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The Case for Renewal:
The North Warning System and Canada

Threats through, to, and in the Arctic:
North American Defence and Security through a Canadian Lens

National Defence Défense nationale

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THE CANADIAN ARMY JOURNAL

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CANADA'S PROFESSIONAL JOURNAL ON ARMY ISSUES

The *Canadian Army Journal*, a refereed forum of ideas and issues, is the official publication of the Canadian Army. This periodical is dedicated to the expression of mature professional thought on the art and science of land warfare, the dissemination and discussion of doctrinal and training concepts, as well as ideas, concepts, and opinions by all army personnel and those civilians with an interest in such matters. Articles on related subjects such as leadership, ethics, technology, and military history are also invited and presented. The *Canadian Army Journal* is central to the intellectual health of the Canadian Army and the production of valid future concepts, doctrine, and training policies. It serves as a vehicle for the continuing education and professional development of all ranks and personnel in the Canadian Army, as well as members from other environments, government agencies, and academia concerned with the Canadian Army, defence, and security affairs.

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EDITORIAL

Welcome to the *Canadian Army Journal* (CAJ) edition 19.2. As I pen this editorial, we are slowly emerging from COVID restrictions. Managing CAJ production has posed some challenges during this period but, with patience and an understanding Army Publishing Office, we continue to forge ahead, offering you another opportunity to read about, reflect on and debate the issues facing our Army. *Strong, Secure and Engaged* and the recently released *Canadian Army Modernization Strategy* make it clear that challenges and threats to Canada continue to emerge within our complex and uncertain security environment. Indeed, Canada's long-held assumption of geographically assured safety is increasingly in doubt and, given that land power remains central to any pan-domain approach to continental defence, it is clear that the Canadian Army must consider the nature and substance of its contributions to that end. With that in mind, we settled on continental defence as our theme for this edition. We hope you will enjoy the articles we have assembled.

Three feature articles view continental defence from perspectives external to the Army. Whitney Lackenbauer starts us off with a discussion of "threats through, to, and in the Arctic," followed by Nancy Teeple's and Nicole Covey's articles on ballistic missile defence and the North Warning System respectively. These issues may seem somewhat removed from general Army discussion, but it becomes clear that, when coupled with the pan-domain approach necessary for successful continental defence, the capabilities and dilemmas addressed in these three articles must be understood by the Army.

These three articles are followed by timely contributions focusing on different aspects of capability development. The first stems from the Canadian Army Land Warfare Centre's research on the future of artificial intelligence (AI). Major Geoff Priems and Peter Gizewski (Defence Research and Development Canada Centre for Operations Research and Analysis) offer a structured overview of possible uses for AI and its potential as a significant enabler of military effectiveness. Perhaps more importantly, it looks at the challenges and opportunities associated with effective AI adoption. Juan-Camilo Castillo offers analysis and recommendations for the design of a deployable joint interagency fusion cell capability, a cost-effective response to today's complex security challenges. Lastly, Lieutenant-Colonel (Retired) Perry Wells provides an in-depth look at the complexities of contemporary defence procurement through the Leopard II procurement project. These articles respectively explore the "conceive," "design" and "build" pillars of the Army's capability development continuum.

Accompanying the above-mentioned features are the CAJ's regular Book Review and Stand-up Table sections presenting opinions and discussion on a wide variety of topics. We also have a strong Note-to-File section, offering articles that are shorter but no less important and interesting. In this edition, it contains a mix of historical, contemporary and future-oriented submissions. The historical perspective is represented by Acting Chief of the Defence Staff Lieutenant-General Wayne Eyre's historical piece on Kapyong and Captain (N) Jeff Biddiscombe's reflection on the establishment of 1 Field Ambulance during World War II. There is also more contemporary thinking by Captain Conway Hui, who calls for the creation of a small drone capability for the Army, and Major (Retired) Les Mader, who extols the benefits of creating a 3rd Special Service Force for sovereignty operations in the Arctic. And, focusing on the future, Lieutenant-Colonel C. W. Hunt's article offers a fresh look at Army force-generation from the perspective of Regular–Reserve Force integration. This article will surely prompt debate and discussion as we continue to seek the potential efficiencies and effectiveness embedded within a stronger and more resilient Regular–Reserve Force integration model for Force 2025.

Lastly, I would like to remind all of you that the CAJ is your journal and that our success depends on your continued interest and submissions. That said, interest continues to grow in CAJ, as evidenced by the increasing number and variety of submissions. I would like to re-emphasize that increasing CAJ's rigour through peer review requires time and patience. Please do continue to write and offer opinions or personal insight on issues of substance facing the Canadian Army. The CAJ team looks forward to hearing from you.

Brigadier-General Chris C. Ayotte, CD
Chief of Staff, Army Strategy

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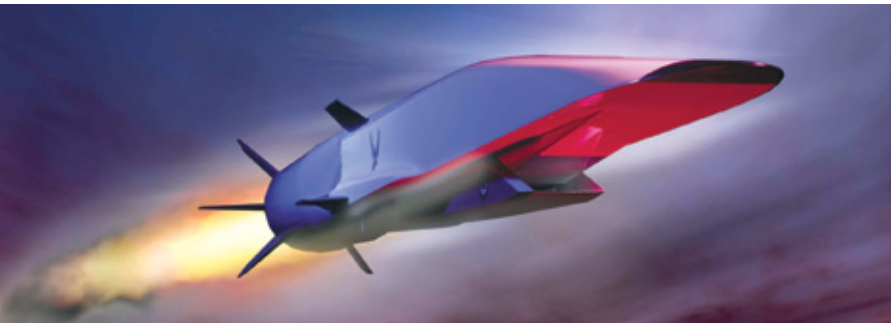

THREATS THROUGH, TO, AND IN THE ARCTIC: NORTH AMERICAN DEFENCE AND SECURITY THROUGH A CANADIAN LENS

P. Whitney Lackenbauer

The Arctic region represents an important international crossroads where issues of climate change, international trade, and global security meet. Eight states—Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden, and the United States—have territory north of 60, while five of these states border the Arctic Ocean. Arctic states have long cooperated on economic, environmental, and safety issues, particularly through the Arctic Council, the premier body for cooperation in the region. All Arctic states have an enduring interest in continuing this productive collaboration.
— *Strong, Secure, Engaged* (2017), p. 50

Canada's 2017 defence policy, *Strong, Secure, Engaged* (SSE), confirms that the Arctic remains an area of particular interest and focus, highlighting its cultural and economic importance as well as rapid environmental, economic, and social changes that present opportunities and generate or amplify security challenges. To meet those challenges and "succeed in an unpredictable and complex security environment," the Government of Canada is committed to an ambitious program of naval construction, capacity enhancements, and technological upgrades to improve situational awareness, communications, and the ability of the Canadian Armed Forces (CAF) to operate across the Canadian Arctic. The justifications for these investments include a range of drivers and dynamics often compressed into a single narrative, with the Arctic region highlighted as "an important international crossroads where issues of climate change, international trade, and global security meet."[1]

The Canadian debate on Arctic security over the last two decades reveals four core schools of thought offering divergent regional threat assessments. Proponents of the "sovereignty on thinning ice" school suggest that Arctic sovereignty, maritime disputes, and/or questions of resource ownership will serve as catalysts for Arctic conflict. This thinking underpinned the "use it or lose it" messaging that dominated during Prime Minister Stephen Harper's first years in office in the mid-2000s. Although this idea no longer dominates academic discussions, it still lingers in news media and public perceptions. Other commentators argue that there is no military threat to the Arctic and that defence resources should instead be directed to dealing with human and environmental security issues associated with climate change and the region as an Indigenous peoples' homeland.

Yet another school of thought argues that, while strategic deterrence continues to have an Arctic dimension (and that this is best conceptualized at an international rather than a regional level of analysis), Canada is not likely to face conventional military threats in or to its Arctic region in the next decade. Instead, members of this school suggest that Canada should focus on building Arctic military capabilities within an integrated, "whole-of-government" framework, largely directed towards supporting domestic safety and

Source: Combat Camera

"soft" security missions that represent the most likely incidents to occur in the Canadian Arctic. It should also invest in sensors and capabilities in the Arctic that can contribute to broader defence-of-North-America missions, but these should not be misconstrued as capabilities needed because the Canadian Arctic itself is specifically threatened by foreign adversaries and vulnerable to attack.

More recent debates emphasize the risks of great power competition globally "spilling over" into the Arctic. Political scientist Rob Huebert, previously the most strident proponent of the "sovereignty on thinning ice" school, recently argued that "a New Arctic Strategic Triangle Environment … is forming, in which the core strategic interests of Russia, China and [the] United States are now converging at the top of the world." He suggests that this new "great game" is not about conflict *over* the Arctic but is rather occurring *through* the Arctic. "This does not make the threat any less dangerous," he suggests, "but it does make it more complicated." With tensions growing between Russia and the West, and China's relationships evolving with both the West and Russia, Huebert asserts that "the primary security requirements of the three most powerful states are now overlapping in the Arctic region, producing new challenges and threats."[2] While this lens is compatible with the basic tenets of the third school, it places more weight on military threats than on "soft" or human security ones.

This article suggests the value of a model that deliberately parses whether analysts are discussing threats *through, to, over*, or *in* the Canadian Arctic. In this framework, threats passing *through* the Canadian Arctic emanate from outside of the region and pass through or over it to strike targets that are also outside of region. For example, a supersonic Kalibr-M cruise missile launched from Russia would likely pass over the Canadian Arctic before striking at a target in the northern continental United States. Sensor systems that detect the launch and track the missile might be based in the Arctic, but it would be misconstrued as an *Arctic* threat in a defence-of-North-America context. Threats *to* the Canadian Arctic are those that emanate from outside of the region and affect the region itself. Examples could include a below-the-threshold attack on critical Arctic infrastructure, a foreign vessel running aground in Canadian waters with deleterious environmental effects, the introduction of a pandemic, or the acquisition of a port or airfield at a strategic location by a company owned and controlled by a non-like-minded state. Threats *in* the Arctic originate within the region and have primary implications for the region. Examples include permafrost degradation threatening critical infrastructure, the failure of a diesel-electric generator powering an isolated community, or heightened polarization of public debate leading to economic or political disruption. Some threats, such as climate change (which is caused by activities outside the region and thus represents a threat *to* it, while regional and local climate dynamics *in* the Arctic, such as extreme weather, threaten local residents), will straddle these categories, but this conceptual exercise can help to determine appropriate scales for preparedness and response to different threats, and by which primary stakeholders should lead response efforts, rather than bundling them all together as a generic laundry list of "Arctic threats."

Current North American defence modernization discussions are likely to amplify the debate about the nature of Arctic security in Canada and the implications for policy and investment.[3] With climate change "opening new access" to the region, Canada's defence policy observes that "Arctic and non-Arctic states alike are looking to benefit from the potential economic opportunities associated with new resource development and transportation routes." What does this mean for a country with Arctic policies predicated on the idea of the region as a *place*—with particular salience as an Indigenous homeland—rather than a threat vector? How do measures to address strategic threats to North America passing *through* the Canadian Arctic relate to threats *to* the region or *in* the region? Where does the Canadian Army fit within this strategic picture?

SETTING CANADA'S ARCTIC CONTEXT

As an Arctic state with forty percent of its landmass north of 60° latitude and 162,000 km of Arctic coastline, Canada's interest in the region is obvious. Its emphasis on the human dimensions of the Arctic, and particularly those related to the northern Indigenous peoples who make up a high proportion of the population, also reflect national realities. Social indicators in Canada's Indigenous North remain abysmal, reflecting the challenges of providing social services and infrastructure to small, isolated settlements spread out over a vast area. Northern Indigenous peoples also face many challenges associated with rapid changes to their homelands, including threats to language and culture, erosion of traditional support networks, poorer health than the rest of Canadians, and changes to traditional diet and communal food practices. Those challenges represent Canada's most acute Arctic human security imperative.

Canadian governments have recognized and grappled with the challenge of balancing the needs of Northern Canadians with economic development and environmental protection for fifty years. Under Conservative Prime Minister Stephen Harper (who was in power from 2006 to 2015), the balance seemed to tip in favour of resource development and hard-line messaging about defending sovereignty. A more careful reading reveals that the Harper government's sovereignty-security rhetoric became more nuanced over time, reflecting an attempt to balance messaging that promised to "defend" Canada's Arctic sovereignty with a growing awareness that the most probable regional challenges were "soft" security- and safety-related issues that required "whole-of-government" responses.[4]

Although the election of Justin Trudeau's Liberal party in October 2015 brought a significant change in political tone, the main substantive elements of Canada's Arctic policy have not changed. A domestic focus on Indigenous rights, environmental protection, and the health and resiliency of Northern communities has been complemented by a renewed commitment to global climate change mitigation and the benefits of co-developing policy with Northern stakeholders and rights holders. Through bilateral statements with President Barack Obama in 2016, Prime Minister Trudeau offered a model for Arctic leadership that placed a clear priority on Indigenous and "soft security" issues over classic defence-of-sovereignty-focused messaging.[5] Similarly, the federal government's *Arctic and Northern Policy Framework* (ANPF), released in September 2019, indicates a concerted emphasis on environmental conservation and improving the socio-cultural health of Northern Indigenous peoples. The decision to link the domestic and international dimensions of Canada's Arctic strategy in a single policy framework reaffirms the inter-connectivity between national, regional, and global dynamics.[6]

The safety, security, and defence chapter of the ANPF lays out the Government of Canada's objectives to ensure a safe, secure, and well-defended Arctic and North through to 2030. "While Canada sees no immediate threat in the Arctic and the North, as the region's physical environment changes, the circumpolar North is becoming an area of strategic international importance, with both Arctic and non-Arctic states expressing a variety of economic and military interests in the region," the policy framework emphasizes. "As the Arctic becomes more accessible, these states are poised to conduct research, transit through, and engage in more trade in the region. Given the growing international interest and competition in the Arctic, continued security and defence of Canada's Arctic requires effective safety and security frameworks, national defence, and deterrence."[7]

Given the evolving balance of power, changing nature of conflict, and rapid evolution of technology globally over the last decade, official Canadian statements recognize the need for new approaches to anticipate and confront threats and challenges. To remain effective in a highly dynamic, complex global and regional environment, policymakers and planners must develop mechanisms to continuously test their assessments, ideas, and assumptions to ensure that they do not become limiting or outdated. Accordingly, contemplating strategic futures in Canada's Arctic requires attentiveness to global, circumpolar regional, continental, and domestic drivers—with an emphasis on levels or scales—that could affect the CAF's mission to keep Canada strong at home, secure in North America, and engaged in the world to promote peace and stability.

Source: Combat Camera

Canadian Ranger Deborah Iqaluk of 1st Canadian Ranger Patrol Group participates in Arctic training during Operation NANOOK-NUNALIVUT in Resolute Bay, Nunavut, on 28 March 2019.

Source: Combat Camera

Members of the Arctic Response Company Group unload qamutiiks after returning from patrol to Canadian Forces Arctic Training Centre during Operation NANOOK-NUNALIVUT 2018 near Resolute, Nunavut, on 17 March 2018.

Source: Combat Camera

A member of 1st Canadian Ranger Patrol Group fishes during Operation NANOOK-NUNALIVUT in Cambridge Bay, Nunavut, on 11 March 2018.

"Given the growing international interest and competition in the Arctic, continued security and defence of Canada's Arctic requires effective safety and security frameworks, national defence, and deterrence."

THREATS *THROUGH* THE CANADIAN ARCTIC: SITUATING THE ARCTIC IN A GLOBAL CONTEXT

For nearly a century, Canada has invested in building and sustaining an international system that reflects its values and interests. A shifting balance of power and the re-emergence of major power competition now threatens to undermine or strain the established international order and rules-based system. China, as an emerging economic superpower, aspires to a global role proportionate to its economic weight, population, and self-perception as the Middle Kingdom. Russian President Vladimir Putin's recent declaration that liberalism is "obsolete"[8] affirms that his country has deviated from its early post-Cold War path, and its revisionist behaviour in Georgia, Ukraine, and Syria exemplifies Russia's willingness to test the international security environment. Consequently, Canada's role is less obvious in the emerging multipolar world, which challenges the Western-designed security system, than it was in the bipolar Cold War order or the unipolar moment that followed. This creates more space for emerging state and non-state actors to exercise influence, including in the Arctic.

