



CANADIAN ARMY

TODAY

SPRING 2021 | VOL. 5 | ISSUE 1

THIS ISSUE

- Force 2025: Structure review
- Land C4ISR: The digital spine
- Arctic warfare training
- Delivering vaccine logistics
- Tests, trials and evaluations
- FORCE Combat
- Big wrecker
- What roles for robots?

Digital Transformation
Culture, data and a roadmap

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IN THIS ISSUE

SPRING 2021 | VOL. 5 | ISSUE 1

THEME

14 **DIGITAL TRANSFORMATION**

To change an analog culture will require a solid roadmap, quality data, and new ways to bring forward creative ideas. Chief of Staff, Strategy, BGen Chris Ayotte explains.

18 **SPINE UNTAPPED** by Chris Thatcher

As the Army risk-manages the many interdependencies of Land C4ISR, which will provide much of the future digital backbone, it's looking to tap Canadian tech talent.

20 **SECRET SHELTERS** by Richard Bray

The main deliverable of the Combined Joint Intelligence Modernization project? Top secret information facilities to be fitted on the new MSVS-SMP trucks.

22 **UNLEASHING CULTURE** by Mike Nelson

Fostering an Army digital culture is about creating space to unleash what already exists, but is constrained by organizational structures and bureaucracy.

DEPARTMENTS

54 **ARMY CADETS** by Lt(N) Sean Costello

Strength and perseverance: In October 2010, 14 cadets set off on an expedition to the foot of Mount Everest. Here's how that experience shaped some of them.

56 **IN PROFILE** by Chris Thatcher

Trials and evaluations: Considered by some as a hidden gem, the Canadian Army Trials and Evaluation Unit in Gagetown is a growing resource to test the merits of any new capability.

67 **SCIENCE & TECH** by Maude Amyot-Bourgeois and George Nikolakakos

Harvesting insight: How combat simulation and data farming are playing a pivotal role in Army upgrade and acquisition projects.

70 **ON THE HORIZON**

Crafting requirements: Emerging technologies are forcing the Army Technical Staff Officer and Army Technical Warrant Officer programs to adapt.



On the Cover:

Members of Garrison Petawawa participated in combat first aid training as part of theatre mission specific training in May 2020.

Photo: Avr Melissa Gloude

IN THIS ISSUE

SPRING 2021 | VOL. 5 | ISSUE 1

FEATURES

24 **FORCE STRUCTURE**

As part of a recently released modernization strategy, the Army is conducting a wide-ranging effort known as Force 2025 to analyze its future force structure. Here is what that could mean.

30 **VACCINE LOGISTICS** by Ian Coutts

To help with the distribution of COVID vaccines, the government is leaning on Army planning and logistics expertise. **MGen Dany Fortin** explains why.

34 **COLLECTIVE EFFORT** by Chris Thatcher

In resuming training, 3rd Canadian Division modified many of its core high readiness exercises to meet pandemic restrictions while still meeting primary objectives.

38 **DISPERSED AND VIRTUAL** by Chris Thatcher

The scenario, injects, incidents and adverse events were the same, but Ex Unified Resolve had a very different feel for the brigade in the validation box.

42 **AS THE ARCTIC HEATS UP** by Ian Coutts

... so too has Arctic warfare training. To improve skills and introduce new ones, the Army's Advanced Warfare Centre has expanded its Arctic operations courses.

46 **ARCTIC TRACKS** by Ian Coutts

The Domestic Arctic Mobility Enhancement project is still holding to a plan to deliver new multi-purpose transport by 2025.

48 **BIG WRECKER** by Ken Pole

As the Army replaces fleets of logistic vehicles with bigger and heavier options, it's seeking a recovery capability that can handle the size and weight.

51 **URBAN OPS ON TRIAL** by Allan Joyner

With site acceptance testing complete on the new Urban Operations Training System, soldiers are playing a critical role in user trials.

60 **FORCE COMBAT** by Dr. Tara Reilly et al.

Ever wonder how the Army's combat fitness test was created? Here's a look at the science and research behind it.

64 **ROLES FOR ROBOTS?** by Chris Thatcher

Under a buy-and-try project, the Army will soon be asking light infantry to test the utility and applications of unmanned ground vehicles.

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EDITOR'S NOTE



One of the lessons from the U.S. Army's failed effort in the first decade of the 2000s to modernize the battlefield with networked manned and unmanned capabilities, better known as the Future Combat Systems initiative, was prescriptive requirements too early in the process, "without fully understanding the technology ... and the integration that would have to happen, and the integration risk," General John Murray believes.

That is no longer the case. As Murray, commander of Army Futures Command (AFC), and other senior leaders repeatedly emphasized during Global Force Next, a virtual conference hosted by the Association of the United States Army in March, the Army will only buy what it has tried when it comes to emerging tech.

One of the objectives of AFC has been to get new capabilities into the hands of soldiers as early as possible to gather invaluable feedback for both the Army and the vendor. Capabilities need to be developed around a soldier-centric design, and that early soldier feedback, what he called "soldier touch points," is "driving how we shape certain projects."

Case in point is the ongoing trials of robotic combat vehicles. By getting soldiers behind the controls in field tests, the Army is better understanding its future options and "developing how we can most effectively use the materiel."

Project Convergence, which Murray oversees, is intended to inform future requirements about data and cloud technologies, among other things, before the first specification documents are written.

"We specifically talk characteristics; we don't talk requirements," he said of engagement with industry, which is now happening sooner in the acquisition process. Defence companies have often pushed for more latitude to be innovators, so the Army does not "define a solution, only the problem" when it first lays out its needs.

The Canadian Army has not been as definitive in its intent to trial new capabilities before statements of requirements are written. But more projects are being described as iterative or being acquired in cycles or spirals. And while the use of buy-and-try minor capital projects has long been part of the Army's procurement toolbox – learning how soldiers might use a new system before a major capital investment is planned – its use appears to be happening more frequently.

This issue is about Army modernization, and in particular the digital transformation and culture and other changes required for that to happen. But as you'll see, trials and evaluation, buy-and-try and cyclical procurement are all part of the lexicon as the Army builds its future digital backbone, examines unmanned ground vehicles and expands networked training systems. And more often than not early soldier feedback is central.

Chris Thatcher, Editor

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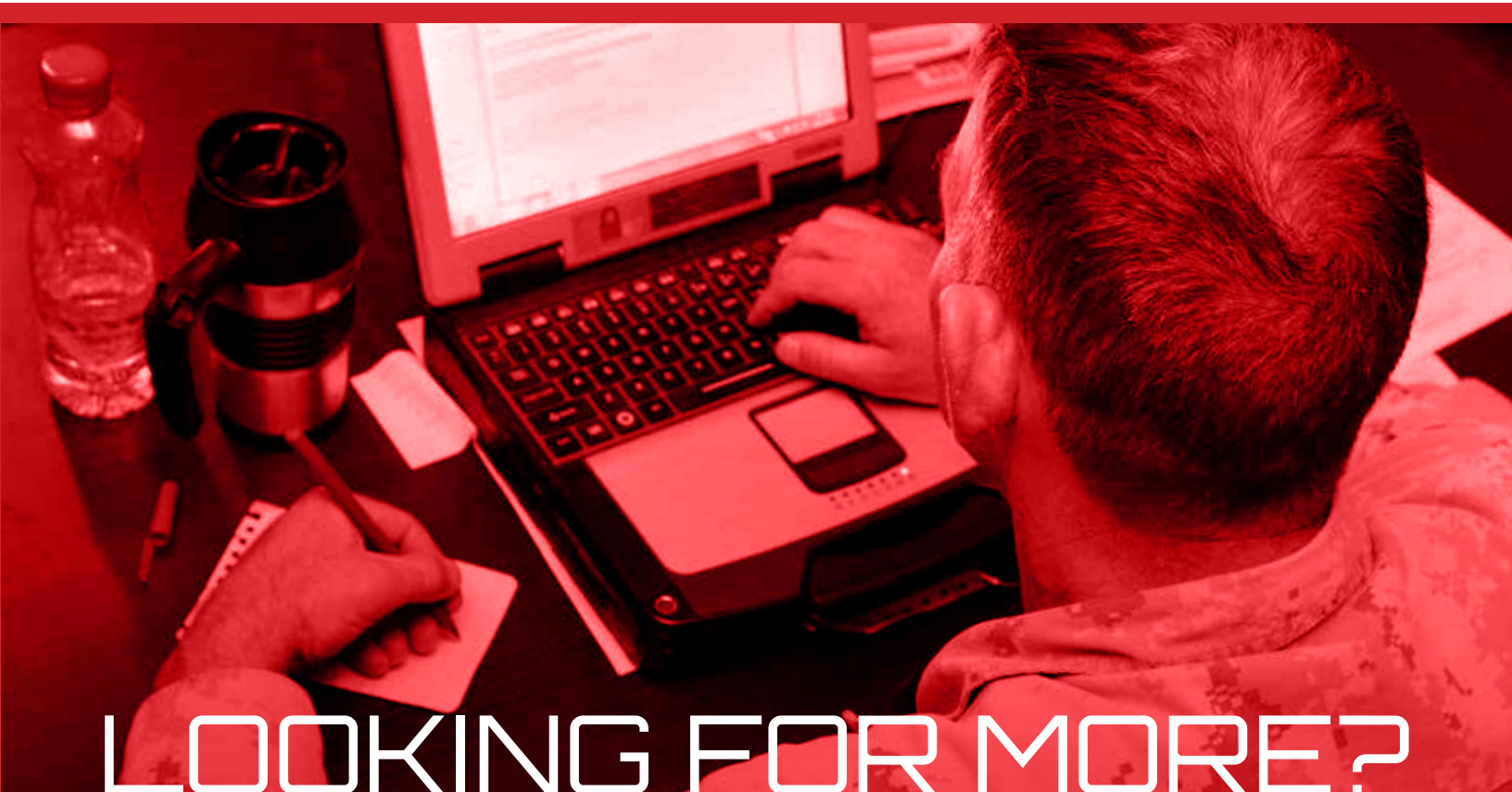
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CONTINUING THE PATH TO MODERNIZATION



Then BGen Michel-Henri St-Louis, commander of Joint Task Force Operation Impact, gives a briefing at Ali Al Salem Air Base in Kuwait on Jan. 16, 2020. Photo: Cpl Jerome Lessard

Major-General Michel-Henri St-Louis became Acting Commander of the Canadian Army on April 19 after Lieutenant-General Wayne Eyre was appointed Acting Chief of the Defence Staff.

St-Louis has served at the operational and strategic level. He deployed on six different missions, including to Bosnia, Croatia, Afghanistan and the Middle East, and served as Deputy Commanding General for Operations of America's First Corps (U.S. Army) at Joint Base Lewis-McChord, Wash., and as Commander of Joint Task Force Impact. Most recently, he was Commander of the Canadian Army Doctrine and Training Centre.

With his extensive operational and training experience, his goal is to ensure the continuity of the Army program.

"The Army is on a clear path of modernization to ensure we're ready to handle any task given to us," said St-Louis. "Our strategic document, *Advancing with Purpose*, discusses the future of warfare and outlines how the Army must be ready to react across all domains including

psychological and physical, and able to work with all joint elements. That is what we will prepare and train for within the Army."

As the Army modernizes, it will remain focused on its primary business – readiness. Since March of last year, readiness has been impacted by COVID-19. Despite the challenges this has presented, the Army has continued to conduct individual and collective training and support overseas missions, as well as aiding Canadians through Operations Laser and Vector. To ensure the Army is able to continue training and serving on operations safely, it is rolling out a COVID-19 vaccination program.

"As I come into the responsibilities as Acting Commander and for the time that I have them, I intend to follow the roadmap for change established by my predecessors to modernize," St-Louis said. "As we do this, we will also tackle the need to root out misconduct, face the COVID-19 headwinds, and generate a land fighting force that is ready for any mission. ■

PISTOLS ON TARGET FOR FALL CONTRACT AWARD

The quest to replace the Browning Hi-Power, the Army's almost 60-year-old 9mm semi-automatic pistol, is through the draft request for proposals (RFP) stage.

Public Services and Procurement Canada released a draft RFP on Feb. 26, 2021, and should have the final RFP to interested vendors shortly. The government aims "to have a contract in place by fall 2021," said a spokesperson for National Defence.

While a new pistol will eventually be delivered for all Army, Navy and Air Force personnel on deployment, "the current solicitation is to support the Canadian Army only," the spokesperson noted.

"Military Police requirements will be handled via a separate RFP later this year ... [while] options in the future [will] support Royal Canadian Air Force and Royal Canadian Navy needs."

Under the planned RFP, the government will procure a minimum of 8,000 pistols for the Army and expects initial deliveries by summer 2022. Options for up to 16,500 could be included to meet the wider Canadian Armed Forces requirements.

The value of the initial Army contract is not yet known, but the total contract if options are exercised could be as much as to \$18 million. ■



Firing the Browning 9mm pistol during CAFSAC 2019. Photo: S2 Camden Scott



LCol Sarah Heer and the Op Unifier command team on a visit to the Simulation Center at the 25th Military Police Training Centre in Lviv on Dec. 17, 2020.
Photo: Avr Melissa Gloude

DIVERSITY STRENGTHENS OP UNIFIER TASK FORCE

Diversity in the ranks matters. Lieutenant-General Wayne Eyre reiterated that point when he revised and reissued his command philosophy as the commander of the Army at the time in early February. “I consider diversity to be a force multiplier that better enables us to address complex issues and thus must be nurtured and protected,” he wrote.

The Army still has much to do to establish a better gender, racial and ethnic balance among soldiers – women, for instance, comprised less than 14 percent as of February 2020, according to National Defence. But it doesn’t need to look any further than Operation Unifier in Ukraine to understand the importance of the commander’s intent.

“The organic diversity of our Task Force (TF) is a reflection of the strength of the diversity in the Canadian Armed Forces,” said Lieutenant-Colonel Sarah Heer, commander of the 10th rotation of the security force training and capacity building mission. “It has allowed us to have a far greater reach and

impact then we could have had with a single homogenous group.”

ROTO 10 had over 200 members representing more than 40 different trades from the Regular and Reserve Force providing officer curriculum development, NCO leadership development, individual specialist training, and collective training for both the Armed Forces of Ukraine (AFU) and the National Guard of Ukraine (NGU).

Diversity in its composition enhanced the TF’s ability to gather information and improved the credibility and effectiveness of its interactions with the host nation, she said.

“The TF is fortunate to have various leadership roles filled by women. This conveys a strong message of equality between the capabilities of men and women, and provides clear international examples for the AFU and NGU of women as legitimate military leaders, highlighting that gender is not a barrier in this regard and supporting Women, Peace and Security (WPS) initiatives to integrate gender

perspectives on operations.”

Among Heer’s leaders was Sergeant Danielle Larocque, an Officer Development Team member from the 3rd Battalion, The Royal Canadian Regiment, who taught troop leading procedures and the military decision-making process with the Air Assault Academy of the AFU Officer Military Academy in Odesa.

“The Air Assault Corps does not have any female members and, in spite of this, Sgt Larocque has been able to forge and nurture a strong relationship and earn the respect of the Academy staff and students, many of whom are combat veterans of the ongoing conflict in the Donbass region,” said Heer.

Captain Ellen Humenny, of the 2nd Regiment, Royal Canadian Horse Artillery, was the Task Force gender advisor to the commander and staff to ensure gender perspectives and gender-based analysis (GBA+) are applied. She also served at the NATO Liaison Office in Ukraine as their WPS advisor.

“Our diversity, gender

perspectives and GBA + analysis have greatly assisted us in delivering training and capacity building programs here in Ukraine while also allowing us to effectively support Ukrainian aspirations to achieve NATO interoperability which includes integrating gender perspectives on operations,” said Humenny.

One of her greatest successes was training and workshops with the NGU Non-Commissioned Officer Academy in Zolochiv. “It was an incredible chance to be able to speak with NGU personnel that work at the tactical level, who are directly affected by the legislation, policies, and doctrines that are being currently amended and created at higher levels. Sometimes, there is a disconnect from the strategic level and the tactical, a problem that I don’t believe is unique to Ukraine. But to hear the willingness of NGU members regardless of gender and ranks, to have the conversation about gender equality makes what I do at a higher level much more tangible and applicable.” ■

ROYAL REGIMENT OF CANADIAN ARTILLERY STRIKES 150

BY IAN COUTTS

Starting on April 1, keen-eyed observers of Army uniforms would have noticed something new on the left sleeve of gunners' CADPAT: a largish square patch, measuring roughly 10x10 cm featuring the distinctive field gun of the Royal Canadian Artillery, the figure 150 and one of the regiment's mottos, "Ubique" (everywhere), displayed prominently.

On October 20, 1871, the government of the Dominion of Canada authorized the creation of two batteries of artillery, one in Kingston and the other in Quebec, to aid in the defence of Canada and to provide "practical schools of gunnery" for members of the Canadian militia. Those two units are today A and B batteries of the 1st Regiment, Royal Canadian Horse Artillery, and in some ways the ancestors of today's modern Canadian Army.

The patch, which members of the regiment may wear until December 4 – the day dedicated to St. Barbara, patron saint of gunners – is just one of a number of ways the regiment plans to celebrate the historic 150th birthday.

Such anniversaries are commonly marked by parades, concerts and so forth. Unfortunately, because it looks as if COVID-19 will be with us for much of the sesquicentennial year, many of the commemorations will take the form of what Major Trevor Michelsen, regimental major of the Royal Regiment of Canadian Artillery, calls "non-traditional celebrations."

The regimental association has created a web hub, rca-arc.org/heritage/ubique-150, to connect members of the regimental family – serving and former gunners, Regular and Reserve – and to keep them informed of events marking the celebration. The regimental museum at CFB Shilo (en.rcamuseum.com) has also been busy creating virtual museum displays featuring photos and artifacts to showcase the regiment's long and honourable history.

A number of freedom-of-the-city events have been planned, particularly in Quebec, where there are plans for Montreal, Quebec City, Shawinigan and other towns to grant the regiment the distinction. "Some of those have been turned into virtual events, where the CO will meet online with municipal officials and have a conversation about the regiment," said Michelsen.

In Manitoba, Major Jonathan Evans, who has been acting as the lead planner on the 150 Ubique celebrations since September 2020, hopes to hold the Kingston Cup, a hockey duke-out between A and B batteries held each St. Barbara's Day that traces its origins back to the 1930s, "before a larger audience in the arena in nearby Brandon."

If conditions permit, members of 1 RCHA will also be mounting the guard at Buckingham Palace this fall. "It's been a long time coming," said Evans, "and we just recently signed off dates on the 1 RCHA coming in for public duties. [There are] placeholder dates between September 20 and October 30." With any luck, that should see members of the regiment guarding the palace on the date of the regiment's founding. ■



As gunners take to the field this year, they will wear a distinctive commemorative patch. Photo: Bdr Nick Bauman, 11th Field Artillery Regiment

A MERCEDES ZETROS FOR ARMY LOGISTICS?

General Dynamics Land Systems-Canada has announced a partnership with Mercedes-Benz and Marshall Canada to bid for the Army's Logistics Vehicle Modernization (LVM) project.

The trio of well-established companies – GDLS-Canada's Light Armoured Vehicles (LAVs) form the backbone of the Army's combat fleet – intend to offer the latest generation of the Mercedes Zetros to replace the Army's Light Support and Heavy Logistics Vehicle Wheeled (LSVW and HLWV) fleets, both of which are over 20 years old and struggling for spare parts.

Zetros tactical and logistics vehicles have payloads ranging from 0.5 to 110 tonnes and offer a "powerful and versatile platform designed to provide the military user

with the best solution for reliability, durability and ruggedness under the most adverse climate and operational conditions," according to Mercedes.

Both GDLS-Canada and Mercedes are among seven qualified suppliers that

includes Iveco Defence Vehicles, Mack Defense, Navistar Defense, Oshkosh Defense, and Rheinmetall Canada and Rheinmetall MAN Military Vehicles.

