-time professionals to support expanding operations at Cold Lake, Calgary and Bagotville. In addition, Arcfield's partnership with L3Harris on the performance-based contract will support the economic benefits, flexibility, and value of Canada's Sustainability Initiative.

"This award is a testament to Arcfield Canada's proven record as a leading provider of reliable supply chain management solutions. We are honoured to continue our long-standing partnership with the RCAF and look forward to expanding these services to Canada's next generation of fighter and transport aircraft in the future," concluded Kevin Kelly, Chairman and Chief Executive Officer, Arcfield.

Maritime Security Challenges 2022 - Pacific Seapower: Strategic Competition in the Indo-Pacific

returns to The Fairmont Empress Hotel in Victoria, BC this 14-16 November with another program of maritime security topics of our day, including:

- **Challenges to the Strategic Commons** – How are systemic challenges such as the erosion of rules and norms and climate change affecting the maritime domain?
- **Great Power Competition and the Spaces Between** – How is maritime competition between the US, China, and Russia playing out, and how do middle powers such as Canada and Australia navigate these turbulent times?
- **Innovation to Meet Maritime Challenges** – How can innovations to old systems and implementation of new systems help maritime forces adapt to evolving challenges?

Plus, special presentations on competition in the South China Sea, an assessment of the state of commercial shipping, a look at the Royal Canadian Navy's new Arctic Offshore Patrol Ship, and much more!

MSC22 is presented by the Navy League of Canada in cooperation with the Daniel K. Inouye Asia-Pacific Center for Security Studies and the Royal Canadian Navy. The MSC proceedings are intended to foster dialogue addressing maritime affairs in the Pacific region and around the world.

The seas have long been the basis of prosperity and security. A stable and secure ocean commons has been the foundation of the massive expansion of trade, communications, and wealth across the world. This expansion has seen a significant accumulation of seapower in the Indo-



Pacific region, a progression that has been accompanied by new challenges brought about by strategic, political, environmental, and technological change. Change is expected, but not predictable. It is therefore critical for lawmakers, naval planners, academics, and industry operators to reflect on the past, assess the present, and think critically about the future in terms of the evolution and application of seapower. Are you one of the maritime stakeholders prepared to anticipate, adapt, and respond to the challenges and opportunities presented by an increasingly dynamic maritime environment?

Visit the MSC22 website (<https://msconference.com/>) for more information, including an extensive and topical program with an impressive line-up of international speakers.



DAVID HILL

DIRECTOR OF COMMERCIAL OPERATIONS
HEXAGON MANUFACTURING INTELLIGENCE

WHAT IS THE BEST ADVICE YOU RECEIVED?

Listen more than you speak.

WHAT IS THE ONE THING THAT HAS YOU MOST FIRED UP TODAY?

The advancements in technology continue at a tremendous rate. The drive to utilize data for predictive quality, predictive maintenance and autonomous manufacturing is where the industry is headed. We can measure faster and more accurately closer to the point of manufacturing, even on the shop floor. The digitalization of operations and application of artificial intelligence (AI) is an exciting journey to be part of.

WHAT IS A HABIT THAT CONTRIBUTES TO YOUR SUCCESS?

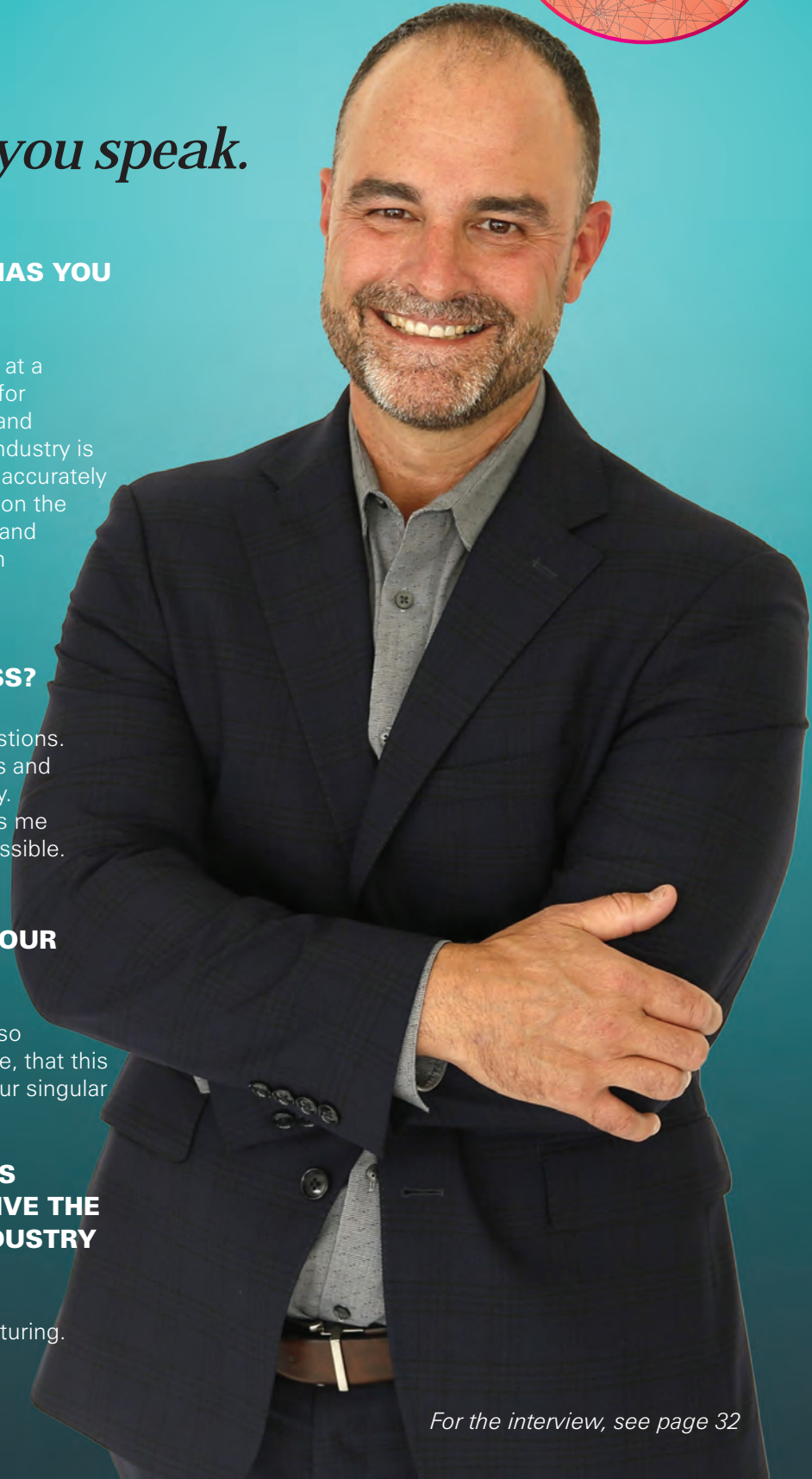
Constant learning. Be curious and ask questions. I enjoy reading about manufacturing trends and following the advancements in our industry. This helps me grow as a person and allows me to support my team in the best manner possible.

HOW IS YOUR ORGANIZATION CHANGING THE GAME WITHIN YOUR INDUSTRY SECTOR?

The shift from automation to autonomy is so important, so critical to our collective future, that this simple notion of 'putting data to work' is our singular goal at Hexagon.

WHAT TECHNOLOGIES, BUSINESS MODELS, AND TRENDS WILL DRIVE THE BIGGEST CHANGES IN YOUR INDUSTRY OVER THE NEXT TWO YEARS?

AI, Data & Analytics, and Additive Manufacturing.



For the interview, see page 32

Government of Canada Awards \$36.14 Million Contract to Dry-Dock and Extend Life of the CCGS George R. Pearkes



The Government of Canada is committed to ensuring that Canadian Coast Guard personnel have the equipment they need to keep Canada's waterways open and safe.

On July 28th, the Canadian Coast Guard announced the award of a

\$36.14 million contract for dry-docking and extending the operational life of Canada's most recently built research vessel, the Canadian Coast Guard Ship (CCGS) George R. Pearkes.

Public Services and Procurement Canada, on behalf of the Canadian

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Coast Guard, has awarded Heddle Shipyards, Hamilton, Ontario, a contract to complete vessel life extension work on the CCGS George R. Pearkes. The vessel, stationed in St. John's, Newfoundland and Labrador, officially entered into service in 1986. It primarily performs light icebreaking and buoy tending and is available for search and rescue and environmental response operations on Canada's east coast.

"A strong, well-equipped, Canadian Coast Guard fleet is essential to protect Canadians on the water, and the marine environment," said The Honourable Joyce Murray, Minister of Fisheries, Oceans and the Canadian Coast Guard. "This Government continues to make important investments through the National Shipbuilding Strategy so that Canadian Coast Guard personnel have state of the art equipment to perform their crucial work. With the vessel life extension of the CCGS George R. Pearkes, Canadian Coast Guard personnel will continue their key role in supporting Canada's blue economy."

The vessel life extension work includes:

- steel hull reinforcement;
- hull, superstructure, deck and mast recoating;
- galley modernization;
- replacement of the bow thruster, cycloconverter, propulsion generator and the internal communication system;
- tail shaft and rudder inspections; and
- domestic and auxiliary system upgrades.

This contract award is categorized under the repair, refit, and maintenance pillar of the National Shipbuilding Strategy (NSS). The NSS ensures that Canada has a safe and effective fleet of ships to serve and protect Canadians for years to come while creating ongoing opportunities for shipyards and suppliers across the country.