Within this broader context, *Strong, Secure, Engaged* highlights three key security trends that will continue to shape events: the evolving balance of power, the changing nature of conflict, and the rapid evolution of technology. All of those trends have direct and indirect application when contemplating and imagining future Arctic security environments, vulnerabilities, and requirements. Furthermore, Canada's ANPF emphasizes the following:

> The international order is not static; it evolves over time to address new opportunities and challenges. The Arctic and the North is in a period of rapid change that is the product of both climate change and changing geopolitical trends. As such, international rules and institutions will need to evolve to address the new challenges and opportunities facing the region. As it has done in the past, Canada will bolster its international leadership at this critical time, in partnership with Northerners and Indigenous peoples, to ensure that the evolving international order is shaped in a manner that protects and promotes Canadian interests and values.[9]

Source: Combat Camera

In a complex security environment characterized by trans-regional, multi-domain, and multi-functional threats, Canada must continue to work with its allies to understand the broader effects of the return of major power competition to the international system and to regions like the Arctic and what that means for Canadian defence relationships and partnerships. Emerging threats to North America, across all domains, must be situated in the context of continental defence and the longstanding Canada-US defence partnership exemplified by the North American Aerospace Defence Command (NORAD). This binational command has proven effective in deterring, detecting, and defending North America's approaches since the 1950s, and it remains "the cornerstone of Canada's defence relationship with the US, and provides both countries with greater continental security than could be achieved individually."[10] Resurgent major power competition and advances in weapons technology pose new threats to continental security, however, which require NORAD to modernize and evolve to meet current and future threats.

Both *Strong, Secure, Engaged* and the ANPF underscore the importance of NORAD modernization efforts, the integration of layered sensor and defeat systems, and improving the CAF's reach and mobility in the Arctic within this alliance construct. New commitments, however, will require creative thinking about infrastructure, surveillance and detection, interception capabilities, and command and control relationships. In light of advanced technologies and capabilities that adversaries can use to strike from multiple directions, NORAD has turned its focus to "all-domain" awareness, improved command and control, and enhanced targeting capabilities that can allow decision-makers to respond "at the speed of relevance."[11] US Northern Command/NORAD highlight the importance of advanced sensors that can detect, track, and discriminate advanced cruise missiles, ballistic missiles, hypersonics, and small unmanned aerial systems at full ranges (as well as the platforms that carry these weapons), as well as new mechanisms to defeat advance threat systems (including advanced cruise missiles capable of striking North America "from launch boxes in the Arctic").[12] Accordingly, talk of the

Members of the United States Navy and United States Coast Guard prepare to conduct a boarding exercise aboard HMCS GLACE BAY during Operation NANOOK-NUNALIVUT 2020 on 18 August 2020.

Source: Combat Camera

need to "harden the shield" to project a credible deterrent against conventional and below-the-threshold attacks on North America anticipates new Canada-U.S. solutions that will incorporate Arctic sensors and systems in a layered "ecosystem" of sensors, fusion functions, and defeat mechanisms.[13] As NORAD commander General Glen VanHerck has recently emphasized, "through all-domain awareness, information dominance, and decision superiority, we will deter in competition, deescalate in crisis, and defeat in conflict."[14]

Furthermore, Canada is working with its NATO allies to re-examine conventional deterrence and how to counter adversarial activities "below the threshold" of armed conflict in the Arctic. The statement in *Strong, Secure, Engaged* that "NATO has also increased its attention to Russia's ability to project force from its Arctic territory into the North Atlantic, and its potential to challenge NATO's collective defence posture" marks a measured shift in Canada's official position. Despite Canada's reticence to have the alliance adopt an explicit Arctic role over the past decade, the inclusion of this reference—as well as the commitment to "support the strengthening of situational awareness and information sharing in the Arctic, including with NATO"—indicates a newfound openness to multilateral engagement on "hard security" in the Arctic with its European allies. NATO is the cornerstone of both Danish and Norwegian defence and security policy, which also opens opportunities for enhanced bilateral relationships. How this newfound interest in NATO's Arctic posture interacts with Canada's longstanding preference to partner bilaterally with the US on North American continental defence remains to be clarified in the next decade.

THREATS *TO* AND *IN* THE CANADIAN ARCTIC: TOWARDS A WHOLE-OF-SOCIETY APPROACH

The growing realization of the disproportionate impact of anthropogenic climate change on the circumpolar region, and concomitant social, economic, and environmental consequences for the rest of the world, also commands global attention. Canada's ANPF highlights that "the Canadian North is warming at about 3 times the global average rate, which is affecting the land, biodiversity, cultures and traditions." This rapid change is "having far-reaching effects on the lives and well-being of northerners, threatening food security and the transportation of essential goods and endangering the stability and functioning of delicate ecosystems and critical infrastructure." There is extensive Canadian interest in how those changes affect Northern peoples and the environment that sustains them at local and domestic scales as well as in the implications of rising international interest in the region. Although non-Arctic observers have traditionally confined their polar interest to scientific research and environmental issues, over the past decade significant international interest and attention has turned to oil, gas and minerals, fisheries, shipping and Arctic governance. In turn, that has generated debates amongst Arctic states about non-Arctic states' intentions and their receptiveness to welcoming Asian countries in particular "into the Arctic cold."[15]

Thus, while most Canadian analysts now downplay the probability of military and security threats to or in the Canadian Arctic over resources or sovereignty in a direct sense, globalization and growing interest in large-scale development of natural resources mean more activity in the Arctic. This generates a growing need to understand, monitor and react to activities affecting security. NATO's 2017 Strategic Foresight Analysis notes that "the growing

number of stakeholders combined with the interconnected nature of the international system, the exponential rate of change and the confluence of trends has continued to increase the potential for disorder and uncertainty in every aspect of world affairs."[16] Accordingly, Canadians must look to more comprehensive approaches that accept and incorporate complexity and uncertainty.[17]

The ANPF observes that "the qualities that make the Canadian Arctic and North such a special place, its size, climate, and small but vibrant and resilient populations, also pose unique security challenges, making it difficult to maintain situational awareness and respond to emergencies or military threats when and where they occur." Climate change compounds those challenges, reshaping the regional environment and, in some contexts and seasons, facilitating greater access to an increasingly "broad range of actors and interests" (both Canadian and international). Accordingly, the 2019 policy framework emphasizes that

> to protect the safety and security of people in the region and safeguard the ability to defend the Canadian Arctic and North, and North America now and into the future, a multi-faceted and holistic approach is required. The complexity of the regional security environment places a premium on collaboration amongst all levels of government, Indigenous peoples and local communities, as well as with trusted international partners.[18]

Given the high proportion of Indigenous people (Inuit, First Nations and Métis) in Canada's Arctic population, as well as Ottawa's political focus on improving Indigenous–Crown relations and promoting reconciliation, the Canadian Arctic and North has a much higher political profile than simple population statistics and parliamentary representation numbers might suggest. As the *Arctic Human Development Report* notes, Indigenous peoples' "efforts to secure self-determination and self-government are influencing Arctic governance in ways that will have a profound impact on the region and its inhabitants in the years to come."[19] Canadian reports highlight longstanding inequalities in transportation, energy, communications, employment, community infrastructure, health services, and education that continue to disadvantage Northerners compared to other Canadians. Furthermore, poor socio-economic and health indicators also point to significant gaps between Northern Canadian jurisdictions and their southern counterparts, elucidating higher rates of human insecurity *in* the Canadian Arctic. Accordingly, Canada's defence and security policies and practices align with its broader national strategy for the Canadian Arctic and the Circumpolar North, which promotes "a shared vision of the future where northern and Arctic people are thriving, strong and safe."[20]

"STRONG AT HOME": THE CANADIAN ARMY, THE ARCTIC, AND CONTINENTAL DEFENCE

Strong, Secure, Engaged explains how being "strong at home" requires domain and situational awareness through increased surveillance and monitoring, better information sharing with partners and allies, and more integrated land, air, and maritime capabilities to project force in the region. The rebranding of Operation NANOOK (the CAF signature operation delivering Arctic training, developing partnerships, and improving readiness) in 2018 to consolidate various operations and exercises under one operational banner reflecting year-round activities better reflects an integrated approach with key allies and partners.

To accomplish those ends, the Canadian military has a modest footprint in the Arctic. There are approximately 300 Canadian Armed Forces personnel stationed in Yellowknife with Joint Task Force (North), 440 (Transport) Squadron, and other units; approximately 1,400 Canadian Rangers serving in 64 communities across the territories with 1 Canadian Ranger Patrol Group (1 CRPG); and a small Primary Reserve unit in Yellowknife. The CAF Arctic Training Centre established in Resolute Bay, which is used to train soldiers in basic survival techniques and to serve as a hub for High Arctic exercises, and the deep-water Arctic docking and refueling facility in Nanisivik have no year-round military personnel. The longstanding Canadian Forces Station at Alert, on the northern tip of Ellesmere Island, and the North Warning System radar stations along the Arctic Ocean and Labrador Sea coasts, also represent part of the Arctic footprint. There are also NORAD forward operating locations (FOL) in Yellowknife, Inuvik, and Iqaluit (as well as a Royal Canadian Air Force FOL in Rankin Inlet).

In *Strong, Secured, Engaged*, the Government of Canada committed to acquiring next-generation surveillance aircraft, remotely piloted systems, and all-terrain vehicles, snowmobiles, and larger tracked vehicles for use in the Arctic. National Defence has also announced the following steps to further improve the CAF's presence and ability to operate in the Arctic:

- Modernizing CAF capabilities in the Arctic, including through the acquisition of six new Arctic and offshore patrol ships, and supporting the modernization of the Inuvik Airport runway.

- Launching the RADARSAT Constellation Mission in 2019, which enhances the CAF's ability to monitor Canada's maritime and northern approaches.

- Investing in a range of space capabilities, such as satellite communications that achieve global coverage, including in the Arctic.

- Launching the All Domain Situational Awareness Science and Technology Program in 2015 and a subsequent science and technology program to help find innovative solutions to address surveillance challenges in the North.

Cumulatively, these military modernization programs combine an element of strategic deterrence (effective on a global scale) and security capabilities designed to protect Arctic resources, disrupt illegal activity, and respond to humanitarian and natural emergencies on the national and sub-national scale. Canada plays a supporting role, within the contexts of its alliances with the U.S. and NATO more generally, in maintaining a global strategic ability by investing in its detection and deterrence capabilities that are based in or potentially will travel through the North American Arctic. To date, those are less about defence of the Arctic itself than about contributions to broader continental defence using forces or systems based in the Arctic.

The CAF must anticipate new risks and threats and develop the capability to project and sustain forces to deal with situations that fall across the entire spectrum of operations. The 2020 Arctic regional operations plan emphasizes that

> the preponderance of CAF activities must consider the safety and security threats that stakeholders living and working in the [Canadian North] face every day. These activities must drive the CAF to build and possess the right balance of dual-purpose infrastructure and defence presence needed in order to deter and defeat threats that may use the Northern approaches to threaten North America while also enabling the conduct of safety and security missions.[21]

Because Canada does not face a credible land-based military threat to its Arctic, the Canadian Army's focus remains on safety and security missions that fit with a comprehensive [whole-of-government] approach as well as on constructive engagement with local populations. *Advancing with Purpose: The Canadian Army Modernization Strategy* observes the following:

> The effects of climate change are perhaps most pronounced in the Arctic. Rising activity levels in Canada's Arctic by state and commercial actors raise the potential for safety and security-related challenges. These include search and rescue operations, response to natural or man-made disasters, and response to actions by states with interests in the Arctic. The Canadian Army must be ready to assist in addressing those challenges through exercises, cooperation with domestic partners, and by providing a physical presence when needed.[22]

These missions also intersect with priorities identified by Northern Indigenous peoples. Their vested interests in Arctic sovereignty and security span the military, political, economic, social, and environmental sectors of security. "The inextricable linkages between issues of sovereignty and sovereign rights in the Arctic and Inuit self-determination and other rights require states to accept the presence and role of Inuit as partners in the conduct of international relations in the Arctic," Inuit Tapiriit Kanatami (the Inuit national advocacy organization) explained in its ANPF partner chapter. "The foundation, projection and enjoyment of Arctic sovereignty and sovereign rights all require healthy and sustainable communities in the Arctic."[23] Accordingly, Canada's defence policy describes how "Indigenous communities are at the heart of Canada's North," and it commits "to expand and deepen our extensive relationships with these communities, particularly through the Canadian Rangers and Junior Canadian Rangers."

The Canadian Rangers are non-combat-oriented Reservists who serve as the military's eyes and ears across the North, providing valuable expertise and serving as critical enablers for Regular and Primary Reserve forces deployed north. Although the risk of an enemy land force incursion into the region is very low, Canada must have the capability to respond to such an implausible scenario (involving small numbers of enemy forces) should it arise. That requires scalable, agile forces that could respond to incursions—albeit highly unlikely—that target critical infrastructure or Northern populations. Four Primary Reserve (P Res) Arctic Response Company Groups (ARCG) based in Southern Canada are trained to respond to need year-round, at a notice to move suitable for routine operations. These ARCGs are dependent upon air support to deploy to and within the Arctic. Developing short-notice Arctic capabilities, in sub-unit strengths, remains an ongoing effort.

Ken Eyre noted in 1981 that "the most significant military characteristic of the Canadian North is not the climate; it is isolation!"[24] That remains true today. The lack of infrastructure in the Arctic exacerbates time and space factors, and investments that build national capacity to sustain deployments throughout the region heighten the probability of mission success. For strategic and mid-distance tactical mobility in remote regions, land forces rely on air transport, which means that improvements to airfields and their connectedness in an operational support hub-and-spoke model that enables more diverse air operations are highly relevant to the Canadian Army. It also means that equipment for short-notice Arctic operations must be transportable by aircraft that can operate reliably in the region. The ability to sustain land forces in the Arctic is also resource intensive. A robust and agile sustainment system must be carefully integrated with whole-of-government capacity and capabilities, must be sensitive to social and environmental conditions, and must avoid depleting the limited resources (both human and material) in local communities.

Members of the Royal Newfoundland Regiment deployed on Operation NANOOK-NUNALIVUT conduct loading drills with a CH-147F Chinook in Yellowknife, Northwest Territories, on 2 March 2021.

CONCLUSIONS

Changing power dynamics in the Arctic are unlikely to derive from regional boundary disputes, resources, or regional governance in the next fifteen years and instead are more likely to be driven by broader international forces and dynamics. Accordingly, official threat assessments are warranted in emphasizing that Canada's Arctic faces no near-term conventional military threats—although resurgent strategic competition globally may have "spill over" effects on circumpolar security. In the case of the North American Arctic, observations or drivers associated with geostrategic competition at the *international* systemic level should not be misapplied to objective and subjective geographical assessments of the *regional* Arctic security environment.[25] Although the evolving international balance of power may undermine global peace and security, that is not necessarily a zero-sum game in terms of *Arctic* regional stability.

Rather than promoting a narrative of inherent competition or impending conflict, SSE emphasizes that "Arctic states have long cooperated on economic, environmental, and safety issues, particularly through the Arctic Council, the premier body for cooperation in the region. All Arctic states have an enduring interest in continuing this productive collaboration." That last sentence suggests that Russia (described elsewhere in the policy document as a state "willing to test the international security environment" that had reintroduced "a degree of major power competition") has vested national interests in a stable circumpolar region. Accordingly, the drivers of Arctic change in Canada's defence policy emphasize the rise of security and safety challenges *in* the Arctic rather than conventional defence threats *to* the Arctic, thus confirming the line of reasoning that has become well entrenched in defence planning over the last decade.[26] The defence policy document also highlights how international threats may pass *through* the Arctic to reach targets outside of the region.

The Arctic is inextricably tied to the rest of Canada, to North America, and to the international system as a whole. That interconnectedness brings opportunities for communities, governance, and economic development, and it also poses complex, multifaceted challenges. Accordingly, strategic forecasters must situate the Canadian Arctic in global, regional, and domestic contexts to anticipate new challenges, promote effective adaptations to changing circumstances, and identify how the military should be trained and equipped to act decisively in concert with its allies. Current discussions about the future of North American defence and security architecture, including new "ecosystem" approaches to integrating layered defences, anticipate a future where NORAD might achieve all domain awareness from the seabed to outer space and have the ability to fuse the data from those sensors into a common operating picture that decision-makers can use to defend against adversarial actions.[27] Although the full extent of Canada's contribution to continental defence modernization remains to be determined, the Arctic will inevitably factor heavily given that the polar region still represents the fastest avenue of approach to North America for various delivery systems emanating from major power competitors.[28]

Anticipating and addressing twenty-first century challenges requires clear, coordinated action to leverage the broad and deep expertise of the modern state and civil society. In the defence and security realm, Canada's Arctic policy emphasizes that meeting "enormous collective challenges requires coordinated action across the whole-of-government—military capabilities working hand in hand with diplomacy and development." That aligns with an ongoing operational role for land forces to support comprehensive approaches to safety and security in a domestic polar context, typically by supporting other government departments and agencies in fulfilling their mandates. Taken together, the opportunities, challenges, increased competition, and risks associated with a

more accessible (and unpredictable) Arctic make the future land operating environment complex and uncertain. *Advancing with Purpose* highlights that "modernizing the Army will not be simple and will require much thought and analysis based on threats, the character of future conflict and operations, and an unwavering dedication to ensuring our soldiers are trained." It also emphasizes that "what we have held as immutable for decades may have to change as we take an honest look at what the future needs."[29] As the international security environment becomes more turbulent, the Canadian Army must be adaptable, agile, and ready to operate effectively in all scenarios. In an Arctic context, that requires more fidelity in anticipating and preparing to address different threats through, to, and in Arctic regions.