The Army acquired over 80 Mercedes-Benz Actros heavy-duty transport trucks in 2007 for its Armoured Heavy Support Vehicle Systems (AHSVS) fleet and has operated a fleet of over 1,000 Mercedes Gelandewagen since 2003; the G-Wagon is being replaced through the Light Utility Vehicle project, which issued a letter of interest to industry in July 2020. ■



Image: GDLS-Canada

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ENGINEERS PROVIDE ATF FORCE PROTECTION IN ROMANIA



Members of 2 CER provided a force protection team for the Air Task Force Romania in the fall of 2020 at Mihail Kogalniceanu Air Base. Photo: S1 Zach Barr

Sapper Peter Pomerleau had been conducting combat first aid training last summer as part of his preparation for a tour on Operation Impact in Iraq when the call came: pack a bag, you're going to Romania. Four days later, he was in isolation at 8 Wing Trenton, Ont.

Pomerleau was one of seven members from 2 Combat Engineer Regiment (2 CER), based in Petawawa, Ont., quickly assembled in June 2020 to provide force protection for an Air Task Force (ATF) heading to Romania in late August.

"This was unique," said Pomerleau, a late replacement added to the team in August, of his first deployment. "Not much engineer specific [tasks], but it was an amazing experience."

Together with several military police and three members of the Air Force, the members of 2 CER formed a 16-person security team monitoring and protecting access to

a tactical operations centre (TOC), an airfield and CF-188 fighter jets, and a quick reaction alert (QRA) facility.

Working 12-hour shifts for three days and then three nights, followed by three days rest, the 2 CER members managed a force protection front desk at the TOC, checking security identification and escorting contractors maintaining systems in the building, and a guard house at the airfield, monitoring the QRA and blocking an access road to the airfield whenever the fighters were scrambled.

"Compared to what we are used to in the Army, and especially as engineers, it was a completely different world for us," acknowledged Corporal Walter Gammeter, an eight-year veteran also on his first deployment.

This deployment was "a welcomed change," he said, and actually allowed 2 CER members far more training time on the firing

range than usual. A brief pause in COVID-19 restrictions in October and warm fall weather even allowed some to enjoy the Black Sea and the nearby city of Constanta.

"Those guys were great," Lieutenant-Colonel Dave McLeod, commander of 433 Tactical Fighter Squadron at 3 Wing Bagotville, Que., and commander of the ATF providing NATO air policing with the Romanian Air Force, said of 2 CER as the mission concluded in early January. "Privates, corporals, sappers who were really happy this deployment was not in the desert. They were darn good at their job, but they also had this great attitude and a great approach."

Assembling the team was largely a virtual undertaking, Gammeter said. They met for one day on the range in Petawawa in July for rifle qualification and did "all the necessary training" to carry the loaded Browning 9mm sidearm,

but otherwise figured out logistics and other issues with the chain of command by phone, email and video – "it was a little unsettling."

Working with the Air Force, however, was a new and educational experience. "I liked our chain of command; they were always looking out for us," he said. "And it was cool to see the planes take off every day. We never get to see that normally."

"I felt pretty lucky to be able to go," said Pomerleau. "Seeing a new side of the military, talking to pilots, seeing how they operate – it was really interesting. Seeing them take off and some of their manoeuvres in the air, that was wicked. And not just our jets, but the Romanians as well."

Given the interest of 2 CER members in the CF-188 Hornets, McLeod suspected the Air Force might have new pilot recruits. "We were talking about it," Pomerleau joked, but for now they are staying on the ground. ■

NEW SHELTER SYSTEM ATTRACTS ARCTIC ATTENTION



Briefing in the Canadian HQSS on Arctic Warrior 2021. Photo: Eve A. Baker

The Army's Headquarters Shelter System (HQSS) has some foreign admirers. The new tent system, acquired from Weatherhaven Global Resources of Coquitlam, B.C. in 2017 on behalf of the Canadian Armed

Forces and first delivered in 2019, got a test under Arctic conditions courtesy of a tactical aviation detachment from the Royal Canadian Air Force.

For two weeks in February,

40 personnel from 450 Tactical Helicopter Squadron trialed two tents during Arctic Warrior 2021, a training event with the 1st Battalion of the 52nd Aviation Regiment (1-52) in Alaska that saw temperatures hover around

-30 C and plummet to -54 on at least one occasion.

"It was probably the jewel of the exercise," said Lieutenant-Colonel Rob Tyler, the squadron's commanding officer. The tents were set up for the detachment's planning and briefing requirements, but quickly became the go-to space for 1-52 members as well for "most of the aviation planning."

Though the tents took a little longer to assemble than the old Tent Expandable Modular System (TEMS), they proved comfortable and well-equipped to work in. "It had everything we needed," said Tyler. "And it wasn't just us who saw it – it was the Americans as well."

"I was concerned, taking it into that kind of cold, that there would be problems. It was perfect. I kept joking I would have to put a guard on it when we packed it up to ship home, otherwise it might just have found its way over to an American battalion. They were quite impressed with it. They took down all the stock numbers to see if they can get their hands on it as well." ■



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DIGITAL TRANSFORMATION

HOW THE ARMY PLANS TO CHANGE ITS ANALOG CULTURE

By Chris Thatcher

It's an imperfect analogy, but imagine showing up at the family barbecue with a stack of CDs under one arm and photo albums under the other. You might garner a nod of recognition from a few, but most family members would probably eye you with bewilderment or pity.

"We don't want to be that person at the party," said Brigadier-General Chris Ayotte. "We want to be the person who shows up with just our phone, because everything's on there, because we're streaming from a cloud somewhere."

Like many large organizations, the Canadian Army is awash in analog business processes and digital stovepipes, equipment and systems that were developed for a specific purpose, but today are less than optimal for the modern battlespace. More problematic, every new piece of equipment, from a personal weapon to a combat or even logistics vehicle, includes more and more sensors gathering and streaming data.

It's hardly a surprise, then, that digital transformation is a critical priority initiative of the Army's modernization strategy. *Advancing with Purpose* calls it

an imperative that "implicates all aspects of the Army enterprise." Published in January 2021, the strategy outlines a digitalization effort far broader than the digitization of information, with "structural, procedural, and governance implications related to data management, artificial intelligence, and even how the Canadian Army will field new capabilities, train, and make decisions."

The task of leading a digital transformation and evolving how the Army thinks about and exploits data rests with Ayotte, the Chief of Staff, Strategy. An engineer by trade, with operational experience in Kosovo, Afghanistan and Iraq, his first priority isn't a deconstruction of analog processes or non-interoperable C4I (command, control, communications, computers and intelligence) systems; it's a shift to a digital culture with a data mindset at its core.

"The main challenge that we're facing is one of culture," he said. "That's going to take a little bit of time. We're going to have to find ways to demonstrate why that is so critical to making the Army more efficient. The things that we say that we want to be able to do with our modernization



Photo: Dan Rogall

strategy, with our future operating concept – those are very difficult to achieve without a digital Army, without a digital culture.”

Most soldiers are already digitally immersed to some extent in their personal lives, adopting electronic and cloud-based services to accomplish a myriad of tasks. He wants that same mindset and cultural acceptance “when they put the uniform on in the morning.”

To ensure the Army has a means to mark progress, the strategy calls for a digitalization roadmap to identify opportunities, encourage innovation, and contribute “to the development of a command-led digital culture.” Ayotte has stood up a tiger team of like-minded people, based on their jobs, interests and expertise, to steer that process. He’s consciously avoiding a top-down, directed approach, instead presenting the Army’s challenges in an open-ended way.

“We don’t want to constrain the imagination and the creativity that’s required to get ourselves a digital culture,” he emphasized. “The passion that

this team has for these problems is incredible and it’s very much the right people to figure out the way to move forward on a digital roadmap.”

Even as the roadmap is being built, he’s seeking incremental gains by adapting processes to a digital reality while simultaneously hoping to “unleash trapped capacity” that could be put to better use. The Army has well-known data problems it has been “grappling with for many years,” he noted, that could provide “small victories that are probably less resource intensive, but demonstrate the benefits of a digital culture.”

A task such as the nominal roll, tracking where everyone is and what they are doing on a given day, could be automated to free up the time company or squadron clerks spend and would provide a dashboard for soldier activity.

“If we do that on a base here or in a unit there, that gets out pretty quickly. And all of a sudden, you’ve freed up five, 10 or 15 folks to do other things, as opposed to manually inputting data,” said Ayotte. “And you’re getting a better feed on what’s actually going on to improve decision-making.”



MWO Genevieve Couture, sergeant major of the Combined Joint Task Force – Operation Inherent Resolve's National Support Element, in Camp Arifjan, Kuwait, in August 2020.
Photo: MCpl J.W.S. Houck

The task of assigning people to high readiness duties for an Immediate Response Unit or the Disaster Assistance Response Team is often a people-intensive effort to determine who is available. Updating the Canadian Forces Taskings, Plans and Operations program that supports that “is a fair bit of work,” he said, that could be automated to quickly compare the tasking demand against human resources available in the unit. “[It’s] not just about doing things faster or better, but also developing new ways to achieve a similar effect.”

A well-crafted roadmap would also be invaluable to the Army’s future major capital projects and some of the difficult capability divestment decisions that the modernization strategy suggests will be coming. Ideally, the roadmap would be completed before the Army decides on some of the critical network elements of its future digital backbone, delivered through projects such as Land C4ISR and upgrades to the Land Command Support System.

Ayotte admitted the Army is not only “building the plane as we’re flying it, but rebuilding the plane in some cases, depending on the technology that’s emerging or the best practices coming from our allies.” Most projects are nearing the end of the options analysis phase of the procurement process, so the Army will have to balance the need to move them forward with ever-changing technology decisions.

“It’ll be a continuous dialogue to try and make sure that as we work these projects through the defence services program, we feed in the most current information so that what comes out the other end is the best product possible,” he said.

BACKED BY DATA

Of concern, though, is data quality. The strategy states that “information advantage in military operations will be gained through the integration and aggregation of high-quality data from a wide variety of internal and external sources.” Ayotte acknowledged that some of what is being manually inputted today “may not be high-quality data. We want to change that.”

While the potential of artificial intelligence and machine learning algorithms may be tantalizingly close to solving some of the Army’s data challenges, “we need to start from the basics,” he said. Incomplete or inconsistent data about personnel availability won’t help automate readiness taskings.

“The reality is that unless you have really good data, and a good data culture, you can’t realize those future capabilities. And it starts with the quality of the data you’re putting in.”

Data stewardship and other introductory courses are being developed under the Assistant Deputy Minister Data, Innovation, Analytics (DIA), along with Microsoft Power Business Intelligence training. “You start understanding that, if I put three or four folks on a Microsoft Power BI course, I can probably solve some of my data problems in the unit,” Ayotte observed. “What ends up happening is you start sharing those best practices and other people get trained, and you start un-trapping more and more capacity.”

While commanders are always interested in increased capacity in their units, qualitative data that improves or supports decision-making will quickly become highly valued as the Army grapples with ongoing modernization and force structure issues raised during its Force 2025 exercise. “It’s a very

powerful thing when you can access the right data to demonstrate a problem you're having or demonstrate the reason why you need to stop or keep doing something," he said.

IDEAS FORUM

A digital culture will position the Army to think differently about its data, but the strategy places much of the technical expertise in the hands of the Signals Corps, a trade that is already struggling to develop sufficient personnel even as communications and cyber requirements continue to grow. Specifically, it states that the "Army will position the Signals Corps to overcome the challenges associated with maintaining a skilled workforce for a digital Army."

Though digitalization is far more than a Signals issue, the Army has been wrestling with the Signals Corps challenges for some time, Ayotte acknowledged. The focus on a digital transformation, however, is "acting as a forcing function for us to adopt some best practices from the private sector in terms of delivering services in a different way."

Can the Army leverage technology to achieve an intended effect with fewer resources by making structural changes or shifting responsibilities? The pandemic has demonstrated that geographic proximity is not always necessary to do a job, he noted. "We've come up with a couple of really good options that allow us to deal with the Signals Corps personnel issues, but at the same time build something that's going to enable us to move forward on our digitalization agenda."

A critical step for Ayotte is opening up the lines of communication to draw out ideas that might be percolating within units and on bases. This spring he intends to stand up a regular digital forum, modelled on the successful digital steering committee that kick-started the transformation conversation with 70 participants.

"We need to provide the venue whereby the best ideas can get air to see if we can implement them," he said. "It doesn't matter where you are, if you identify a data problem and you've got a solution, then let's hear about it. I think that is going to be a great way to unlock some of the talent, enthusiasm and the energy behind this file."

Over the next nine months he wants to steer resources and training to early-adopter units with creative ideas, to then trigger movement elsewhere. "Ideally, as we get further into the year, we start to see some of those creative, innovative solutions migrate across the Army. There's no doubt that if one unit has a problem, many units have a similar data problem."

Partners within the ABCANZ (America, Britain, Canada, Australia, New Zealand) armies and other allies are all undergoing similar digital transformations and "we absolutely need to do the same," said Ayotte. "The time to move on this is now. We know everybody is energized by this. It is really one of those files that is talked about multiple times a week across the department, across the Forces – how we are going to work together to achieve our goals. I don't know if I can think of another file during my time in the military that has been as unifying as this." ■



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Spine Untapped

Seeking new talent and technology for the Army's digital backbone

By Chris Thatcher



A soldier with the Integrated Soldier System tablet.
Photo: S3 Camden Scott

Of all the projects queuing up in the procurement pipeline, none could have a greater impact on the Army's operational digital transformation efforts than Land C4ISR. Sometimes called the digital spine, the program of six individual projects will thoroughly modernize the software, hardware and information architecture that allows the Army to gather, analyze, disseminate and act on the data streaming from every soldier and platform in the battle space.

Often referred to as SSE 42 for its position among the recommendations in the 2017 defence policy, *Strong, Secure, Engaged*, Land C4ISR is not only critical to how the Army will command, control and communicate with all assets, but also a building block in a future pan-domain Canadian Armed Forces (CAF) information network that must be interoperable with the digital backbones of allied partners, especially the United States military's Joint All Domain Command and Control (JADC2) initiative.

How to meet the Army's extensive digital needs and interdependencies among the various projects while simultaneously ensuring each new component can connect to legacy systems and pan-domain efforts is no small task. With some of the technology evolving almost as quickly as features on a cellphone, much will be asked of the defence and high-tech sectors to solve some of the Army's challenges.

"Integration is the watchword," said Lieutenant-Colonel Tom McMullen, head of the Directorate of Land Requirements' C4I (command, control, communications, computers, intelligence) and electronic warfare systems portfolio. By resolving integration issues at the frontend of the program, "we're not left trying to patch systems at the backend."

Photo: DND

The six projects are:

1. Joint Deployable Headquarters and Signals Regiment Modernization (JDHQSRM), an upgrade to the communications systems the Signals Regiment employs when setting up a division or joint task force headquarters;
2. Combined Joint Intelligence Modernization (CJIM), focused on deployable top-secret intelligence shelters and training;
3. Land Command Support System (LCSS) Tactical Command & Control Information Systems Modernization (TacC2IS Mod), new hardware and software for the systems and networks in brigade and battle group headquarters, as well as in radios and some communications systems in vehicles to create a shared land tactical domain;
4. LCSS Intelligence, Surveillance and Reconnaissance Modernization (ISR Mod), the acquisition or upgrade of various sensors, many related to the Army's Land Force Intelligence, Surveillance, Target Acquisition, Reconnaissance (ISTAR) project and connected to the current LCSS network;
5. LCSS Tactical Communications Modernization (Tac Comms Mod), an upgrade of radios and satellites and other communications tools to assure operational and tactical bandwidth for headquarters, vehicles and other platforms; and
6. Canadian Land Forces Electronic Warfare Modernization (CFLEWM), a project to modernize the Army's ability to counter improvised explosive devices and improve its electronic warfare systems.

The Army has considered combining some projects, such as TacComms Mod and TacC2IS Mod, or bundling all three of its primary C4I modernizing efforts – TacComms Mod, TacC2IS Mod and JDHQSRM – into a single program. For now, they all remain separate, but “we have to make a conscious effort to actively manage their interdependencies,” said McMullen.

Since TacComms Mod, TacC2IS Mod and JDHQSRM are all in the options analysis phase and on the verge of clearing the last governance checks, the Army intends to keep them closely aligned as the project team launches into industry engagements, starting with a request for information (RFI) later this spring.

CJIM, a deployable top-secret system within a shelter and a tactical training environment, is also ready to seek industry engagement in the next months, while CFLEWM has completed the

process and its business case and will go before the Defence Capability Board later this year before entering the definition phase in early 2022.

Though the RFI and one-on-one meetings are intended to “give us some preliminary feedback” on technology and costing, McMullen wants a broader, two-way conversation with the sector about the realm of the possible – technological solutions the Army might not yet have considered from companies it has yet to meet.

Over the next decade, the Army will spend between \$3 billion and \$7 billion on C4ISR-related projects. That has sparked keen interest from incumbents on the current Land Command Support System and C4ISR programs such as General Dynamics Mission Systems, Thales, L3 Harris and Collins Aerospace. McMullen sees an opportunity, though, for small and medium sized technology companies and others that might not traditionally engage.

“That’s our edge in Canada,” he said. “With such a high-tech sector and a skilled workforce, it would be a shame to not be able to exploit that. A lot of these things in the C4ISR space are not hardcore defence things. These are things we are seeing in modern technology like cloud computing and cloud-at-the-edge network architecture.”

Consequently, the project team is deliberately avoiding prescriptive preliminary requirements, preferring to pull ideas from industry where it can to influence its eventual statement of requirements.

“If we are too specific on requirements in 2021, by the time we field these systems six years down the road, we’re going to field yesterday’s technology tomorrow,” said McMullen. “At the end of the day, this is still Army tactical C4ISR, so we have to make sure whatever we deliver is conducive to the Army way of fighting in dispersed operations. But more and more of these capabilities are also commercial and dual use technologies, so we need to get the word out to small and medium enterprises through the RFI process.”

Where possible, the project team will facilitate partnerships with its traditional contractors, he added.

MANAGING RISK

In his overarching direction for C4ISR-related projects, the then Army commander Lieutenant-General Wayne Eyre emphasized interoperability at the outset of projects and operational simplicity as a guiding principle. “We don’t want to have to have a PhD to turn on a radio. That user interface has to

be simple,” he said in a recent interview.

McMullen, a signals officer, has taken that guidance to heart. Beyond the high-level mandatory requirements (HLMRs) of each project, he’s advocated for programmatic or “architectural level” HLMRs to ensure that collectively they align and meet essential operational requirements, and can deliver a capability able to plug into the CAF C4I backbone.

“From a systems perspective you are making sure the capability is not only interoperable, but is together with others able to provide the higher-level requirement needed by the war fighter,” he explained. “Right now, that’s the challenge. Each of these projects is treated independently and is a bit siloed off. It’s up to a best-effort approach from the people running them to ensure they have a systems view and manage the interdependencies.”

He is keenly aware of the risks associated with buying any software-loaded technology today to be fielded in 2027-28 that must also interoperate with legacy systems. Had the Army invested in cellphones more than a decade ago, it likely would have acquired shiny BlackBerries rather than risked a stake in iPhones, he observed.

The goal of the C4I program is to prepare the terrain now for that “seamless” mix of systems. But it must also answer questions about de-risking the tensions between acquisition speed and rigour. The Land C4ISR project, in particular, has been a vocal proponent within the Army and National Defence for a more agile way of procuring technology. Changing how project budgets are allocated and adopting an iterative acquisition process that introduces technology as it evolves could reduce some of the typical peaks and valleys that frustrate the Army and industry today.

“I think we need to get into more of a service approach, where we think about C4ISR not as equipment but as a service being provided,” said McMullen. “That cyclical approach to acquisition is compelling and everybody gets it. The challenge we have is to keep harping on that message.”

Introducing more tests and trials of emerging capabilities before requirements are even written could mitigate some of that risk, he noted.

“The biggest outcome for these capabilities is operational quality, making sure soldiers get the right equipment to maintain that edge. There is always a tension between operational risk and development risk. Within the Army, we probably need to do a better job explaining that.” ■

SECRET SHELTERS

Modernizing joint deployable intelligence facilities

By Richard Bray

Major Gaétan Noël is a soldier with many secrets. The procurement project he manages, Combined Joint Intelligence Modernization (CJIM), is creating the deployable facilities where top secret information will be received, discussed, analyzed, processed, and above all, remain secret.