"Canadians from coast to coast to coast know the importance of our Coast Guard. I am thrilled that a company from Hamilton will be able to help ensure that personnel of Canada's Coast Guard have a safe and effective fleet of ships to serve and protect. This contract award today demonstrates that the National Shipbuilding Strategy provides economic opportunities for shipyards across Canada. Canada's skilled shipbuilding workforce is helping us repair and maintain our fleets, while supporting economic growth across the country," concluded The Honourable Filomena Tassi, Minister of Public Services and Procurement.

In order to ensure the safety of Canadian waters, the Canadian Coast Guard will reallocate its other maritime resources while the ship undergoes vessel life extension from Winter 2023 to Spring 2024.

Worldwide Exercise RIMPAC 2022 Successfully Concludes with Extensive Participation from Canada

The 22nd Rim of the Pacific (RIMPAC) exercise concluded on August 4th with over 800 Canadian sailors, aviators, and soldiers having participated in this year's iteration of the biennial exercise that took place in and around the Hawaiian Islands from June 29 to August 4.

The Canadian Armed Forces (CAF) deployed HMCS Vancouver and Winnipeg, two CP-140 Aurora aircraft, and two CH-148 Cyclone helicopters to RIMPAC 2022. Canada also occupied key leadership positions at the mission, including Deputy Command of Combined Task Force RIMPAC and Command of the Combined Force Air Component.

This year's exercise involved 26 nations: Australia, Brunei, Canada, Chile, Colombia, Denmark, Ecuador, France, Germany, India, Indonesia, Israel, Japan, Malaysia, Mexico, the Netherlands and New Zealand. Other nations sent observers including Belgium and Fiji.

"Canada's contributions to RIMPAC this year went beyond the tactical employment of our two CP-140 Auroras and embarked CH-148 Cy-

clone helicopters," said Brigadier-General Mark Goulden, Commander Combined Force Air Component Command. "Whether during strategic planning, or operational execution of the Combined Air Operations Centre weapons system, Canadians were well positioned to deliver air power effects during the world's premier joint and combined maritime exercise."

Canada has participated in every Rim of the Pacific Exercise since 1971 and was one of only three nations to do so in the 28th iteration.

"This year, I had the privilege to serve as the second in command of the largest maritime exercise in the world, alongside Commander, U.S. Third Fleet. Once again, we maintained a long-standing tradition of excellence as a capable and adaptive partner. We continue to serve alongside like-minded nations who value the rule of law, the freedom of the seas, and the rules-based international order," concluded Rear-Admiral Christopher Robinson, Deputy Commander Combined Task Force RIMPAC.

Only here can I be in it from the beginning on a once in a generation program.

Many engineers dream of working on large, complex projects. With Lockheed Martin Canada, I get to do just that by guiding engineers working on the Royal Canadian Navy's newest fleet.

Only here can I be part of the team bringing Canada's most technically advanced ship to life.

LOCKHEED MARTIN

Evan
Deputy Technical Director



CCGS La Poile Bay Dedicated into Service, Strengthening the Canadian Coast Guard Fleet



The Canadian Coast Guard is responsible for ensuring the safety of mariners and protecting Canada's marine environment. The National Shipbuilding Strategy, which was launched by the Government of Canada, is aimed at ensuring that Canadian Coast Guard personnel have the vessels they need to continue delivering critical services to Canadians.

On behalf of the Honourable Joyce Murray – Minister of Fisheries, Oceans and the Canadian Coast Guard – Parliamentary Secretary to the Minister of Fisheries, Oceans and the Canadian Coast Guard Mike Kelloway officially welcomed Canadian Coast Guard Ship (CCGS) La Poile Bay to the Canadian Coast Guard fleet with a dedication to service ceremony at the Canadian Coast Guard's search and rescue station in Louisbourg, Nova Scotia on August 4th.

"I am honoured to welcome the CCGS La Poile Bay into service, as the Government of Canada continues to renew Canada's federal fleet through the National Shipbuilding Strategy. This investment will allow Canadian Coast Guard search and rescue personnel to have state-of-the-art equipment to help respond safely, efficiently, and effectively to rescue incidents," said the Honourable Joyce Murray.

Parliamentary Secretary Kelloway, Canadian Coast Guard Assistant Commissioner Gary Ivany, on behalf of Canadian Coast Guard Commissioner Mario Pelletier, Elder Lawrence Wells of Membertou First Nation, and vessel sponsor Lloydette MacDonald participated in the traditional bottle-breaking ceremony at the ship's bow.

"The importance of these Bay-class Search and Rescue vessels cannot be overstated. That's because, when distress calls come in, it's the Canadian Coast Guard that answers," added Parliamentary Secretary Kelloway. "As Member of Parliament for Cape Breton-Canso and lifelong resident in the riding, I know CCGS La Poile Bay is a reassuring presence to rural, coastal Canadians who make their living on the sea and a great comfort to their loved ones onshore."

In August 2021, Canada's coast guard took delivery of CCGS La Poile Bay, the tenth of 20 new search and rescue lifeboats that are named after geographical bays across Canada. The CCGS La Poile Bay is a search and rescue lifeboat that can maintain a speed up to 25 knots and has a crew of four.

The Coast Guard's lifeboats are specially designed and equipped to respond to search and rescue incidents at sea. Each vessel has a maximum range of 100 nautical miles from shore and can maintain a state-of-readiness for up to 30 minutes after receiving an alert.

The Canadian Coast Guard is operating vessels in key locations across Canada to provide search and rescue services. These include water searches, responding to marine distress calls and assisting disabled vessels.

"It is a great day for our personnel and Canadians to have the CCGS La Poile Bay dedicated to service. These search and rescue lifeboats help us keep our waters safe for mariners and support our marine environmental response capabilities. Vessels like these allow the Canadian Coast Guard to deliver critical services to protect mariners and the marine environment," concluded Mario Pelletier, Commissioner, Canadian Coast Guard.

MARITIME SECURITY CHALLENGES 2022

Pacific Seapower: Strategic Competition in the Indo-Pacific

A full program of topical maritime issues, including:

- *The Arctic and Offshore Patrol Ship: New Platform, New Operations* – Cdr. Cory Gleason, HMCS Harry DeWolf, Royal Canadian Navy
- *Indo-Pacific Fisheries and Interstate Tensions* – Dr. Daniel Pauly, University of British Columbia
- *A Regional Perspective on Geopolitics in the Pacific Islands* – Darshana Baruah, Carnegie Endowment for International Peace

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SILVER LININGS IN THE STORMY PRESENT

CERTIFIED
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Canadian Council for
Aboriginal Business 



The 160 year old advice that, “The dogmas of the quiet past are inadequate to the stormy present,” is remarkably fresh today as we face new existential threats, a dizzying pace of change and a sense that the old dogmas need to learn a new trick. Or, as the rest of that quote goes, “We must think anew and act anew.”

The stormy present does have a few silver linings though. That same pace of technological change has expanded the realm of the possible and created new tools to meet old challenges.

RaceRocks is on the forefront of this challenge. The woman-led, certified aboriginal business is delivering technology-enabled solutions to modernize and improve training and simulation.

In the past, the instructor-led classroom-based model was the only option for training and education. Now, virtual reality, augmented reality and immersive learning tools are rapidly becoming more cost-effective, powerful and available. VR headsets and haptic feedback systems are becoming lighter and smaller, and changes in software and data now allow learning systems to be more interoperable and reconfigurable and training that is much more adaptable and accessible.

The feel and fidelity of the experience is

opening up new ways to approach training while reducing risk and cost. The Rigid Hull Inflatable Boat Simulator (RHIB Sim) RaceRocks developed with the Royal Canadian Navy can put the sailor in high-risk and challenging situations that are too risky, costly or require resources (trainers, assets) and weather conditions to replicate in the real world.

The RHIB Sim is a full motion simulator, but the leaps and bounds in VR technology and distributed learning models have opened up the opportunity for distributed learning models where a learner only needs a network connection and a VR headset. Trainees can engage from virtually anywhere in the world, on their own schedule, at their own pace, with more creativity and freedom than in a traditional classroom setting...and there are no “learning curve” dents in the boat.

As RaceRocks President Anita Paluk points out, the advantages of immersive and distributed training are providing the “push”; but there is also a pull from learners themselves.

“We live in a world where on-demand immersive entertainment and interactivity are realities of our day-to-day experience. That has set the bar for learner expectations. Technology-enabled learning uses digital tools, virtual environments and interactive media in a thoughtful way to best

meet that expectation as well as an organization’s training goals. This may mean distributing learning to personal devices so learners have easier access, creating a game or simulation to allow learners to practice skills, or incorporating rich media like video or 3D graphics into training to better illustrate concepts,” said Pawluk.

RaceRocks is pioneering this evolution in training with a next-generation learning platform that is collaborative, adaptable and scalable. The platform expands learner and instructor capabilities with innovations like lesson curation that can build customized learning paths specific to the individual learner and can assist designers with content creation.

“The future of learning is going to be even more learner centric. The platform will have to adjust and adapt to the needs of the individual learner. However, it doesn’t matter how slick the graphics are or how cool the tech is, if the content isn’t rooted in solid curriculum design and isn’t achieving the learning outcomes that the organization needs, then the training isn’t effective. Working with an experienced and capable team that understands both the curriculum and technology will achieve the best outcomes,” said Pawluk.

If you are looking for a guide through the stormy present to “think anew and act anew”, RaceRocks would like to meet you.

FINGERPRINTING:

131 YEARS OLD AND JUST GETTING WARMED UP

NEW DEVELOPMENTS IN FINGERPRINTING HAVE ALWAYS COME FROM CANADA

While evidence suggests fingerprinting was used for identification purposes during China's Qin Dynasty (~300 B.C.), the first documented use of fingerprinting for law enforcement was in 1891 by Juan Vucetich, head of the bureau of Anthropometric Identification at the Central Police Department in La Plata, Argentina.