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THE FUTURE OF CANADIAN PARTICIPATION IN MISSILE DEFENCE

Nancy Teeple, Ph.D.

Source: Wikipedia

INTRODUCTION

With North American defence and North American Aerospace Defence Command (NORAD) modernization back on the Canada–US bilateral agenda, the issue of missile defence is likely to be revisited in Canada. Missile defence (MD) is a controversial issue in Canada on a number of fronts. Missile defence is believed to undermine strategic stability by creating asymmetric advantage for one state and vulnerability in another. Canadian opinion regarding Canada–US relations is often influenced by the fear that Canada's foreign and defence policies would become so aligned with those of the US that Canada would lose its independence. Canadians' sensitivity to procurement costs challenges the acquisition of any new defence capability, which often becomes a matter of national debate.

However, future uncertainties concerning the security and defence of North America in light of the resurgence of great power competition, rogue state nuclear actors, and the rise of destabilizing technologies entangling the nuclear and conventional domains necessitate revisiting the question of Canada's participation in missile defence in the years to come.

Canada is an active military player in the world; because of its geography and middle-power status, it must partner with strong nations through bilateral and multilateral alliances and defence partnerships such as NATO, NORAD and the Five Eyes in order to secure its safety, and it must also contribute to those alliances to reinforce trust and reciprocity. In a rapidly shifting strategic context, it is past time for Canada to review its contribution to North American defence and its role in missile defence.

The following discussion explores how Canada's defence policy, strategy and capabilities will adapt as the Canada–US bilateral North American defence relationship evolves. This adaptation will likely include Canada's future participation in missile defence in response to emerging threats in the international security environment, through the modernization of Canada's capabilities in multiple domains and the increasing integration of North American defence architecture with the US.

Building upon the works of established experts, this article explores the changing concept of missile defence, including advances in delivery technology such as advanced cruise missiles, hypersonic vehicles, stealth aircraft, and new maritime platforms designed to evade missile defence systems. The options for participation are considered in light of political palatability, costs and benefits, modernization of current capabilities and the development of new capabilities. Canada's preference for a passive, defence-dominant role in the binational relationship in NORAD and other bilateral agreements may shift to incremental support to, and involvement in, missile defence—from non-kinetic passive defence activities to offensive roles in new domains such as cyber.

THE CANADIAN DOMESTIC POLITICAL CONTEXT: NUCLEAR WEAPONS AND MISSILE DEFENCE

Canada has an ambivalent relationship with nuclear weapons and missile defence. Since the Cold War, Canada has maintained a commitment to strategic stability through arms control, nuclear non-proliferation, and disarmament. This commitment includes limiting antiballistic missile defence (ABM) systems, which undermine the logic of mutually assured destruction by threatening the other state's ability to retaliate with a nuclear strike. The mutual vulnerability created by the mutual threat of annihilation, or otherwise unacceptable damage to cities, disincentivizes the use of nuclear weapons and thus creates an equilibrium of strategic stability. Strategic defences cause instability by incentivizing states to create capabilities to evade missile defence through some asymmetric capability: a pre-emptive or preventive first strike. The Anti-Ballistic Missile Treaty (ABM Treaty) of 1972 (revised in 1974) imposed limitations on missile defence sites to allow for mutual vulnerability while also ensuring the survival of leadership, depending on whether the state chose to protect a capital city or a missile site.[1]

CANADA'S POLICY INCOHERENCE

From the Cold War to the present, Canada has followed divergent policies on the role of nuclear weapons in national security and in continental and European defence. Philippe Lagassé points out the dissonance in Canada's two-track policy of promoting strategic stability through nuclear arms control and disarmament in contrast to its alliance obligations, manifested in divergent approaches by Foreign Affairs and the Departments of National Defence, respectively. On the one hand, Canada "tacitly endorsed and facilitated the United States' offensively oriented nuclear strategies," while (to support strategic stability and arms control) discouraging "offensive nuclear doctrines and the arms races they have tended to fuel." Lagassé argues that this contradictory two-track policy served Canadian national interests. The defence of North America required "maintaining a credible nuclear weapons posture," in spite of the emphasis on the "futility of nuclear war and arms races."[2] Notably, Lagassé affirms that the technological development of ballistic missile defence (BMD) threatens to "expose the contradiction and force Ottawa to give precedence to strategic defence over strategic stability, or vice-versa."[3] Duane Bratt describes Canada's nuclear policy as "schizophrenic" in that Canada deployed nuclear weapons domestically[4] and supported the US deployment of nuclear weapons in European NATO states[5] while actively promoting nuclear non-proliferation internationally: "Canada will continue its long tradition of nuclear cooperation with the United States—even as

it strides the international stage as a leading proponent of nuclear disarmament." Bratt affirms that Canada's security is dependent on its relationship with the US and that nuclear weapons are critical in American defence doctrine, and he reminds us that Canada "remains firmly under the protection of the American nuclear umbrella." Bratt also suggests that Canada will "in the end" support US missile defence, either through financial contributions or by allowing the US to use Canadian territorial airspace.[6]

Fergusson argues that Canada pursued a doctrine of separation in order to keep missile defence off the public agenda, due to its link to US strategic nuclear forces and its implicit link to the weaponization of space. Keeping BMD "at a distance" was Canada's preference "even if it has meant that the defence of Canadian territory and population centres would be left to the discretion of Canada's southern ally."[7] The doctrine of separation involved treating nuclear weapons, missile defence and military space as separate "policy baskets," but all three are linked in Canadian policy through NORAD. This approach is intended to keep strategic missile defence separate from Canadian progress on bilateral cooperation on the military uses of space. Fergusson argues that this separation is unlikely to continue if Canada moves forward to consider reversing its policy on missile defence, placing the issue on the public agenda.[8]

The role of public opinion was particularly influential in decisions made by the Diefenbaker, Pearson and Pierre Elliott Trudeau governments to station US nuclear weapons in Canada or to remove them. Variables in the ABM systems debates included anti-Americanism, the influence of Quebec politics, and fears of space weaponization.[9] Canada declined an ABM role in 1967; Brian Mulroney turned down formal government support to the Strategic Defence Initiative in 1985; Paul Martin dithered and declined in 2004/05; Stephen Harper and his Foreign Affairs Minister, John Baird, considered BMD and rejected participation in 2012;[10] a 2014 Senate recommendation considering a role for Canada was ignored;[11] in 2015 Justin Trudeau indicated that BMD was off the table for Canada; and in 2017 he reiterated that the Liberal long-standing opposition to missile defence would not change "any time soon."[12] However, Trudeau's responses appear to push the issue down the road rather than closing the door on the matter.[13]

Public opinion plays a role in leadership decisions to participate in missile defence, involving manipulating Canadians' fears about the prohibitive costs of missile defence, the dangers of giving up sovereignty to the US, the effectiveness of interception technology, diplomatic consequences, and whether Canada faces a threat.

Consensus is growing among scholars on these issues. A 2018 Macdonald-Laurier Institute report indicates that the majority of Canadian defence and security scholars and missile defence experts maintain that Canadian involvement in BMD would not worsen Canada's diplomatic relations, and some argue that it would better align Canadian foreign and defence policies with the NATO BMD program. Technical and operational limitations should not dissuade Canadian involvement; in fact, limited BMD gives Canada access to a system under a "great power guarantor."[14]

Financial cost poses a challenge, given that the US has not provided a figure for the cost of Canada's participation, and Canada is reluctant to consider participation without first seeing the price tag. The cost will be affected by how Canada participates, whether through hosting radars or interceptors or through some other form of support. This is what McDonough describes as a "known unknown," namely "what the United States may require from Canada to secure both participation in missile defence and involvement in the interception process in North America."[15] Canadians are already sensitive to the costs of procuring new defence equipment and capabilities that they think are unnecessary, and uninformed and politicized opinions often have an impact when procurement becomes an item of national debate.

Criticisms about the effectiveness of the Ground-Based Midcourse Defense (GMD), Ground-Based Interceptors (GBI), and other systems—Patriot, Aegis, Theatre High-Altitude Area Defense (THAAD)—were refuted by reports that recent tests demonstrate increasing success of interception. In Collins' survey of Canadian experts' perspectives on missile defence, by 2017 "the Aegis SM-3 missile has scored an impressive 33-out-of-40 test record while THAAD has hit all 14 targets in tests since 2006" and "even the GMD has achieved technical success … in May 2017, the US Missile Defence Agency had its first successful intercontinental ballistic missile (ICBM) interception test." In addition, the survey argues that "technical limitations could still be addressed with multi-layered theatre missile systems, where midcourse and terminal systems operate in tandem with one another," thereby filling gaps.[16]

The Macdonald-Laurier Institute survey results demonstrate that the Canadian epistemic community is becoming more receptive to a Canadian role in missile defence. This suggests that the time is ripe for an open and informed public debate addressing the realities of the emerging North American threat and Canadian position, geographically and geopolitically. Benefits to Canada involve either further integration into the defence architecture of North America, providing it with access to information on strategic planning and space, or achieving limited decision-making authority.[17]

Canadian domestic opinion regarding Canada–US relations is often challenged by the fear that Canadian foreign and defence policy would become so aligned with the US that Canada would lose its independence. A debate among scholars regarding this decision concerns "defence

against help" with respect to Canadian sovereignty and security concerns that the United States would take action to protect its national security interests by "helping" Canada defend North America. "Defence against help" has often been used to justify Canadian defence decisions to participate or not participate in nuclear sharing or missile defence, fearing "United States continental defence priorities as a threat to Canadian sovereignty … owing to potential territorial encroachment to protect the American heartland." Although "defence against help" provided a useful descriptive framework to understand Canada's approach to managing "continental security-sovereignty dilemmas" from the 1930s to the end of the Cold War, P. Whitney Lackenbauer affirms that the "defence against help" concept is unhelpful as a decision-making strategy for Canada in the 21st-century continental defence context. Lackenbauer argues that a rational analysis of the benefits to Canada in its bilateral and binational defence partnership should guide defence policy and investment in essential capabilities in response to evolving threats to the shared homeland.[18]

REVISITING CANADA'S ROLE IN NORTH AMERICAN STRATEGIC DEFENCE IN A CHANGING LANDSCAPE

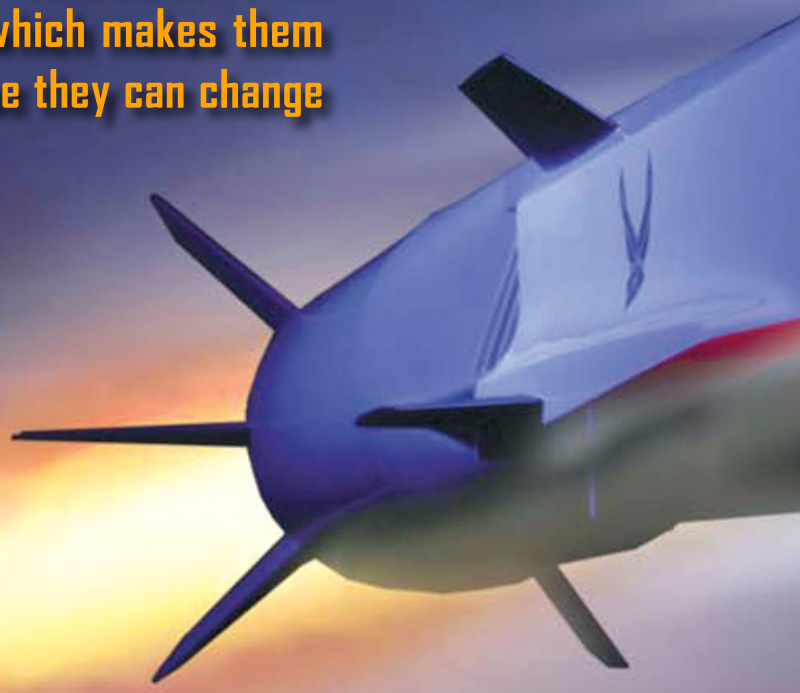
The North American strategic context is evolving in unpredictable ways as the international security environment becomes more volatile and uncertain. The events of 9/11 demonstrated that the continent was not immune to threats and actors originating abroad. New threats posed by rogue nations and terrorists potentially employing weapons of mass destruction (WMD) against the US and its allies prompted American leadership to withdraw from the ABM Treaty in 2002. The US then moved to modernize the nuclear triad (traditionally comprised mainly of the three "legs" of nuclear delivery systems by land, sea, and air), to include expanded national missile defence with active and passive defences, responsive infrastructure, command and control (C2) and intelligence planning, and the entanglement of nuclear and non-nuclear strike capabilities among the sea (submarine-launched ballistic missiles [SLBM]), air (bombers), land delivery platforms (intercontinental ballistic missiles [ICBM]). This New Triad "offers a portfolio of capabilities and the flexibility required to address a spectrum of contingencies."[19] Russia and China responded to the US withdrawal from the ABM Treaty with nuclear modernizations of their own. Rogue states such as North Korea and Iran pursued nuclear weapons technology and ballistic missile delivery technology. North Korea became a nuclear weapon state in 2006,[20] while Iran continues to develop its nuclear and ballistic missile program.

Guided by the 2002 Ballistic Missile Defense Review and the 2002 National Security Presidential Directive / NSPD-23, the George W. Bush administration proceeded with developing the GMD system of interceptors and radars to protect the US homeland from WMD terrorism and rogue states with nuclear ambitions.[21] The architecture and concepts continued to evolve through subsequent administrations.[22] In 2010 the US and NATO began a series of phases to deploy ballistic missile defence in Europe,[23] through the European Phased Adaptive Approach centred on the Aegis sea- and land-based missile defence system deploying SM-3 midcourse interceptors. This BMD system is intended to protect NATO-deployed forces from short-, medium- and intermediate-range ballistic missiles launched from Iran.[24] Since the 2010 Lisbon Summit, Canada has committed its support to ballistic missile defence in Europe and the Pacific theatre, but not in the continental US.[25] Canadian critics fear that Canada's participation will undermine arms control and encourage destabilizing nuclear arms races by provoking Russia and China into developing offensive delivery systems, and increasing the risk of crisis instability by creating first-strike incentives.

EVOLVING NORTH AMERICAN SECURITY AND DEFENCE

NORAD expert Andrea Charron, in her evaluation of the evolution of North American defence,[26] describes the unprecedented transformation of the geostrategic and geopolitical landscape with the emergence of new weapons systems. Former NORAD and U.S. NORTHERN COMMAND (USNORTHCOM) Commander General Terrence O'Shaughnessy states, "We face a more competitive and dangerous international security environment today than we have in generations. And like yesterday, our security environment is marked by the re-emergence of Great Power competition with an evolving balance of power."[27] O'Shaughnessy identifies several Russian threats to North America: Russian aircraft and surface ship incursions into the Arctic, Russia's development of hypersonic missiles tipped with both conventional and nuclear warheads, and subsurface nuclear torpedoes. He notes that the most geographically vulnerable area is the Canadian Arctic, where Russian forces are active. Vulnerable targets include the North American economy, in which communications networks, dams, pipelines, power grids and roads can be attacked. This requires NORAD to evaluate new ways to counter North American threats.[28] More recently, the General affirms that Canada and the US have lost their military advantage over Russia in the Arctic, as Russia has been expanding its capabilities in the region, including air, maritime and land platforms for delivering strategic weapons, such as advanced cruise missiles. He states that "in order to reclaim our strategic advantage in the High North, it is critical that we improve our ability to detect and track surface vessels and aircraft in our Arctic approaches and establish more reliable secure communications … in the higher latitudes" through a network of space-based and underwater sensors linked with traditional radar systems.[29] In order to improve the ability to monitor activities in the North, General O'Shaughnessy promotes the Joint All Domain C2 (JADC2) concept through NORAD and USNORTHCOM—a joint capability necessary for homeland defence to provide domain awareness in real

"Hypersonic glide vehicles (HGV) travel at immense speeds (above Mach 5), as do ICBM re-entry vehicles; however, HGVs are incredibly manoeuvrable, which makes them difficult to track and intercept because they can change direction quickly and unpredictably."