The main CJIM deliverables are Temporary Sensitive Compartmented Information Facilities (TSCIF). From the outside, a TSCIF will look like any other standard ISO 20-foot container. But the resemblance to the common 'sea can' ends there. The Canadian Armed Forces (CAF) TSCIF will contain the advanced computing and communications electronics to take in data from a range of sources, process and analyze it, and allow the operators to give commanders the latest actionable intelligence.

"This is where our analysts, commanders and leaders can go to process, store and discuss top secret material," explained Noël. "The Canadian Forces has long needed temporary facilities that can be deployed quickly. They need to protect from adversaries who may want to eavesdrop by taking advantage of sound leakage or electromagnetic emissions."

"This is going to be a huge step forward for the armed forces," he said. "Every time we deployed in the past, we pretty much had to rebuild top secret networks and secure facilities from scratch, using the skills and expertise of our people, and the capabilities that came to hand. We have developed assets that do the work of TSCIFs in the field on recent and continuing deployments, including Romania, Latvia, Iraq, Kuwait, and Africa, doing the intelligence analysis to support operations."

Today, when every soldier is a sensor and data flows in an unceasing stream, the new capability will be a valuable asset to commanders in the field and to decision makers at every level of headquarters, expanding data fusion and leveraging future artificial intelligence applications.

"In the past, of course, we did Intelligence fusion, but without the necessary tools. We had skilled people who had to do their best. Now we have software that can integrate information from multiple sources and deliver options based on that analysis to commanders," he said.

The CJIM project has three elements. The first is the physical transportable container-based TSCIF. The second is an array of electronics and computing power that will be installed inside those containers. The third is the storage and training component, which has some unique aspects.

"The warehouse where they are kept, and everything else associated with the storage of the units, and the training facilities for personnel to operate them, all need to be hardened as much as the TSCIFs themselves against

eavesdropping and intrusion," explained Noël. That means there will need to be some new or heavily modified buildings, probably close to existing military installations.

Being a joint CAF project, the users include the Army, Navy and Air Force, as well as some other government departments and agencies. "Because these are multi-user assets, they need to be quickly configurable to many different configurations," he noted.

Many military and security personnel are familiar with fixed SCIF environments, but the TSCIF will have some unique features. "The big difference with these units will be the fact that when deployed, they may have limited bandwidth or no bandwidth at all. Meanwhile, of course, the users and operators inside the facility need to be able to continue working. We're doing some pretty advanced planning against that challenge and in three years we expect to have a functioning prototype system."

The shelters must also have shielding to provide a high level of acoustic attenuation and emissions security.

CJIM is the only project being delivered at the Top Secret (TS) classification level for the Army's Land C4ISR portfolio of projects. CJIM will work at the brigade, joint task force, and division level on a modernized network.

"Because intelligence fusion is always done at the TS level, we prefer to keep TS analyses with entities that possess enough capacity to accomplish intelligence fusion. That is why we say that this capability is with these higher entities, brigade and division, for the security aspect and size requirements," Noël explained.

The defence policy, *Strong, Secure, Engaged*, mentions CJIM as part of two initiatives: the modernization of "land-based command and control, intelligence, surveillance and reconnaissance systems," and the integration of "existing and future assets into a networked, joint system-of-systems that will enable the flow of information among multiple, interconnected platforms and operational headquarters." The project is in the options analysis phase of the procurement process and is expected to enter the definition phase in 2023. Delivery would begin in 2025 and conclude by 2030. CJIM carries an estimated cost of between \$100 million and \$249 million.

Noël plans to send a request for information to industry soon to gauge company interest and gather input on how to structure the procurement. "We are able to buy off the shelf for this project. There is a competitive field of vendors both here in Canada and from abroad," he said. ■



The CJIM project will deliver a TSCIF, a top secret container-based ops shelter, to be transported by a MSVS-SMP. Photos: DND



Unleashing Culture

Getting (un)comfortable with digital transformation

By Mike Nelson

We thrive in chaos – or at least we did, when we were young and facing unprecedented challenges when deployed early in our careers. Then we moved to Ottawa, and it was not long until we realized the days of getting our boots dusty in far-away places were over as we oriented ourselves to the machine that is the Department of National Defence. We came in green, full of life, and ready to bless National Defence Headquarters (NDHQ) with all the wisdom of our operational experiences. We believed we could have an impact, drive change, and make things better for those who followed in our footsteps.

in the pan-domain reality. Further, digital transformation is not a product of technological innovation or novel organizational practices. Instead, it is the diligent pursuit of adaptation and agility in the face of evolving circumstances. It is an organizational culture.

While many acknowledge the need for change, the required actions needed to facilitate it are not always readily apparent, and the willingness to take action – or tolerate risk – is even less so.

In successful businesses the decision-making structure tends to be largely decentralized, characterizing a culture imbued with mutual trust



Then came the gut punch: the realization that our new reality would not foster our motivation, initiative, or confidence, and that what we set out to accomplish during this phase of our careers might have been a pipe dream.

This may hurt to read, and you may not agree, but it is the reality for many. However, it is not inevitable. Given the imperative for digital transformation, there may be no better opportunity to revitalize Ottawa, give NDHQ life, and – just as importantly – give our uniformed personnel purpose.

Digital transformation is not so much a competitive advantage as it is a necessity for the Canadian Armed Forces, and the Canadian Army more specifically, to remain relevant among our peers, whether friends or foes,

among leaders and staff, and the ability for decision makers at the edge to do what they are intended to: make decisions and take action. The success of a decentralized decision-making structure depends on the shared understanding of a common vision or intent, mission and strategy.

Enabling staff to make decisions at the edges allows actions to be taken faster and more accurately, given that staff may have situational awareness that does not exist at higher levels. Alignment of tactical decisions with strategic intent encourages the adaptability and agility necessary for the organizational culture of digital transformation to not just take root and survive, but to thrive in an ultra-competitive environment.

This culture closely reflects the command-and-control concept of Mission Command. A common thread conceptually unites the business world and the military: in both cases, teams of individuals are working together, often under immense pressure, to achieve a desired end state. In Mission Command, authority for specific decisions is delegated and distributed to reduce centralized control and achieve an extant capability to continue operations. This is a necessity in a variety of operational contexts. Small teams distributed over large geographical areas require increased decision-action autonomy from traditional hierarchical chains of command. In these situations, tactical actions can have strategic consequences. We train for this reality.

The business world has demonstrated that Mission Command can be successful in enabling digital transformation, even in large complex organizations. In Ottawa, however, few would claim that they feel enabled or empowered in a way that reflects Mission Command, especially regarding financial authorities and procurement. This must change if digital transformation is to be successful and we are to remain relevant. Although leaders tend to desire control over the decisions made in their organizations, to keep pace with our allies and stay ahead of adversaries in the digital age, the Canadian Army will have to exercise Mission Command at a corporate level, push control to lower levels and enable these lower levels to be successful so that organizational leaders can focus on leading change, rather than be obstacles to it.

Change Leadership

This command-led digital culture change implies that leaders must lead from the front, take risks, create safe space for subordinates to take risk, and demonstrate that their calls for change are not merely political, but are a shared duty in our service to Canada and its people. Culture change will not be achieved solely by mandates or policies, or through leadership's vision for change. It should also be noted that while command-led leadership may demand compliance, it can't dictate optimism, trust, conviction, or creativity.

Culture lives in the hearts and minds of people, and is realized through their actions and their shared perception of how things are done. Changing corporate culture requires a movement, and movements are driven by emotion. Leadership must therefore harness the diffuse dissatisfaction with the status quo and demonstrate the feasibility of digital transformation and the value it delivers.

Change will result in friction within traditional defence culture. Although a modest amount of friction is positive, because resistance often indicates where the culture needs to evolve, too much friction will bring an operation grinding to a halt. Resistance to change is often attributed to the human condition, but this does not tell the full story. Defence culture is institutionalized in organizational structures, bureaucracy, administration, and processes. The institution is not built to facilitate change. It is built to maintain the status quo. Military staff embody this reality, but have little influence over it.

Leadership must therefore demonstrate that the institutional change of digital transformation is truly feasible and in the workers' interests, and that individuals or small groups can have an impact, drive change, and make things better for those who follow in their footsteps.

This begins by defining not just a vision, but a path forward that is within the power of staff to influence and achieve tangible outcomes. For this to occur – and without digging too deeply into change management theory – leadership must invest in creating a sustained sense of urgency. The resulting pressure should instill a deep desire, and even responsibility, to change that

comes from a shared sense of purpose conjuring individual emotion and inciting collective action.

To achieve buy-in from the unformed community, this urgency must not be focused on the business of defence, but rather the motivation that is rooted in protecting the soldiers that fight with or for us, while enabling them to achieve mission success. Momentum can be achieved through various mutually supportive actions, including removing obstacles to digital transformation and empowering teams of passionate enthusiasts to deliver a series of small wins that can be built upon or scaled before anchoring that change into organizational culture.

Fostering a Canadian Army digital culture is about leadership opening doors and creating space to unleash a culture that already exists, but is constrained by the organizational structures and bureaucracy of defence as an institution. Digital transformation demands Mission Command, and in order for decision-makers at all levels to take action, leadership must themselves be fully involved in each phase of the change process, from creating a sense of urgency to removing obstacles, creating short-term wins, and anchoring those changes in the culture of defence. ■



A member of 2 CMBG on an exercise in November 2020.
Photo: Pte Sarah Morley



Mike Nelson is the founder of CINTIQS, a Canadian military technology accelerator focused on helping dual-use emerging technology companies commercialize innovative capabilities for the Canadian Armed Forces. They also work closely with the CAF to enable digital transformation via the vast opportunities available to them from across the Canadian high-technology ecosystem. He served for 12 years and has operational experience with both the conventional and Special Operations Forces.

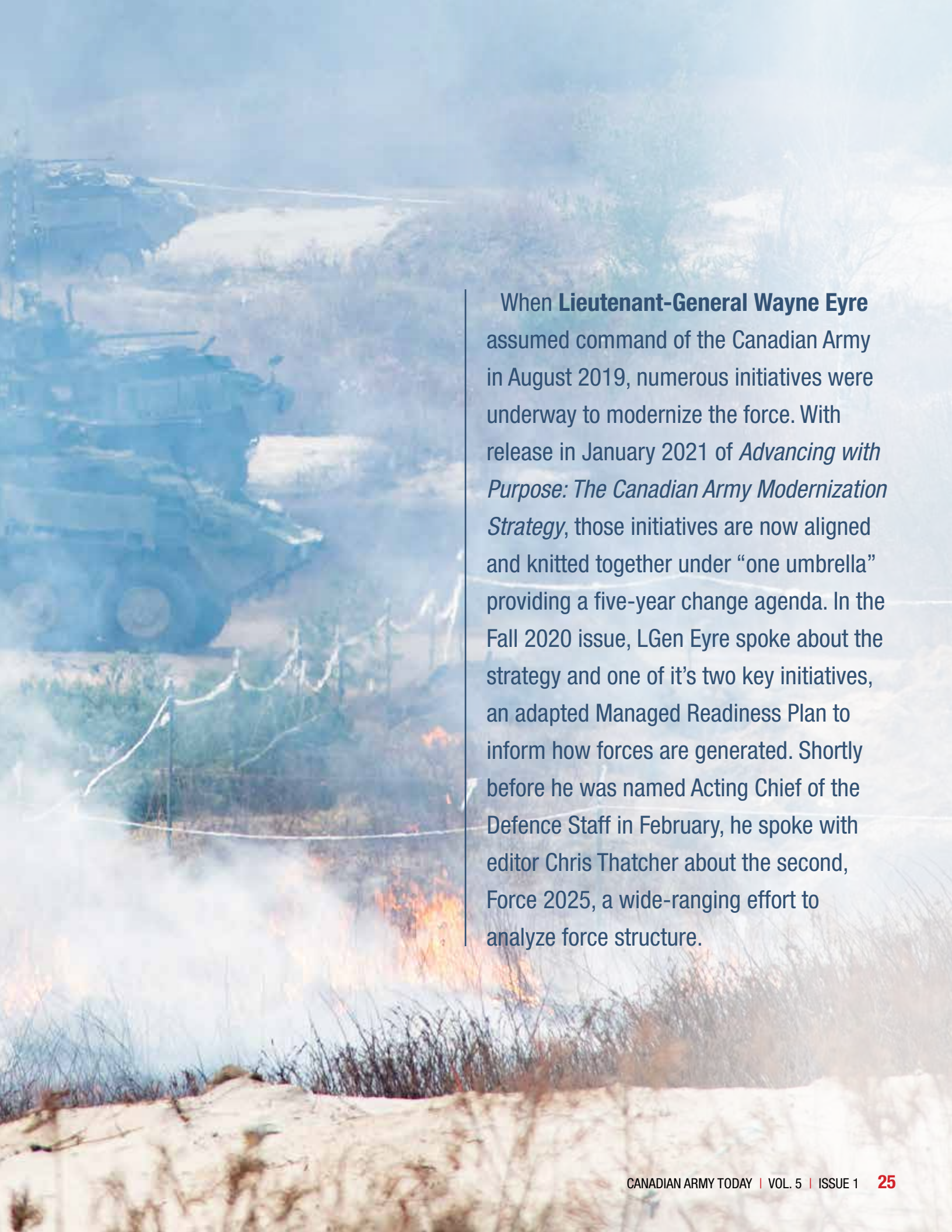


FORCE 2025

Informing the Army's future structure

By Chris Thatcher

Soldiers from 2 CMBG participate in a brigade-level training exercise at Garrison Petawawa in November 2020. Photo: Pte Sarah Morley



When **Lieutenant-General Wayne Eyre** assumed command of the Canadian Army in August 2019, numerous initiatives were underway to modernize the force. With release in January 2021 of *Advancing with Purpose: The Canadian Army Modernization Strategy*, those initiatives are now aligned and knitted together under “one umbrella” providing a five-year change agenda. In the Fall 2020 issue, LGen Eyre spoke about the strategy and one of its two key initiatives, an adapted Managed Readiness Plan to inform how forces are generated. Shortly before he was named Acting Chief of the Defence Staff in February, he spoke with editor Chris Thatcher about the second, Force 2025, a wide-ranging effort to analyze force structure.



A Reservist with the British Columbia Dragoons during Ex Gunner Duke in March 2021. Photo: Cpl Djalma Vuong-De Ramos

In your preface to the strategy, you describe the current operating context and suggest that the Army we have is not the Army we need. What do you need? What is changing today that has you concerned about tomorrow?

We need to take a look at the evolution of how land power is being employed and predicted into the future. Land power continues to be extremely relevant because that's where our population is, and wars are lost and won in and amongst the population. That's not to say the other domains aren't relevant. In fact, you could argue that the information domain has almost become the central domain to operations. But land power and its actions create effects in that information domain, more so than other domains, because of that physical and psychological presence. Part of that could be related to deterrence; some theories suggest physical presence is the best form of deterrence. You could argue that NATO during the Cold War provided just that. And we see that with the enhanced forward presence in Latvia today. It also speaks to skin in the game. If you're going to put your boots on the ground, it means you are committed to the operation at hand.

How has land power changed? We've had a close look at the recent conflict in Nagorno-Karabakh, which provides some interesting lessons on the use of land power. You've seen the introduction of some new capabilities like loitering munitions and capabilities used in unique combinations – air defence, electronic warfare, long-range precision strike. It comes down to the concept of combined arms integration, a concept that Napoleon used with his Grande Armée and has continued to evolve over centuries – the mixing of complementary capabilities to present that dilemma to the enemy. I see that as one of our core strengths, the ability to integrate these various capabilities. What we're going to see in the Army, and you'll see in this modernization strategy, is our vital ground for training has moved from the combat team, that traditional tank-infantry cooperation that hasn't changed since the end of the Second World War, to more of a combined arms team, where we expect that subunit command and control (C2) node to be able to integrate various different arms to create that effect. One of our strengths is being able to task tailor and scale our forces for whatever the mission is at hand. And ensuring that all of our subunit C2 nodes can do that is important to give us that flexibility.

Does what you've seen in Nagorno-Karabakh and elsewhere suggest greater investment and possible expansion of the capabilities nested in the Canadian Combat Service Brigade (CCSB)? Do you have enough of their capacity and capability to meet your needs?

There are a few capabilities that we have to redouble our efforts on. Ground-based air defence is one. This just emphasized, again, how important investing in that capability is. Our electronic warfare capability is hugely important. Long-range precision fires — we're not quite there yet, but we planted the seed in the modernization strategy. It's an area I firmly believe we need to invest in, and maybe not just ground strike; maybe we need an anti-ship capability as well to give us more flexibility.

The other thing we've learned from these land operations is dispersion is becoming more and more important. The traditional concentration of units, the massing together, is no longer viable on the current battlefield. Our Adaptive Dispersed Operations (ADO) concept, where we have small groups of highly networked troops, is more and more relevant. If you're together, you become a target. We saw that in Ukraine in 2015, where a couple of Ukrainian battalions were wiped out through MLRS (multiple launch rocket system) strikes. A subset of that, which is going to be the subject of a lot of work, is counter-UAS (unmanned aerial system) capability.

The other thing that's changing in land operations is a downward proliferation in combined arms of joint capabilities. Our junior commanders are now expected to be able to use more tools than was previously the case. When I went through infantry officer phase training, and when I was a platoon commander, I didn't have a lot of other tools from outside that I needed to employ. Nowadays, whether it is indirect fires, joint fires, joint terminal attack controllers, engineers, having non-government organizations or other capabilities attached to your platoon, or even working in tandem with a host nation force, lower and lower level commanders are expected to be able to integrate those. And that integration is increasing our training requirements.



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A student on a Joint Terminal Attack Controller course participates in live fire training in Romania in 2019.
Photo: S1 Erica Seymour

Although you are confronting more varied threats, the strategy makes pretty clear that over the next number of years you will probably see little if any growth in budgets, resources and personnel. What's the trade off here? What are you going to have to start to think about in terms of where you put your priorities?

With Force 2025, what we're doing right now is assembling that demand signal. What are all the demands that are out there, in terms of new capabilities, in terms of our training system, in terms of the different types of tasks and institutional support – making sure our bases are able to support everything that's needed. It all comes down to how we slice the pie. If the pie isn't going to grow, we have to rebalance how it is being sliced.

An exercise we're going through as part of this is to look at the demand side, the supply side, and then what are the hard decisions in terms of trade offs. We're not there yet. I haven't put a lot of constraints on our director of Land Force Development and the planning effort, and that has freed up the imagination in the field force. That said, we are prisoners of geography, of culture, of existing infrastructure. So, our arcs of manoeuvre are somewhat limited. I don't see shutting down units per se; I do see perhaps rerolling of units, perhaps changing the size of some of the force elements within units.

Recognizing that it's early in the process, do you have particular areas of focus where you might start to look at structural changes?

Do we have the size of our force elements right? Is the company, is the squadron, is the battery design that we have now, is it fit for purpose for some of the new capabilities we're bringing in, and the new way of operating? That's why the operating concept, *Close Engagement*, has to go hand-in-hand with the structural concept. How do we do combat team attacks? How do we do company group attacks in an adaptive dispersed environment? That thinking needs to inform Force 2025 as well.

We need to take a look at the demand signal for some of our capabilities. CIMIC (Civil-Military Co-operation), for example, has a high demand both internationally and domestically. Do we have the force generation for that right? And it is going to be increasingly important that we invest in our Reserve mission tasks.

You've noted that Operations Reassurance and Unifier are serving as laboratories for multinational interoperability and countering disinformation and hybrid activities: How is that informing the structural decisions and investments for Force 2025?

One of the things I have challenged our leaders to do on these missions, and we are about to formalize it with something called the Operational Writing Program: You are learning lots of lessons over there, your duty as a professional is to contribute to the body of professional knowledge by putting pen to paper and capturing those. What has worked in the information space over there? I know in Latvia they were doing some excellent work with the embassy to inoculate the local population from adversarial propaganda.

As we continue to develop our CCSB capabilities like small unmanned aerial systems, electronic warfare, and our medium range radar, can we put them over there for one tour, see how they work out? How do we best employ it? What lessons have we earned?

You're attempting some potentially significant transformational changes while simultaneously generating forces and conducting operations. Is there a risk of these objectives interfering with each other?