After that, it only took 20 years for the RCMP to set up the Fingerprint Bureau in 1911. Three years later, in 1914, North America's first forensic lab opened in Montreal. The then-revolutionary facility inspired many others to build their own, including the US Bureau of Investigation, which later became the FBI. In 1924, they opened an Identification Division for accepting and collecting fingerprints for law enforcement services across the country.

Since then, fingerprints have been the cornerstone of forensic science and the easiest way to catalog people, suspects or inmates, keep records of public employees and perform security checks on private citizens.

And this doesn't seem to be changing, despite the significant strides in forensic

and identification science related to DNA.

"I have long thought fingerprinting will become obsolete when law enforcement agencies stop maintaining fingerprint databases and concentrate on DNA data-bases," says Simon A. Cole, professor of criminology and law at the University of California at Irvine. "That has not happened yet."

And according to Professor Jennifer Mnookin, former dean at the UCLA School of Law, it probably won't any time soon.

"Human gene editing or biochips may eventually change our idea of the human self in meaningful ways, but fingerprint evidence is about something much more mundane: was this body, this finger, this person at the scene of the crime? For this reason, it is likely to remain important."

Today another Canadian company is changing fingerprint technology

On a recent episode of Vanguard Radio, host J. Richard Jones sat down with Paul Guindon, CEO of Commissionaires, the only national not-for-profit security company. It was formed in 1925 as an employer of veterans upon their return from WWI.

The bulk of their discussion centred on the next iteration of taking, cataloging, and using fingerprints.

"Around 2006, the RCMP was experiencing huge backlogs in processing ink and roll fingerprints," said Mr. Guindon. "It was taking weeks or sometimes months to get feedback on a set of fingerprints. They decided on technology as a way to address this, chose Commissionaires to pilot the project and made us the first company to be certified outside of the RCMP to offer digital fingerprints."

Instead of traditional ink and roll fingerprinting that was the default way to collect fingerprints up to that point, Commissionaires rolled out digital fingerprint technology that processed a full set of prints in about 15 minutes. But more than that, it could immediately be run through the entire RCMP database and return results within hours versus weeks or months.

It was a huge success across the board, and especially in the private sector.

In the past, with background checks potentially taking multiple weeks to complete, employers and their new hires could get stuck in holding patterns with unfortunate



PAUL GUINDON
CEO OF COMMISSIONAIRES

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Leonardo is home to the sustainable future thanks to its long-term vision, consisting of engineering expertise, knowledge and skills. It exploits the digital to enhance its legacy businesses, accelerating technological evolution.



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consequences on both sides. The employer might have had to operate short-staffed until the background check cleared. And the new hire would have had to wait that much longer to start working, which would have been a bigger problem had they very much needed to start earning money.

The Commissionaires approach to fingerprinting solved all those problems at once, and the RCMP wasted no time getting behind the company.

Today, Commissionaires has over a hundred digital fingerprinting systems deployed across 50 offices in most major cities in every province and territory.

Commissionaires wins by staying ahead

Recognizing that consumers expect the option to have anything come to them, Mr. Guindon created a mobile fingerprinting service he now regularly sends to university campuses and large companies.

“Instead of sending employees or students one by one, we can go to their location, take a bunch of prints in any given day of the week or any weekend, and have them processed quickly so everyone can get on with it.”

Another interesting path Mr. Guindon took was to set up an offshore version of his service for Canadian citizens working or living outside Canada who need a fingerprint taken.

A third was an international program where someone has ink and roll prints taken by a Canadian embassy/consulate or local police agency, then couriers the prints to Commissionaires who transfer it into a digital format.

The latest being developed by Mr. Guindon and his team is a new technology that would get the fingerprinting process from 15 minutes down to five.

And while he would never say he saw the

COVID-19 pandemic coming, being able to offer digital fingerprinting was certainly helpful.

“We obviously had to amend our processes a little bit to protect clients and operators,” said Mr. Guindon. “But we were able to process prints all throughout the pandemic time. I’m not sure how we would’ve done it with the old ink and roll.”

Digital fingerprinting for a digital world

Despite the super-cool iris and facial recognition devices we see in spy movies, fingerprinting is the default biometric method of access control because it’s much more affordable. It’s also predictable, non-intrusive, safe, and easy to catalog.

For this reason, Mr. Guindon and his team at Commissionaires have branched out to provide more fingerprint-related services like security system installation, IT integration, cyber security, and training programs for everything they offer.

And with 83.4 percent of the world’s population owning a smartphone and roughly 60 percent of those phones already using fingerprint biometrics, getting buy-in from employees to move away from security card access control and towards fingerprint technology is easier than ever. Today, the fingerprint access control market is estimated to be worth \$4.4 billion, up from \$2.5 billion in 2014.

The future of digital fingerprinting

Fingerprint technology is set to start replacing or living next to traditional physical methods of verification like PIN numbers at ATMs or at the point-of-sale in retail environments.

Another big change coming is the storing of biometric fingerprint data on a bank card or credit card itself instead of in a

centralized database. The big benefit of this approach is protection of financial institution’s customer data in the event of a cyber-attack.

But maybe the biggest future change coming to fingerprinting has to do with the rise of the sharing economy — and specifically home sharing.

People who rent out their homes through platforms like AirBnB or VRBO will be able to ditch the practice of constantly watching their door cam and will instead be able to install digital fingerprint reading to grant and revoke access to renters. And all of it will be automated so the homeowner can rest easy wherever they are with the knowledge that everything’s taken care of back home.

This will no doubt spur more people into considering adding their homes, sheds, businesses, rehearsal spaces, sports fields, and restaurants/bars to a sharing platform, further growing this exciting new area of the economy.

Commissionaires will be wherever fingerprinting security goes next

“For as long as we’ve been providing fingerprints and background screening, which goes back to about 17 years, we’ve brought other security services online as well,” says Mr. Guindon. “Today, our clients include municipalities, law enforcement departments and private sector companies looking to either beef up their security or conduct workplace investigations into security breaches.”

But the real opportunity he sees is in proactivity.

“Threat risk assessment is a big deal,” he says. “We’ll tell a client ‘Okay, well, you have this facility, how best can we protect it? What kind of security cameras and system should you put in place? How many people have to manage those systems? And what kind of biometric security do you need? Then we can do the installation. We can do the servicing and maintenance, and really work with our client to create a complete solution — not just the fingerprinting part. But the fingerprint technology ties everything together.”

You can listen to the entire interview with Paul Guindon, CEO of Commissionaires, here



And you can learn more about Commissionaires on their website <https://commissionaires.ca/en/about-us/>

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RETHINKING PERSONNEL POLICY

RUSSIA'S INVASION OF UKRAINE HAS HAD A PROFOUND INTERNATIONAL EFFECT, PUSHING WESTERN MILITARIES, THE CANADIAN ARMED FORCES INCLUDED, TO RETHINK THEIR MISSIONS AND POSITION IN THE WORLD.

Personnel are at the core of armed forces' success and this rethinking of the CAF cannot exclude its members. Personnel management is all the more important as Canada's military has had to deal with compounded crises: one of recruitment and retention aggravated by the COVID-19 pandemic, and one of culture, which resurfaced through sexual misconduct scandals involving some of the CAF's most senior leaders.

Cognizant of how much the world and social circumstances have changed, many have argued that the current defence policy, Strong, Secure, Engaged (SSE) needed revisions. For this reason, Budget 2022 promised a defence policy review, one that

would steer the CAF towards operational effectiveness for the plethora of security challenges characterizing the 21st century.

The validity of such a policy review is under debate, but this piece argues that the CAF would benefit from one in terms of its personnel management. Since SSE's publication in 2017, Operation Honour has faced its demise, job dissatisfaction in the ranks is high and it is clear that the CAF will not be able to meet its diversity targets set for 2026. Added to those issues are a CAF that is overstretched and understaffed (by at least 7,500 people, according to Chief of the Defence Staff Wayne Eyre) and costs of living are once more becoming an issue in the ranks. While it is an ambitious policy that claims to put

personnel first, SSE has gaps that a policy review needs to address sooner rather than later.

Strong, Secure, Engaged: The Broad Strokes

The topic of personnel management is SSE's first chapter. Titled "Well-Supported, Diverse, Resilient People and Family," this chapter acknowledges the complexity of personnel issues. The policy seeks to address recruitment, training, and retention; job satisfaction, benefits, and compensation; wellness and mental health; sexual misconduct; diversity; and military-to-civilian transition.

To tackle concerns and fulfil objectives such as "ensuring effective recruitment,

Members of The Royal Canadian Regiment participate in a scenario as part of the Basic Tactical Aviation Course (BTAC).
Photo: MCpl Laura Landry, Canadian Armed Forces

T:



training and retention” and “fully leveraging Canada’s diversity,” SSE offers some solid initiatives. However, the objectives are vague and there is no outline for potential measurement. Some of the initiatives are concrete, such as diversity targets, a goal for growth in the ranks, the appointment of a diversity champion, the creation of the CAF Transition Group or tax relief for deployed personnel under the rank of lieutenant-colonel. Other initiatives are the promise of human resource and retention strategies. Most of them have yet to see the light of day, according to the 2020-21 Departmental Results Report.

Another limitation of the SSE’s personnel chapter is that the initiatives it presents seem to stand on their own, without much

connection to one another. These initiatives are top-down, centred on National Defence Headquarters (NDHQ) as the authority for implementation.

The culmination of Operation Honour and the 2021 scandals, the recruitment and retention issues and high level of dissatisfaction among the ranks, among other concerns, require a more holistic approach to personnel management, one that better bridges the overlap between concerns and are mission specific.