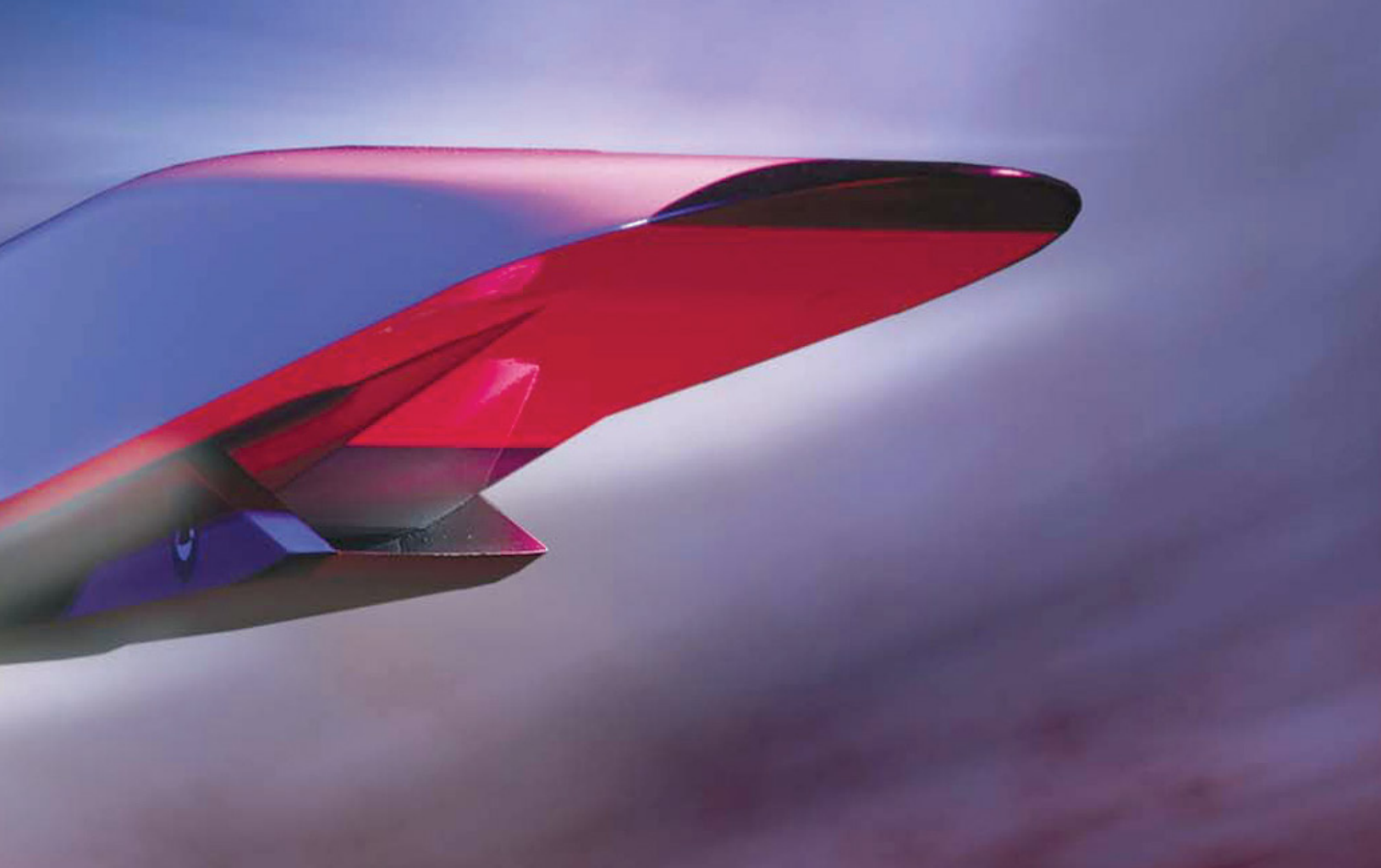


Source: Wikipedia

time to sense incoming ballistic missiles and new hypersonic glide vehicles and cruise missiles. This program intends to link sensors with shooters and use predictive analysis to advise decision makers facing complex decisions on the consequences or outcomes "at the speed of relevance."[30]

General O'Shaughnessy's recommended responses to the growing threat are part of Canadian and American efforts to close the gap in capabilities to detect, deter and defend against new threats to North America. Charron and Fergusson address the challenges of the modernization and evolution of North American defence,[31] which has implications for Canada's future participation in missile defence. Within the framework of the evolution of North American defence (EvoNAD), the binational Canada–US command NORAD evaluates the long-term implications of strategic developments.[32] Charron states, "At EvoNAD's core is the examination of immediate and future threats to North America and the utility of current defence structures and capabilities to meet them."[33] This process requires a re-evaluation of requirements to counter threats emerging in multiple domains in conjunction with revisions to Canada–US defence cooperation. The defence of the US involves the defence and security of Canada due to its geographical location at the top of the North American continent, bordering the Arctic from which aerial, ballistic and maritime threats may arrive via the Arctic, Pacific and Atlantic Oceans. Charron predicts greater Canada–US cooperation in the current and evolving context and suggests that "the functional demands of this new threat environment could lead to NORAD's ultimate transformation into an integrated, multi-domain and dimensional North American Defense Command solution."[34] Canada's defence policy, as presented in the 2017 White Paper *Strong, Secure, Engaged* (SSE), does not discuss missile defence, but it does address new threats and challenges in the North American and Arctic context, the importance of NORAD and its need to evolve with the threat, in addition to upgrading the North Warning System (NWS).[35] On the other hand, SSE makes no mention of allocating funds to these initiatives. Fergusson notes that the Canadian public is "largely uninformed and disinterested" regarding NORAD modernization and the NWS.[36] However, recent meetings between Prime Minister Trudeau and President Biden addressed NORAD modernization as a binational priority.[37]

The NWS is a network of long- and short-range radars in the High North designed to detect and provide early warning of air and missile incursions into North America. This system is integral to Canada–US defence cooperation on North American security, as it is directly related to the evolution of North American defence in light of emerging technological advances by adversaries.[38] The NWS is incapable of managing the modern threats posed by air-launched cruise missiles (ALCM) today. Charron highlights gaps in which the NWS cannot identify and track Russian long-range bombers before they reach North American airspace, when they arrive at their ALCM launch points over the Arctic Ocean or farther distances, and the radars



cannot track ALCMs in flight due to their low radar profile signature and terrain flight paths.[39] A limited number of US Airborne Warning and Control Systems platforms for detecting ALCMs and sea-launched cruise missiles (SLCM) at a distance from North American coasts are available,[40] and although the recent Canadian Army Modernization Strategy prioritizes acquiring a ground-based air defence capability to intercept theatre-level targets, such a system is unlikely to be fielded before 2026.[41] Fergusson adds ground-launched cruise missiles (GLCM) to the problem mix, suggesting that they may pose a long-range threat against North America if Russia deploys them in the Arctic.[42] Thus, Charron asserts that the next-generation NWS will need to identify and track air-breathing threats and maritime threats. It requires ground-, sea- and space-based sensors, and it needs to move farther north and farther down the North American east and west coastlines. A "new NWS will entail integrated land, air, sea and space systems into a single system-of-systems construct."[43] Charron suggests that with new capabilities being developed by Russia, namely next-generation long-range ALCMs and SLCMs, in addition to hypersonic vehicles, the conditions are set for the "merger of air and missile defence, and the air and outer space domains."[44] A key emerging concept for regional and global battlespaces is Integrated Air and Missile Defence, which expands the spectrum that must be defended against current and emerging threats.

NEW CAPABILITIES AND NEW DETERRENCE CONCEPTS TO ADDRESS EMERGING OFFENSIVE TECHNOLOGIES

The *2019 Missile Defense Review* (MDR) outlines the new direction for the US missile defence strategy in response to innovations in offensive weapons systems that threaten the US homeland by exploiting gaps in the missile defence capabilities to track, target and destroy incoming missiles.[45] The 2019 MDR is consistent with policy, strategy capabilities outlined in the 2017 National Security Strategy, the 2018 Nuclear Posture Review, and the 2018 National Defense Strategy. These documents outline emerging strategic challenges and requirements for new concepts and capabilities, including expanding the nuclear arsenal and missile defence. Both General O'Shaughnessy and the MDR describe the need for a system to manage all missile threats, not just ballistic missiles: a layered integrated system to deal with HGVs, advanced cruise missiles, intelligence, surveillance and reconnaissance (ISR) gaps, and other challenges.[46] Speaking at the Center for Strategic and International Studies (CSIS) in 2019, O'Shaughnessy stated that existing and planned BMD is capable of meeting the threat from North Korea but was never designed for Russia's and China's large stockpiles of missiles capable of covering various ranges.[47] In an "uncertain future security environment," the 2018 Nuclear Posture Review justifies expanding and diversifying the nuclear arsenal, shifting from a mission limited to defending against ballistic missiles (BMD) to confronting new missile threats posed

by hypersonic vehicles and advanced cruise missiles, and possibly detecting and intercepting unmanned underwater vehicles. This shift in posture invites broader missile defence concepts. General O'Shaughnessy proposed new definitions of "cost imposition" to deter adversaries from attacking and suggested adding non-kinetic means such as cyber to deter aggressors.[48] The methods for achieving deterrence by denial have expanded to multiple domains with conventional, unconventional, kinetic and non-kinetic options.

NEW OFFENSIVE WEAPONS SYSTEMS

The current environment can be described as a volatile post-arms-control transition phase starting with the US withdrawal from the ABM Treaty, the Joint Comprehensive Plan of Action, the Intermediate-Range Nuclear Forces (INF) Treaty, the Open Skies Treaty and potentially the New Strategic Arms Reduction Treaty, which had been extended for five years but requires a new negotiated treaty to replace it. In this new era, as the US and Russia lose confidence in arms control, we are seeing the removal of constraints to destabilizing technologies, in conjunction with the emergence of new systems not addressed by arms control. In developing technologies to offset American conventional and nuclear advantages, Russia and China attempt to restore parity by developing capabilities that can defeat missile defence. Notably, the CSIS reports that "Foreign missile threats have continued to evolve in number, range, sophistication, and survivability." They are longer-range, more accurate, and diverse. The multifaceted threats that could overcome current defence systems of the US and its allies include "advanced cyber intrusions, electronic warfare, and hypersonic boost glide vehicles."[49]

NEW MISSILE THREATS FROM RUSSIA, CHINA, NORTH KOREA, AND POTENTIALLY IRAN

Russian advances in nuclear delivery systems pose the greatest threat to North America. Russia is the only nuclear peer competitor to the United States, although China is quickly becoming a competitor by rapidly modernizing its comparatively smaller arsenal. Russia's modernization of its large and diverse arsenal includes a number of technological offsets for which current US missile defence and early warning are not equipped, namely the Avangard hypersonic glide vehicle, a new heavy ICBM (Sarmat) with MIRVs, the new Bulava SLBMs with MIRVs deployed on Borei-class SSBNs (Submersible Ship Ballistic Missile Nuclear), the Kinzhal high-precision air-launched ballistic missiles (deployed on Tu-22M3M, MiG-31k interceptors, and planned for the next-generation Sukhoi-57 stealth fighter), the Kh-101/Kh-102 Raduga conventional and nuclear-capable long-range standoff ALCM (deployed on Tu-160, Tu-95MS16, Tu-22M3/5, and Su-27IB [Su-32] strategic bombers),[50] Kalibr land-attack cruise missiles, the Poseidon autonomous underwater vehicle[51] and the (failed) Burevestnik hypersonic cruise missile. Hypersonic capabilities are particularly problematic for missile defence. Hypersonic glide vehicles (HGV) travel at immense speeds (above Mach 5), as do ICBM re-entry vehicles; however, HGVs are incredibly manoeuvrable, which makes them difficult to track and intercept because they can change direction quickly and unpredictably. Next-generation cruise missiles also pose a significant challenge to missile defence due to their low-altitude path and manoeuverbility—they cannot be detected by ground-based radars until they close in on their targets.[52] The Poseidon unmanned underwater torpedo can use stealth to detonate a nuclear warhead against a coastal city. Russia's advantage in longer-range standoff weapons is that it can launch these systems from outside North American airspace and maritime space. Thus, many platforms can threaten North America from Russia's Arctic territory. The INF Treaty–violating GLCM—the Novatar 9M729 (SSC-8)—can threaten NATO allies in Europe.

As a revisionist state with global ambitions, China is modernizing its arsenal, which is currently a small minimum deterrent force with a "No First Use" doctrine. Like Russia, China is enhancing its SLCMs and ALCMs and hypersonic capabilities, and developing new ballistic missile systems with MIRVs, manoeuvrable re-entry vehicles, decoys and jamming devices.[53] Its strategic forces modernization includes upgrading its road-mobile ICBM numbers with MIRVs and shifting to solid-fuel rockets. With these developments, China is attempting to asymmetrically offset US strategic advantages by pursuing capabilities to assure retaliation against the US.[54] China's qualitative and quantitative modernization indicates a shift from minimum deterrence to an offensive posture. China's regional and longer-range delivery systems are not the only threat to the US and its allies; its Arctic ambitions[55] and cooperation with Russia create new challenges for North American defence in countering China in the polar region.

North Korea is rapidly advancing its ballistic missile program, including intercontinental range capabilities. In addition to explicitly threatening the US with nuclear weapons, its ballistic missile tests signal to the US and regional allies its intention to use its capability for "coercive nuclear pre-emptive threats," and it "potentially could employ nuclear weapons in the event of conflict in Asia."[56] North Korea's ICBM ambitions could threaten the US homeland and, by proxy, Canada's West Coast. Political rhetoric and missile tests put the issue on the Canadian radar, and Canadian media briefly mentioned the question of Canada's participation in missile defence. A North Korean missile could accidentally strike Canadian territory by missing its US target, or be used as a deliberate "soft targeting" of Canada to coerce the US in a confrontation.[57]

Iran is seeking to expand its regional influence and status through its nuclear and ballistic missile program. Iran's nuclear program spurred US and NATO plans to deploy the BMD system in Europe. Its success in "improved accuracy, range, and lethality" may threaten US forces and allies in

the Middle East, Eastern Europe and South Asia.[58] Its longer-range developments may pose a threat to the east coast of North America,[59] which led the Obama administration to consider whether to install a GBI site in the northeastern US. In Canada, this entailed discussion among defence officials and analysts about whether Canada would install an X-Band radar site in Goose Bay, Labrador, to detect any incoming missile from the Middle East.[60]

NEW CONCEPTS SHOULD DETERRENCE FAIL

As a distinct feature of missile defence, deterrence by denial is evolving with the threat and the modernization of the nuclear triad, and with nuclear and conventional entanglement. The denial mission of missile defence can range from partial to comprehensive defence. The former deploys limited systems to protect a launch site, C2 site, or a major (capital) city; the latter defends an entire nation (or continent) from all types of missile threats. Missile defence employs advanced technology with hit-to-kill vehicles guided by advanced sensor systems and a "look–shoot–look" doctrine. The missile defence architecture is improving, with warhead tracking, target discrimination (one of the most difficult BMD tasks), and computer processing to increase its effectiveness. However, as the system improves, adversaries seek to develop less costly counter-measures and decoys to overcome the system.[61] Thus, the 2019 MDR outlines the four missions for missile defence to manage the range of missile threats to the continent. The first is traditional *deterrence* to disincentivize an adversary from taking aggressive action by imposing consequences that far outweigh the benefits of taking the action. Deterrence can be passive and defensive if the emphasis is on retaliation, but it can be offensive or involve denial if it is is intended as a disarming pre-emptive strike against an adversary. The second mission is *active defence* to intercept a missile in flight, at the mid-course or terminal phase. This is a right-of-launch denial role that can be perceived as offensive by the adversary (i.e. denying its ability to strike), or defensive by the state deploying the system for homeland defence or defence of allies. The third mission is *passive defence*, which is "intended to mitigate the effects of a missile attack" or "mitigate the potential effects of offensive missiles." The elements involved are hardening; dispersal; deception; redundancy; and enhanced resilience and defence of bases, logistics and other key facilities and functions.[62] The fourth mission is *attack operations* to destroy offensive missiles prior to launch. These operations are conceptualized as "left of launch" or "left of bang." This is what Charron and Fergusson refer to as intercepting the "archers" (platforms) rather than the "arrows" (missiles) pre-emptively.[63] Given the emergence of new domains of warfare, such as space and cyber, attack operations can be carried with kinetic or non-kinetic means. New concepts and plans for technological innovation to carry out the four roles for missile defence provide opportunities to explore options for Canada that span non-kinetic options, passive defences, and revised approaches to deterrence.