We're going to have to continue to deploy for operations. But perhaps at some point we need to moderate the force employment demand signal to give us time to make these wider changes. Our priorities are going to be governed by our annual operating plan. We can't prosecute all of the initiatives in the modernization strategy simultaneously, we just don't have that change capacity. So, it's ruthless prioritization. We're working on some now like Force 2025. I issued commander's planning guidance for the Ranger enhancement program just over a month ago. Those are two higher priority ones.

We are putting together a tracking mechanism, almost like a project management piece, where we can track the various states of the different initiatives. I get briefed monthly and what interests the commander fascinates everyone else. The challenge with many strategies is, you put them out and they become fire and forget. They have big lofty terms, but not the nuts and bolts, assigning responsibility to different aspects. And that's what I tried to communicate in the foreword – it's a combination of a strategy and an action plan.



Members of the battle group in Latvia hone dismounted capabilities on Ex Beast Raider in December 2020 while observing COVID mitigation measures, including training bubbles.
Photo: EFP-Latvia Imagery Technician

This is predicated on some principles, themes that cut across all of the initiatives. Expand on those.

One is digital transformation. It's not just the digitization of our data. It's having a mindset where we change our business processes. If we just digitize our data and have the same forms, the same processes as we have had since the 1950s, we're missing the boat here. We have to think of new ways to get after our business with this new technology. That has to be embedded throughout.

The One Army concept of Regular Force, Army Reserve, Rangers, civilians all working together on one team, with balanced components to produce a capability is important. One of the structural changes that has potential is integrated units, part Regular and part Reserve Force. 21 Electronic Warfare Regiment is a case in point where that seems to be working. Can we do that with more of our units? Do we increase the full-time component in some of our Reserve units to make sure mission tasks are viable? As we take a look at our Rangers, have we got the staffing of Regular and Reserve correct? And across the entire force, do we have the right civilian support in place?

We absolutely have to be interoperable. In fact, a high-level mandatory requirement for any project going forward is going to be interoperability – it has to be baked in from the get-go. Joint interoperability as well, the ability to plug into the larger C4I spine. At the same time, another principle I'm insisting on is simplicity. We don't want to have to have a PhD to turn on a radio. That user interface has to be simple. Another is being ADO-ready, ready to plug into that adaptive dispersed operations construct. And one that's gaining importance in my view is versatility: capabilities that are relevant across the widest spectrum of missions and tasks and geographic locations as possible.

The strategy flags sustainment as a risk area. You write that “recent operations and exercises have exposed significant Combat Service Support (CSS) challenges at all levels, and especially for concurrent or large-scale operations.” What is your concern?

Whatever capital projects we have, we have to make sure in-service support is built in and not as an afterthought. As we saw with Operation Laser as we activated territorial battalion groups, they were very limited in their operational reach based on their integral combat service support. We need to beef up the Reserve domestic responsibility with CSS companies, whether it is transport, maintenance, food services, to make that more robust. One of the perennial

observations of Exercise Maple Resolve is our lack of long-haul trucking capacity. That really drives how far we can project a force, especially if you are looking at moving food, fuel, ammunition and all of those commodities that sustain a force. That may become a Reserve mission task, a trucking company.

We also need more maintenance capacity so that we are increasing both the production and the availability of spare parts. In some cases, we haven't properly scaled our spare part availability with some of the new capabilities we have brought in. The other part of sustainment is the supply chain, just increasing the visibility, the tracking of where things are. Part of this is based on our entire supply chain fragility; improving that is another one of our central priorities.

Allied armies, especially the ABCANZ (American, British, Canadian, Australian, New Zealand) armies, are going through similar exercises. Are you able to draw from their lessons learned?

We're closely connected from that perspective. The United States are the leaders in this, so we stay well plugged in through our liaison officer network, through staff talks, through combined exercises. They are all facing similar challenges in terms of how the security environment evolving and how land power fits into that, especially as we see the rise of some of the other domains and the necessity to make investments in those. We see the challenge of culture and society, and how do we keep that toxicity out of our ranks. We've got to harvest best practices where we can find them.

The strategy has now been widely distributed. What do you want soldiers to understand most from it?

That change is going to be a constant. The security environment is rapidly evolving, technological change is accelerating, and that means change has got to be part of our culture. So, new ways of doing business, having an open mind, being able to listen and identify weak signals that actually mean something that we have to change. Being innovative in our approaches and not being stuck to a dogmatic way of doing business – adopting the spirit of an entrepreneur. But at the same time, we have many lessons that have been earned in blood and it would be foolhardy of us to forget. We need to find that balance between continuity and change. ■

VACCINE LOGISTICS

Army planning expertise central to vaccine distribution



As part of Op Globe, the CAF airlifted humanitarian and medical supplies to Barbados and other locations with a CC-177 Globemaster. Photo: Cpl Jerome Lessard

By Ian Coutts

Canada's road to immunization has been a bumpy one, with delays in the initial procurement of vaccines and other distribution problems. In recent months, the immunization plan has been on a better track, with the vaccines – about a million doses a week – showing up where they are needed and the most vulnerable populations receiving priority protection in a timely fashion.

That the various vaccines are arriving in a timelier manner and in the quantities required is in no small part thanks to Major-General Dany Fortin and his team of about 50 Canadian Armed Forces (CAF) members, many drawn from the Canadian Army, who have been working with the Public Health Agency of Canada (PHAC) to ensure that, when those vaccines land in country, they end up where they can be injected into the arms of waiting Canadians.

The Army's involvement in this process is not surprising. At heart, the distribution of the various vaccines is a logistical problem of the kind that militaries excel at: something essential for an operation has to be sourced and moved from A to B according to some larger plan. This holds true whether it be ammunition for a combat deployment or shelters and building materials after a natural disaster.

That said, an outsider learning that the Army is involved in distributing vaccines might immediately imagine a hands-on approach: long lines of military trucks trundling along highways or soldiers stacking boxes filled with medicine. In the early days of the pandemic, the CAF was involved in this direct



MGen Dany Fortin

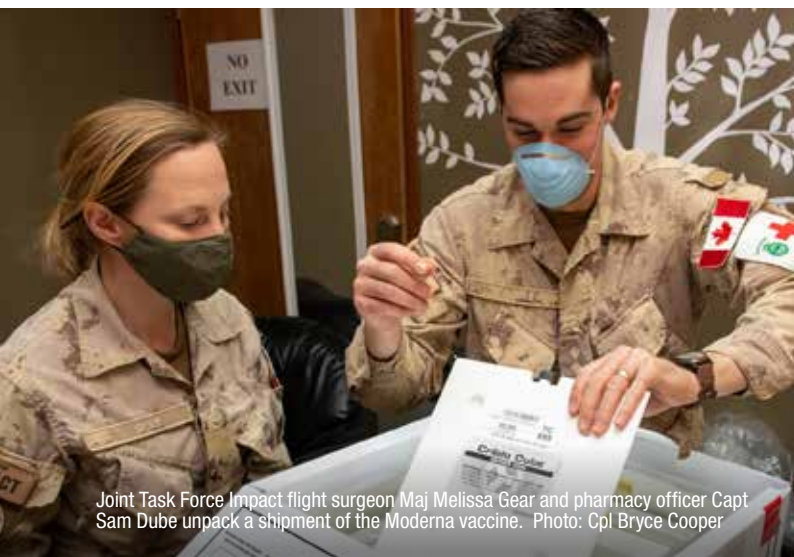
fashion during Operation Globe, which brought home Canadians stranded overseas at the beginning of the pandemic, and Operation Laser, where Reservists were employed to support staff in long-term care homes in Ontario and Quebec. More recently, Canadian Rangers have assisted with the delivery of vaccines in northern Ontario and Manitoba, and CAF members have been active in other isolated parts of Canada.

That's not the case here. As Fortin points out: "We have trucks and personnel that can complement any [delivery] effort, but we are not optimized for that kind of delivery." Handling and transporting medicines and vaccines is a highly specialized role, and there are already companies that do it on a regular basis.

"The best way to develop a complex logistics chain in Canada," pretty much the definition of what has been needed to distribute the COVID-19 vaccines, "is to leverage what industry has to offer," he said. "There are companies that have experience with pharmaceuticals, that can bring the product into the country, handle it with the proper equipment, freezers and so on, and then distribute it through reliable transporters, who have experience with shipping pharmaceutical products."

What Fortin and his team – and he is careful always to emphasize that their work is a team effort – brought to PHAC when he was appointed Vice President Logistics and Operations in the fall, was their experience planning intricate operations and what might be called a "logistical" way of approaching problems. As Shannon Proudfoot put it in *Maclean's* magazine recently, it's





Joint Task Force Impact flight surgeon Maj Melissa Gear and pharmacy officer Capt Sam Dube unpack a shipment of the Moderna vaccine. Photo: Cpl Bryce Cooper



Medical technician Pte Luis Penagos receives his first COVID-19 vaccination at Garrison Petawawa. Photo: Avr Lanny Jellicoe



The first CAF Moderna vaccine shipment arrives at Garrison Petawawa under police escort. Photo: MCpl Geneviève Lapointe

an approach that says, "Problems aren't an unwelcome hiccup in the plans, they are the plans."

"When we started, we identified the need for logistics planners," said Fortin. "We have a senior logistics officer, a colonel, and a handful of planners working with him."

A key problem, that word again, was the challenge of moving goods that had to be kept frozen: in the case of the Pfizer vaccine, at an ultra-low temperature of -70 Celsius. "One planner spent long days for the last five months on all things freezers – dry ice, freezer boxes, and so on."

The first CAF personnel began showing up at PHAC in the summer of 2020, with Fortin himself joining in November. The 50 or so members serving with him now are an eclectic mix. "There's different trades: logistics, communications, combat arms, some generic planners and occupational people."

Fortin himself does not have a logistics background. A gunner by training, "the majority of my career was spent in operational units," he said. He has served as a deputy commander of I Corps on exchange with the United States Army, the commander of the NATO training and capacity-building mission in Iraq, and currently as commander of 1st Canadian Division Headquarters in Kingston, Ont. As he noted, "I have experience working with complex problems," both in the Army and during a stint in the Privy Council Office.

CONTINGENCY PLANNING

"In the last few weeks," Fortin explained in late March, "we have really established a distribution system."

It's a complex supply chain. "Our main logistics supplier is Fedex-Innomar," a joint venture run by the courier company and Innomar, a firm specializing in delivering pharmaceutical goods. "They work hand-in-hand to deliver proper storage and handling."

Pfizer, with their particular refrigeration needs, however, use Purolator. They prefer to deliver directly to where the vaccine is being given out, while Fedex-Innomar and their partners have adopted a more hybrid approach, delivering to both central hubs and points of use. Administering the drug is a provincial responsibility, and each province has its own preference regarding delivery. But they need to know when to expect deliveries. Each week, Fortin and his team oversee millions of doses headed for hundreds of destinations, making sure they reach them in a timely fashion.

The CAF contingent will likely remain in place until early fall. "I think we should plan on providing support to the agency that will continue beyond our tenure here," Fortin said. "We have to plan for multi-year vaccinations. The military approach is to plan for all sorts of contingencies, so my focus is that there will be another pandemic and there will be another multi-year vaccination campaign of some sort. It may not require as much support from the different agencies and government departments and the CAF. I hope I'm wrong, but we need to have some sort of core capability here."

What has he learned from his experience? "A couple of things. Myself and my colleagues here will have an appreciation of inter-agency work. You get a very different perspective working with an agency outside the CAF. Very different."

"The other thing I think it will give the team members is a sense of how decisions are made in government and the interactions between the agency and other departments, but also way up to the highest level and back down. We've all learned a lot and I hope to be able to return to the Army and teach people how to engage in inter-agency work or support a large operation like this one." ■



2 Field Ambulance and 1 Royal Canadian Horse Artillery in front of a CC-130 Hercules at a staging hub in Thompson, Man. Photo: S3 Megan Sterritt



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COLLECTIVE EFFORT

TO RESUME COLLECTIVE TRAINING, 3RD CANADIAN DIVISION MODIFIED MANY KEY EXERCISES, INCLUDING MAPLE RESOLVE



Sgt David Valentine (left) and Cpl Zach Cushing of 2 PPCLI during joint training with 408 Tactical Helicopter Squadron on Ex Frigid Kapyong at CFB Shilo in January 2021.
Photo: MCpl HJL MacRae

By Chris Thatcher

“Odd. I don’t know a better term to describe it.” Brigadier-General Bill Fletcher had just returned to Edmonton in August 2020 after a two-year posting as the Deputy Commanding General – Operations with XVIII Airborne Corps of the U.S. Army at Fort Bragg, North Carolina.

The position had been a rewarding and career-building experience, but he was back in Canada, energized and keen to get started with the “ideas built up in my head about the training we were going to do.” Now, the new commander of 3rd Canadian Division faced a road to high readiness severely disrupted by a global pandemic. “Nothing was foreign, nothing was broken, but it wasn’t where I expected it. It just felt odd.”

Regular and Reserve Force individual training had resumed across the Division after a four-month pause, but it was clear collective exercises would need to be rethought to continue protecting soldiers and their families, while still achieving the training objectives necessary to confirm the Division’s various units ready as a contingency force for global deployment on July 1.

“There is always tension at the best of times between personnel tempo and what we are trying to achieve, and it was just exacerbated by COVID,” explained Fletcher, an infantry officer who previously commanded 1st Battalion, Princess Patricia’s Canadian Light Infantry and 1 Canadian Mechanized Brigade Group (1 CMBG), both based in Edmonton.

“Everything just took longer. We had to rationalize what was essential and what we could

reasonably take a pass on, understanding that we are accepting some risk in terms of our normal road to high readiness, and make some deliberate and ruthless decisions as opposed to stumbling into it on a month-by-month basis.”

The first challenge was cultural, he said, foregoing the Army’s normal tendency to seek the greatest solution possible with the resources at its disposal. “In this instance, we had to ask ourselves, what’s good enough.”

The Division adopted an incremental approach, conducting collective exercises first in small groups and then maintaining those cohorts as much as possible even as exercises increased in size and complexity. With each training event, the Division gained confidence in integrated larger groups. By the late fall, there were as many as 600 soldiers in the field at one time, though still relatively segregated.

“We broke it down into platoon/troop, company/squadron level manoeuvre, and the highest we went was that company/squadron,” said Fletcher. “The battalion-level command and control architecture was really there to orchestrate the exercises and sustain them, as opposed to being the focus of the exercises themselves. I am very proud that we made it up to [that level of] exercise with very few instances of COVID. And because of the mitigation measures, none of those cases escaped the woods of Wainwright.”

In mitigating against the spread of the coronavirus, however, the Division and brigade had to pare back the length of some exercises to

achieve “only the benchmarks that we absolutely need to achieve in terms of generating the collective readiness required,” he acknowledged. Ironically, the overall time on the exercise was often extended by as much as a month to accommodate quarantine periods, which meant isolating at home or in a cohort.

The Division was able to draw on lessons and best practices from across the Army, in particular 2nd Canadian Division which, under a revised Managed Readiness Plan, is also on a readiness training program and working through similar challenges.

Integrating Reserve units into the Regular Force, often a key feature of late summer and early fall collective training, was cut back to limit travel and contact with those also holding down civilian jobs. Instead, Reserve units primarily focused on individual training in the armouries and local field exercises.

“Our Reserve collective training took a fairly big hit,” said Fletcher. “We did achieve some Reserve integration but it was really on the level of individual augmentation as opposed to bringing in a formed body or significant elements.”

How that impacts the ongoing development of Reserve mission tasks remains to be seen, though he suggested some of the lost time could be made up this summer and fall after the Division assumes the role of the Army’s contingency force and begins more theatre-specific training for NATO missions. “We took an operational pause from growing the capability beyond where it is now. We didn’t lose a

tonne of ground, but we certainly didn't make up any ground from the mission task perspective."

Despite some of the setbacks, Fletcher was particularly impressed with how rapidly units adopted virtual communication and distributed learning. "We took a lot of our cues, frankly, from what Sergeants and Master Corporals were doing leveraging technology to keep in touch with their people, look out for their welfare, and deliver low-level training."

If distributed learning networks were viewed as a strategic-level asset before the pandemic, soldiers quickly adapted and brought them down to the tactical. Fletcher described watching a young sergeant at an armoury in Calgary instruct a section on Zoom in map and compass skills. "It was phenomenal to me because it was something that never would have entered my head to leverage the technology like that. Yet folks were doing that all the time. I would say we have come light years. We've learned a bunch of lessons that even in a post-pandemic world we will still leverage."

Regular and Reserve units, for example, could conduct the rehearsals and "initial marry-up drills" that introduce standard operating procedures and ways of doing business at company and battalion level in advance of any live exercise. "We could get right into the meat of our training without having to spend time doing orientation type stuff."

As the Division rolls into the last of its marquee training events, Exercise Maple Resolve in May, it's preparing for between 2,000 and 3,000 soldiers in the field, albeit under modified circumstances. The exercise normally serves as the culminating event for the brigade, validating the competency of its headquarters and subunits for operations.

This year, the headquarters achieved its confirmation in a computer-assisted exercise, Unified Resolve, in February. Maple Resolve will shift focus to 1st and 2nd PPCLI as the primary training audience, "the two battle groups that we require for those high readiness tasks, the NATO response component in particular," said Fletcher. "The brigade will be there to oversee

things in the field, but it will be a minimal footprint. They won't be tactically exercised."

While the Lord Strathcona's Horse (Royal Canadians) will provide a robust opposing force to challenge the battle groups, many other elements will be on the margins. "Stuff we might have previously done, we've decided to down tools," he said, including 1 Service Battalion and any elements that do not "interface" with the battalions.

Unlike recent Maple Resolve exercises, the Army will also limit the validation of new capabilities. The exception will be the Canadian Combat Support Brigade (CCSB), which has recently introduced a new architecture to integrate division- and brigade-level enabling assets such as electronic warfare, intelligence, ISR and airspace coordination.

The revised structure allows CCSB elements to connect to the brigade or battle group through one point of contact, rather than bolting on each component separately. "You have a ready-made (CCSB) headquarters with all these pieces in it. We trialed it at Unified Resolve and it showed some significant promise, so we're going to validate it in the field. I'm pretty excited to see how that works."

While the Division's road to readiness has been anything but routine, Fletcher had high praise for how the units have responded to maintaining training events in the midst of a pandemic. "It's a testament to the leadership at the battalion level and below, the innovation they were able to leverage," he said.

More than anything, he wants to get out and see more of it in person. Like everyone else, COVID mitigation measures have restricted him to more virtual meetings than troop visits. "Our soldiers are doing fine – we have dug a bit of a hole in terms of our readiness, but nothing we can't dig our way out of with some planning and foresight. What we have really missed is that personal interaction, which is one of the key components of leadership. It's cathartic. That's the piece I really miss." ■



Reservists and Regular Force members of 14 Military Police Platoon, 12 Military Police Platoon and 1 Military Police Regiment conduct a C8 range in early March. Photo: Cpl Djalma Vuong-De Ramos

PANDEMIC ASSISTANCE

Third Canadian Division's Immediate Response Units and Territorial Battalion Groups are normally on short notice to move. But the past 12 months have seen both on a heightened readiness posture to support Operation Laser (pandemic assistance) and Operation Vector (vaccine distribution) across western Canada.

"I've got forces, Regular and Reserve on contract, ready to respond across the spectrum," said BGen Bill Fletcher, the division commander.

Since the late fall, members from the 2nd Battalion, Princess Patricia's Canadian Light Infantry (2 PPCLI) based in Shilo, Man., and members from the 1st and 4th Canadian Ranger Patrol Groups (CRPG), supported by medical personnel from 1 Health Services Group, have been responding to COVID outbreaks and provincial calls for assistance in remote northern communities.

"We have worked everything from support to long-term care homes, to chopping wood, distributing food, wellness checks in the community, assistance with contact tracing, and assistance with emergency management planning," he said. "Planning and execution, and setting up all the architecture to do that, is second nature to the Army."

Most deployments have been small, between four and 40 personnel, "but I think it has been tremendously appreciated when we show up," he added. "It has been very rewarding for our soldiers... because they get to see a result."

41 Canadian Brigade Group (CBG) in Alberta, 38 CBG in Manitoba and 39 CBG in British Columbia have assisted with COVID testing logistic support at border points, provided planning and contracting expertise to provincial organizations, and are positioned to support vaccine distribution in northern communities as required.