Defence Policy Review: Rethinking People First, Mission Always

A defence policy review does not need to overhaul the objectives and ideas outlined

in SSE to have the intended effects. Some of the disruptions this could cause might override the benefits of such an approach. Encouragingly, Anita Anand announced on May 10, 2022 that DND is taking the direction of an update, which will ensure a certain level of continuity.

However, the personnel file has yet to get the level of prioritization required to ensure the CAF and its members can adequately respond to the threat environment. The problem is not new – the latest report on discrimination in the Department of National Defence (DND) and the CAF observed that the defence team has yet to implement the majority of two decades worth of personnel-related recommendations. It is an issue of leadership

Monitoring at all levels in order to identify unintended consequences and successes and allow for change of course on a more case-by-case basis will go a long way to ensure progress and change without disrupting processes.

buy-in, based on a misunderstanding of the objectives and impact of personnel and diversity policies on the CAF. Retired general officers have suggested combat readiness needs to be prioritized over culture change, overlooking that putting mechanisms in place to prevent any form of misconduct, as well as to improve job satisfaction and morale, could go a long way toward enhancing the CAF's operational effectiveness.

So, how can we get that buy-in and institution-wide prioritization? Rethink what “people first, mission always” means, and make personnel considerations systematically integral to planning related to the CAF's core missions.

For example, the defence policy review is expected to expand the core mission that continental defence includes NORAD modernization – and Budget 2022 reflects this renewed priority. In this case, integrating personnel to this mission means outlining what needs to be done on the personnel management side for mission success. Considerations should include:

- What skills and type of personnel (from non-commissioned to officers, regular force or reserves) are needed in the policy and procurement agencies;
- Which people need to be deployed to operations related to North American defence and what they need in terms of equipment and training to fulfil this mission well;
- The career progression objectives that relate to this core mission;
- How to ensure continuity as individuals change postings;
- How to better support families as they relocate to the U.S. or as a member is deployed on operations, taking into account service couples, recruitment and the burden on the different occupations and environment.

The personnel-related requirements will be highly different for other core missions, such as “providing assistance to civil authorities and non-governmental partners in responding to international and domestic disasters or major emergencies.”

The same should go for culture change. Instead of viewing it as a pursuit that oc-

curs in isolation from the CAF's core mission, it would be useful for the defence policy review to look at how the demands for culture change – as currently spearheaded by the Chief Professional Conduct and Culture (CPCC), the Chief of Military Personnel and the Judge Advocate General will impact the core missions. For example, a review must examine how enhanced harassment training should fit with other training and how culture change-related work should compare to the objectives of the core mission.

Second, the defence policy review should examine ways to ensure some continuity with the initiatives outlined in SSE. The latter promises several initiatives in terms of compensation and fair benefits: modernizing the honours and awards system, a “Comprehensive Canadian Armed Forces Retention Strategy” and a “strategy for human resources”, plus continuing to implement an already extant strategy, the Diversity Program and Action Plan.

We have yet to see some of those initiatives come to fruition, i.e., the CAF Retention Strategy; others have just come out, such as the Total Health and Wellness Strategy (launched in April 2022). In the meantime, the Path to Dignity and Respect (the culture change strategy) was released in November 2020, the Declaration of Victims' Rights is about to be implemented, the report on systemic racism came out on April 25 and the minister of National Defence received the results of the Arbour review on May 20.

It is common for the CAF to abandon or rewrite strategies: a new version of the Diversity Strategy, first initiated in 2018, is in the works. Operation Honour has seen a high turnover of initiatives,¹ and the Path to Dignity and Respect, while having been published recently, appears to stand outside the culture change initiatives currently under way. In fact, CPCC announced in a recent briefing that the Path will not be used to implement culture change.² Those strategies may miss certain aspects of military life that affect personnel, but not implementing them might hinder progress in more substantial ways. Rewriting strategies is not necessarily the best ap-

proach if they do not bear the expected results. Monitoring at all levels in order to identify unintended consequences and successes and allow for change of course on a more case-by-case basis will go a long way to ensure progress and change without disrupting processes.

Third, it is imperative for the defence policy update to communicate that personnel policy is not a series of initiatives that Military Personnel Command and different agencies within environmental (i.e., air force, army, navy) headquarters need to undertake, but rather a complex, ambiguous and interconnected series of issues that impact every aspect of military life for service members, their families and the civilians who constitute the defence team.

This can be done in several ways. The defence policy review can establish a system that allows for constant dialogue vertically (both top down and bottom up) and horizontally (across units, occupations, environments, regular forces to the reserves and vice-versa). This would help identify problems at the source, foster the sharing of best practices and allow for the fine-tuning of policies to better account for the needs of different occupations, ranks and subcultures in the CAF (and based on the different core missions the CAF is involved in).

Working from the ground up, from the objectives to the solution, can also be useful. This approach would require the CAF to set objectives that have a clear, measurable end goal and identify the problems that make these objectives necessary. If some issues overlap, they should be examined for how and why they do. The dynamics that contribute to issues should be looked at based on the plethora of research conducted by Defence Research and Development Canada and the Director General Military Personnel Research and Analysis. This approach would determine if some of those barriers impact certain sections of the CAF differently (based on rank, occupation, environment, gender) by conducting a broad gender-based analysis plus, and devise plans accordingly, cognizant of the interconnections estab-



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POLICY

lished. Then, to ensure the devised policies have the intended effect, they should be closely monitored based on the above approach.

Conclusion

The past two years have created a need for a defence policy review that makes personnel issues an integral part of the implementation of the CAF's core missions. While the ideas listed above could provide a roadmap for rethinking how personnel management is done within DND/CAF, it is a lot to ask for a defence policy review. The purpose of defence policies is more about expressing government intent and commitment to certain issues, and less about giving the CAF a detailed roadmap on how to manage its activities from the top down. Also, expecting the CAF to get all the complexities of personnel management right is unrealistic, especially given how understaffed and overstretched it is.

However, at a time when the CAF has acknowledged being under existential threat and in need of a culture change, the defence policy can harness the momentum

already in place to offer clear direction for the CAF. The revised ethos, the Directives on Inclusive Behaviour, the Total Health and Wellness Strategy, the upcoming Reconstitution Plan and the Arbour review signal that the moment is here for the DND and the CAF to rethink what "people first, mission always" practically means in an environment where attrition is high and recruitment is low.

Integrating a holistic personnel strategy that looks at all aspects of the military human resources management at the centre of the CAF's core missions can help seize this moment and offer CAF members, their families, and the civilian members of the defence team the stability and direction they need for mission success. ■

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1. Allan English, "Comprehensive Culture Change' and Diversity in the Canadian Armed Forces: An Assessment of Operation Honour after

Three Years and Implications for the Latest CAF 'Diversity Strategy,'" Paper presented at the IUS Canada Conference, Ottawa, October 2018.

2. Author's own observation from attending external stakeholder briefings organized by the Department of National Defence. The announcement that CPCC would not implement the Path took place on May 12, 2022.



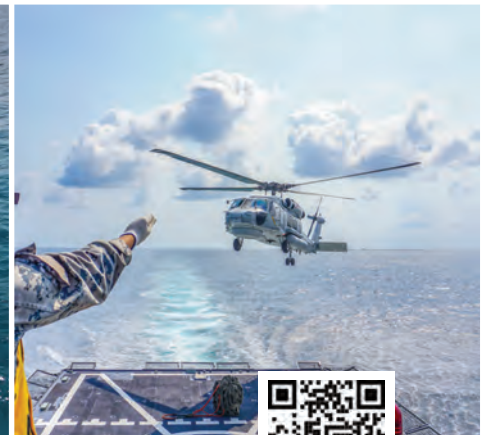
Charlotte Duval-Lantoine is the Ottawa operations manager and a fellow at the Canadian Global Affairs Institute. She completed a master's in military history at Queen's University, during which she started researching the toxic culture of leadership in the Canadian Armed Forces during the 1990s and its impact on gender integration, which had begun in 1989.



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THE REVOLUTIONARY IMPACT OF MIXED REALITY: TRAINING AT THE POINT OF NEED



BY CHARLES RICHER,
DIRECTOR OF LEARNING
SUPPORT, KOGNITIV SPARK

The technology and solutions provided by mixed reality (MR) are evolving at a very rapid pace, with some of the most measurable and positive impacts being found within the arenas of learning, training, and the provision of remote support for technicians. The benefits of this disruptive technology are so great that many within the education and training worlds are deeming it as a revolutionary breakthrough. This, in turn, has been fueling adoption at an exponential rate. Articles and case studies highlighting the use cases and benefits for the application of MR (also referred to as extended reality (XR)) in various industries and in academia are prevalent and bountiful.

Creating a valuable and intuitive MR tool for this very purpose has been Kognitiv Spark's "raison d'être." Our product, RemoteSpark™, allows for and enhances

the exchange of knowledge and ultimately the completion of learning. It enables tasks to be completed in a manner that is conducive to not only learning and supporting, but also retention of knowledge and skills to then be shared.

How does this happen?

An end-user gets outfitted with a HoloLens2 headset. They then initiate a call to an expert who can be located anywhere in the world. Once the call is connected over a secure network, the expert provides guidance, mentoring, and knowledge to the end-user while in situ. This is made possible due to the integration of MR and real-time connectivity of the HoloLens2. The expert also shares digital assets with the end-user which assists in learning, comprehension, and knowledge retention. Digital assets can include pictures, pdf documents, 3D models, animations, and holograms. The end-user can interact with the digital assets in their environment and use them to learn, refresh knowledge, or view animations designed to provide linear pathways to learning. Additionally, the end-user remains hands free once the call is initiated. This means that they are free to carry on using their hands, sight, and hearing to carry out the task before them.