CANADA'S CURRENT ROLE IN STRATEGIC DEFENCE OF THE CONTINENT

The Canada–US continental defence relationship comprises formal and informal arrangements, namely NORAD, bilateral defence arrangements involving memorandums of understanding (MOU), the Military Planning Committee, and the Permanent Joint Board on Defence. Since 2006, NORAD's mission has involved aerospace warning and control and maritime warning.[64] NORAD's limited role in missile defence is to provide early warning and attack assessments. Although Canada is not a part of missile defence, it does cooperate in providing warning and characterization of missile threats under its aerospace warning mission.[65] Canada can warn the US about an impending attack, but it cannot participate in responsive decision making or interception, which is NORTHCOM's mission. Canada is currently outside the protection of US GMD.[66] In 2017, Canadian former Deputy Commander of NORAD, Lieutenant-General Pierre St-Amand, stated that the US is under no obligation to defend Canada against an incoming missile: "We're being told … that the extant U.S. policy is not to defend Canada."[67] This situation could change in the context of evolving North American defence and security.

OPTIONS FOR CANADA'S PARTICIPATION IN MISSILE DEFENCE

As North American defence evolves, Canada's contribution may span the defence-to-offence spectrum of options, depending on the domain(s) involved. Early on, support for passive defence and providing enhanced ISR might best fit Canada's preferences, and those options might be considered as part of an incremental shift over time towards more active and offensive means. Canada may choose partial or full participation, but it remains to be seen what they would look like. New domains such as space and cyber offer unique opportunities for Canada to explore non-kinetic approaches to disabling systems electronically. New domains and advanced technological development create opportunities for Canada to participate in the research, development and testing of kinetic and non-kinetic missile defence capabilities through MOUs with the US defence industry.[68] This opportunity is being explored, as evidenced by recent consultations with NORAD, Canadian technology companies, officials and academics in a Conference of Defence Associations Institute (CDAI) forum to address how Canadian industry can participate in innovation to close the capability gaps and seams in sensors, data fusion and analytics, and defeat mechanisms.[69]

CYBER

Canada is developing a cyber capability, although it is still lagging behind its allies in this domain. Cyber could be one way for Canada to contribute to missile defence in a non-kinetic role to detect, disrupt, destroy or deter adversaries' launch capabilities through offensive cyber-attacks. In 2018, Futter and Collins considered this option through the Bill C-59 framework that expands the

Communication Security Establishment's (CSE) mandate to allow for offensive cyber activities.[70] Although the CSE is administered under DND, it is likely that this option would have to be a CAF-only role, which would require Canada to step up its Cyber Command to be capable. This role falls within MDR's attack operations, which might have implications regarding acts of war and might encounter resistance in the domestic Canadian context.

ARCHERS AND ARROWS: CANADA IN CRUISE MISSILE DEFENCE

Charron and Fergusson recognize the need to intercept launch platforms ("archers") and not just focus on the ("arrows"). This approach implies intercepts close to Russia, which could shift NORAD's posture from defence to defence/offence, via a pre-emptive strategy. Canada might prefer to leave the archers to the US and focus instead on the counter–cruise missile defence function of intercepting arrows (active defence) by air-, ground- and sea-based capabilities in a binational military division of labour. Although there might be limited domestic support for Canada hosting an interceptor site, Fleming suggests that Canadian interceptors would increase its relevance to the US.[71] Canadian interceptors could also provide another layer against missiles that make it through US GMD.[72] In order to fill the gap in the North, Canada could allow US fighters to deploy to northern Forward Operating Locations for the archer mission. Although this is a politically contentious issue, Charron and Fergusson argue that this approach is covered by NATO Article V.[73] The approach would also be consistent with supporting the US BMD system in Europe. Fergusson suggests that in light of the delay in replacing the CF-18 with anti–cruise missile capabilities (which also may not be sufficient), shorter-range, ground-based anti-CM defences (such as a point defence system) might be necessary to defend limited geographical areas. SSE prioritizes ground-based air defences for investment—for overseas, but possibly also for North America. Fergusson suggests, however, that Canadian homeland point defences are unlikely to be part of NWS modernization cost-sharing.[74]

The maritime threat is also relevant to defence against cruise missiles, particularly those launched from sea-based platforms. These SLCMs become air-breathing threats, which might require integrating air and maritime defence, linking the regional commands.[75] Currently, maritime defence cooperation occurs between the Royal Canadian Navy and the US Navy through MOUs.[76] McDonough considers the maritime option in Canada's participation in missile defence through the back door of NATO—a multilateral rather than bilateral option, to which Canada might be more receptive. This option involves a Canadian role in the sea-based Aegis BMD mission and considers whether that role should involve long- or short-range missiles, and/or perhaps cruise missiles.[77]

ENHANCING DOMAIN AWARENESS: NEW RADARS AND SENSORS

With the evolution of North American strategic concepts and defence, NORAD could expand its role in All Domain Awareness in the Arctic,[78] an important capability being promoted by General O'Shaughnessy.[79] Charron and Fergusson maintain that NORAD is the obvious solution to the demands of the new threat environment. It provides surveillance to more domains, providing the Commander with more information that takes "decisions further out in time and space." This role expands NORAD's missions while also distancing the Command from "the threat to bang continuum."[80] Fergusson argues that Canadian participation in missile defence begins with interception or a dedicated co-located radar not linked to NORAD or its early warning mission.[81] NORAD provides early warning to missile defence, which is the extent of its role in that program. Canada could deploy a radar in contribution to NORAD's early warning as formal participation in missile defence, which would provide Canada with its desired access to US continental missile defence intelligence, systems information and operational planning.[82] An option proposed in 2005 would involve establishing a third site in the northeastern US to counter Iranian developments in long-range ballistic missile technology in conjunction with successfully achieving a nuclear capability. This third site would require greater participation,[83] at the very least a Canadian radar site on Canada's East Coast, namely an X-band radar site in Goose Bay.[84] Fleming suggests that Canada could station radar and sensor sites in its territory to "assist in the detection, discrimination, and tracking of missiles … as well as the determination of a successful interception." In the event that Iran succeeds in advancing its ballistic missile and nuclear program to ICBM capability, Canada could leverage its geography in support of an interceptor site in the northeastern US.[85]

OUTER SPACE

Canada's space assets provide an opportunity for an expanded role in missile defence through enhancing space situational awareness. Canada's Sapphire Satellite is part of the US Space Surveillance Network, which indirectly provides data to both NORAD and the GMD system through Strategic Command.[86] Canada–US space cooperation has been managed bilaterally outside NORAD (although NORAD tracks inbound missiles and other objects in orbit),[87] but a revisiting of Canada's participation in missile defence would impact NORAD's role in keeping early warning separate from missile defence.[88] In addition to Sapphire, other Canadian space assets might provide an option for integration into a missile defence role, such as the polar Radarsat-2 and RADARSAT Constellation, which could enhance All Domain Awareness.[89] Fergusson suggests that an "asymmetric" contribution in military space would allow Canada to be involved in strategic defence, with the hope that it would lead to NORAD obtaining a strategic defence C2/ballistic missile mission. This option would allow Canada to contribute asymmetrically and keep strategic defence at a distance, which is less problematic for domestic politics.[90]

Source: syntheticaperturerадar.com

Sapphire is Canada's first military satellite and plays an important role in space-based surveillance of outer space.

Source: Department of National Defence

Canada's Sapphire satellite, a space-based electro-optical sensor, will track natural and human-produced space debris in medium earth orbit. Data from the satellite will be contributed to a Space Surveillance Network.

"Canada's receptivity and role will also be influenced by the uncertainty created by the evolution of missile threats from adversaries."

Source: mda.space

The RADARSAT Constellation Mission (RCM) satellites developed by MacDonald, Dettwiler and Associates Ltd. for the Canadian Space Agency.

Source: syntheticaperturerадar.com

The RCM will ensure data continuity and improve operational use of synthetic aperture radar and system reliability.

Adversaries' developments of kinetic and non-kinetic anti-satellite weapons threaten satellites networked to ground systems through disruption, disabling and possible destruction. Canadian defence interest in accessing space implies possible future investments in non-kinetic defensive space capabilities, such as "satellite hardening, maneuverability, stealth [and] reconstitution alongside surveillance," rather than denial capabilities, which imply a role in space weaponization. Canada's interest in the peaceful uses of outer space would be maintained through this passive defence capability, leaving the more problematic offensive missions to the US.[91]

CONCLUSION

This article predicts that Canada's thinking on continental defence requirements will shift towards increasing support for missile defence, particularly in the post-INF context, as adversaries increase their ability to threaten North America with advanced missiles and other offensive systems. The evolution of North American defence, with the increasing integration of domains and capabilities in the evolution and modernization of the binational defence command, creates opportunities for new Canadian roles in the continental defence architecture. Available options include the potential to expand contributions from early warning, assessment and data sharing to actively deploying interceptors or taking an offensive non-kinetic role. These options will depend on receptivity in the domestic political context, sensitivity to cost, sovereignty, and being seen as supporting the US offensive nuclear posture. Canada's receptivity and role will also be influenced by the uncertainty created by the evolution of missile threats from adversaries. These include Canada possibly becoming a target for adversary coercion to demonstrate resolve to the US; testing its extended deterrence policy; and efforts to divide allies. Joining continental missile defence provides benefits to Canada by increasing its credibility as a US defence partner, strengthening the binational relationship, increasing its leverage and influence in decision-making processes, and being prepared for the risks, threats and challenges posed by an increasingly uncertain and unpredictable security environment.

ABOUT THE AUTHOR

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ENDNOTES

1. The 1972 ABM Treaty permitted MD to protect two targets—one missile silo and one city. The 1974 Protocol imposed further limitations on systems so that only one site could be defended—a city or a silo. NTI, "Treaty on the Limitation of Anti-Ballistic Missile Systems (ABM Treaty)," Overview – *Nuclear Threat Initiative*, 26 October 2011, https://www.nti.org/learn/treaties-and-regimes/treaty-limitation-anti-ballistic-missile-systems-abm-treaty/.

2. Philippe Lagassé, "Canada, Strategic Defence, and Strategic Stability: A Retrospect and Look Ahead," *International Journal*, Vol. 63, No. 4 (Autumn 2008), 918ff.

3. Lagasse, "Strategic Defence," 918.

4. "Canada deployed four nuclear weapons systems—the Bomarc surface-to-air missile, the CF-104 Starfighter nuclear bomber, the Honest John short-range battlefield rocket, and the Genie air-to-air unguided rocket." Duane Bratt, "Canada's Nuclear Schizophrenia," *Bulletin of the Atomic Scientists*, 58.2 (March/April 2002): 47.

5. During the 1950s and 1960s, West Germany, Italy, Turkey, Netherlands, Greece, Belgium and Greenland (Denmark) hosted US nuclear weapons, and Britain and France stored US nuclear warheads. Bratt, "Schizophrenia," 48. This relates directly to the contradiction of the articles of the multilateral 1968 Nuclear Non-Proliferation Treaty, which prohibits proliferation of nuclear weapons beyond the established nuclear weapons states (NPT Treaty – articles I, II, and III). However, these weapons remain under US control, so whether they actually violate the NPT can be debated.

6. Bratt, "Schizophrenia," 45, 48, 50.

7. James Fergusson, "Off the Radar: Strategic Defence and Military Space," in *After Afghanistan: An International Security Agenda for Canadians*, ed. James Fergusson and Francis Furtado (Vancouver: UBC Press, 2016): 230.

8. Fergusson, "Off the Radar," 230–231.

9. Jeffrey F. Collins, *Should Canada Participate in Ballistic Missile Defence: A Survey of the Experts*, Macdonald-Laurier Institute (July 2018), 9.

10. This decision was made despite the fact that the Harper government had approved European NATO BMD at the Lisbon Summit in 2010. Collins, *Should Canada Participate*, 10.

11. A bi-partisan Senate report. Parliament of Canada, "Canada and Ballistic Missile Defence: Responding to the Evolving Threat," Standing Senate Committee on National Security and Defence (June 2014).

12. Bruce Campion-Smith, "Trudeau Weighs Calls to Join Ballistic Missile Defence," *Toronto Star*, 19 September 2017, https://www.thestar.com/news/canada/2017/09/19/trudeau-weighs-calls-to-join-ballistic-missile-defence.html.

13. Lee Berthiaume, "Liberals Have Not Ruled out Joining U.S. on Ballistic Missile Defence: Sajjan," *Globe and Mail*, 4 October 2017, https://www.theglobeandmail.com/news/politics/liberals-have-not-ruled-out-joining-us-on-ballistic-missile-defence-sajjan/article36488585/.

14. Collins, *Should Canada Participate*, 19.

15. David S. McDonough, "Canada, NORAD, and Missile Defence: Prospects for Canadian Participation in BMD," CDA Institute Vimy Paper (April 2016), 17.

16. Collins, *Should Canada Participate…*, 13. A minority of respondents to the survey argued that GMD systems would prove less capable against sophisticated countermeasures such as MIRVs, and have yet to be tested "in a real world circumstance." (14).

17. Collins, *Should Canada Participate…*, 19.

18. P. Whitney Lackenbauer, "'Defence Against Help': Revisiting a Primary Justification for Canadian Participation in Continental Defence with the United States" (Waterloo: Defence & Security Foresight Group briefing paper, May 2020), 2, 10, 14. Charron and Fergusson argue that "defence against help" is an inappropriate concept for understanding Canada–US relations, as Canada has never rejected an instance of US help, but they present no evidence to the contrary. In agreement with Charron and Fergusson, Lackenbauer affirms that "the U.S. will not do anything within Canadian territory without Canadian government permission." See also Philippe Lagasse, "Nils Orvik's 'Defence against Help': The Descriptive Appeal of a Prescriptive Strategy," *International Journal*, 65.2 (2010), 463–474.

19. Hans M. Kristensen, Robert S. Norris and Ivan Oelrich, "From Counterforce to Minimal Deterrence: A New Nuclear Policy on the Path Toward Eliminating Nuclear Weapons," Federation of American Scientists (April 2009), 15. https://fas.org/nuke/norris/nuc_10042901a.pdf.

20. The DPRK withdrew from the Nuclear Non-Proliferation Treaty (NPT) in January 2003 and has conducted nuclear tests since 2006. In July 2017, North Korea successfully tested an ICBM (Hwasong-14 and Hwasong-15). NTI, North Korea, Nuclear Threat Initiative (August 2019), https://www.nti.org/learn/countries/north-korea/.

21. Thomas Karako and Ian Williams, "Missile Defense 2020: Next Steps for Defending the Homeland," Center for Strategic and International Studies – Missile Threat (April 2017), xiv–xv. http://missilethreat.csis.org/wp-content/uploads/2017/04/170406_Karako_MissileDefense2020_Web.pdf.

    The current GMD architecture includes 2 interceptor sites; 7 types of sensors—land, sea, space, multiple distributed fire control systems; (2016) 36 GBIs—in silos—in Alaska and California (to counter North Korea and Iran); (2017) 8 additional interceptors—44 GBIs. New/integrated systems: sea-based X-band radar (SBX), upgraded early warning radars, SPY-1 radar on Aegis ships, forward-based TPY-2 radars. Karako and Williams, "Missile Defense 2020…," xiv–xv.

22. In December 2016, Congress passed a *National Defense Authorization Act* to update policy in response to recent threats and the requirement for a more robust and layered system, expanded to defend allies and deployed forces, and provide a hedge against unpredictable regimes. CSIS, *Missile Threat*, 2017, xviii.

23. At the Lisbon Summit in 2010, the NATO–Russia Council discussed cooperating on territorial BMD and a joint ballistic missile threat assessment to prepare a future cooperative framework. NATO Review, "Missile Defence," (updated 2015), https://www.nato.int/docu/review/Topics/EN/Missile-defence.htm.

24. Details of the phases and upgrades to SM-3 interceptors available at Kingston Reif, "The European Phased Adaptive Approach at a Glance," Arms Control Association (January 2019), https://www.armscontrol.org/factsheets/Phasedadaptiveapproach.

25. The Senate testimony by Frank Harvey highlights the inconsistency in Canada's policy on ballistic missile defence. He notes that, at the NATO Lisbon Summit in November 2010, all NATO members committed to "[d]evelop the capability to defend our populations and territories against ballistic missile attack as a core element of our collective defence …" and quotes Barack Obama's closing remarks at the summit: "[W]e've agreed to develop missile defense capability that is strong enough to cover all NATO European territory and populations, as well as the United States." This commitment was reinforced at the 2012 Chicago Summit. Harvey correctly states, "As a NATO member, there is no question any longer that Canada officially endorses the logic, strategic utility, and security imperatives underpinning BMD." Canadian Global Affairs Institute, "Canada and Ballistic Missile Defence," Policy Update (March 2014), https://www.cgai.ca/canada_ballistic_missile_defence.

26. Andrea Charron, "From NORAD to NOR[A]D: The Future Evolution of North American Defence Co-operation," CGAI Policy Paper (May 2018), https://www.cgai.ca/from_norad_to_nor_a_d_the_future_evolution_of_north_american_defence_co_operation.