COVID ASSISTANCE SNAPSHOT

Nov 22-29: A multi-purpose medical assistance team supported the Rod McGillivray Memorial Care Home Opaskwayak Cree Nation in The Pas, Man., to help manage a COVID outbreak.

Dec 3-Feb 28: About 20 Rangers from the 4 CRPG were activated in the Hatchet Lake Denesuline First Nation to assist local officials with COVID relief efforts.



Members of 2 Field Ambulance and 1 Royal Canadian Horse Artillery at a staging hub in Thompson, Man., in March. Photo: S3 Megan Sterritt



Supporting a vaccination clinic in Nisichawayasihk Cree Nation, Man., in March. Photo: S3 Megan Sterritt

Dec 4-31: Six members of 4 CRPG were activated in the Shamattawa First Nation to assist local officials. On Dec 9, a liaison and reconnaissance team of 11 from 2 PPLCI flew in to help assess the situation with community and provincial partners. On Dec 12, about 40 members from 2 PPCLI and a multi-purpose medical assistance team of 17 from 1 Canadian Forces Health Services Group of nurses and medical technicians arrived to provide assistance.

Dec 14: A liaison and reconnaissance team from Shilo assessed the situation in Red Sucker Lake First Nation, Man., before a 34 person team, including medical personnel, was deployed on Dec 17.

Dec 8- Jan 15: 13 Rangers from the 4 CRPG assisted Fond-du-Lac Denesuline First Nation officials with COVID relief.

Jan 17-Feb 9: After eight personnel from Shilo and a Ranger helped assess the situation in Garden Hill First Nation, approximately 30 personnel were deployed on Jan 20 to work alongside members of the community and other government departments and agencies to provide humanitarian assistance and address emergent community needs.

Jan 30-Mar 1: Five Rangers were activated in Fort Nelson First Nation, B.C., to provide assistance with a COVID outbreak.

Feb 2-20: Eight members of 2 PPCLI supported a liaison and reconnaissance team to assess the situation in Pauingassi Anishnaabe First Nation. On Feb 6, 18 personnel arrived via CH-147 Chinook helicopter to provide COVID relief support.

Feb 19-Mar 1: Four members of 2 PPCLI joined a liaison and reconnaissance team to assess the COVID affected communities of Pimicikamak Cree Nation and the Incorporated Community of Cross Lake. On Feb 23, eight medical and 17 general duty staff from Petawawa, Ont., and Shilo arrived in the community via C-130 Hercules to provide COVID relief support.

Mar 7: A reconnaissance and liaison team from Shilo deployed to Mathias Colomb Cree Nation. After an assessment, a 41-person multi-purpose medical assistance team composed of medical staff from 2 Field Ambulance in Petawawa and general support staff from Shilo deployed to assist the community.

DISPERSED AND VIRTUAL

Adapted to pandemic protocols, Unified Resolve still provided valuable lessons

By Story by Chris Thatcher, Photos by MCpl Alexandre Paquin

As the Canadian Army's largest computer-assisted training event, Exercise Unified Resolve often requires a year of planning to construct the scenario, develop the injects, secure the network and coordinate the movement of troops and contracted support from across the country to deliver a complex challenge to a large training audience.

Lieutenant-Colonel Shane Gifford was just starting to get his head around the problem when the reality of trying to deliver it in the midst of a global pandemic set in.

The exercise director with the Canadian Manoeuvre Training Centre, this was going to be his third Ex Unified Resolve. It should have been relatively routine. COVID-19 ensured it was anything but.

Though mitigating the pandemic was a constant factor throughout the planning process, provincial and municipal health regulations kept changing in the months leading up to the exercise in early February. "It was always difficult to predict where things were going to head, so we had to adapt the exercise on

the fly," said Gifford.

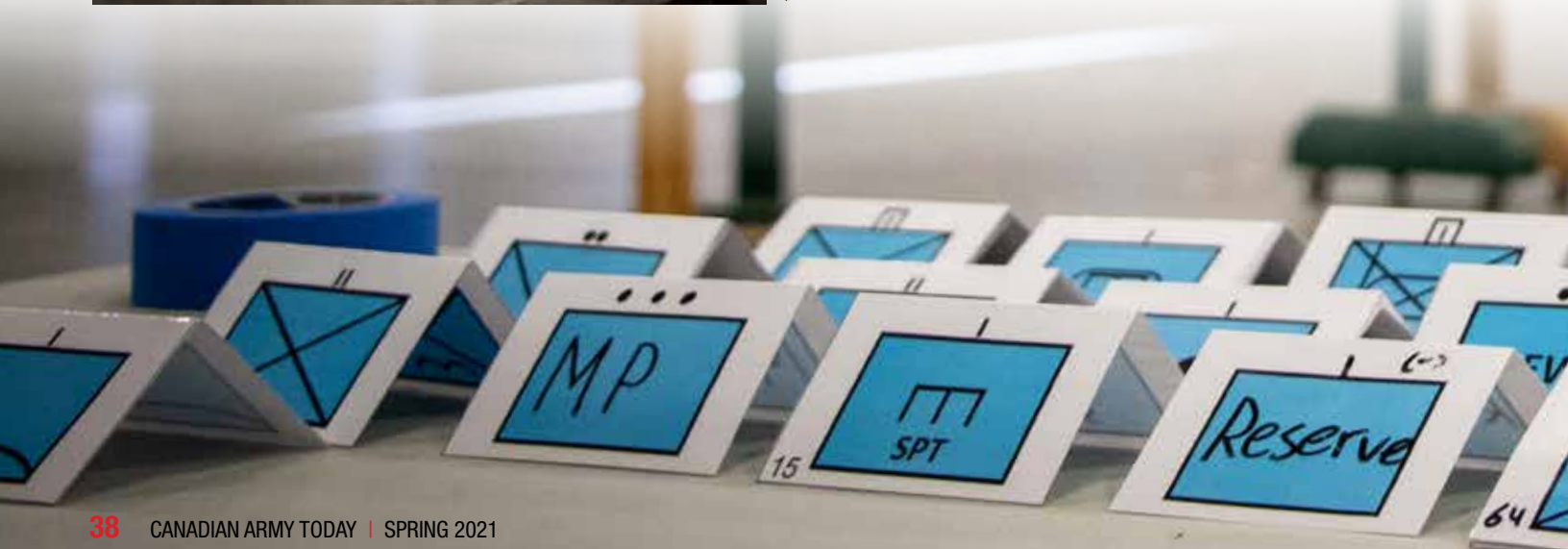
Though Unified Resolve (UR) has often incorporated units from dispersed locations, most of the training audience, supporting role players and exercise control are located in one location. In 2021, dispersion became the watchword. The primary training audience (PTA), 1 Canadian Mechanized Brigade Group (CMBG) headquarters and some of its subunit headquarters, remained in Edmonton, Alta., while the higher control headquarters, played by 1st Canadian Division, participated from Kingston, Ont., and the flanking brigades, role-played by members from 5 CMBG in Valcartier, Que., and 2 CMBG in Petawawa, Ont., connected from their home bases.

The Canadian Army Simulation Centre, which normally orchestrates the exercise from a facility adjacent to the PTA, remained in Kingston. And a unit from the Canadian Combat Support Brigade traveled from Gagetown to test-drive its new operating concept for delivering electronic warfare, ISR, intelligence, and other enabling functions to the Division.

While planning had picked up in earnest over the summer as health regulations were easing, by late fall most provinces were bracing for a second wave of COVID cases. When the exercise began on January 31, Ontario was under a stay-at-home order, Quebec had declared a nighttime curfew and Alberta was restricting all gatherings. Unified Resolve was classified as essential training, but participants would still have to navigate local rules.

"It became clear it was going to be very difficult to come up with a one-size-fits-all solution," Gifford said. "We eventually defaulted to the rules that were extant in each location."

After consultation with the commander of the Canadian Army Doctrine Training Centre, Major-General Michel-Henri St-Louis, the exercise team made two significant changes: First, the number of participants was scaled back, including supporting contractors; and, as a result of that, the exercise was reduced from 24 hours per day over the six days to just 12 hours each day, from 0700 to 1900, which eliminated an entire nightshift of military and supporting personnel.



"We took a 30 to 40 percent appetite suppressant on the number of people while still meeting the training objectives for the exercise," said Gifford. Unified Resolve 2019 had almost 1,500 participants concentrated in a few locations; in 2021, the total was 727, split between Edmonton (296), Kingston (230) and Valcartier (201).

Though Gifford and the exercise team did not know it at the time, the exercise in 2020 had provided them a dry run for what was to come. Capitalizing on the Army's emerging training network, UR20 had involved over 900 participants distributed across three locations in Petawawa, Kingston and Valcartier. Resolving the technology challenges then helped inoculate the team in 2021.

"It certainly told us what we needed to focus on in terms of preparation prior to the exercise," he said. "We spent more time this year ensuring that the communications network was up and running prior to pushing go on the actual exercise. A lot of effort went into making sure our command and control system, the Land Command Support System, was working properly, with enough time to work out any bugs. That was a lesson learned from last year."

THE EX MUST GO ON

With all regions of the country affected by the pandemic, some questioned the wisdom of holding a large collective exercise, even with members dispersed across multiple locations. Colonel Wade Rutland, commander of 1 CMBG, acknowledged the rumblings but argued "turning off" yet another exercise wasn't really an option – the Army's readiness had already been significantly impacted by cancelling Maple Resolve, its largest confirmation exercise, in May 2020.

"I think we've come to realize that you can't just shut down operations and training in this environment, because our adversaries haven't," he said. "The Canadian public still expects us to provide safety and security and if the call comes, they are not going to accept that we shut down because of COVID."

The ripple effect of cancelling one major exercise in the Army's three-year

high readiness rotation means that a brigade's personnel might not get a similar opportunity for three years. "You don't lose a year, you lose a generation of years," Rutland stressed. "To miss a year of this cycle is really detrimental to the institution."

Lieutenant-General Wayne Eyre, at the time the Army Commander, suggested exercises like Unified Resolve and Maple Resolve were precisely the reason why the Army has been able to respond quickly to provincial calls for assistance in long-term care facilities and northern communities. "Our ability to operate in these emergencies comes from years of practice on these different types of exercises. The ability to face complexity, large scale operations, to add structure to chaos – that's what our planners are doing at the Public Health Agency of Canada right now. Our readiness is based on these exercises."

The brigade had resumed individual training late last summer and each unit had completed a major field exercise in the fall, all with zero cases of COVID, so Rutland felt confident his headquarters and units had adapted to health



LCol Wade Rutland on the map.





Unified Resolve was conducted observing local and military health protocols.

measures such as mask wearing and “creative ways to do things.” Still, UR21 was different.

“It is hard to communicate with a mask on. It’s hard to project your voice. We can’t have as many people in, say, orders groups or rehearsal drills, just because of spacing,” said Rutland, who previously participated in UR16 and UR19. “But we found ways to adapt or just accept the kind of inefficiencies inherent in operating in that environment.”

Headquarters functions and brigade subunits were located in separate rooms, with designated washrooms and separate meals delivered every morning, limiting interaction. In Kingston, where the exercise control, divisional headquarters and other elements would normally operate from a common space, each had a separate room.

Fewer participants and a different structure might have lessened some of the realism and friction found in previous Unified Resolve exercises, but it did not reduce the training value, Rutland noted. “One of the things about a crisis is that you often have to look at things with a fresh set of eyes. I think we actually made a lot of great progress in Unified Resolve because of some of the mitigation measures.”

If the exercise is normally an intense six-day blur of around-the-clock operations, testing endurance as battle fatigue sets in, then the switch to a 12-hour day created a better opportunity to learn. An after-action review (AAR) often occurs midway through the exercise, while participants are still in the thick of the fight. This time, the AAR took place at the end of each day.

“Normally you’re thinking about getting right back into it and because the pace is so high, you don’t get a chance to implement some of the fixes you identify,” he said. “[This time] you could really focus on that after-action review and then immediately put into effect your fixes the very next day. We found we

made great progress on our identified [AAR] points. I don’t know if that was just a side benefit of this, but it certainly allowed us to focus on learning and getting better.”

The usual sleep deprivation and loss of information generated by shift changes affected some of the realism, and the 12-hour day meant the exercise resumed where it had left off the day before and keeping track of time became a test in and of itself. “There are definitely advantages to the 24-hour model – that is the way we will fight,” he added. “In future exercises, perhaps we will be able to take some of the good learning points from this iteration, such as more frequent AARs, to make the overall exercise the highest-value training experience possible.”

LESSONS FROM THE BOX

The primary objective of Unified Resolve is to validate the brigade headquarters and some of its unit commands for global deployment. Under recent changes to the Managed Readiness Plan, 1 CMBG is one of two brigade groups along with 2 CMBG on the road to high readiness in 2020-21. It will become a contingency force, ready for deployment if required.

The exercise confirmed the brigade HQ and the headquarters of 1 Combat Engineer Regiment, 1 Service Battalion and 1st Regiment, Royal Canadian Horse Artillery. In May during Maple Resolve, a field exercise, the brigade headquarters will serve as a higher control while the focus shifts to validating the manoeuvre units, Lord Strathcona’s Horse (Royal Canadians) and the 1st and 2nd Battalions, Princess Patricia’s Canadian Light Infantry (the 3rd Battalion completed its high readiness training at the Joint Readiness Training Centre at Fort Polk, Louisiana in March).

Constructed on the Army’s Decisive Action Training Environment, the



The exercise was reduced from six 24-hour days to six 12-hour shifts to reduce participants.

exercise scenario involved the conduct of high-intensity combat operations against a peer adversary in a region based on the Caucasus, testing the brigade's ability to plan, command and control, conduct and sustain operations. Though the usual pre-event planning, rehearsal and delivery of orders remained the same, explained Gifford, the release of a divisional order to the training audience the week before became a virtual event rather than an in-person battle procedure gathering. "Half of Unified Resolve was that real precise and detailed planning effort," said Rutland.

Though a shorter exercise, the battle task standards and the volume of injects remained the same. The PTA was challenged to manage predicaments involving legal incidents, child soldiers, religious leader engagement, joint targeting, cyber operations and electronic warfare (EW), and counter an adversary with an extensive information operations capability.

"There was certainly a focus on those things that deal with the local population, dealing with the issues that are going to arise operating in a host nation and having to understand the human geography," said Gifford. "But we also portrayed the extensive capability the enemy had to conduct cyber ops and EW, whether jamming or conducting cyber type activities against our networks."

Rutland helped craft the Standard Operating Procedures (SOPs) for the first rotation of the enhanced forward presence battle group in Latvia and said SOPs and doctrine refined over years of operations and exercises allow the battalion command staff to manage the injects while remaining engaged in combat.

"We were able to do many things at the same time, which I think was just a product of the evolution that we've gone through as an Army," he said. "Managing the battle, making sure that fires and effects were coming to the right place, making sure that we could call division assets at the right time,

keeping track of where our flanking brigade units were and our own units – it's harder than it seems. We were able to generate a lot more common operating picture fidelity by the end, which is just a mark of how much people learned during the exercise."

In the final after-action review, the brigade identified "about 100 points" to be assessed and, in some cases, "war-gamed" before it embarks on Maple Resolve, said Rutland. Those include operating in a degraded communications environment where jamming or network cyber attack are prominent.

But he also wanted to focus on command and control of movement and logistics. If the Army had a certain freedom of movement in counterinsurgency operations – albeit under a constant threat of IEDs – that's no longer the case. Access to roads can be limited or denied, and bridges and other obstacles can become choke points. "I'm not sure we're as skilled as we need to be on some of these logistics and administration management things," he said.

By shifting to a 12-hour exercise day, UR21 was effectively condensed to the equivalent of three, he noted, and time normally allocated for resupply of fuel, food and ammunition was simulated, creating a hectic pace that "would be unsustainable in a real fight – everyone recognized that in the after-action." Maple Resolve, a 14-day exercise, "will make up for some of those realism gaps."

When Unified Resolve concluded on February 6, there were no reported positive COVID tests among the participants at any of the four locations. Rutland credited a general duties platoon in Edmonton with ensuring a successful event, bringing in meals and sanitizing workspaces, washrooms and doorknobs several times a day. "They don't get enough credit. That was a massive behind the scenes effort. If there had been a COVID outbreak because of food, the exercise would have shut down." ■



A snowmobile and Qamutiik convoy in 2015. Photo: Julia Krebs-Vandeloosdrecht

As the Arctic heats up, so too has Arctic warfare training

By Ian Coutts

"It's not the end of the world just because it's minus 40."

Well, maybe not. Especially if you are, like Warrant Officer Daryl Towns, the man making that comment, a subject matter expert on Arctic warfare at the Canadian Army Advanced Warfare Centre (CAAWC). Or the two on the conference call with him, laughing appreciatively at his witty quip, Captain Fred Morin and Warrant Officer Fraser Lupton, respectively the course officer and his second in command.

For the 35 odd students in the school's current Arctic Operations Course, who were trudging through that exact temperature on a five-kilometer march to the nearby training area named Crystal City a few days before, it might not have been funny, but it certainly was true. Not only can you survive in those sorts of temperatures, you can function and function quite effectively. Which is the goal of the Arctic Training Centre and that of the Canadian Forces Cold Weather Platoon based out of CAAWC in Trenton, Ont.

Canada's Arctic covers 2.6 million square kilometers. That's just the true barren lands lying north of the tree line. Add in various areas south of that where extreme cold still makes it difficult to operate for a good deal of the year and you are looking at between 40 and 45 percent of the country. All too often, out of sight, out of mind for those living in the south. Climate change and restive neighbours are focusing attention on the Arctic like never before.

Reflecting this, one of the initiatives in *Strong, Secure, Engaged* (SSE), was to "enhance the mobility, reach and footprint of the Canadian Armed Forces in Canada's north." The Royal Canadian Navy's new Arctic and offshore patrol vessels are intended to aid that, as is whatever replacement for its BV 206 tracked vehicle the Army finally chooses.

But where the snowshoe hits the tundra, so to speak, there are challenges. Canadians like to think of ourselves as hardy outdoor types, indifferent to cold and at home in the wilderness. But says, Morin, "it's a great fallacy. Most of the recruits we are getting now are from the city and not necessarily outdoorsy people, which might have been true in the past. We're seeing reduced skills in just the basic abilities needed to work in the winter warfare environment."

Perhaps echoing that, this year CAAWC revamped its curricula, taking the two courses it previously offered and splitting one of them in two, and overhauling the course content. The three courses now are: Cold Weather Operator, Cold Weather Operations Leader (CWO-L) and Arctic Operations (AO). New this year, the CWO-L course was hived off from the old Arctic Operations Advisor course, to help the Army develop some skills beyond the basic level, but not quite as complex as what the Arctic Operations Advisors learn.

The Cold Weather Operator course is the Centre's basic offering, training most in the Army will complete at some stage of their career. A week in length, it features "living in the Arctic tents, operating as a section, right down to the basics – how to dress in layers, that sort of thing," explained Lupton. "They



Surveying the route on the Arctic Operations course in 2015.
Photo: Julia Krebs-Vandeloosdrecht



Survival shelter construction is part of the Cold Weather Operator course.
Photo: Julia Krebs-Vandeloosdrecht

spend a minimum of one night in a survival shelter.”

Revamped this year, there is a renewed emphasis on skills that were fading – skiing, for example, which has not been taught in recent years – or were not previously taught at the operational level. The Operator course, for example, now instructs students in how to rescue themselves should they fall through the ice. Previously, this was taught only to those taking the Arctic Operations Advisor Course.

Aimed at subalterns and junior non-commissioned leaders, the goal of the Cold Weather Operations Leader Course is to give soldiers the skills to lead a section or a platoon in a cold weather environment and be able to pass on the skills they’ve picked up to their subordinates. A three-week course, “half a week is classroom and theory and from there the majority is out in the field,” said Lupton. That includes three days and nights in a survival shelter on their own. Added Towns, “it’s all led by the students with the mentorship of the staff.”

The 35 doughty souls who had been trudging north from Resolute Bay to Crystal City a few days before were participants in the Arctic Operations Course, the most complex of the three and at five weeks, the longest program offered at the Arctic Training Centre. The goal is for the students to develop a level of expertise in operations above the tree line that they can share with their own units after they complete the program. Course offerings range from cultural information about Inuit culture, to working with the Canadian Rangers, and gaining an in-depth understanding of building ice shelters and igloos (which is what their students were doing the day they spoke to *Canadian Army Today*). As part of their training, students plan and mount a sovereignty patrol in the high Arctic – the kind of work emphasized by SSE.