Why is this so effective?

When polled, the majority of field workers, students, and people in general report that they like to learn in a "hands on" or "learn by doing" type of way, and that they genuinely understand the benefit from doing so at the point of need, where they are about to carry out a task. This is the beau-

ty of using MR for learning and training purposes – it enables that exact type of learning environment.

The most effective learning style and approach is one that improves learning and retention through an interactive engagement between the user, the expert, the digital data, and applying the knowledge while immersed in the actual environment. One of the biggest buzzwords around this style of learning is "Experiential Learning." Most view this as the user applying their various modalities and cognition to learn, apply, and retain knowledge – essentially learning through experience or by doing. This makes perfect sense, and that learning style is grounded on learning theory by David Kolb. His theory applies perfectly in the MR setting as well as many others such as John Dewey's hands-on learning approach, Gardner's Multiple levels of Intelligence, and the VARK model (Visual, Auditory, Reading and writing, and Kinesthetic). MR and the impact it offers for improving knowledge transfer and retention levels can be traced directly to these theories when one wants to gain insights as to why it is far more effective than the traditional classroom approach of talk, chalk, and sage on the stage.

At Kognitiv Spark, we are committed to offering the best-in-class MR solution and will continue to evolve with the technology so that the end-users will always have access to a tool that enables them to learn, train, and support at a standard and level that is second to none, where they need it, when they need it. 🇨🇦

UNB DIGITAL EXPERTISE

PROVIDES SECURE AND SEAMLESS INTERACTION AROUND THE GLOBE

How can mixed reality allow world-leading expertise to be shared from across the globe? That's a top-of-mind question for UNB researcher Dr. Scott Bateman, an expert in human-computer interaction. Dr. Bateman is the director of UNB's Spatial Computing Training and Research Lab (SPECTRAL). He works with researchers, students and partners, like Fredericton-based Kognitiv Spark, on building advanced virtual, mixed and augmented reality technologies. The lab focuses on transforming expertise sharing for the aerospace, manufacturing and healthcare industries.

"Mixed reality technologies enable users to communicate with experts and to share digital information easily and seamlessly, integrating them directly with their current environment. It seems like science fiction, but the technology is already here," said Dr. Bateman.

The SPECTRAL lab was established with support from Kognitiv Spark as part of UNB's Fulcrum Initiative, a project launched to enable easier and more relevant relationships between external industry partners and university researchers. In short, it exists to help you leverage the broad range of researchers and facilities to maximize your return and the quality of your solutions.

By working with UNB's Research & Innovation (R&I) Partnerships team, your investment can go further by tapping into UNB's broad range of subject matter experts, student experience offerings and external funding sources.

Do you need to make sure your remote solutions are well-secured? UNB's nation-leading Canadian Institute for Cybersecurity is a call away. Are you working on augmented reality for prosthetics and rehabilitation use? Dr. Bateman is actively collaborating with UNB's Institute for Biomedical Engineering, which brings six decades of ground-breaking discoveries in this field.

Through the R&I Partnerships team, UNB's network extends to collaborators at other institutions and in the community – partners like Ignite Fredericton and the new Knowledge Park Cyber Centre, where UNB researchers are currently testing a gait-based biometric security solution.

Knowledge Park is Fredericton's Innovation District Hub and High Tech cluster, a 35-acre research and technology campus offering



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more than 300,000 square feet of high quality, executive office space designed to house globally-focused companies in a unique collaborative environment. A proud member of the Association of University Research Parks (AURP), a network of 26 R&T Park campuses across Canada and 200+ in North America, Knowledge Park is tailor-made for the world's leading cybersecurity research organizations.

Want to learn more? Find UNB's R&I Partnership team and Knowledge Park at DEFSEC Atlantic 2022 in Halifax and I/ITSEC 2022 in Orlando, where they will focus on SPECTRAL's capabilities. ■



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HOW AI AND RESILIENT SUSTAINMENT WILL HELP THE CAF TRAIN AND MAINTAIN MISSION READINESS

Training is an operational capability, and a well-trained military force is key to continued Canadian security and sovereignty.

Dynamically responding and adapting to an evolving threat environment is critical to soldiers retaining a competitive edge across all domains. Achieving this high level of readiness requires innovative, affordable training solutions that can be both adapted at the point of need and offer rapid performance assessment to accelerate decision making and deliver a resilient sustainment program.

Training Solutions at Point of Need

To prepare for Joint All Domain Operations (JADO) soldiers use virtual reality technologies for an efficient mix of synthetic and live training. Reconfigurable virtual trainers, provide individual to collective skills training both at home base and while deployed. Lightweight, deployable hardware packages in a smaller simulator footprint, adaptable to various vehicle types, deliver training at the point of need, allowing personnel to continue training while on missions.

Trainers At Home

Lockheed Martin Canada's operator trainers stem from a common baseline, SEASMRT, configured to run either on land or on ship. An on-board training solution, called SETT (Shipboard Embedded Team Trainer) is used by six classes of ships across three different navies. This solution utilizes either a synthetically generated scenario, or live tracks displayed against a synthetic virtual world. Multiple ships can

Lockheed Martin Canada's 30+ Year History of Supporting Maritime Training



Each successive program has stood on shoulders of its predecessor

also share the same training environment, allowing force-level synthetic training exercises at sea. Shore-based operator trainers wrap the CMS330 operational software in a synthetic environment, closing the gap between training and operations. The SEASMRT trainer product provides reconfigurable, multi-purpose training for individuals, sub-teams, and full team mission rehearsal wherever the need.

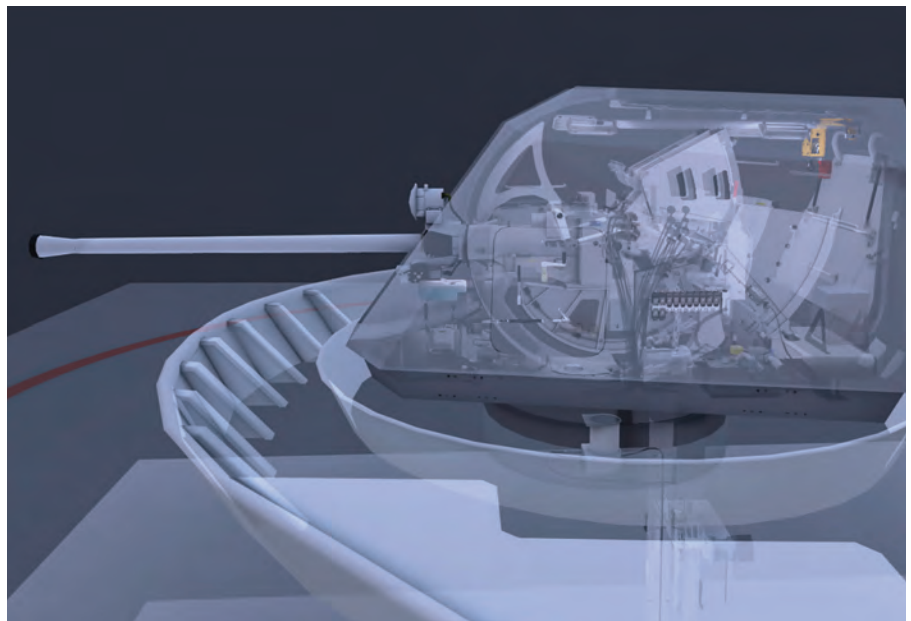
Performance Assessment to Accelerate Decision Making

Information must be provided at the speed of relevance in order to overcome adversaries. Increasingly, soldiers are facing skill decay and cognitive overload due to the speed and detail necessary for each decision. Joint task force commanders operating within the all-domain environment need real-time decision support to gain the advantage.

Lockheed Martin Canada's Maintenance training has modernized to include two variants: VISTA™ (Visual Interactive Simulation Training Application) simulations are digital twins - high fidelity, free-play graphical and behavioural models of devices, equipment, subsystems and systems. SMART (Synthetic Multi-Role Accessible Relocatable TEL) applications are directed, non-linear learning opportunities that are designed to provide students with high graphical fidelity while providing learners with remediation and guidance as needed. Both VISTA™ and SMART are compatible with learner tracking standards like xAPI, which can be used to provide detailed performance analytics. This flexible, dual approach creates a cost-effective, immersive and fully interactive training solution.

Resilient Sustainment for the 21st Century

Being prepared today through innovative training systems is only the first step. To guarantee success, the future force must be sustained. The Canadian Armed Forces needs to be able to rely on industry partners and their robust pipeline of talent and technology to provide speed, readiness and resilience. In-service support and sustainment is critical to the overall mission support package, but resilient sustainment provides assurance of an enduring capability. Continuous military operations will



be achieved through better, more agile support to the dispersed land, sea and air environments and can be assured by implementing enhanced logistics Command and Control and AI-based platform prognostics.

Data has the power to reduce risk in operation and deployments by enabling predictive maintenance to reduce platform downtime. The aim should be to achieve

a high velocity supply chain with parts provided when and where they are needed with no single point of failure across the logistics chain. This requires a paradigm shift in platform and equipment availability and the development of superior, assured, environmentally sustainable and cost-effective logistic services. To guarantee future success, the future well-trained military force must be sustained. ■

Back to the Future?