27. Statements by NORAD commander General Terrence J. O'Shaughnessy at the Ottawa Conference on Security and Defence in 2019. James Careless, "NORAD Commander: North America is in Most Danger Since 'Height of Cold War'," Canadian Defence Review, 2 December 2019, http://www.canadiandefencereview.com/news?news/2624.

28. James Careless, "NORAD Commander: North America is in Most Danger Since 'Height of Cold War".

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The Case for Renewal: The North Warning System and Canada

Nicole Covey, Ph.D.

Source: Wikimedia

Source: defensenews.com/

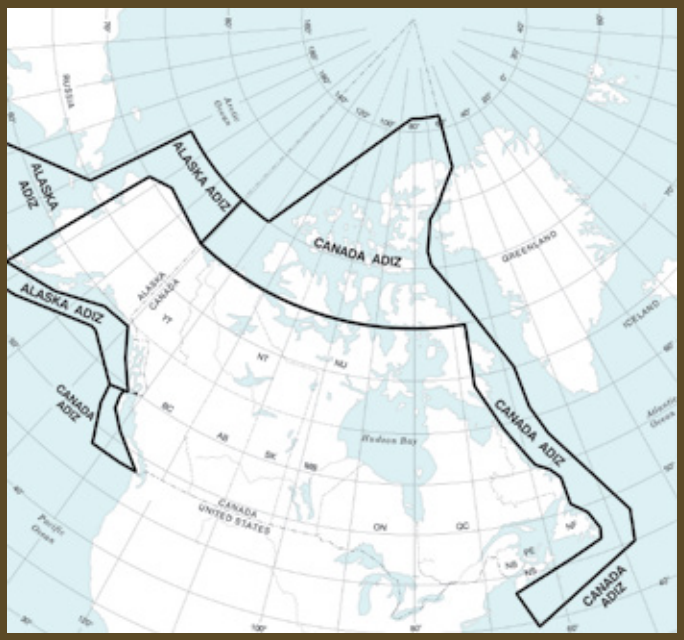
The North Warning System (NWS) has played a vital role in Canada's defence plan since it came into service near the end of the Cold War, and it continues to play a key role in a close Canada/United States defence partnership. This paper aims to demonstrate the continued relevance and importance of the NWS renewal project through the lens of Canada's domestic, continental, and international security spheres. While not intuitively linked to the land power domain, it is a support consideration for widely dispersed land forces in austere environments,[1] in particular, the Arctic. It is argued that the prioritization of NWS and other North American Aerospace Defense Command (NORAD) modernization projects will be beneficial to the Canadian government through strengthening the Canada/US defence relationship and filling a gap in North America's (and, by extension, Canada's) defence system during an era of increasing global tensions.

THE NORTH WARNING SYSTEM

The NWS was created in the late 1980s as an upgrade to the distant early warning (DEW) line and was designed to protect North America from the Soviet threat during the Cold War. The NWS is a series of short and long-range, ground-based, unmanned radar stations that extend across Canada to the North Slope in Alaska, with additional radars on the west coast of Greenland.[2] The NWS is essential to NORAD's aerospace warning and control mandate. The NWS struggles, however, to "see" certain threats to North America—especially slower and lower moving drones or high speed and higher altitude weapons. Nevertheless, it remains NORAD's primary air detection system.[3] This stationary and passive defence relic is reaching, and some argue has already reached, the end of its serviceability and needs to be replaced. While the NWS renewal project is still in initial stages, Canada and the United States are working together, via NORAD and with industry partners, to find the most effective way to modernize the NWS as part of the overall NORAD modernization project.[4]

"The NWS is essential to NORAD's aerospace warning and control mandate."

Source: Staff Sgt. Emily Kenney



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During the early years of the Cold War, NORAD maintained three radar lines (the DEW, mid-Canada, and Pinetree lines) that were intended to be used as an air threat tripwire for the protection of the North American continent. The DEW line was located farther north than the other two and was designed with the Soviet bombers of the day in mind. The mid-Canada line was meant to confirm information presented by the DEW line and demonstrate that the threat was moving farther south. The southernmost radar line was the Pinetree radar line. Once the Soviet bomber reached the Pinetree line, the invader would be attacked via surface-to-air missiles and interceptors.[5] The NWS replaced the obsolete DEW line and was created to deal specifically with the advances in missile technology in the form of air-launched cruise missiles (ALCM) but was not located any farther north.[6] The current radars are remotely monitored from a control centre at 22 Wing North Bay, in Ontario, but private contractors maintain the radars.

The DEW line "decommissioning" ended up resulting in the largest ever environmental clean-up project by the Canadian government and cost over five hundred million dollars. The 63 DEW sites, 42 of which were located in Canada, were simply abandoned and left to contaminate the land with toxic chemicals.[7] It is readily acknowledged that that cannot be repeated, and attention must be paid to the Canadian government's environmental responsibilities with regard to both old and new radar sites.

The NWS's renewal and concomitant northern infrastructure investment that is part of wider NORAD modernization efforts (such as extending and repairing Arctic runways) has the opportunity to benefit the local populations. The key term to keep in mind is "dual use." It is too expensive to build purpose-built infrastructure in the Arctic and, as safety and security threats can easily become defence threats, being able to monitor a variety of threats in multiple domains is the goal. It is vital that local populations be consulted and be part of the modernization projects. There is a significant infrastructure deficit in the Canadian north, and all NORAD modernization projects must bear that in mind.

The NWS is unable to properly detect a host of current weapons' technology, which is not surprising given that it is based on 1970s thinking. Not only is it optimized for air threats of a certain speed, altitude and direction; the system is "vulnerable to new data exploitation methods and too old for parts to be easily accessible."[8] In an age of increased cyber warfare, it is vital that the state be able to secure its defence systems from data exploitation, including the information feeds both into 22 Wing and outward to other operating centres. Another problem with the NWS is that the current range of the radar system does not cover the entire Canadian Arctic archipelago and does not match the Canadian air defence identification zone (CADIZ)[9] (Figure 1 shows the extended CADIZ range and Figure 2 demonstrates NORAD's current radar coverage).

That creates the conditions for blind spots. Ideally, Canada and the United States want to track potential threats as far out in time and space as possible and not wait until they are deep into Canadian territory to detect them.[10] Given new geopolitical tensions, threats in new domains and the ability of both state and non-state actors to launch from anywhere in the world and potentially hit North American targets, an ecosystem of sensors is required.[11]

The NWS renewal and other NORAD modernization investments were key defence priorities in *Strong, Secure, Engaged (SSE)*, the 2019 mandate letter for the Minister of National Defence, as well as in the 2021 supplemental mandate letter for the Minister of National Defence. The problem is that no specific funding has been earmarked for these projects. In *Strong, Secure, Engaged*, it says "[c]ollaborate with the United States on the development of new technologies to improve Arctic surveillance and control, including the renewal of the North Warning System."[12] In the 2019 mandate letter, one of the top priorities laid out for Minister Sajjan is to "work with the United States to ensure that the North American Aerospace Defense Command (NORAD) is modernized to meet existing and future challenges, as outlined in *Strong, Secure, Engaged*."[13] The 2021 supplemental mandate letter noted that, in addition to COVID-19, a priority is still to "[e]nsure the Canadian Armed Forces have the capabilities and equipment required to uphold their responsibilities through continued implementation of *Strong, Secure, Engaged*, including new procurement, continued investment in infrastructure improvement and planned funding increases."[14] And of course, in President Biden's first foreign leaders' telephone call on Friday, 22 January 2021, he and Prime Minister Trudeau discussed the importance of continental defence. Specifically, the two "agreed to expand cooperation on continental defence and in the Arctic, including the need to modernize NORAD."[15] Considering that the modernization effort was discussed so early in Biden's presidency, it demonstrates the importance that both governments want to place on upgrading the NWS, modernizing NORAD and continental defence more broadly.

Given that the air domains of Canada and the United States are indivisible, and that successive NORAD commanders have called on the need for more information about possible threats earlier, the NWS, NORAD's "eyes" in the Arctic, is a natural starting point. "The need to be able to warn of aggressive action as far away as possible in terms of time and geometry has never been greater, but the NWS is simply not designed for such a task."[16] Because of budgetary constraints, especially in light of federal COVID-19 spending, the United States' military, industry and Canada have been investigating how to extend the utility of the NWS. One such initiative is called Pathfinder. Pathfinder uses artificial intelligence (AI) and machine learning to help analysts see what the NWS is detecting but could not interpret before.[17] The NWS renewal, therefore, will be a long and multilayered project. Rather than instant replacement, the NWS will be improved in stages. Pathfinder is already proven to increase the ability of the NWS to detect patterns and increase the information outputs from radar technology. The NWS, like the DEW line before it, served Canadian defence interests admirably in the past, and it is time to continue Canada's northern radar legacy by modernizing the system so that it can continue to remain relevant in the current and future age.

DOMESTIC

In the 2018–2023 Defence Plan, which operationalizes SSE, the first two core missions are to "Detect, deter and defend against threats to or attacks on Canada" and "Detect, deter and defend against threats to or attacks on North America in partnership with the United States, including through NORAD."[18] Those two core missions are directly related to the ability of the NWS to carry out its designed function and alert NORAD regions to aerospace threats targeting North America. The system also contributes to the land power dependencies arrangement as articulated in the 2019 publication, "Close Engagement: Land Power in an Age of Uncertainty," which explains the need for a collaborative approach across different aspects of the Canadian military in order to fully respond to the evolving threat environment.[19] The NWS is also a vital source of information for NAV Canada and other agencies confirming flight patterns of civil aviation. In terms of domestic-security-related considerations in regard to the NWS renewal effort, the civilian information that the NWS provides is of vital importance.

In the short term, the "gap" between the sight line of the NWS and CADIZ can be decreased with the airborne warning and control system and drones, but a future NWS should be more optimally located and be able to detect a myriad of threats in all domains.[20] It is likely that space, land and maritime sensors will combine to create a "system of systems" to maximize the information collected coupled with increased use of AI and machine learning to detect patterns of behaviour.

While the cost of the NWS modernization project is expected to be high, as is the case with any Arctic infrastructure project, it is a cost that must be borne by the Canadian government with assistance from the United States. At this time, no one is sure if the cost-sharing arrangement between Canada and the United States to build the NWS, in which Canada contributed 40% of the costs and the United States paid 60%, will be used for future arrangements.[21] It is highly unlikely that Canada would be able to renegotiate a better cost-sharing agreement with its southern neighbour, especially if the United States viewed Canada's refusal to modernize as a snub against the two countries, longstanding partnership. The cost of the Canada/US defence relationship deeply

Source: The U.S. National Archives

The power plant inside the North American Aerospace Defense (NORAD) Space Command Cheyenne Mountain Complex.

fracturing or even breaking down would have serious repercussions in both the political and economic spheres. Therefore, while the costs of future renewal projects are expected to be very high, the NWS benefits all armed services and multiple Canadian agencies as well as companies. Continuing with NWS renewal is still a financially wise decision despite the high deficit Canada will carry as a result of the COVID-19 pandemic.

The NWS remains vital to the defence of Canada. And Canada does not have another system that could serve in place of the NWS.[22] In order to properly defend the state, Canada *requires* the ability to detect threats through its North.[23] Climate change and the growing accessibility to the North American Arctic is increasing the urgency for Canada, and NORAD, to modernize northern defence infrastructure.[24] The NWS renewal was placed in the mandate letter for Canada's Minister of National Defence, and the project was indicated to be a way for the state to ensure its north is both strong and secure, key elements of Canada's current defence policy *Strong, Secure, Engaged*.[25]

CONTINENTAL

The NWS and NORAD modernization are essential for continental defences. The NWS plays a key role in the protection of North America and is a key asset for the binational NORAD command.

The Canada/US defence relationship is unique because of its interconnectedness on many fronts related to economic matters, security, safety and, of course, defence. Canada and the US have several binational agreements. Binational means that both sides are obligated to think of and contribute to North American defence, as opposed to the United States and Canada operating separately. Be it the Permanent Joint Board on Defense, the International Joint Commission or the NORAD Agreement, these binational arrangements are unique to North America. The especially close defence relationship does not hinder the two states, respective sovereignties. The NWS is one of NORAD's few assets and is as important to the United States as it is to Canada, even if Canada hosts more radar sites.[26] What is more, NORAD and the continental defence relationship that sees exceptionally close connections between the navies, coast guards, armies, police and intelligence agencies brings more to Canada than just those issues surrounding defence; it also contributes to building closer ties between the countries and allows Canada to accumulate political capital with the United States.[27] Regardless, NORAD, with its bi-national command structure, is a symbol of this unique Canada/U.S. defence relationship[28] and, therefore, it stands to reason Canada needs to prioritize NORAD as long as it values the defence relationship.

Despite the strong defence relationship between Canada and the United States, there still exists a gap of expectations between the two countries in terms of defence contributions, at least historically speaking.[29] There is the concern that, if Canada does not contribute enough to the relationship and is seen to be a strategic liability to its southern partner, the US would defend itself despite Canada, and Canada would simply lose its ability to make decisions related to the defence of North America.[30] This is referred to as the "defence-against-help" thesis developed by Nils Orvik. According to the theory, Canada views its defence relationship with the United States through the defence-against-help lens, in which a smaller state works to maintain and invest in a level of defence so that a larger state does not step in to "help" secure the smaller state.[31] According to Donald Barry and Duane Bratt, the defence-against-help theory is especially important in regard to the Canada/US defence relationship because of North American geography; and so, since the 1930s, defence-against-help has played a key role in relation to Canada defence and security policies.[32]

The 22.68-metric tonnes blast door in the Cheyenne Mountain nuclear bunker is the main entrance to another blast door (background) beyond which the side tunnel branches into access tunnels to the main chambers. NORAD, Cheyenne Mountain, Colorado.

Source: Wikipedia

"The NWS plays a key role in the protection of North America and is a key asset for the binational NORAD command."

Andrea Charron and Jim Fergusson, however, argue that the defence-against-help thesis never applied to Canada and the United States; after all, Orvik was explaining what defence decisions Finland, Sweden and Norway needed to make against an aggressive Soviet Union.[33] The analogy, according to Charron and Fergusson, has been co-opted as a convenient shorthand to compel certain Canadian defence decisions in the face of lukewarm political will on the part of the Canadian government rather than bona fide fears of retaliation by the United States against Canada. If defence-against-help was truly in play, the US would never have been satisfied with Canada's refusal to participate in the US' ground-based midcourse ballistic missile defence program, with the country refusing not once but twice—with no consequences—to contribute to a system that is considered vital to the United States' national security.

The very nature of having a strong defence relationship with the United States does not infringe on Canadian sovereignty, as the security for both states under this relationship is interdependent.[34] Instead, this close defence relationship and NORAD allows Canada to demonstrate its ability to fulfill its role in the defence of North America, and it allows Canada to have a larger voice in continental security measures that it would not normally have, considering its relative defence capabilities and budget.[35] If Canada wants to maintain its voice in matters related to continental security, and not just simply be a passive actor in the decisions made by the United States, Canada needs to demonstrate that it takes continental defence seriously, and the state can do this by prioritizing the NWS renewal effort.

INTERNATIONAL

While there are many possible international implications to consider, this paper will briefly address two points: the breakdown of the 1987 intermediate-range nuclear forces (INF) Treaty, and the increase in global tensions. The INF Treaty was signed in 1987 by the Soviet Union and the United States and entered into force in 1988. Both signatories were required under the treaty to eliminate all of their respective ground-based cruise and ballistic missiles that reached between 500 and 5,500 kilometers by June 1991.[36] NATO ministers decided in 2018 to support the American position that Russia was violating the terms of the treaty, but Russia refuted the allegations put forth in January 2019 and, in August that same year, the US, under the Trump administration, decided to officially withdraw from the INF Treaty, citing Russian violations.[37] Because of the breakdown of the INF Treaty, the importance of modernizing the NWS becomes even more important and time-sensitive. The NWS is unable to track Russia's newest generation of ALCMs and ground-launched cruise missiles (GLCM).[38] Without the INF Treaty in place to moderate the threat of Russian missiles entering North American airspace, the NWS needs to be modernized quickly because of the vulnerability of the system (which is therefore a major vulnerability in regard to continental defence), as "we cannot deter what we cannot defeat, and we cannot defeat what we cannot detect."[39] The breakdown of the INF Treaty demonstrates the rise of missile-based threats, and the current iteration of North America's radar system is unable to properly fulfill its role in alerting NORAD to incoming threats.