Of the 35 participants, one is on exchange from the French Army’s École militaire de haute montagne (High Mountain Military School) and the rest come from right across the Army. Most are Regular Force members from the combat arms, but about 30 percent come from the Primary Reserve and about the same from non-combat arms – maintainers, signallers, “and a supply tech this year.”

“Generally, the course is very combat arms-oriented,” said Morin.

By southern standards Resolute Bay features consistently cold weather, with below zero highs from September through to May. But one surprising fact about the Centre’s work is how short a season it has to deliver the training. “There’s a finite window when temperatures are right prior to the end of March, when the storms start and it gets dicey getting flights in and out,” said Lupton.

“On the 11-16th of January, we piloted the new Operator course, then immediately after, Leader, and then we transitioned to the AO course. It was back-to-back-to-back. The facility that we have here caters to quite a few training audiences – the RCAF’s survival school, the search and rescue technicians from out West,” and they all need to be accommodated in quarters that the centre shares with the National Research Council’s Polar Shelf Program.

When the course wound down at the end of March, Morin, Lupton and Towns returned south to CAAWC, where they will spend the next few months evaluating this year’s courses and planning for the next. Their students, too, returned to their home units, including some to participate in Operation Nanook-Nunaliut 2021 in the Northwest Territories, the Canadian Armed Forces’ annual northern exercise, where they had the chance to put their newly gained skills to the test. ■



Members of the Arctic Operations Course arrive at a destination by snowmobile and Qamutiiks on March 16, 2021. Photo: MCpl Nathan Deringer



MCpl Nathan Deringer processes a seal pelt on March 20, 2021 as part of the Arctic Operations course. COVID-19 mitigation measures included the use of course bubbles. Photo: Cpl Ashley Richard



Building ice shelters and igloos on the Arctic Operations course. Photo: Julia Krebs-Vandeloosdrecht



The Operator course includes how to survive going through the ice. Photo: Julia Krebs-Vandeloosdrecht



Members of 3R22R take shelter next to a BV-206 vehicle during Ex Trident Juncture in Norway in 2018. Photo: MCpl Pat Blanchard



Bae Systems Hägglunds BvS10



ST Kinetics Bronco

Arctic mobility makes tracks

By Ian Coutts

Call it the musk-ox of Canadian defence procurements. As other needed projects see costs balloon or timelines stretch out before them, the Army's Domestic Arctic Mobility Enhancement (DAME) project, the search for a new vehicle suitable for use in Canada's far north, continues to plod implacably forward, step by step, just like that sturdy Arctic beast.

Readers may recall an article about the DAME project back in the fall of 2019. At that point, the search to find a suitable multi-purpose replacement for the BV 206 tracked vehicle first purchased in the 1980s and now at the end of its useful life, had essentially been ongoing since 2016. Initially, the Army had been calling for the contract to be awarded by about 2025. By 2019, the project team appeared to have bettered that – delivery would begin by 2025, with the contract awarded earlier.

Two years on, the Army is still holding, more or less, to that goal, according to Major Noel Mackey, the project director for the DAME program with the Directorate of Land Requirements.

"We are beginning to move the process into the definition phase," he said. "That's where we'll get the statement of requirements, get input from industry, plus start finalizing a lot of the maintenance and support issues, and get ready for the request for proposals," which could be issued as early as fiscal year 2023-2024.

Initial delivery is still expected sometime in fiscal year 2025-26. More or less where it was before. "That's optimistic, but that's what we're working with," he said.

Back in 2019, the project had what were termed two front-runners it was particularly interested in, BAE Systems' BvS10 and the ST Kinetics Bronco. The Army is still interested in both, but cautions Mackey, "there are other manufacturers who have expressed an interest" in the program.

Indeed, although one of the assumptions about the project at the time was that any potential choice be a tracked vehicle, even this is not carved in stone. "There's a Ukrainian company called SHERP," he said, "and they have a wheeled vehicle. But its drive system and tire deflation-inflation system lets it act like a tracked vehicle."

Such details will be ironed out in the definition phase. In 2019, the assumption was a minimum purchase of 100 vehicles. Mackey said the Army is now thinking a minimum of 111 up to 153, in four variants: standard troop carrier, command post, cargo and equipment version, and ambulance.

One major alteration in the program concerns possible deployment. Back in 2019, the Army assumed that whatever was purchased would be kept in the north, a move that would have required the acquisition of shelters and other infrastructure to store them.

Now, said Mackey, plans are to keep the vehicles mainly in the south, with a complement in the north at an established facility in Resolute Bay, Nunavut. Pre-positioning them up north doesn't really make sense given the distances, he explained. "It's much easier to keep them at established bases and then transport them around by air." ■



BIG WRECKER

As the Army's vehicles get bigger and heavier, recovering them has become a challenge

By Ken Pole

Whether helping with civil disaster management at home or overseas on a combat mission, the Canadian Army has a daunting challenge when it comes to recovering damaged vehicles, despite having about 130 platforms designed specifically for the role.

The current fleet of triple-axle Heavy Logistic Vehicle Wheeled (HLVW) trucks has been doing yeoman service for nearly a third of a century, but many of the Canadian Armed Force's (CAF) fleets of armoured and other vehicles have evolved since the 1980s, growing in size and weight, and are now beyond the capabilities of the "wrecker" variant of the HLVWs.

Major Robert Greer, the project director for Enhanced Recovery Capability (ERC), chuckled when asked if the legacy fleet had simply been "used and abused" over the years, often in severe environments.

"They've been fully depleting themselves," agreed the member of the Corps of Royal Canadian Electrical and Mechanical Engineers (RCEME).

The CAF is in the process of replacing all logistic vehicle fleets with new

wheeled armoured vehicles that are larger and heavier, to accommodate the weight of armour protection kit (APK) while simultaneously improving mobility and payload capacity. The CAF is also making much greater use of intermodal shipping containers and mobile shelters, based on the ISO shipping container footprint, to move materiel and provide a range of workspaces such as command posts, medical facilities and workshops. As the heavier wheeled vehicles are introduced into service over the next five to seven years, the existing tow trucks will only be able to winch and tow 54 percent of the fleet and will not be able to lift the bulk cargo containers during a recovery operation.

Through qualified supplier engagements and technical studies, the ERC project requirements have evolved from a single variant solution to ideally two variants: a four-axle 8x8 and a five-axle 10x10, said Greer. "Unlike the HLVW with add-on armour, both variants of the ERC will have the ability to enhance crew protection, swappable armoured cabs or some protection add-on armour



Left: MCpl Peter Guy of 16 (Saskatchewan) Service Battalion in a Heavy Logistics Vehicle Wheeled pulls out a Medium Logistics Vehicle Wheeled from sand in 2005.
Photo: Cpl Bill Gomm

Above: Canadian and American maintenance members prepare to extract a vehicle in the Hohenfels Training Area on Ex Allied Spirit VI in 2017.
Photo: MCpl Jennifer Kusche

for deployment into high-risk areas.”

The five-axle vehicle will have a rotator boom capable of handling complex recoveries and 20-foot sea containers, which can weigh as much as 16 tonnes when fully kitted as workshops or command posts. The need for a boom was confirmed at the outset of the project, particularly when recovery involved a vehicle damaged by an improvised explosive device (IED) or a rollover. “It would have been instrumental in Afghanistan for some situations such as where we had narrow roads and the vehicle to be recovered was in a ditch,” Greer noted.

The ERC project is essentially a “one-for-one” replacement of approximately 130 or so vehicles, including up to 30 armoured cabs. They will be stationed with 79 units across 33 Army, Air Force and Reserve bases nationwide.

“Because of the size of these vehicles, there are limits on where we can base them,” said Greer. Reserve units likely would be assigned the smaller 8x8s.

As for overseas deployment, marine transport is one option. Rapid response, however, means air transport will be a mandatory requirement for the vehicles that could end up weighing “at least 30 tonnes, and up to the high 40s.” Some 10x10s on the market are even heavier. The RCAF’s fleet of five Boeing CC-177 Globemasters are capable of the task, he added.

At present, the ERC will require space for a crew of two, but Greer said a

third seat would be “nice to have.” In the RCME world, the two-person crew is comprised of a driver, the crew chief, who is in overall charge of a recovery, and a “swamper” responsible for running lifting cables to the disabled vehicle and setting up a safe operating perimeter. A third crewmember arguably affords some flexibility and possibly added safety in complex recoveries.

TIGHT TIMELINES

The procurement process began in April 2017 with a letter of interest (LOI). Feedback from manufacturers resulted in a second LOI in March 2019 and, combined with industry days and one-on-one sessions, has helped ensure what Greer called “a shared understanding” of the project.

Following a formal invitation to qualify (ITQ) in August 2019, and a revised ITQ in November 2019, the project has a list of qualified suppliers that includes London, Ont.-based General Dynamics Land Systems – Canada, which has built hundreds of Light Armoured Vehicles for the Army; well-known North American manufacturers Navistar Defense Canada and Oshkosh Defense Canada, both subsidiaries of American parent corporations; and European-based entrants Rheinmetall Canada Inc. of Saint-Jean-sur-Richelieu, Que., a subsidiary of the German defence giant headquartered in Düsseldorf, and



Ukrainian Armed Forces students and Canadian instructors practice vehicle recovery. Photo: Joint Task Force - Ukraine

Iveco Defence Vehicles, headquartered in Italy, but owned by CNH Industrial, an Italian-American corporation with head offices in Britain. Rangler Manufacturing, a Calgary-based supplier of large vehicles for the Alberta petroleum sector, has also been added to the roster.

"All have potentially suitable vehicles or are pairing up with another company which has one," said Greer. "They wouldn't have made it through the ITQ if they didn't have a vehicle currently in use."

The prospective timeline, which he admitted is tight, is to move the project from definition to the implementation phase in 2023. Initial vehicle delivery is expected in the spring of 2025 and final delivery a couple of years later.

A final request for proposals is expected this summer, possibly by June. "We'll be starting paper evaluation in the fall. With that, [manufacturers] have to deliver a vehicle so that we can begin physical testing on it, which would be early in 2022. It's quite a tight timeline for them to have one ready because they'll have to modify their plants and then conduct their own testing to confirm compliance before the vehicle is delivered," Greer observed.

That would set the stage for 18 months of bid evaluation and vehicle trials, leading to a contract award "around April-May 2023."

Initial industry feedback to the project suggested the Army was "shooting for the stars because [the] technology's not there" yet to meet all the requirements in one vehicle platform, Greer acknowledged. But the engagement process has helped refine requirements, validating a split fleet, and "let us know realistically

what we should be asking for in certain specifications to complete the mission. There will be some minor modifications to meet Canadian transportation and safety regulations, regardless of which company wins the contract."

That includes lights and some safety specifications unique to Canada. Then there are the provincial road regulations. Each qualified supplier has had to share – and may possibly have to modify – their design with provincial transportation departments, which have "unique features such as weight, dimensions, distance between axles, etcetera," Greer noted. "Some requirements are being massaged due, in turn, to provincial feedback. There's not a set standard across Canada."

Overall vehicle dimensions can affect whether escorts or special permits are required due to road and bridge clearances. There also could be issues with tire loadings on road surfaces. Spring thaw can mean softer surfaces and require lighter loads, a common practice in the logging industry and elsewhere in the civilian world. "We're in the same predicament. Once the ERC leaves on a recovery call, depending on what time of year it is, it could be over the road limits," he said. "Also, tire sizes can differ between manufacturers, which is another reason for them to be talking directly with the provinces."

The project is well on track to procure platforms that can "extricate disabled or damaged vehicles by pulling, lifting or righting them and then moving them to a safe place where repairs can be completed and they can be returned to use, whether on operations at home or abroad," he added. ■



URBAN OPS ON TRIAL

Site acceptance, first user tests completed on new training system

By Allan Joyner

For four days in mid-March, a section of soldiers from Charlie Company, 3rd Battalion, Royal 22nd Regiment, navigated through a village in the training area of 2nd Canadian Division Support Base Valcartier, Que., engaging an enemy as the sounds and smells of village life and urban combat swelled and wafted around them.

When urban operations instructors from Charlie Company reviewed the video, comparing the first day “dry” rehearsals to the final day of combat, “it was like night and day,” said Captain Marian Janek. “The soldiers improved so much over that time, the instructors said it was incredible. That was four days of training. They can’t wait to get the whole company in there.”

Janek is the project director for Urban Operations Training System (UOTS), an Army-wide program to instrument training villages at locations in each of its four divisions, from Wainwright in Alberta to Gagetown in New Brunswick. The user trial in Valcartier was the first opportunity for the section of Vandoos to put the new system through its paces and provide Janek with final feedback.

While the pandemic has restricted travel and slowed progress on a number of Army projects over the past year, the UOTS team was able to complete site acceptance of the overall system in the summer of 2020 at 5th Canadian Division Support Base Gagetown with assistance from the Canadian Army Trials and Evaluation Unit. A platoon from the 2nd Battalion, The Royal Canadian Regiment (2 RCR), then conducted the first user trial in September.

Members of 3R22R breach a door of an urban operations training building at CFB Valcartier. Photo: Capt Marian Janek



Members of 2RCR, part of a training bubble, advance on the urban village, Camp Petersville Gagetown, during user trials. Photo: Cpl Stephanie Labossiere

Functional testing of the system in Valcartier was completed in January and, as Janek was holding the user trial, UOTS team members from the Directorate of Combat Systems and Equipment Management conducted the functional test in Wainwright. A user trial will follow this summer once Exercise Maple Resolve concludes. A functional test and user trial will also be held at 4th Canadian Division Support Base Petawawa in May and July, respectively, if COVID doesn't further disrupt the plan.

"The site acceptance test in Gagetown demonstrated that the overall system works," explained Janek. "With the functional tests, we're confirming the subsystems at each site. The user trials, though, are when you may see things come up that you may not have been able to test or have foreseen in the original engineering tests. I can't understate their importance. Having actual users run through an exercise helps us identify issues [only they would notice]. Both 2 RCR and the Vandoos were really professional and extremely passionate about urban ops."

The Army has been training for urban operations in simulated environments for decades, but each base had developed its own footprint from available resources, mostly sea containers arranged to represent buildings. UOTS standardizes the training experience and integrates the villages into the Army's larger Weapon Effects Simulation (WES) system, its training network that is itself undergoing a modernization effort – an initial request for information was released to industry in March.

Each location has a mix of fully and partially instrumented buildings, ranging from one to three stories and from 1,600 to 10,000 square feet. Wainwright is the largest setup, with 23 buildings, 10 of which are fully instrumented. Petawawa has 17 buildings, nine fully instrumented, while Gagetown has 10,

five fully instrumented, and Valcartier has nine, four fully instrumented.

The buildings are concrete but can emulate the properties of wood or mud structures so that the resultant effects by blast from the UOTS fragmentation grenade and improvised explosive device (IED) simulators are patterned to reflect live fire. The interiors include doors breachable by kinetic force, including a battering ram. The fully instrumented structures feature infrared cameras, high-fidelity positional tracking of friendly and enemy forces, microphones, speakers, and variable lighting that can be affected by damage to dummy electrical panels.

Both the fully and partially instrumented buildings have universal outlets to plug in smoke and aroma generators, pop-up target kits that can shoot back, and IED simulators. The partially instrumented buildings have the tracking system and universal outlets, but not the video or sound capture picked up by the microphones.

"We can now do force-on-force training in a fairly adjudicated system," observed Janek, a former warrant officer with the Princess Patricia's Canadian Light Infantry. "Previously, it was bit of a judgment call as to who shot who first and how effective the shot was. This takes all that guess work out of it – you either did it or you did not."

UOTS now allows exercise observer-controllers, the former adjudicators of weapons fire and blasts from IEDs, to observe from the periphery of a section, rather than in advance of it, which sometimes "tipped off" soldiers to a possible threat awaiting them in a room.

"The feedback I've been getting so far from the user units has been overwhelmingly positive," said Janek. "I always ask for negative comments and I do get some, but the positives far outweigh the points to improve on."

The few issues with integration of components into the WES environment identified during the first user trial have been resolved but still need to be tested, he added.

More significant for both instructors and students, the UOTS will fundamentally change how urban operations skills are taught and absorbed. From the exercise control (EXCON) centre or from ruggedized tablets in the village, instructors can map the floor plan of multiple buildings and monitor soldier icons on each floor or through a live video link, assessing how they navigate corridors, round corners and entire rooms.

"In playback mode, you can see the action in video, 2D or 3D like you would in a video game," said Janek. "You can make the buildings semi-transparent and see where everybody is at one time in the buildings and surrounding area, which is particularly useful for big muscle movements like seeing how sections or platoons move through an objective."

With the ruggedized tablets, instructors or observer-controllers can conduct quick hot washes or more detailed after-action reviews with soldiers, drawing on video from their tablets or by plugging into one of the universal outlets and downloading information from the EXCON.

"The urban ops instructors who were running the tactical portion of my user trials really enjoyed using that. They were taking video of specific things they were seeing and using that for debriefs and it made it crystal clear to their training audience what they were talking about," Janek noted.

The EXCON can track up to 3,000 entities at a time, from individual

soldiers to vehicles, pop-up targets and minefields. It communicates with the buildings and entities via a central tower and a fiber network – the tower covers a two-kilometre radius around each village. Wainwright has two towers that cover the entire training area, including the UOTS village, which can track over 4,000 entities.

The EXCON facilities are located anywhere from 500 metres (in Gagetown) to 25 kilometres (in Wainwright) from the training village. They are operated by three representatives from Cubic Field Services Canada, the prime contractor for both UOTS and the WES system, and will coordinate with the training unit for the configuration of effects needed for an exercise.

Management of the UOTS facilities is being incorporated into the WES in-service support contract. The project will declare the village in Gagetown IOC (initial operating capability) and "open for use," said Janek, once a new Contractor Conducted Logistics Support agreement is finalized this spring.

Some testing still remains on the WES soldier harness and the weapon small arms transmitter to confirm software patches, but otherwise UOTS site tests and user trials should reach completion by late summer, opening the door to larger exercises.

"It is a new system and we're still figuring out what the demand for use will be," Janek admitted. "But as with any new technology, there will be areas we can make better over time. I've noticed Cubic are very evolutionary in their thinking and try to produce the best training experience, I think over the years it will just get better and better." ■



Sappers of 34 Combat Engineer Regiment participate in a breaching exercise in March 2021. Photo: DND

By Lt(N) Sean Costello

Strength and perseverance, forged on Mount Everest

We recently checked in with a number of former Royal Canadian Army Cadets, who became connected during an experience of a lifetime some 10 years ago. In October 2010, 14 senior cadets set off on an Army Cadet International Expedition, accompanied by four Canadian Armed Forces (CAF) Reserve officers of the Cadet Instructor Cadre. Their destination: the iconic and rugged terrain of the Mount Everest region of Nepal.

Considered the peak of the Army Cadet Program's multidiscipline expedition training track, multi-week expeditions such as this grant participants numerous opportunities to challenge themselves, leaning into a deeper understanding of what they are capable of and allowing them to safely explore what lies beyond any self-limiting beliefs they may have held when their journey began.

Many participants followed their love and

passion for the outdoors, including Emanuelle Mazeau, who moved to the Gaspésie region of Quebec to enjoy an active lifestyle with her growing family, when she is not instructing in the classroom of a childcare center. What did she learn from her time in cadets?

"Perseverance! When you do something like a 28-day trek to Everest Base Camp, there's a point where everyone hits their wall and has to push themselves through. Moreover, looking back 10



Members of the 2010 RCAC International Expedition pause along the south ridge of Pumori, above Gorakshep, Nepal to take in the view of Mt. Everest's peak en route to Base Camp after summiting Kala Patthar. Photo: Capt Cory Lohnes

years later, I realize how important an expedition it was. At 18 years old, we don't really know what's big or small and now I realize the magnitude of the challenge. It's a learning experience that I treasure each day."