THE CREATION OF A FOREIGN HUMAN INTELLIGENCE SERVICE IN CANADA

THE QUESTION OF WHETHER CANADA SHOULD HAVE A FOREIGN HUMAN INTELLIGENCE SERVICE, ALONG THE LINES OF THE AMERICAN CENTRAL INTELLIGENCE AGENCY (CIA) OR THE BRITISH SECRET INTELLIGENCE SERVICE (MI6), DATES BACK AT LEAST TO THE 1990S, AND EVEN TO THE END OF THE SECOND WORLD WAR WITH CANADA'S DECISION NOT TO PURSUE ESPIONAGE ACTIVITIES ABROAD. HOWEVER, THE ISSUE REGULARLY RESURFACES IN ACADEMIC, POLITICAL AND MEDIA CIRCLES.

This paper does not aim to settle the debate definitively, but rather to review the salient points of the debate between advocates and opponents of the creation of a foreign human intelligence service (FHIS) in Canada, considering the current international context and recent developments in Canadian intelligence. While recognizing the existing transformations in Canadian intelligence, this paper argues that whatever Canada's intelligence needs may be, it is unlikely that it will move towards the creation of a foreign human intelligence service in the short to medium term, and that Canada's intelligence needs can be met without the creation of a foreign human intelligence service.

Canada and Foreign Human Intelligence

Intelligence activities are relatively unpublicized in Canada and rarely part of the political debate, unlike our American



and British neighbors. A 2021 report by the Canadian Security Intelligence Service (CSIS) on public attitudes of itself shows that Canadians know relatively little about CSIS' functions as an intelligence service. When the Communications Security Establishment (CSE) is mentioned to Canadians, only 26% say they have heard of it and 11% may have heard of it. This demonstrates that Canadians are largely uninformed about their intelligence agencies and their functions.

CSIS was created in 1984 to replace the Royal Canadian Mounted Police (RCMP) Security Service, which was accused at the time of having, among other things, an aggressive approach to intelligence by using illegal political espionage operations. The goal was to move security intelligence to a civilian – not a law enforcement – agency. The RCMP, however, retains its law en-

forcement mandate in matters of national security. CSIS, on the other hand, has no police prerogative. Its mandate is to investigate and report to government on activities that may constitute threats to the security of Canada, to take steps to reduce the threat, to provide security assessments on individuals requiring access to classified information, sensitive sites or on applicants for citizenship, permanent residence, refugee protection or other temporary visitors. It is also mandated to collect foreign intelligence, on Canadian soil, at the request of the Minister of Foreign Affairs or the Minister of National Defence.

The notion of foreign intelligence in Canada is not understood in geographic terms, but rather in terms of the nature of the intelligence. Thus, while CSIS has limited foreign intelligence collection capabilities, it does have a presence abroad

as part of its security intelligence mandate. Security intelligence relates to threats to the security of Canada as set out in Section 2 of the CSIS Act: espionage or sabotage directed against Canada or detrimental to its interests; foreign-influenced clandestine activities threatening Canada; terrorism in or from Canada; and covert and unlawful actions aimed at the violent overthrow of government or the undermining of an established system of government. Foreign intelligence is broader and is understood to be any intelligence about a foreign, i.e., non-Canadian, entity. While the distinction may appear clear in the text, the reality is more ambiguous. First, according to Section 16, CSIS may collect foreign intelligence within Canada, provided that it is not directed at Canadian citizens or permanent residents and only at the request of the departments of Foreign Affairs or Defence. Second, it is questionable to what extent CSIS can collect foreign intelligence under its Section 2 mandate to investigate threats to the security of Canada. However, if one thing is clear, it is that CSIS has limited capabilities in terms of foreign intelligence collection and foreign operations.

The second primary intelligence agency is the CSE, the heir to the World War II signals intelligence intercept and cryptanalysis efforts. CSE's primary mandate is to protect the Government of Canada's information and computer systems, collect foreign signals intelligence, and conduct defensive and active cyber operations. As such, CSE is Canada's foreign intelligence service, although its mandate is limited to signals intelligence. However, CSE cannot intercept signals intelligence on Canadian territory or from Canadian citizens, except when assisting other agencies such as CSIS, the RCMP or the Canadian Armed Forces.

Canada does have a foreign intelligence service, but it is limited to signals intelligence. This Canadian specificity leads some to propose the creation of a specifically foreign human intelligence service in Canada, which would then fill the presumed weakness of CSIS.

For the Creation of a Foreign Human Intelligence Service

What are the main arguments in favour of such an intelligence service? First, a foreign human intelligence service would provide Canada with information that would allow it to make relevant decisions based on

When the Communications Security Establishment (CSE) is mentioned to Canadians, only 26% say they have heard of it and 11% may have heard of it. This demonstrates that Canadians are largely uninformed about their intelligence agencies and their functions.





Headquarters of Communications Security Establishment (CSE, formerly CSEC) in Ottawa, Canada. Photo: wikipedia.org

information that Canada has decided to collect according to its priorities, especially in a changing world where reliance on foreign intelligence from our allies no longer necessarily serves Canadian interests. Indeed, as Stephanie Carvin and Thomas Juneau argue, the information Canada receives from its allies often reflects the priorities and interests of those allies and not necessarily those of Canada. Some argue that Canada has potentially missed out on important information for its decision-making, and that the opportunity to collect foreign intelligence would advance Canada's geostrategic, economic, military, environmental and scientific objectives.

While not arguing for or against the creation of a FHIS, Farson and Teeple examined four options for Canada to develop a human foreign intelligence capability, none of which appear to be a solution. First, Canada could create a new institution, but the costs involved (estimated at about C\$200 million in 2006, compared to the current C\$500 million for Australia's foreign intelligence service) would likely exceed the country's intelligence needs – not clearly identified by the authors – and it is not clear that the creation of such a service would be well received by the public. Second, Canada could significantly expand the role of CSIS, allowing it to collect foreign human intelligence and conduct clandestine operations, but this would raise many legal issues, although they could be resolved. Third, it would be possible to add a foreign human intelligence component to an agency that already facilitate foreign intelligence activities, such as CSE. However, such an addition would run up against the particular organizational cul-

ture of CSE, which exclusively focuses on signals intelligence. Finally, the last proposal would be to moderately expand the foreign intelligence powers and mandate of CSIS.

Recently, several articles have been published that bring the debate over the creation of a foreign human intelligence service in Canada back to the forefront. While assumed that this debate, at least in the academic arena, was over, Hensler has reopened this debate by publishing an article examining Canada's foreign human intelligence service question, 25 years after he first spoke out in favour of such a service. The author begins by reviewing the long hesitation and evasiveness of various governments, both Conservative and Liberal, to address the issue, sometimes arguing that more studies are needed (when there are already enough), sometimes claiming that such a service would damage Canada's international reputation. For the author, not only is this not the case, but it reflects a lack of understanding by governments on what a foreign human intelligence service is and what it does. Finally, the main point of his argument, apart from noting that Canada would gain independence from the foreign intelligence it receives and that it could gain influence, is that Canada falls behind most of its allies, and that the creation of such a service would show Canada's allies, notably the Five Eyes, its commitment to being on an equal footing and thus increase its prestige.

On the other hand, over the past few months, numerous academic, journalistic and intelligence practitioner forums have also revived the debate. Some, with-

out taking a position, remind us that it is time to seriously consider the question, as Canada is increasingly dependent on allied intelligence. Others point to the financial and political costs of creating such a service and of engaging in clandestine espionage abroad. However, even if it is to enter the arena of international espionage, a foreign human intelligence service must be at least aggressive in its pursuit of valuable information. The government must be prepared to support this aggressiveness and, above all, to take responsibility in the event of failure or leaks to the media.

The arguments for the creation of such a service all focus on the defence of Canadian national interests through the collection and analysis of foreign intelligence and the over-reliance on allied intelligence. The allies could indeed decide to terminate intelligence-sharing with Canada, although this seems unlikely at this time. Canada would need such a service to have a decision-making advantage, while advancing its interests on the international stage. For example, a very good threat and intelligence assessment of Iraq's possible possession of weapons of mass destruction (WMD) in 2002-2003 allowed Canadian intelligence to assess that there was insufficient evidence to support this possibility. However, this correct intelligence assessment was made in the absence of an FHIS and on the basis of intelligence provided by allies.

Against the Creation of a Foreign Human Intelligence Service

On the other hand, many people are against the creation of such an intelligence service. For Robinson, this would be a considerably suboptimal policy choice for the Canadian government, as it raises many questions about the public accountability of such a service while questioning the usefulness of this type of intelligence for decision-making. Indeed, there is no solid proposal currently to make clandestine operations accountable to the public, and there is no evidence to suggest with certainty that foreign intelligence has a direct impact on the choice of a particular policy. For others, the purpose of Canadian intelligence would not be to spy extensively on foreign countries to gain foreign policy advantage, but rather to protect Canadian territory and people.

Stuart Farson's 1999 contribution takes a similar stance on this debate. Accord-

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Canada has chosen to have a very limited foreign human intelligence capability, while at the same time developing a significant foreign signals intelligence capability. This lack of foreign human intelligence has led many to argue in favour of an FHIS in Canada, whether this means creating a new intelligence agency or expanding the mandates of CSIS.

ing to Farson, Canada would not need a foreign human intelligence service because all of Canada's intelligence needs are being met. He identifies four areas of intelligence utility in Canada: business and commerce, national security, foreign relations, and international obligations. In the first two areas, business and national security, intelligence is directed inward. Political intelligence for foreign relations is already well provided by the network of Canadian embassies, which report a great deal of information that only needs to be better analyzed and disseminated. Finally, as for Canada's international obligations, it can rely on its main allies to obtain the necessary information. Moreover, one of Canada's concerns would be not to be a threat to the United States, which leads it to favour inward-looking intelligence.

However, it could be argued that since 1999, Canada's intelligence needs may have changed, which will be the subject of the next section.

Is It Time for Canada to Have a Foreign Human Intelligence Service?