As global tensions continue to rise around the world, the defence of North America cannot be put on the backburner, in a place where the high north is out of sight and out of mind. "NORAD is at a point where changes in the threat environment have created a need for NORAD to modernize its capabilities to defend North America."[40] North America's northern flank is no longer protected by the harsh northern environment, as global climate change and technological advances make the region more accessible. In 2007, Russian bombers resumed training exercises outside of the CADIZ, and while those bombers have remained in international airspace to date, this demonstrates that NORAD needs to continue to improve the nature of North American defence, and modernizing NORAD includes Canada. The NWS is nearing its end of life, but initiatives like Pathfinder are demonstrating what the asset should be. The NWS struggles to keep pace with new technology, such as hypersonic glide vehicles and drones, as it was never designed to detect that technology.[41] In order to respond to the growing great power competition that is occurring, Canada must prioritize the renewal of the NWS in order to ensure that North America remains secure.

CONCLUSION

The NWS plays a key role in North America's continental defence but, because of its location and existing technological advances, it struggles to properly fulfill the role it was designed to play. The NWS is a key part of NORAD's defence strategy and, if Canada does not prioritize this renewal, there is the concern that it will badly damage the close defence relationship that Canada shares with the United States and lose privileged access to intelligence, training, and leadership positions within the US military. Budgetary constraints will not allow for a complete replacement of the NWS by the end of its service life in 2025. However, over time and with the help of new technology, it can be upgraded to extend its life until a new system of systems that joins all the domains can be created. There is no other system that can do what the NWS is currently doing over such an enormous expanse of territory. The information that the NWS provides is vital not only to Canada (and, by extension, the Army) and the United States, but to allies as well. With the breakdown of the INF Treaty, the Arctic becoming more accessible, and increased global tensions, the role for the NWS is far from over. Canada needs to prioritize NWS renewal to ensure that the North American continent is safe.

ABOUT THE AUTHOR

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LEVERAGING ARTIFICIAL INTELLIGENCE FOR CANADA'S ARMY:

Current Possibilities and Future Challenges

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Source: Adobe

INTRODUCTION

Interest in the military applications of artificial intelligence (AI) is growing worldwide. Indeed, much like a number of other advances in technology, AI is increasingly viewed as a potentially significant enabler of military effectiveness.

Not surprisingly, interest in the implications that AI holds for the Canadian Army (CA) and the possibilities that exist for its adoption are on the rise. Questions concerning how and to what extent AI may be employed to potentially benefit the realization of *Close Engagement: Land Power in an Age of Uncertainty*, the Canadian Army's capstone operating concept, and enhance the conduct of the Army's five operational functions, are particularly salient. So too are questions concerning the challenges that could confront the effective adoption of AI and the measures required to surmount them.

This article offers a preliminary examination of those questions. It derives from ongoing work on AI at the Canadian Army Land Warfare Centre[1] to examine and identify the implications that AI holds for the CA and the effective realization of the Army's capstone operating concept.

The article outlines the prospective benefits and challenges that AI poses in terms of adoption by militaries and the conduct of military operations. It then examines the potential impacts of AI on the realization of *Close Engagement*, identifying areas where the application of AI holds the prospect of enhancing the Army's operational effectiveness. The article concludes by outlining a number of key prerequisites and practices necessary to ensure that such efforts are pursued responsibly and effectively.

ARTIFICIAL INTELLIGENCE

Definitions of AI are numerous and evolving.[2] As currently defined by the Department of National Defence however, AI is "the capability of a computer to perform such functions that are associated with human logic such as reasoning, learning and self-improvement."[3] While not universally accepted, such a formulation offers an institutionally familiar and sufficient basis for the discussion of AI within a CA context.

POTENTIAL BENEFITS

Incentives for the exploration, development and adoption of AI by military organizations are compelling. Given the capacity of high-speed computers (network speed and processing power) and AI algorithms to process and analyze massive quantities of data with a degree of speed and accuracy far beyond that of humans, claims that AI-enabled systems could potentially transform defence across the board are not surprising. By acting as a means of boosting the speed of analysis of humans and machines, AI holds the promise of enhancing data use, management and situational awareness capabilities. For militaries, the results could well translate into cost savings, improved control systems, faster decision-making, new operational concepts and greater freedom of action.

Artificial intelligence-enabled information and decision support systems have the potential to facilitate better decision-making in "complex, time-critical battlefield environments," allowing for a quicker identification of threats, faster and more precise targeting, and the creation of flexible options for commanders based on changing conditions on the battlefield.[4] Applications can range from command and control and intelligence, surveillance and reconnaissance to training and logistics. Moreover, as the backbone technology of robotic and autonomous systems, AI holds out prospects for innovations in weaponry by enabling the development of advanced autonomous systems with considerable military potential (e.g. robotic systems and drones).[5] AI may even generate dramatic shifts in force structures and operational concepts, potentially reducing burdens on personnel and the costs of military hardware while at the same time increasing the efficiency and effectiveness of warfare itself.[6]

The fact that such technologies are ever more ubiquitous, and increasingly available to friend and foe alike, further incentivizes the pursuit of AI-enabled military technologies. In the case of the former, growing interest in AI among allies highlights the need to have sufficient AI capabilities to ensure future allied interoperability and military effectiveness. As for the latter, evidence of sustained exploration and investment in military applications of AI on the part of adversaries (e.g. Russia, China) bolsters incentives to pursue such technologies to detect and defend against future prospects for ever more AI-enabled military threats.[7]

LIMITATIONS AND CHALLENGES TO ADOPTION

Prerequisites for the effective introduction of AI are nonetheless considerable and may well impose limits on the capacity of military organizations to fully realize some of the possibilities that applications of AI offer. In addition, militaries may not be fully willing to pursue some of the possibilities inherent in AI technologies themselves.

Indeed, current capability is confined to the performance of discrete functions and the learning of specific tasks (e.g. narrow AI). The brittleness of AI technology is concerning. Brittleness is reflected by any algorithm that cannot generalize or adapt to conditions outside a narrow set of assumptions.[8] For instance, with the addition of a few bits of graffiti, a stop sign can be read as a 45-mph speed limit sign.[9] Application to circumstances involving excessive uncertainty can in fact be especially dangerous.[10] Take, for example, the erroneous selection and prosecution of a friendly target such as a friendly fighter or civilian vehicle. As such, limitations on the

use of AI in military settings—and in military operations in particular—can be considerable. Faced with an environment in which incoming information may be unreliable, incomplete or even deliberately falsified by adversaries, willingness to trust in the solutions that such technologies may offer remains justifiably weak.

Beyond that, and even in areas in which such technology is generally considered reliable, its development and application can be demanding. Requirements include ensuring that data is available in sufficient quantity for the development of the algorithms to be used for enabling military systems. They also include ensuring the quality of the algorithms themselves, a requirement that depends on the provision and effective preparation and coding of training data before AI is integrated into military systems, as well as ensuring the validity of incoming data from the real world, which includes edge cases (uncommon use cases). And they include ensuring that the AI developed and integrated in military systems is reliable (i.e. that it works in the manner in which it is intended).[11]

Each of those requirements can involve considerable challenges. The acquisition of large amounts of data for training may encounter organizational resistance to data-sharing based on political and legal constraints, thereby reducing the quality of algorithms to be trained and the reliability of those systems that use them.[12] Data acquired may contain racial, gender and other biases stemming from data preparation and coding.[13] Furthermore, as algorithms become more complex, vulnerabilities to manipulation through the injection by adversaries of bad data in training datasets can grow.[14] To the extent that such challenges are present, trust in AI and its application in a military context is likely to suffer.

Those risks may be held in check through careful human supervision and robust testing. That said, truly effective oversight requires a familiarity with the details of the AI technology on the part of operators as well as significant systems integration and socialization that may be difficult to achieve. The challenge of effective oversight is compounded given the difficulties of understanding the technology itself. The processes involved in machine reasoning do not easily equate to those of humans,[15] nor is the logic that AI systems employ easy to comprehend. For commanders and system operators charged with and responsible for the use of capabilities—some of which can well determine life and death—placing faith in technologies whose decision-making processes are opaque at best can be a bridge too far.[16]

Source: Adobe

IMPLICATIONS FOR THE CANADIAN ARMY

Such realities indicate that adoption of AI on the part of the CA, while offering promise, must proceed with caution and be informed by a realistic sense of limits. Neither Canada nor the CA are immune from encountering the challenges described above. For instance, the closer that AI technology gets to the kill chain without appropriate human oversight, the greater the risk that catastrophic consequences could occur. Accordingly, care must be taken to study or adopt technology where it can aid human decision making. A "black box" AI that instructs a human on what to do would be unacceptable. An AI advisor must be able to explain its recommendations/conclusions so that a human can comprehend and has confidence in the recommendation proposed. The human decision-maker must be able to offer leadership a clear and comprehensible explanation of the AI-derived solution provided.[17]

Nevertheless, if pursued and applied carefully, much of what AI offers generally aligns well with CA requirements as detailed in *Close Engagement, Land Power in an Age of Uncertainty*. *Close Engagement* aims to address the challenges of an operational environment characterized by rapid change as well as by a wide range of complex humanitarian challenges and ever more technologically enabled adversaries capable of fielding a range of increasingly maneuverable lethal and non-lethal systems and elaborate countermeasures. Meeting such challenges rests heavily on the capacity to ensure access to the information and analysis needed for understanding and adjusting to changing conditions faster than adversaries. Such a goal requires versatile personnel, adaptable equipment, organization and processes, and "an ability to develop shared understanding."[18] As an advanced method of information processing, AI can offer an essential means of helping to address such needs by providing a capacity to process and analyze data from a widening array of sources faster and more accurately than is humanly possible. As such, AI can serve as an important decision-making aid, enabling the development of both the individual and shared understanding essential for determining potential courses of action, for prioritizing the acquisition, disposition and use of military assets, and for providing the data, information and actionable intelligence needed to conduct operations in a timely manner.

Beyond that, AI may even serve to bolster the security of the network upon which the Army relies. "High-capacity networks able to operate over long distances offers a significant advantage"[19] to the conduct of Army operations. In fact, a secure and robust network is central to ensuring the swift, secure distribution of the data and analysis needed for the effective conduct of Army operations.

Source: Department of National Defence

Data collection exercise for a Defence Research and Development Canada – Valcartier project known as Joint Algorithmic Warfighter Sensors. The project is part of a larger Canadian Army science and technology portfolio, Empowered Dispersed Operations in the Digital Age.

By offering the prospect of developing algorithms capable of guarding against network failure, electronic warfare and cyberattack, AI may serve to more fully ensure that the Army is capable of "reap(ing) the network's advantages,"[20] and thereby conduct operations in a more secure, coordinated and collaborative manner. Improvements in areas such as interoperability, force-generation, power projection and sustainment, and the conduct of dispersed operations, may all stand to benefit as a result.

Throughout, as AI technology is pushed to the tactical edge, there will be a need to ensure that enough electricity (energy) is available to support it. In addition to the network, work on advanced power management and battery technology will be essential.

ENHANCING OPERATIONAL FUNCTIONS: POTENTIAL OPPORTUNITIES

Examination of the implications of AI for each of the Army's five operational functions[21] provides fidelity both on the manner in which military applications of AI should be considered by Army decision-makers as well as on some of the possibilities it holds for supporting *Close Engagement* and Army operations.

COMMAND

Artificial intelligence has the potential to strengthen the command function of military operations by increasing human–machine collaboration in both the planning and execution of military operations. Indeed, the capacity of machines to process and make sense of vast amounts of information and to complete complex tasks and match or exceed human performance is increasingly evident.[22] As such, AI holds the promise of significantly lessening the cognitive burden on soldiers and significantly aiding decision-making.

Given that the exercise of command is a fundamentally human endeavour, any AI application must be responsive to human control. Accordingly, system design must reflect human needs and requirements. User interfaces should be simple and/or intuitive in design to better ensure functionality. Moreover, given that AI technology has yet to reach the point where humans can rely unfailingly on algorithms, the provision of fail-safe mechanisms that allow operators to shut systems down should they perform in an unintended or incorrect manner, or to adjust systems when situations and/or orders so warrant, must be an essential component of design and development.[23]

Applications conforming to such parameters may be numerous. In the area of communications, AI technologies may prove useful for improving communication flow, offering means of distributing messages in a manner that is both more accurate and more timely than existing methods. Indeed, AI systems could be combined with procedural mechanisms (labelling) such as precedence—the communication differentiation scheme used by the now defunct Automated Data Defence Network—to prioritize messages based on content (i.e. Routine, Priority, Immediate, Flash and Flash Override). The result would be a practical and seemingly attainable means of allowing traffic to be throttled through the system with a level of speed, accuracy and skill, especially during combat operations.

Using AI in facilitating alliance communication may prove attractive as well. Notably, given security classifications and caveats, information sharing and trust can emerge as friction points within allied coalitions during the conduct of operations. Potential problems of this nature are best determined and resolved prior to operations (i.e. when time is not a factor). Otherwise, such discussion risks slowing the critical flow of information that can affect operational outcomes. While part of the solution involves improving both the type and nature of security markings contained on information, AI can serve as an efficient means of facilitating the quick and effective distribution of such information once processed. The result may well be an improved capacity to share more information with allies and joint, inter-agency, multinational and public partners.

Aspects of battlespace management may also profit from AI technologies. Here, possibilities might include the production of AI-generated courses of action (COA), as well as risk and options analysis of the COAs produced. Indeed, the AI-enabled gaming of options (using thousands of simulations) could lead to faster risk identification as well as to the identification of mitigation measures required to address them.

Beyond that, the commander's personal staff could be bolstered by using AI-enabled advisory support to legal and policy advisors.[24] For both, the body of scholarly work (legal articles, legislation, case law, and policies of foreign nations) that can be reviewed and flagged for human review by an algorithm is extremely fast and increasingly accurate. The implementation and use of such a process would provide a commander with timely and accurate information to make more complex and time-sensitive decisions.

SENSE

Artificial Intelligence may be particularly well suited for enhancing the operational function of Sense. AI systems have a relationship with data, which is derived from sensors (or inputs). It has been said that every soldier is a sensor. AI offers the promise of making each soldier, and every other sensor that is networked, available to many "clients" to complement human decision-making. The ability to network and share can be a significant force multiplier that could create synergies in operations that currently do not exist.

Potentially beneficial injects of AI in support of the Sense function are plentiful. Such technologies may be especially useful for performing imagery and signals analysis. As detailed and repetitive tasks, imagery and signals analysis consume an inordinate amount of human effort. Typically, these tasks require more people than currently practical to hire, with each person hired requiring high security clearance levels to enable data review (which gives rise to security risks and inordinate costs). Yet, if conducted by AI, not only would output be quick and accurate, but those personnel previously involved could be redirected to more profitable pursuits. Such a move would cue humans to focus more precisely on any anomalous data flagged by the AI system.

At some point, AI may also be highly useful for optimizing sensors for targeting. Here, while choices will need to be made in future to determine if direct kinetic effects will be permitted, or if there will be limitations or conditions set to govern kinetic or non-kinetic effects, the capacity of AI to support the process appears viable. AI could enhance the capacity of sensors to assist in determining targets (including targets of opportunity) and in notifying/cueing decision makers. Once targets of interest are established, AI could also assist in identifying those actions/options most appropriate for achieving the operational effects that decision-makers seek.

The data mining of social networks and open sources to determine relationships, plans and patterns of life and to confirm events, as well as the use of sentiment analysis to determine the specific or general feelings of a population on an issue based upon explicitly stated feelings or non-verbal behaviours, offer similarly promising avenues for AI application.[25] Other potential uses may include the development of immersive digital environments to help train soldiers, as well as AI-enabled translation applications to facilitate language understanding for operations abroad. The former may not only serve to enhance collective training but may also help lower the real-world costs of putting soldiers into the field. Meanwhile, AI-enabled language applications offer an accessible means for performing tasks such as real-time translation and the transcription of meetings. The results may not only include more accurate communication, but also the creation of better working relationships with local inhabitants (especially if combined with sentiment analysis). Eventually, soldier capability—a key element of *Close Engagement*—could also improve, given the cultural understanding, facial and name recognition, and the human intelligence information likely to be gained.[26]

ACT

Act integrates firepower, manoeuvre and offensive information operations to achieve desired effects. In terms of AI, such operations raise issues of human-machine teaming, trust, and the delivery of both lethal and non-lethal effects.

Human-machine teaming represents a cornerstone for AI development and operationalization, and maximizing the strengths of the human and machine, while minimizing the shortcomings of each, is central to its effectiveness. For example, the AI can spot an anomaly in a data set that would otherwise be unseen by a human and then pass it to a human, who can then decide what that anomaly may mean and the action to take. In many cases, such teaming may already meet this standard. Yet confidence in the capacity of such teaming to perform assigned tasks correctly in all potential circumstances still remains elusive.