In 2010, the primary objective was to summit Kala Patthar, at an altitude of approximately 5,600 meters (over 18,500 feet). Every day brought fresh lessons and leadership opportunities, as cadets rotated through the "team lead" position of both the Lead and Sweep teams. With different duties and responsibilities assigned to each group, there was plenty of variance in the experiences, with little opportunity to predict exactly what would be encountered through each of the 28 days of trekking.

A number of the former cadets chose to enroll in the CAF, including Master Corporal Lucas Mayo, who is currently in his 10th year of service with the Princess Patricia's Canadian Light Infantry. Invited to look back on his cadet years, he shared, "I learned discipline, and overall pride in wearing the uniform. Showing up on time, ensuring that your boots were shined, your uniform was ironed, and your beret formed properly." During his service, Mayo has deployed twice, to Afghanistan and Ukraine.

Reinforcing the common theme of perseverance, Tim Doering also shared his experiences: "After graduating from Algonquin College, I spent my summers roofing and my

winters skiing, snowshoeing, snowboarding." Currently however, he is healing from a major injury that left him temporarily in a wheelchair and in a position where he had to learn how to walk again. He is on the road to recovery, and we are proud to recognize him as an excellent example of what personal strength and resiliency looks like. ■

Lt(N) Sean Costello is a Unit Public Affairs Representative with the Cadets and Junior Canadian Rangers. For more information on the Army Cadet Program visit www.canada.ca/join-cadets



Trials and Evaluations

Meet the unit that can put any new piece of equipment through its paces

By Chris Thatcher

You could do worse than borrow from the marketing campaign of Dos Equis: You might not always need an equipment trial, but when you do, use CATEU.

Like The Most Interesting Man in the World, the Canadian Army Trials and Evaluation Unit (pronounced katoos for short) has its share of noteworthy tales, some of which even involve stuff blowing up. But like the beer, the unit needs a campaign to build its brand.

Project directors from the Directorate of Land Requirements (DLR) who have tapped its expertise to put new equipment through its paces and evaluate form, fit and function have high praise for the unit. But many still remain unaware of the capability.

“We are a hidden gem and I do think amongst the Army as a whole, and from commanding officers I’ve spoken to, many don’t know who we are and what we do,” acknowledged Major Mike Chagnon, commanding officer of the small unit nested within the Combat Training Centre at 5th Canadian Division Support Base Gagetown.

Chagnon assumed command in July 2020 and immediately put marketing near the top of his to-do list. An infantry officer of 25 years with The Royal Canadian Regiment, with Joint Command and Staff College, project management experience and several operational tours under his belt, advertising is not his forte. “But I set out as a goal when I took command to spread that word.”

CATEU was stood up in 1998 as the Land Force Trials and Evaluation Unit, a recognition at the time by the Army commander the service needed a unit dedicated to equipment testing and confirmation that was separate from the Land Engineering Test Establishment in Ottawa. In those first years, projects were modest – work on ballistics, fuel consumption, weapons – and often human factors related, proving the ergonomics of a new vehicle.

Over time, the portfolio has expanded to trials of more complex systems and to evaluations of future capabilities the Army is considering, such as unmanned ground and micro aerial



Soldiers participate in a Commercial Wrecker Trial conducted by CATEU in February. Photo: Cpl Stéphanie Labossière



vehicles. CATEU's customer-base has also grown beyond DLR to including Defence Research and Development Canada (DRDC), the Quality Engineering Test Establishment at National Defence, the Build in Canada Innovation Program, now known as Innovation Solutions Canada, and others such as the schools at the Combat Training Centre (CTC).

CATEU, however, is often a late contributor to any equipment project. Perhaps because of its low profile, the unit is frequently engaged by project directors after requirements have been written and even after equipment has been selected.

Chagnon was part of the Medium Support Vehicle System—Standard Military Pattern logistics truck project in 2016 and said CATEU's evaluation

of the truck “was the first time the chassis, the box in the back and the trailer were integrated, and we knew the trucks were being delivered within months after that.”

One of his goals is to get the organization involved in procurement projects earlier in the process.

CATEU has a modest team of around 30 personnel comprised of trial officer teams, support staff and image technicians. But it has access to soldiers in the 2nd Battalion, The Royal Canadian Regiment (2 RCR) and the eight schools of CTC, as well as units across the country, all of whom are proficient at pushing new equipment to its limits and beyond and offering frank assessments of its utility in the Army.

As software and interoperability increasingly become the defining factors in new capabilities, early feedback from soldiers could prove invaluable to de-bugging and de-risking projects. It could also flag necessary changes well before they become expensive fixes.

There has been more awareness in recent years, Chagnon noted. CATEU is now dialed in to Army Capabilities Development Board meetings and “can see what's on the horizon” and how and where it might play a role.

“Planning-wise, we are starting to be involved more in some of the bid evaluation testing,” he said. “We're also getting involved in some of the RAMD (reliability, availability, maintainability, durability) testing, but in a supporting role. We are getting involved in helping those tests and evaluations. It is getting better.”

That is reflected in the unit's planning forecast for the next year. Typically, CATEU might have seven to eight trials earmarked for a given year, a few of which might be postponed or cancelled. Over the next 12 months, 12 to 15 projects are already on the calendar and Innovation Solutions Canada continues to generate calls for proposals, meaning more requests could be forthcoming.

“Some of these are in a supporting role—we are not doing the detailed test planning and analysis afterwards—but for some we definitely are,” said Chagnon.

While COVID-19 could affect the schedule, CATEU has managed to move forward on a number of projects even as it has navigated the restrictions imposed by the bubble around the Atlantic provinces and limitations on non-essential travel. Few project teams have been able to travel to Gagetown, but CATEU has been able to send trial teams elsewhere, providing they quarantine.

“COVID has caused some delays in terms of being involved in collective training exercises,” said Chagnon, “but we are planning to do all those trials. If we have to adjust the plans because of the pandemic protocols in place, we will.”

The trial of a commercial heavy wrecker under the Enhanced Recovery Capability project, for instance, was temporary slowed due to travel restrictions, but CATEU held regular virtual meetings with the DLR team “to make sure what we were testing was in line with what they want to test.” (The trial was completed in late March.) It's also planning for trials with three possible options for



CATEU trialed the applications of a micro UAS, the FLIR Black Hornet (opposite) in 2019. Photo: DND



the Army's Advanced Water Supply System project before the DLR team finalizes requirements and the government issues a request for proposals, and for a light infantry trial with a first iteration of kit for the Soldier Operational Clothing and Equipment Modernization project.

Last fall a CATEU trials team conducted site acceptance testing of the first Urban Operations Training System in Gagetown, a fully instrumented training "village" also being built at bases in Valcartier, Que., Petawawa, Ont., and Wainwright, Alta. With the DLR team unable to participate at this first site, CATEU completed the final tests and led a trial run with soldiers from 2 RCR and urban operations instructors from the Infantry School to assess the GPS tracking system, sound, smoke and odour systems, pop-up targets and door-breaching systems.

"We got really good feedback on the various sounds, smells and other aspects of the system," said Chagnon.

Soldiers and instructors were also able to see how the tracking and after-action reporting system immediately "helped them get better," he added. "Knowing that subsequent villages are being upgraded in Valcartier, Petawawa and Wainwright, they'll be able to make some fine-tuning adjustments in those future iterations."

CATEU was also able to send a team to Petawawa in the late fall to support 2 Combat Engineer Regiment (2 CER) in the evaluation of a possible contender for the Light Vehicle Tactical Bridge project, part of the Army's larger Bridge and Gap

Crossing Modernization program. Over a week, 2 CER constructed, launched and recovered the bridge under different conditions during day and night while CATEU gathered data and feedback. "Even though it took a bit longer to build and take apart than expected, the unit was very happy with it and kept it so they can still use it and provide feedback to the company," he said.

COVID-19, however, has delayed several trials for Innovations Solutions Canada projects. An evaluation of an unmanned automated patrol vehicle for perimeter security will be completed later this summer after a camera system from Europe was delivered late. And a soldier-held GPS tracking system for Reserve units to monitor movement, provide some simulation in training and help with after-action reviews has been extended until the Reserve units resume collective training.

"We have done a bit of testing here with the CTC schools, allowing the courses like the advanced reconnaissance patrol to use the tracker just to make sure we can collect data," Chagnon explained. "But it's for the Reserve and though the company is happy with the data they have received from us so far, without the Reserve units having a chance to play with it and see how useful it is to them, they want to wait until things open up."

Whenever possible, CATEU strives to put equipment in the hands of field soldiers and have them test the limits of the capability, said Chagnon. "We want soldiers to be able to play with, break it even, and tell us what works and what doesn't."

The unit's reports, which are usually delivered

in 90 days, range from basic user feedback and human-factors input to a detailed assessment of the equipment against manufacturers' claims and the project's high-level mandatory requirements. "Depending on how complex the trial is and how much math and science is involved, that will dictate the level of detail in these reports."

If Chagnon expands CATEU's brand recognition, he may also have to request more resources as demand for its services increases. Most of the unit's trials teams have completed the Army's Technical Staff Officer or Technical Warrant Officer programs, but you don't need a science or engineering background to put new equipment through its paces, he stressed. "It is definitely a mindset. Having fresh minds has definitely been an asset to the unit." ■



As part of a Commercial Wrecker Trial conducted by CATEU, soldiers tow a TAPV. Photo: Cpl Stéphanie Labossière

The development and evolution of a fitness objective or occupational fitness standard is likely a more complex and thorough process than one would expect. There are layers of research to ensure reliability, sensitivity, validity, diversity, accommodation, administration and delivery considerations. What follows is a brief history of the conception and development of the FORCE Combat assessment of soldiers' physical readiness and the work of the research team that has helped successfully develop it for the Canadian Army.

Army training follows two main doctrines, the Battle Task Standards (BTS) and the Individual Battle Task Standards (IBTS). The IBTS has a physical component, focused on improving the physical capacity of the soldier in the form of muscular strength and endurance, aerobic capacity, and agility, to meet the demands of serving in the Army. Physical fitness is a fundamental component of the Army Performance Triad and essential to readiness, resilience and total fitness. The IBTS for physical capacity was the Land Forces Command Physical Fitness Standard (LFCPFS). As of 2017, it is FORCE Combat.

FORCE Combat allows the Army to assess soldiers' physical readiness and resilience as a part of the Mission Ready strategy. Prior to FORCE Combat was the Battle Fitness Test (BFT), developed from 1984-1991, with four representative common tasks of an Army soldier: Evacuation of a casualty in

environmental standards. This evaluation was named Fitness for Occupational Requirements of Canadian Armed Forces Employment (FORCE).

FORCE was embraced by the Army as a valid minimum physical employment standard, but it was recognized that Army IBTS physical fitness objectives should be more reflective of demands of recent deployments.

Before FORCE, the Army achieved exemption from the CAF EXPRES test on completion of the BFT. However, in 2009 the physiological demands (oxygen consumption) of the then 13km ruck march were measured directly as 23 milliliters per kilogram per minute, the same aerobic capacity required to achieve Level 2 on the EXPRES shuttle-run test. Therefore, the Army was not achieving universality of service though passing the BFT.

Results of 851 online surveys and 78 one-on-one interviews found that 57 percent reported dismounted patrols shorter than 5km, and only 13 percent reported performing dismounted patrols between 10km and 15km, despite the BFT being 13km. These interviews identified that the average load worn during a 24-hour operation was approximately 37kg, and 52kg on operations lasting beyond 24 hours.

This was 12kg or more in excess of the load worn, and less than half the distance marched, compared to the BFT. However, training exercises were still

FORCE COMBAT

An evolution in combat fitness

By Dr. Tara Reilly, Dr. Hans Christain-Tinglestad, Jacqueline Laframboise, Maj Nadia Worthington and LCol Matthew Sprague

60 seconds or less, using a fireman's carry over 100 metres; ammunition box lift in 300 seconds or less; maximal effort digging in 300 seconds or less (move 0.486m³ of pea gravel); and a 13-kilometre loaded march carrying full fighting order (FFO=24.5kg) in 2 hours and 24 minutes

In 2007 the Canadian Army Doctrine and Training Centre (CADTC) tasked the Personnel Support Programs' Human Performance Research & Development (PSP HPRD) group to review the relevance of the BFT in light of current demands. Of primary concern were injuries experienced by members performing the BFT and a lack of standardization in delivery, preventing individual assessment.

Based on a detailed review of the missions and demands since the early 2000s, and 13 observations of field exercises, the research team collected data on dismounted patrols, loads carried, as well as speed and distances traveled. As a result, it was recommended that the fireman's carry be replaced by a casualty drag which also captured the demands of a vehicle extrication.

In addition, the PSP HPRD team conducted a series of online surveys and one-on-one interviews with members from CFB Petawawa, CFB Edmonton, and CFB Valcartier from 2008 to 2010.

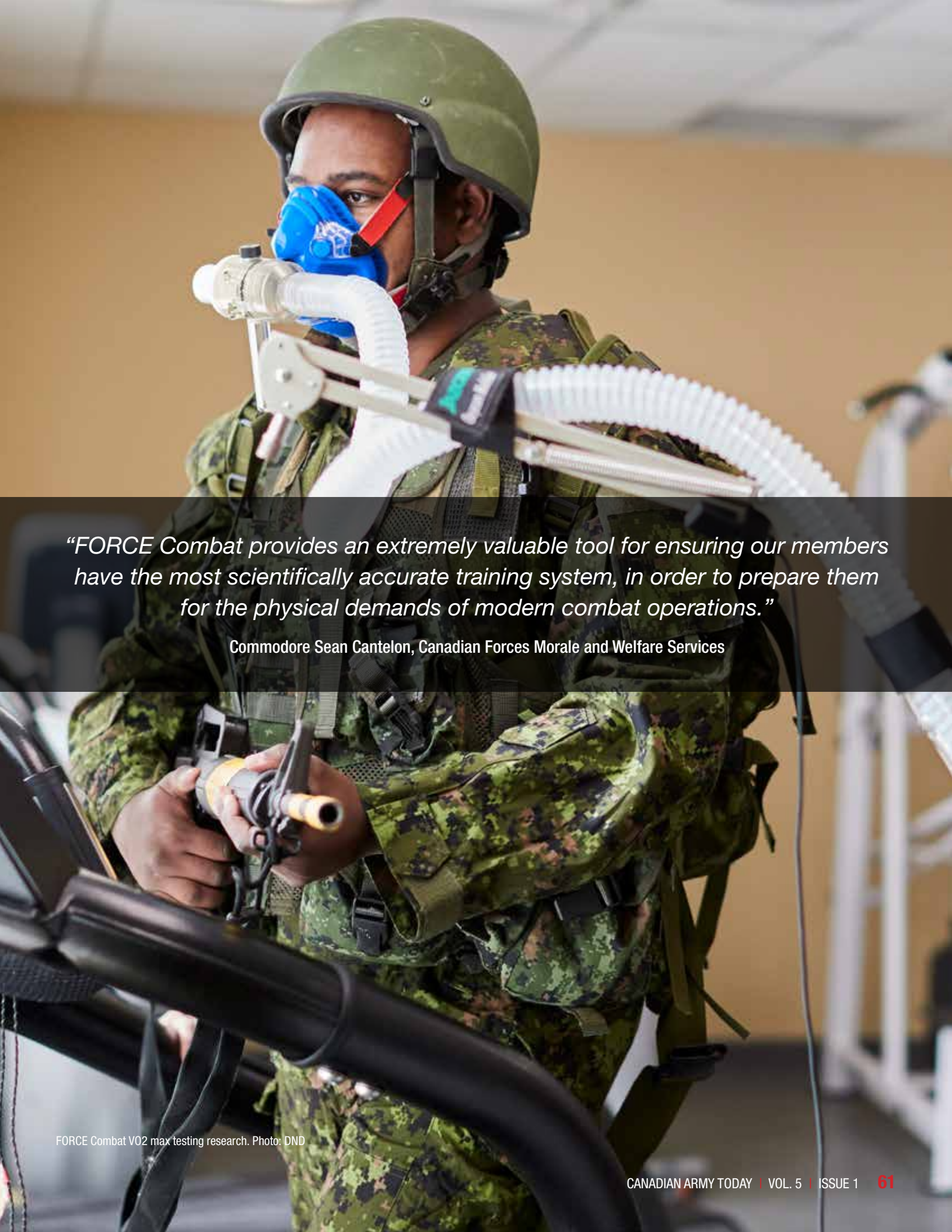
In 2008, the PSP HPRD team commenced work on developing element-specific physical performance standards for the Royal Canadian Air Force and the Royal Canadian Navy, as well as a more relevant BFT. In the end, it was decided to implement a new Canadian Armed Forces (CAF)-wide fitness standard to measure universality of services demands, as opposed to separate

following 13km routes through the training area with 24.5kg or less.

Surveys and interviews indicated that a dominant component of Army missions took place in built-up areas, a demand missing from the BFT. The metabolic demand of certain urban operations tasks was measured by the PSP HPRD team as high as 34 milliliters per kilogram per minute, averaged over a period of five minutes.

A generic skill-free simulation for urban operations was developed with leadership and subject matter experts from the Combat Training Center (CTC) at CFB Gagetown. The simulation consisted of an approach to a three-story townhall building, window entry, walking at an operational pace to the third floor, and performing a two-person casualty evacuation back to the point of entry, followed by a 25-metre casualty drag with an 82kg mannequin. Teams of five performed this scenario repeatedly, and the metabolic demand was obtained.

Based on these measured demands of the scenario, the PSP HPRD team proposed the concept of a modified FORCE evaluation (FORCE Combat). With the support of CADTC, various options were trialed with Army research participants, including 35kg or 45kg loads for the 5km march, and the FORCE circuit performed in physical training gear, CADPAT, and FFO (25kg or 35kg). Energy cost and metabolic data were presented to experts from the Infantry School at CTC, and CADTC. Data demonstrated that to ensure a member could perform the urban simulation, the 5km load-bearing march should be completed in 50 to 60 minutes wearing Battle Order (35kg), followed by a 5-minute rest to remove the pack, then a FORCE circuit wearing FO (25kg).



“FORCE Combat provides an extremely valuable tool for ensuring our members have the most scientifically accurate training system, in order to prepare them for the physical demands of modern combat operations.”

Commodore Sean Cantelon, Canadian Forces Morale and Welfare Services



Soldiers in full fighting order conduct the Force Fitness test in December 2016. Photo: Cpl Andrew Wesley

FORCE COMBAT VALIDATION

FORCE Combat was approved by the Army on May 18, 2016 with a plan to roll out in April 2017. Before the April Implementation it was agreed to conduct reliability testing and FORCE Combat trials. The ideal time to complete the circuit component of FORCE Combat had not been identified. Also, the initial measurements of the metabolic demand of performing the urban scenario had only been conducted in a sample of male infants, which does not match the diversity of the Army. This allowed for a gender and age free standard, based on occupational demands.

Therefore, the PSP HPRD team revisited the original urban scenario with a broader sample of combat arms and support trades, older members of various ranks, and female members. To predict a FORCE Combat completion time matching the metabolic demand of performing the urban ops scenario, linear regression analysis was employed, and a time of 14 minutes and 40 seconds was recommended.

In the initial trialing of FORCE Combat, clear signs of substantial skill components affecting speed and performance were observed, suggesting a training effect on performing FORCE Combat, where multiple trials could result in improved performance without any change in physical capacity. Therefore, a reliability study determined how many practice attempts should be recommended. Over a three-week period, each participant was asked to come in for seven testing days. The only significant increase in performance was observed between the first and second trial, indicating one practice trial prior to their first FORCE Combat was sufficient.

TRAINING PROGRAM

Preliminary results from the trialing of FORCE Combat showed that as much as 33 percent of Army staff were unable to complete, with no work up training. This discovery prompted the initiation of a research study to design a 12-week progressive training program (using the Dfit.ca platform) of 60 min, five times

a week, for 12 weeks to prepare staff for FORCE Combat.

An experimental and a control participant group were tested on the FORCE Combat evaluation before the start of the training program (week 0) and post-training week 4, post-training week 8, and post-training week 12, to track their progress.

The results showed that performance improvement in FORCE Combat completion time was substantially higher in the group receiving PSP Dfit.ca training.

Like the BFT, the 12-week training program is an integral part of ensuring readiness without injury and is reflective of the Mission Ready strategy. Personnel who are likely or required to complete FORCE Combat are encouraged to begin work-up training. Army leaders are expected to promote and support training programs enabling the development of well-trained soldiers.