While we have seen the pros and cons of such an intelligence service, the main ques-

tion remains: does Canada need it? Thus, even though Canada is largely dependent on its allies for foreign human intelligence, and that it would be advantageous for decision-making to rely on its own intelligence, it is not clear that Canada needs a new service for this purpose. Stephanie Carvin and Thomas Juneau, who agree on the importance of decreasing dependence on foreign intelligence from our allies, all the while increasing Canada's ability to collect its own intelligence and produce its own analysis, propose to "Canadianize" Canadian intelligence. By this, the Juneau and Carvin intend mainly to improve the analytical capabilities within the Canadian intelligence community, while relying more on Canadian-gathered intelligence. Thus, there is no need to create a new intelligence service, but rather to increase the efficiency of existing services. This proposal is consistent with recent developments in Canadian intelligence. For example, there has been an incremental evolution in the mandates and powers of CSIS and the CSE over the past twenty years. CSE now has the authority to employ active operations in cyberspace, including the disabling of devices or computer networks that pose not only a threat

to Canadian security, but also a threat to Canada's international affairs.

For its part, CSIS now has a disruption and threat reduction mandate. However, this still applies to security intelligence and CSIS is prohibited from incurring physical harm against any person. In addition, a federal judge recently authorized CSIS to conduct investigations abroad, even if the investigations violated the laws of the state in question, when dealing with threats to the security of Canada. While Canadian intelligence is still quite limited with respect to foreign intelligence, there are incremental developments that consider the contemporary context in which intelligence operates and are intended to make Canadian intelligence more efficient in its tasks.

On the other hand, and without risking a hazardous prediction about the future of Canadian intelligence, it is unlikely that Canada will engage in such an institutional creation soon. Even Hensler, an advocate of the creation of such an intelligence service, notes that Canada has an inherent aversion to foreign human intelligence. Moreover, Canada's national security culture is rather risk averse. Other recent research on the Canadian intelligence community has also come to similar conclusions, suggesting that the Canadian way of doing intelligence is not to engage in clandestine foreign intelligence gathering. Rather, Canada is said to have a defensive and minimalist intelligence culture, emphasizing the protection of Canadian territory and people, while collecting foreign signals intelligence and contributing to a multilateral intelligence-sharing partnership.

Conclusion

Canada has a unique approach among its allies to foreign intelligence, understood not in geographic terms, but in terms of the nature of the intelligence collected. Canada has chosen to have a very limited foreign human intelligence capability, while at the same time developing a significant foreign signals intelligence capability. This lack of foreign human intelligence has led many to argue in favour of an FHIS in Canada, whether this means creating a new intelligence agency or expanding the mandates of CSIS.

For advocates of the creation of a FHIS, the advantage would be that Canada would decide what intelligence to collect based on its priorities and interests, rather



than relying on the intelligence, or even analysis, of its allies, which often do not reflect Canadian interests. On the other hand, some are skeptical about the benefits and feasibility of such a service, arguing that Canada has no additional need for foreign intelligence, that the costs would be significant, or that Canada's priorities are not in spying on foreign countries, but in protecting its territory and its population against specific threats.

In particular, the paper argues that Canada currently does not need to create an FHS. Instead, it needs to make the existing Canadian intelligence apparatus more efficient through its "Canadianization", as proposed by Carvin and Juneau, i.e., by improving analytical capabilities and relying more on Canadian intelligence. On

the other hand, it is unlikely that the country would embark on such an institutional creation given its rather minimalist and defensive risk-averse culture.

Thus, while this makes the creation of a foreign human intelligence service unlikely in the short term, it does not preclude an incremental evolution of the legal framework surrounding intelligence practice in Canada. The evolution of the legal framework is necessary, as noted by CSIS Director David Vigneault, for Canadian intelligence to adapt to the international environment and to new security challenges. This is the option that various governments have chosen over the past 20 years.

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PERSPECTIVE

THE FUTURE INTEGRATED TRAINING ENVIRONMENT

The *Future Integrated Training Environment* (FITE) is a Canadian Army concept that addresses the integration of live, virtual, and constructive training environments to support and improve future individual and collective readiness. In essence, it advocates for the use of integrated and networked simulation programs to effectively and realistically prepare Canadian soldiers for the contemporary operating environment.

The first tangible implementation of the FITE will be the procurement of the Land Virtual Crew Training System (LVCTS). The LVCTS will provide a range of advanced combat vehicle virtual simulations that will transform the way the Canadian Army conducts individual and collective training for mounted combat operations.

The FORC3 team, a strategic partnership between Rheinmetall and Lockheed Martin in pursuit of the LVCTS project, is positioned to provide the most advanced training solution to fulfill the needs of the Canadian Army. The FORC3 LVCTS solution offers the potential to become the nexus for the integration of live, virtual, and constructive simulations, delivering a single, highly realistic, synthetic training environment – precisely as envisioned by FITE.

With the FORC3 team solution, the



The five custom-built simulation centres proposed in the FORC3 LVCTS solution will create highly realistic synthetic environments that replicate the future land operating environment.

LVCTS will enable a more rigorous and objective analysis and assessment of the individual (Level 1) technical and leadership skills for the effective execution of mounted combat operations. This capability will provide the foundation for mission-focused collective training, employing virtual simulation, from crew (Level 2) to combat team (Level 5).

The FORC3 team stands confident and ready to meet the challenges inherent in a project as dynamic and complex as that of the LVCTS. "We are proud of our team's skills and capabilities, drawing on four decades of experience in providing cutting-

edge combat vehicle virtual simulation to Canada and our most important NATO and Five-Eyes allies", says Pietro Mazzei, Vice-president, Rheinmetall Canada. The FORC3 team will leverage this expertise to provide Canadian soldiers with the best possible training and preparation for future operations. ■



Pietro Mazzei,
Vice-president of
Electronic Solutions,
Rheinmetall Canada

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Q How is your organization changing the game within your industry sector?

Our vision for the future. For decades, our customers have counted on us to help them overcome their most complex challenges and stay ahead of emerging threats. That may sound trite, but we must be leaders in the “what if we could make this happen...” game by providing the most technologically advanced solutions that were never specified. To align with the priorities of our customers in the decades ahead, we have to think beyond what they are envisioning and offer those solutions. Collectively, inside Lockheed Martin, it’s all part of what we deem the concept of deterrence called 21st Century Security.

Q What are the biggest impediments to innovation in your industry sector?

I think we continue to work inside a system that does not provide the agility necessary to get products to market at the pace of our adversaries. We are seeing that shift in mindset necessary to help drive toward that agility and certainly everyone is motivated to deliver but we need to evolve

our engineering and acceptance practices with greater efficiency. Simply put, both industry and the customer must be in lockstep in finding ways to reduce time to market for key capabilities that are needed now.

More broadly, winning the race for talent have never been more imperative. While that statement is being worn into the ground daily it is no less relevant. The lines between the defence industry and commercial industry have never been more blurred. What was once the protected domain of defence specific skillsets is now applicable in multiple, broad-based sectors.

Q How has innovation become ingrained in your organization’s culture and how is it being optimized?

Innovation roadmaps are grand plans to help you get to be market leaders, but innovation can come from anywhere. It’s about having the mindset and collective understanding that great ideas can rise to the surface from just about any corner inside your organization. Whether it’s process efficiencies or product enhancements, some of our best ideas have come from the grass roots development teams.

Aligning to our 21st Century Security vision, we can accelerate the adoption of innovative networking and related technologies into our product and service lines, such as CMS 330 while enhancing the performance and value of our major customer platforms. We will partner with defense and commercial companies to find and develop future systems to bring cutting-edge technology to the modern, highly contested battlespace.

Because our portfolio spans every branch of the Canadian Armed Forces, we have unique insights into the challenges and opportunities to enable optimal battlespace awareness by providing unmatched command and control solutions across land, sea, air, space and cyber.

Q What technologies, business models and trends will drive the biggest changes to your industry over the next two years?

All areas of warfare along with the associated information sharing and control are now inextricably linked. Stop thinking about developing single use technologies or anything that can’t be applied or linked to the greater network. Joint All-Domain

Operations (JADO) is the term that will be with us for a while. Today’s challenges to global security aren’t just changing – they’re accelerating faster than ever before. Our adversaries are highly adaptive and confronting us from every domain across air, sea, space, land and cyber.

The aircraft, ships and ground vehicles our Canadian Forces operate today collect an abundance of information. Processing and analyzing that amount of data is a challenge, especially when you factor in multiple levels of security at which those systems operate. By synchronizing major systems and crucial data sources with revolutionary simplicity, JADO provides a complete picture of the battlespace and empowers our military to quickly make decisions that drive action.

Q How did you start out in this industry and how has it brought you here today?

When I transitioned out of uniform and into the defence industry in 2009 it was something I never saw coming. Halifax Class Modernization was just kicking off and I was offered a program manager role in training systems development. It was not an easy decision to leave the Forces but that inner voice kept telling me, “it’s time.” 2009 was one of the most challenging times for the company and we had many difficult phases on that program but the memory that sticks out most from my transition are the people who met me at the door that first morning, those who welcomed me in and mentored me and those in the teams that supported me from the outset. They are some of the brightest and best people I’ve ever met and I am pleased to say they are leaders in their own right inside LM today. To this day, it’s the people that motivate me.

Over the years, it just seemed that opportunity was everywhere, and I’ve been fortunate enough to have been provided a range of responsibilities from my leadership that has groomed me and helped me get to my current role. The experience of working as part of a massive capture like the Canadian Surface Combatant program is a once in a lifetime venture. ■



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#INTHISTOGETHER

DAVID HILL

DIRECTOR OF COMMERCIAL
OPERATIONS
HEXAGON
MANUFACTURING
INTELLIGENCE



Q How did you start out in this industry and how has it brought you to where you are today?

When I was young, I always had a passion for fast cars, motorcycles, snowmobiles, and anything that had a motor attached to it. I loved tearing them down, making minor improvements and figuring out how they worked. So naturally I was drawn to the manufacturing world. My journey in quality started many years ago when my father, who worked for General Motors at the time, recommended that I meet for dinner with one of their cutting tool suppliers to talk about the tool and die industry. I had friends starting in the trade, and of course, Windsor is well known for their expertise in tooling and advanced manufacturing. I have always been interested in the business aspect of manufacturing and envisioned being in a business development type role even at 19.

During the dinner with my father and the account executive, I was told to enter the trade, and learn and understand the manufacturing process, and bring credibility to your future customers. Sales is not only about a transaction. It is about building trust in the solution and creating a partnership. That meeting

resonates with me to this day. It brought me into the precision gauging and check fixture world. I completed an apprenticeship in Tool and Die and started as a fixture builder nearly 30 years ago. Precision gauging and sheet metal fixturing was the primary focus for the company I worked for. The trend in manufacturing to move from hard fixtures to flexible, re-deployable non-contact scanning is what allowed me to move into a sales role. The rest is history.

Q What is your role at your organization today?

I am currently the Director of Commercial Operations for Hexagon Manufacturing Intelligence, Canada. In 2017, I took the role of building a direct team to support our Canadian Manufacturers. Hexagon has a large customer base within Canada and always had local technical support. But our goal of opening solution centers with sales, training, and the latest technologies had yet to take shape. In my current position, I have the opportunity to work across different functions of our organization. I learn from and interact with some very talented people in services, application engineering, training and finance. In all honesty, being part of this journey to build out such an amazingly talented team has been the best part of my job at Hexagon.

Q What was your most challenging moment?

This is an interesting question because life is full of challenges every day. To keep my answer in the theme of the manufacturing industry, I am going back to 2003. At this time, the company I worked with became the Canadian distributor for a white light scanning technology. This scanner was really a game changing at the time and very new to industry. In my mind this technology would be welcomed with open arms and people would be relieved, that finally we have a technology that makes life easier! I was wrong. It was met with constant skepticism around accuracy. I was dealing with comments such as “this technology shows too much.” To call it a challenge would be a mild statement. The companies in the supply chain we were working with feared they would never achieve buyoff from their custom-

ers because scanning showed the entire part. Out of tolerance areas were glaring. In contrast, today conversations around the digital twin are prevalent and laser scanning and structured light are utilized in all facets of manufacturing.

Q What was your A-HA moment or epiphany that you think will resonate most with our readers? Tell us that story.

Funny enough, my A-HA moment came from visiting a HxGN Live event in Las Vegas. This event focuses on everything Hexagon. I work in the Manufacturing Intelligence division of Hexagon which in itself is vast. When I toured the Vegas event and saw for the first-time what other divisions including Novatel, Intergraph, Geosystems, Safety Infrastructure provided from a technology standpoint, I was blown away. Within the Manufacturing Intelligence division, it was an eye-opener to learn how our solutions drive the manufacturing process from design engineering, production machine, to quality. I have always been very process oriented, so watching Hexagon acquire strategic companies over the years to build out our portfolio has been enlightening.

Q What is the one thing that has you most fired up today?

The advancements in technology continue at a tremendous rate. The drive to utilize data for predictive quality, predictive maintenance and autonomous manufacturing is where the industry is headed. We can measure faster and more accurately closer to the point of manufacturing, even on the shop floor. We have sensors gathering information and monitoring the production line. With access to the gathered from parts by scanners metrology instruments, and manufacturing systems this information can be utilized strategically to head off scrap before it happens is key to quality and profitability. The digitalization of operations and application of artificial intelligence (AI) is an exciting journey to be part of. ■



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online



Top view of the cf-18 demonstration jet
Photo: Derek Heyes

In 2022 and beyond, there's a need for **A COMPREHENSIVE AEROSPACE STRATEGY**

A strong, national aerospace industry supports a strong economy, strong communities, and a strong, competitive Canada in the face of rapidly changing geopolitical challenges.

There can be no doubt this is an industry that can, and must, be prioritized as a driver of our nation's economic and security interests. Accordingly, it requires a long-term national aerospace strategy that renews the government-industry partnership, leverages our competitive advantages, and positions us to lead in the aerospace sustainability revolution.

While geopolitical tensions have been steadily mounting, Canada's defence spending falls short of the NATO target of two per cent of GDP.

Russia's unprovoked invasion of the Ukraine has forced an examination of defence and foreign policy with a focused attention on the need for Canada to have the means to play a bigger role in the North Atlantic Treaty Organization (NATO) and continental defence within NORAD.

There are encouraging signals in the

steps the Canadian government is taking regarding NORAD modernization with our American ally.

As recognized through Canada's Joint Statement on NORAD Modernization, to meet our security and defense objectives, both Canada and the United States must be secure within our shared North American continent. The stronger and safer we are at home, the more we are capable of engaging and acting together in the wider world, in support of a strong, rules-based international order.

Canada and the United States have long benefited from the protection afforded by North American geography. However, growing strategic competition, rapid advancements in technology, and ongoing changes in our climate are eroding that protection, including by exposing North America to a greater and more complex conventional missile threat.

NORAD modernization represents an opportunity for government to plan and align policy and investments with Canadian national security and industrial objectives to ensure that Canada's aerospace

sector plays a defining role in delivering capability, bolstering our arctic sovereignty and continental defence.

SEIZING OPPORTUNITIES THROUGH A NATIONAL STRATEGY

How do we ensure Canada maintains and advances its global leadership with the creation of new, high-value jobs, strategic R&D and Canadian innovation? Investments in defence, sustainable aviation fuels (SAF), electric engines and technologies, hydrogen combustion and advanced aerodynamic designs will bolster our competitiveness in the global cleantech market, estimated to grow up to \$6 Trillion by 2023.

More collaboration is required to ensure we seize the opportunities ahead. We need look no further than other competitor nations to see what is possible. For example, the Government of the United Kingdom (UK) is working actively with industry through their UK Aerospace Sector Deal, their National Space Policy, and their Defence and Security Industrial



The recently announced NATO Climate Change and Security Centre of Excellence to be located in Montréal provides a tremendous opportunity for industry to work in collaboration with Global Affairs Canada and the Department of National Defence as an active partner.

NATO's Secretary General welcomed Prime Minister Trudeau of Canada to NATO's Summit in Brussels, June 2021. He thanked Canada's generous offer to host a NATO Centre of Excellence on Climate and Security. Photo: NATO

Strategy towards economic and environmental goals. These strategies and partnerships have led to the industry-led Decarbonisation Roadmap. Canada could do the same and seize a generational opportunity to centre a much-needed national aerospace strategy and defence industrial strategy to ensure continued Canadian leadership over the next 30 years.

Additionally, aerospace's role in national security, defence trading relationships, the broad societal impacts, and applications of its innovations, as well as the exceptionally long product and investment timelines, set it apart and require a close partnership with government.

We are committed to work with government to find efficient ways of reducing delays in the defence procurement process. The geopolitical environment is changing rapidly and requires fast-paced government action. Large procurement projects affecting aerospace will be launched in the upcoming years and we need to make sure that an efficient and timely procurement process is in place.

SUSTAINABILITY & FUTURE FACING INNOVATION

On sustainability, reaching net-zero and transitioning to green innovation is an imperative for industries across the globe, including Canada's aerospace sector which spans civil aviation, defence and space. In fact, looking out over the next 20 to 30 years, there are huge opportunities for Canadian aerospace to lead on the global stage - defence sector included - especially if we have a renewed partnership with gov-

ernment to ensure the right policies and programs are in place.

Getting these things right will increase GDP contributions and export capacity. Canadian Aerospace has always been synonymous with discovery and invention. Many of the technologies we rely on today, including cellular technology and solar cells, are the direct result of aerospace discovery, multi-sectoral collaboration, and dedicated support. A national strategy will ensure this future facing innovation continues.

Our industry is at the forefront of finding solutions to climate challenges and we want to work together with the government to achieve them. The recently announced NATO Climate Change and Security Centre of Excellence to be located in Montréal provides a tremendous opportunity for industry to work in collaboration with Global Affairs Canada and the Department of National Defence as an active partner.

There is a global innovation race underway in aerospace sustainability. Canada's competitor countries are moving quickly to ensure their aerospace industries seize the cleantech opportunities which also drive economic opportunities. Canada must not cede this ground.

Canadian aerospace has always been a bold, future-facing industry with world-leading inventions. We have a decades-long history of excellence and achievement. Canada is one of the few places where an aircraft can be designed, built, and certified - we have the talent and ability to see the process through from start to finish.

STATE OF THE INDUSTRY

According to our most recent State of Canada's Aerospace Industry report, produced in conjunction with Innovation, Science and Economic Development Canada, the sector generates \$24B in GDP and close to 200,000 jobs to the Canadian economy. R&D investments topped \$710 million in 2021, the highest among all Canadian manufacturing industries.

Canada ranks first in the world for the production of civilian flight simulators, second for the production of business and regional aircraft, and first for the production of turboprop and helicopter engines.

With a highly skilled workforce that is the envy of the world, a robust export capacity and a global reputation for cutting-edge innovation and technology, Canadian aerospace is well positioned to lead in the new green revolution.

As the transition to greener technologies accelerates in the coming years, even more could be accomplished through a concerted partnership with government.

The opportunities are endless. We must ensure we are positioned to seize them. ■



Mike Mueller, President and CEO, Aerospace Industries Association of Canada



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