More information regarding FORCE Combat can be found at www.cfmws.com, and FORCE Combat training programs are available at www.dfit.ca.

ENVIRONMENTAL FACTORS

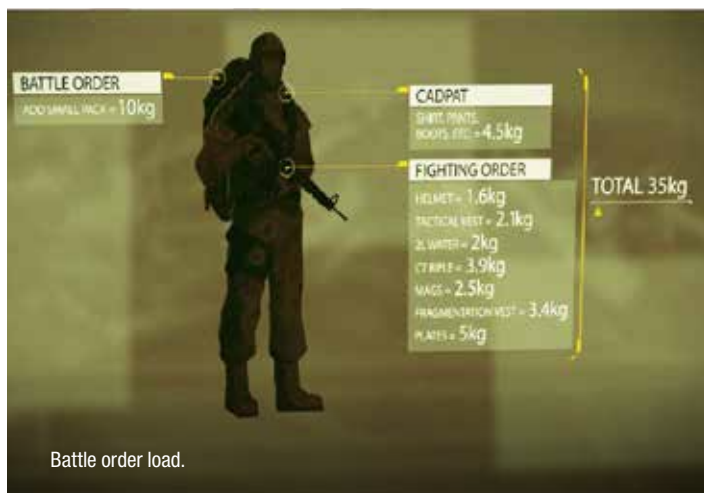
With the experienced increase in environmental temperatures over the last decade, heat-related injuries (HRI) have also been on the incline. Heat-related injuries vary in severity, from mild heat exhaustion to more serious cases like heat stroke which in some cases can be life-threatening. Between 2012 and 2015 a total of 225 heat-related injuries were recorded in CAF members.

The current Heat Stress Prevention Advisory for the CAF was updated in 2016, prior to the implementation of FORCE Combat, based on the demands of the BFT, which although a longer march, required less load and no fragmentation vest.

In light of FORCE Combat implementation, with the risk of HRI in mind, an upper limit of 19°C wet-bulb globe temperature (WBGT) was suggested to reflect the Vice Chief of the Defence Staff General Safety Program, Vol 2. However, no scientific data exist on how temperatures above 19°C WBGT



Soldiers conduct a 25-metre casualty drag with an 82kg mannequin as part of the urban ops simulation in Gagetown in 2018. Photo: Cpl Genevieve Lapointe



Battle order load.



2Lt Ashley Stiffler during urban ops phase 2 trials in Gagetown in 2018. Photo: Cpl Genevieve Lapointe

would affect cardiovascular and thermoregulatory responses in members performing FORCE Combat.

Two studies to address this were conducted by the University of Ottawa Nutrition and Metabolism Research Unit (one funded by PSP and the NMRU, and one funded by the Army). FORCE Combat was performed in various environmental conditions: 19°C (60%RH and 330W/m2 solar load) and 21°C (50% RH), 24°C (50%RH and 330W/m2 solar load), and 30°C, (50%RH). A total of 66 participants including older males and 10 females were tested on their physiological response to performing FORCE Combat in the heat. An additional 13 civilian females were recruited to supplement CAF participation.

These preliminary results seem to suggest that performing FORCE Combat at environmental conditions approaching 24°C WBGT would not increase the risk of exposing the general members to undue harm, but a more detailed analysis of this data is required before such a recommendation can be made.

FUTURE CONSIDERATIONS

Future evolution for FORCE Combat should include intelligent data capture and data analytics of Army performance to allow quarterly briefings to the leadership on operational readiness. This technology, used for the FORCE evaluation, captures member performance and has been found to be very informative and help better direct physical training programs and services as well as identify needs for injury prevention strategies. ■

Dr. Tara Reilly, Dr. Hans Christain-Tinglestad and Jacqueline Laframboise are with Human Performance Research & Development, Directorate of Fitness, Personnel Support Programs, Canadian Forces Morale & Welfare Services; Maj Nadia Worthington is with the Canadian Army Doctrine and Training Centre (CADTC); and LCol Matthew Sprague is with the Directing Staff, Canadian Army Command and Staff College.

UNMANNED TRIALS



General Dynamics Land Systems-Canada Multi-Utility Tactical Transport.

Soldiers to Test UGV Applications

By Chris Thatcher

Sometime in the next 24 months, light infantry soldiers could be asked to help test the utility of unmanned ground vehicles (UGV).

The Directorate of Land Requirements (DLR) intends to buy and try up to five autonomous vehicles under a minor capital project, and will provide one to each of the Army's three light infantry battalions and two to the light engineer regiments.

"We want to give troops that typically carry the biggest loads on foot a chance to play around with these vehicles, see how they'd used them and tell us how well they might work and be integrated within real missions," said Major Tony Ross, who leads the Light Infantry Enhancement project. Experimenting with UGVs is a side effort to better understand how to best fit a rapidly emerging technology into operations.

In addition to turning loose the light infantry to push the vehicles to their limits under a

variety of operational conditions, Ross plans to conduct more specific and formal trials of the five vehicles with Defence Research and Development Canada (DRDC) and the Canadian Army Trials and Evaluation Unit at CFB Gagetown. Part of any buy and try would also include two years of integrated logistics support to gauge the level of maintenance required by units to keep the vehicles rolling.

The user feedback and performance data from both the formal and informal trials will provide a basis for future requirements documents if the Army decides to proceed with a major capital project and "invest more heavily in autonomous systems," he said. "For now, it is very much putting our feelers out and getting acquainted with this technology and building our knowledge base before we move onto something bigger."

In 2016 the Army took a similar approach to evaluating four-wheeled, lightweight off-road transport for the light forces, acquiring 36 Polaris

Industries MRZR-D vehicles and 12 trailers through a buy and try. Feedback from different user communities contributed to the eventual statement of requirements and a request for proposals is expected in 2023.

Ross is also hoping to capitalize on other National Defence efforts to engage with companies developing autonomous platforms. Last year, the Innovation for Defence Excellence and Security (IDEaS) program issued a competitive project, "Getting Vital Supplies to Troops Using Autonomous Vehicles," on behalf of the Army. One participant met the contract award criteria, and if funding is granted, DLR might be able to acquire several test vehicles for its trials. "That would give us a chance to compare two different platforms at the same time," he said.

The recent push to evaluate UGV capabilities is being driven by a number of factors, not the least of which is the Infantry Corps itself, Ross explained.



The Canadensys Aerospace HAWC or Hybrid Amphibious Wheeled Carrier (pictured) and the Raptor (Robust All-terrain Platform, Tele-operated/Robotic) are options for a UGV trial.

In a document published last June, *Soldier Burden Capability Gap*, the Corps identified unmanned capabilities as a potential need and recommended DLR begin research “into UGVs to support overburdened light forces soldiers.”

According to load effects assessment studies led by Linda Bossi of DRDC Toronto, the optimal weight a soldier should carry is approximately 30 percent of their bodyweight when fighting and 45 percent when marching. Light forces soldiers often end up carrying about 60kg all the time. Though armies have tried to reduce the size and weight of kit, they have nonetheless heaped more and more sensing technology on soldiers in recent years. “We keep adding to the soldier burden but we are not giving them anything to take it away,” Ross observed.

The advantage offered by unmanned capabilities was flagged in the Army’s recently released modernization strategy, *Advancing with Purpose*, which noted that “autonomous systems can

already perform many dull, dirty, and dangerous tasks but also have incredible potential to expand their utility, including their ability to operate collaboratively with humans creating a system in which the sum of the parts is greater than the whole. The requirement for a human in or on ‘the loop’ will remain for any application of lethal force, but their utility to assist with sensing and sustaining are already apparent.”

Allies have made similar assessments. The United States Army is well down the road to introducing robotic combat vehicles (RCV) and will conduct a company-level soldier assessment of light- and medium-weight prototypes in 2022. In late 2018, the British Army held its first Army Warfighting Experiment, named Autonomous Warrior, that featured 71 robotic and autonomous systems. Ross has also been monitoring the U.K.’s Future Capability Group Robotic Platoon Vehicle effort, which will trial vehicles from several

companies through a similar buy-and-try process “to see which vehicle might meet their needs,” he said. “They are very much in the just-starting-out-stage as well, but a bit ahead of us.”

UGVs are not new to the Army. Explosive ordnance disposal teams have been operating a family of three robotic systems for years: the Telerob Explosive Ordnance Disposal and Observation Robot (also known as Teodor); the Vanguard Mark III; and the Cobra – the latter two are due to be upgraded or replaced through a project called Advanced Improvised Explosive Device Detect and Defeat (AIEDDD).

Ross wants to understand their potential beyond a mule or logistics capacity, hauling soldier gear and equipment to an objective autonomously or via remote control. DRDC has drawn up vignettes of possible applications that include tracking back and forth between a unit in contact and a company quartermaster to deliver

ammunition and other supplies; transporting casualties to a helicopter evacuation point while also supporting a medic performing treatment – perhaps even monitoring vital signs; serving as a launch and recovery platform for small and micro unmanned aerial systems; and as a charging station for soldiers with multiple devices.

One scenario involves the UGV mounted with an automatic grenade launching system being deployed, rather than dismounted soldiers, to take out a sniper in a building after an aerial drone first locates the target.

“We don’t know all the applications it could have yet, but it is definitely not just logistics. There are a lot of different things it could do,” said Ross, an infantry officer with the Princess Patricia’s Canadian Light Infantry who is immersing himself in unmanned vehicle technology.

One of DLR’s requirements will be to connect the UGV to the Army’s recently fielded integrated soldier system suite (ISS-S), which includes a cellphone-like device connected to a hub and radio. “We want an app that would allow soldiers to control whatever UGV we acquire from their ISS-S console,” said Ross. Rheinmetall Canada, the prime contractor on the ISS-S, is among the companies interested in the trial and has already demonstrated the ability to operate its eight-wheeled Mission Master from the soldier tablet.

A decade ago, UGVs were mostly the creation of small entrepreneurs and inventors, building rudimentary vehicles in their garage. Today, most major defence companies have a platform and all are looking for opportunities to demonstrate them to militaries. In addition to Rheinmetall Canada, Ross has spoken with companies like Thales Canada and Canadensys Aerospace, a southern Ontario-based company best known for flight hardware and software design on the Mars and Moon rovers – it has two autonomous rugged platforms, the optionally-manned HAWC (Hybrid Amphibious Wheeled Carrier) and the Raptor (Robust All-terrain Platform, Tele-operated / Robotic). Ross expects to have a long list of interested participants by the time a buy-and-try request for proposals is ready.

Though DLR is pursuing funding approval for a lengthy list of projects, Ross expects UGV trials to become a priority area of investment sooner rather than later. “This is going to be big in the future. Canada needs to start investigating this technology now so that we can keep pace.” ■



Rheinmetall Canada Mission Master cargo variant



A loaded GDLS-C Multi-Utility Tactical Transport



Rheinmetall Mission Master protection variant

Harvesting Insight

How combat simulation and data farming are playing a pivotal role in upgrade and acquisition projects

By Maude Amyot-Bourgeois and George Nikolakakos

Computer wargaming and combat simulation have a long tradition of providing valuable and economical decision support to often costly and complex Canadian Army equipment upgrade and replacement projects. These simulation tools can be used to carry out experiments that allow for the relative effectiveness of alternative equipment systems and force structures to be analyzed within the context of well-defined combat scenarios.

In the late 1990s, the U.S. Marine Corps identified the need for combat simulation models that could account for the inherent nonlinearity of modern warfare. In 1998 the international Project Albert team, which included defence members from the U.S., Germany, Sweden, Australia, New Zealand and Singapore, was established to explore this issue. From this community, a suite of new combat simulation models was developed and the concept of “data farming” was born.

Data farming is a process that relies on the generation of a large volume of simulation output data based on the broad exploration of the parametric space in a combat model that is kept as simple and abstract as possible. The multitude of data points generated using this method represent various outcomes that can be analyzed to predict trends, find the variance in the outcomes, identify and explain outliers, measure the impact that different factors have on the outcome, observe the interaction between those factors, and more. These various insights can then offer a valuable complement to other methods of decision support such as the use of more detailed high-fidelity combat models.

Bdr Kevin Perron of 2 Royal Canadian Horse Artillery launches a Raven B mini UAS
Photo: Cpl Francis Gingras

The vast amounts of data produced using this method typically necessitates the use of high-performance computing. As computer technology has increased, so too has the amount of insight that can be gained using data farming methods.

A primary simulation tool currently being employed within Defence Research and Development Canada's Centre for Operational Research and Analysis (DRDC CORA) is the New Zealand Defence Technology Agency (DTA)-developed Map-Aware Non-uniform Automata (MANA) model. MANA, which resulted from the Project Albert initiative, has been used by the DTA and international defence agencies to examine a variety of military aspects including maritime surveillance and patrols, land sensor mixes, cordon tactics, humanitarian assistance, maritime force protection, and weapon effectiveness. MANA has also been used to study the fractal properties of combat.

Within DRDC CORA, MANA has previously been applied to examine Army issues including the use of non-lethal weapons in hostile crowd confrontation situations and the development of convoy tactics, techniques, and procedures in a counter-improvised explosive device situation. Additionally, it has been used to conduct coastal surveillance planning and assessment and to model a naval force protection scenario.

The Land Force intelligence, surveillance and reconnaissance (ISR) modernization project and the Ground-Based Air Defence (GBAD) project are two examples of how ongoing MANA data farming is being conducted in support of Army acquisition.

LAND FORCE ISR MODERNIZATION

The Canadian Army is planning the modernization of its ISR capabilities. This includes the design of an ISR architecture tailored to meet the requirements of each of the eight core missions of the Army as outlined in Canada's defence policy, *Strong, Secure, Engaged*. DRDC CORA is presently using MANA to test a multitude of potential sensor configurations within the context of a vignette that was developed to represent a future army operations concept for the fourth CAF core mission, which is to lead or contribute to international peace operations and stabilization missions.

The scenario modeled in MANA represents a NATO brigade responsible for monitoring an area and engaging threats. The objective of the study is to determine the key sensor parameters that have the greatest influence on mission success. Sensor parameters being scoped have included different types of sensor platforms, the total number of sensors, the sensor detection range, and the sensor survivability.

The simulation output data is analyzed using innovative machine learning methods to predict trends and explain behaviors in the metric outputs.

GROUND-BASED AIR DEFENCE

The Ground-Based Air Defence project will see the acquisition of a GBAD system that will provide tactical air defence protection to friendly forces and key installations during expeditionary and domestic operations against diverse air threats. The air defence system will include the effector platforms (which may include some combination of guns, missiles, directed energy weapon



An AN/MPQ-64 Sentinel Air Defense System from the South Carolina Army National Guard's 263rd Army Air and Missile Defense Command at 22 Wing North Bay in 2016. Photo: Cpl Joseph Morin



A member from 5th Canadian Light Artillery Regiment with the Raven-B (CU-173).
Photo: Cpl Matthieu Racette

systems, and electronic warfare systems), munitions, a sensor suite, fire control software and an integrated C4ISR system. Potential key threats include rocket, artillery and mortar munitions, air-to-surface missiles and bombs, and remotely-piloted aircraft systems.

DRDC CORA is currently applying MANA to provide scientific insight into this acquisition project. The goal of these experiments is to assess the performance of a selection of GBAD assets and different combinations of GBAD assets against various threats within the context of combat scenarios such as convoy protection and point defence.

With the rise of high-performance computing, multi-dimensional data visualization, and advanced machine learning methods, the application of combat simulation and data farming to Army projects has become increasingly relevant and valuable. In addition to the above projects, DRDC CORA is presently exploring the use of MANA to model air defense against ballistic missiles in the context of North American continental defence.

Future Canadian Army acquisition and upgrade projects could greatly benefit from conducting assessment studies using MANA data farming as part of a comprehensive simulation methodology. ■

Maude Amyot-Bourgeois is an experimental physicist with Defence Research and Development Canada's Centre for Operational Research and Analysis (DRDC CORA) and a member of the Canadian Army Operational Research and Analysis Team (CA ORAT). Dr. George Nikolakakos is an experimental physicist in DRDC CORA and a member of the CA ORAT. © Her Majesty the Queen in Right of Canada.



The Air Defence Anti-Tank System (ADATS) at CFB Suffield during Ex Potent Knight in 2007.
Photo: MCpl Dan Noiseux, Joseph Morin

Cpl Elijah Clarke works the tech of a TAPV gun. Photo: Pte Daniel Pereira

LEARNING TO BUY TECH

The pursuit of artificial intelligence, machine learning, hypersonic weapons and robotics, among other emerging technologies, represent the “great technological race of the 21st century,” General (Retired) John Allen told the Ottawa Conference on Defence and Security in March.

How militaries develop and apply those capabilities “will dramatically shape the character of war,” suggested the president of the Brookings Institution and former commander of the NATO International Security Assistance Force and U.S. Forces in Afghanistan.

Allen’s comments served as a stark reminder of how much more complex defence procurement will be. The Internet of Things is fast becoming a concept that will apply equally to armies as it will to home appliances. The days of buying anything that won’t talk to something else are nearing an end. Interoperability is the preeminent watchword for most projects, deconflicting interdependencies among the multitude of tasks project teams must manage.

In some armies, the responsibility for developing requirements and delivering equipment is an established trade. In the Canadian Army, it’s a posting. That can present a challenge when technology is changing so rapidly.

The task of preparing procurement, sustainment and trials staff at the Directorate of Land Requirements (DLR), Director General Land Equipment Program Management (DGLPEM), Trials and Evaluation Unit (CATEU) and other organizations rests with the Army Technical Staff Officer (ATSO) and Army Technical Warrant Officer (ATWO) programs, delivered under the Applied Military Science (AMS) program at the Royal Military College.

The ATSO and ATWO programs were adapted from the U.K.’s Defence Academy at Shrivenham in the early 1990s and consists of 18 courses on defence procurement, project management and technology. Delivered over a 12-month period, they provide students with a foundation in applied mathematics, physics, chemistry and materials, as well as critical thinking and decision analysis, and an appreciation for how procurement and project management work within the defence sector and within National Defence and the federal government.

“In a year, we try to give them as much procurement, management and technological knowledge as possible for them to work effectively,” explained Lieutenant-Colonel Gregory White, AMS chief instructor. The Army “is not just operations and training – procurement is also a large part of the big machine.”

In a typical year, eight to 10 warrant officers and master warrant officers and 12 to 14 captains and majors will enrol in a common curriculum that

includes modelling and simulation, systems engineering, logistics engineering and management, military communications, military information systems (MIS), weapon systems, battlefield surveillance and target acquisition, military human factors, testing and analysis, and vehicle systems survivability and mobility.

Over the year, students will also complete a research project, either individually or as part of a team, where they take a deep dive into a research problem proposed by sponsoring organizations like DLR, DGLPEM, CATEU and others across industry and the Canadian Armed Forces. The equivalent of an MBA, “that is always the most technological cutting-edge stuff,” White noted, ranging from artificial intelligence (AI) applications to solar energy storage.

Where the military was once on the leading edge of technology development, today it is often a follower and adapter of commercial invention. If the challenge for the Army is “to militarize this technology that is changing faster than we can make it green,” then the challenge for AMS instructors is to keep course content current – not ahead of technology, but in line with what the Army is procuring, said White.

The curriculum is reviewed regularly, and already the programs are grappling with how cloud computing and AI applications employed by warehouses and freight companies, for example, could fundamentally change military logistics. The MIS course, traditionally a how-does-a-computer-work program, has recently doubled from 40 hours to 80 hours of instruction and now includes components on operational and tactical networks as well as corporate systems and the computer architecture that comprise the larger National Defence enterprise.

“We now have a third component that is cyber security at both the tactical and corporate levels, because those are two utterly different worlds,” he said. Looking ahead, the programs are developing curricula for military communication systems to provide the foundations for digital networking.

Even vehicle systems instruction, which has focused on the fundamentals of vehicle performance, is starting to adapt to the arrival of robotics and autonomy. “Does that become an independent course? Or does it stay within the vehicle course?” said White.

Solving the Army’s technology challenges is not the sole remit of procurement staff. Acquisition is a team sport with a lot of moving pieces, something that is reinforced in the program, White stressed. But the technological race the Army is now on means AMS staff will be in a constant state of change even as it reinforces procurement fundamentals. ■

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