Accordingly, building trust in the capacity of AI to perform correctly must represent a key area for further research and investigation. To that end, efforts could focus on the testing and eventual refinement of AI-enabled systems in "edge cases," i.e. in circumstances that pose particularly difficult or complex challenges (e.g. how an AI system might target a child soldier, or a non-combatant who may be providing intelligence to the enemy, or perfidy, i.e. false surrender under flag of truce). The insights gained could be used to further develop systems capable of optimizing soldier/operator trust.[27]

Challenges also surround applications of AI to military systems for the delivery of lethal effects. Central to that question is the degree to which such systems may pose issues of reliability or violate existing Laws of Armed Conflict (LOAC). Questions concerning where to use AI in the Sense-Decide-Act loop will require careful consideration. While it is clear that it is appropriate to use AI as part of Sense, the decision to do so must be conducted by a human. Beyond that, a decision must be made if and when AI may be used within Act.

In fact, current doubts regarding trust in the reliability of AI strongly suggest that, while the pursuit of fully autonomous and semi-autonomous lethal weapon systems areas should be investigated—particularly given the potential need to defend against such systems—their development and use must await the results of further experimentation and research. Any view to employment of such systems must be based on high confidence that they will perform as intended and on the understanding that such use would only occur within established ethical and legal parameters (e.g. the LOAC).

The active pursuit of AI-enabled non-kinetic effects may be more productive. Applications in the informational and cyber domains could yield benefits for shaping the operational environment.[28] Such applications may be used to prevent or slow the need for the application of kinetic effects. For instance, non-kinetic emails containing instructions for blocking communication, or that contain viruses that lead to a denial of service, may prove useful for preventing the transmission of information to a kinetic force (such as a soldier with a weapon, or the operation of a weapons system/platform). Investigation of smart virtual personal assistants (VPA)[29] such as Siri and Alexa may yield benefits as well. Systems such as those could support the Act function in areas such as navigation, communication, targeting, logistics and health systems. Applications may eventually be extended to include weapons systems (kinetic, or non-kinetic), with VPAs used to improve weapon accuracy and assess weapon impact on targets.

Finally, the exploration of AI technologies capable of enabling the use of swarming techniques is also worth pursuing.[30] The technique, which takes the form of multiple simultaneous (or near simultaneous) attacks to overwhelm a defender can be accomplished with technology such as AI-enabled robots/drones (in the tens, hundreds, or even thousands).[31] Growing interest in swarming techniques within both allied and adversarial defence establishments suggests that enabling technologies be investigated for adaptation to defensive (Shield) purposes at a minimum and, eventually, for purposes of offense.

SHIELD

AI applications appear well suited to supporting the Shield function. The prospect of unmanned robotic systems replacing humans in situations or acts likely to carry a high risk of serious injury or death accords well with the intolerance of Western nations for casualties.[32]

AI-enabled military systems could provide increased standoff detection of chemical, biological, and explosive threats, especially through sensors (integrated onto other platforms, or standalone). Smart adaptive clothing technology could be integrated into uniforms. And AI could also be used to help optimize personal protective equipment designs and configurations.[33]

Applications in the area of network protection may prove equally beneficial. Given *Close Engagement's* call for a mobile yet fully networked field headquarters, AI applications that allow for analysis of the electromagnetic environment (wired, optical, laser, wireless), security, and the optimization of means and methods of communication could offer greater functionality as well as security. Such efforts would help to reduce or mask electromagnetic signatures, thus lowering the prospect of headquarters being targeted during combat operations. Indeed, AI could help counter an enemy's ability to gain information from friendly transmissions by masking the quantity, nature, frequency and duration of communications.

A Canadian Armed Forces member works with the Telerob Explosive Ordnance Disposal and Observation Robot (tEODor) during the force integration training phase of Exercise ARDENT DEFENDER 18.

Source: Combat Camera

Source: Combat Camera

An Explosive Ordnance Disposal Technician operates a tEODor Remotely Operated Vehicle while his coworker uploads forensic images to their laptop during Exercise ARDENT DEFENDER.

Source: Combat Camera

A Remote Mobile Investigator inspects a vehicle containing a suspected simulated improvised explosive device during Exercise ARDENT DEFENDER.

Source: Combat Camera

Corporal Frederick Nadeau and Corporal Tyler Bell of 2nd Regiment Royal Canadian Horse Artillery perform maintenance on a Light Utility Vehicle.

To address security concerns, a robust AI-enabled red team could be formed to test the system and act upon any intrusions by authorized and unauthorized users that are detected.[34] The digital platform would offer a measure of control over communication, and its analysis would enhance understanding of what is happening within friendly systems. Anomalies detected, such as unusual access or information transfers (i.e. downloads) could then be flagged for immediate denial and followed up via human investigation.

Additional benefits may exist in the area of route security. Here, application of computer vision could assist in reducing the likelihood of being mined or booby-trapped without detection. Other systems such as autonomous route clearance or demining systems could be used as well. More specifically, such applications could form part of a larger system for overcoming battlefield obstacles through route planning.

Autonomous weapon systems for perimeter defence, ground-based air defence and similar anti-access/area-denial applications could also generate new capabilities, assuming that legal and policy enablers are in place. In this case, the term "autonomous" would be a version of supervised autonomous, which includes preparation of the system to delineate the area to be affected, the time that the area is to be affected, the nature of the targets to be engaged, and/or the type of systems that may be selected to engage a target, which could be a mix of kinetic and non-kinetic systems.

Finally, AI could be used in a variety of ways to reduce the likelihood of being targeted by integrated reconnaissance-strike systems through smaller or managed signatures in all spectra. Considerable research is needed into methods for reducing all signatures. Land forces should seek not only to be invisible or masked in electro-magnetic environments but also to be more opaque in all light spectra and quieter in operation.

SUSTAIN

Sustain encompasses most logistical functions and includes Health Services. Linkages with civilian advances in AI technology are clearer in the Sustain realm than in the case of other operational functions. As such, applications of AI may be especially conducive to the area of Sustain, as less work may be required to operationalize AI-enabled solutions.

Close Engagement suggests that "control of overall logistics capability must be centralized at formation level."[35] The use of AI holds promise for enabling just such an approach, so long as all elements of the logistics chain remain connected with data.

Potential AI applications include support of predictive maintenance.[36] In order to make improvements in vehicle maintenance, consideration must be given to ensuring that information can be gleaned from the vehicle in an asynchronous but episodic manner (i.e. not always connected, but frequently connected). Accordingly, AI-enabled sensors could be installed

to gather information such as vehicle diagnostic data, fuel consumption, mileage and tire wear, and track all work performed on a vehicle (this information is not currently collected in the CA fleet). The collection of such data fleet-wide would permit the conduct of data analytics for purposes of predictive vehicle maintenance. In addition, it could assist maintainers in deciding when optional maintenance could be performed under tactical conditions.

Smart supply chain management, as well as the development of advanced logistics, also represent attractive candidates for AI application.[37] Areas to be explored could include the use of drone and other technology for autonomous delivery and return of logistics. Moreover, risks to soldiers could be reduced through use of autonomous convoy and resupply. Leader/follower and wingman concepts could be investigated in support of the effort.

Beyond that, AI could support medical and casualty evacuation using smart systems to enable recovery of personnel. Expertise can be shared (virtually) closer to patients for local treatment by non-experts and AI can also assist in providing personalized medical treatment plans and robotic surgery.[38] Accordingly, the CA should advocate for AI within the Surgeon General's line of authority.

CONCLUSION: THE WAY AHEAD

Clearly, application of AI offers numerous possibilities for enhancing Army capabilities in a range of areas. Potentially beneficial applications are evident in the case of all five of the Army's operational functions. If effectively pursued, the results could serve to make the conduct of *Close Engagement* more efficient, effective and secure in the process. Indeed, the development of AI technology promises to aid the speed of decision making, enable the achievement of desired effects through a more effective use of lethal or non-lethal actions, reduce risks to the force, and reduce the cognitive burden from the individual soldier to the formation commander, and it also holds the promise of aiding defence against many offensive AI technologies/techniques.

Achieving such results will require ingenuity, resources and allocative skill. Sustained investment in the materiel and human resources required for pushing AI forward will be essential.[39] So too will organizations capable of adopting and integrating technologies from the non-defence commercial sector to ensure innovation as well as effectively procuring the technologies and systems required.[40]

To those ends, the CA must work with others in a collaborative environment to share ideas and knowledge and, later, to share data/information during the employment of AI systems. Development of a viable data strategy capable of ensuring the effective marking, processing and sharing of data both domestically (i.e. with other government departments and agencies) and abroad (with allies and partners) will be particularly important.[41] Moreover, given the speed with which developments in AI can take place, technology horizon scanning should be conducted on a regular basis with an emphasis on AI.

Beyond that, considerable effort must be made to ensure trust in the development and use of AI-enabled military systems. Accordingly, rigorous experimentation and testing practices and more intuitive man-machine integration will be needed to ensure that the strengths of each are emphasized. While some tolerance for failure must be allowed in the process of developing and integrating AI into military systems, criteria for success must be clear so as to allow for learning if and when failure occurs. Throughout, care must be taken to ensure that efforts aimed at the development and use of all AI-enabled systems are informed by the need to fully adhere to prevailing ethical standards within the Canadian military as well as international norms and laws governing armed conflict (i.e. LOAC).

Addressing such requirements will be challenging. Indeed, it will require considerable engagement and cooperation as well as the clear and continual articulation of Army needs and requirements, both within and beyond the military.[42] That said, given the growing significance of AI to defence and security, pursuit of such efforts are essential. Not only is the promise that AI holds for military organizations, including the CA, clear, but the potential threats that may arise given its pursuit by our adversaries cannot be ignored.

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ENDNOTES

1. See Canadian Army Land Warfare Centre, "Toward an Army Artificial Intelligence Concept: Some Initial Food for Thought" (Kingston: unpublished manuscript, December 2020).

2. Indeed, ongoing progress in the development of AI technology has served to ensure that definitive definitions of AI are elusive. As Evan Stubbs, Chief Analytics Officer of SAS Australia, has noted "…the definition [of AI] is a set of moving goal posts…."

See Asha Barbaschow, "Artificial Intelligence," at https://www.zdnet.com/article/ai-tends-to-lose-its-definition-once-it-becomes-commonplace-sas/ 31 May 2016, (accessed on 30 October 2019).

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4. According to Matej Tonin, AI holds the potential to:

   - vastly improve the reaction times of defensive systems against fast-acting weapon systems, such as hypersonic missiles, cyber-attacks, or directed-energy weapons;
   - deliver actionable information faster to decision makers, which could potentially deliver a decisive edge on adversaries;
   - quickly discover cyber intrusions by detecting evasive malicious codes or by scanning for suspicious patterns of behaviour rather than for specific code; and,
   - help identify attempts to manipulate citizens through disinformation campaigns.

   See Matej Tonin, "Artificial Intelligence: Implications for NATO's Armed Forces," Report No. 149, Science and Technology Committee (STC), Subcommittee on Technology, Trends and Security (STCC), 13 October 2019, pp. 3–4.

5. Ibid. p. 3.

6. Ibid. p. 4.

7. Ongoing Chinese and Russian investments in autonomous systems have fueled an increasing unease about a potential new revolution in military affairs and a subsequent AI arms race. Given that reality, and notwithstanding the possibility that adversarial applications of artificial intelligence are speculative and may at times be based on worst-case analysis, the need to be vigilant and explore as well as adopt and integrate AI where possible to improve capability would be both responsible and sensible. See Mary Cummings, "The AI that Wasn't There: Global Order and the (Mis)Perception of Powerful AI," and Michael C. Horowitz, Lauren Kahn and Christian Ruhl, "Introduction: Artificial Intelligence and International Security," both in Policy Roundtable: Artificial Intelligence and International Security, *Texas National Security Review*, June 2020, pp. 8–9, and p. 3 respectively. Available online at https://tnsr.org/roundtable/policy-roundtable-artificial-intelligence-and-international-security/ (accessed on 26 June 2020).

8. M.L. Cummings, "The Surprising Brittleness of AI," https://www.womencorporatedirectors.org/WCD/News/JAN-Feb2020/Reality%20Light.pdf.

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10. Michael Horowitz, Lauren Kahn and Christian Ruhl, "Introduction: Artificial Intelligence and International Security," p. 2.

11. On these points, see Michael C. Horowitz, Lauren Kahn and Christian Ruhl, "Introduction: Artificial Intelligence and International Security," both in Policy Roundtable: Artificial Intelligence and International Security, *Texas National Security Review*, June 2020, p. 3.

12. Ibid.

13. Ibid.

14. Ibid.

15. Peter Gizewski, "Building Trust in Artificial Intelligence-Enabled Capabilities: Problems and Prospects," DRDC-RDDC-2020-L164 (Ottawa: Defence Research and Development Canada, September 2020), p. 5.

16. Ibid.,

17. For example, an AI system can identify a target and flag it for review by a human technician, who then verifies the observed target. From that point, the image is shared with the decision, maker, who then reviews the evidence (e.g. a photo) and confirms the target (individual, location or equipment) in question. The operational environment is considered by the decision-maker, and the type of target engagement is selected by the decision-maker to prosecute the target. Finally, the executive decision is made to engage (or prosecute) the target.

18. Canadian Army Land Warfare Centre, *Close Engagement: Land Power in an Age of Uncertainty* (Kingston: Army Publishing Office, 2019), pp. 15–16.

19. Ibid., p. 38.

20. Ibid.

21. The operational functions provide a means of understanding key aspects of the operational environment. Such categorization constitutes a "bucketing" or sorting system and, as such, is imperfect. In a similar way, AI is a cross-cutting discipline that has the potential to affect almost every aspect of the military. Consequently, the categorization of AI applications discussed in this section cannot be definitive. In fact, in some cases, applications discussed in the context of one particular operational function may arguably have equal if not more relevance for another. That said, such categorization is suggestive of the various possibilities that AI offers in each of these areas.

22. As Matej Tonin notes, "AI's ability to sift through today's data-rich environment and communicate findings in a compelling manner…will become ever-more important. While human resources currently allow for the processing of, at best, 20% of the information produced today, this percentage could go down to a mere 2%." See Matej Tonin, "Artificial Intelligence: Implications for NATO's Armed Forces," Report No. 149, Science and Technology Committee (STC), Subcommittee on Technology, Trends and Security (STCC), 13 October 2019, p. 3.

23. Efforts aimed at rendering the logic of AI more comprehensible to human operators should be pursued in tandem with such efforts. Indeed, the investigation of measures aimed at ensuring that the outputs of AI and the manner in which they are arrived at are easily understood will be a key component in facilitating greater trust and confidence in the adoption and use of AI in command. For a useful overview of potential measures aimed at generating such trust, see Marlon W. Brown, "Developing Readiness to Trust Artificial Intelligence within Warfighting Teams," *Military Review*, (January–February 2020), pp. 36–44. Available online at https://www.armyupress.army.mil/Journals/Military-Review/English-Edition-Archives/January-February-2020/Brown-AI-ready/ (accessed on 7 July 2020).

24. Ibid.

25. Ibid.

26. Canadian Army Land Warfare Centre, *Close Engagement: Land Power in an Age of Uncertainty* (Kingston: Army Publishing Office, 2019), p. 33.

27. To this end, a series of common cases could be drawn up, as well as a list of the most complex cases (i.e., edge cases) for testing purposes. Studies should be undertaken to understand attitudes towards AI algorithms, and the trust that the soldier and commanders place in them, and how this trust is achieved for optimal employment of a system.

28. Alain Auger, *Artificial Intelligence (AI)-enabled Applications for the Canadian Army*, DRDC-RDDC-2019-L080 (Valcartier: Defence Research and Development Canada, April 2019), p. 4.

29. Ibid.

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33. Alain Auger, *Artificial Intelligence (AI)-enabled Applications for the Canadian Army*, DRDC-RDDC-2019-L080 (Valcartier: Defence Research and Development Canada, April 2019), p. 4.

34. On this point, see Alain Auger, *Artificial Intelligence (AI)-enabled Applications for the Canadian Army*, DRDC-RDDC-2019-L080 (Valcartier: Defence Research and Development Canada, April 2019), p. 3.

35. Canadian Army Land Warfare Centre, *Close Engagement: Land Power in an Age of Uncertainty* (Kingston: Army Publishing Office, 2019), p. 46.

36. Alain Auger, *Artificial Intelligence (AI)-enabled Applications for the Canadian Army*, DRDC-RDDC-2019-L080 (Valcartier: Defence Research and Development Canada, April 2019), p. 4.

37. Ibid.

38. Ibid.

39. AI is not a field that is static. It is growing and evolving rapidly, and a lack of investment can result in being left behind. Hiring qualified personnel at the outset, investing in education, and planning for the employment of AI will require long-term thought and planning. Investment in technology will involve building the infrastructure that supports AI research and development, testing and deployment. That will be costly, as systems are routinely and frequently upgraded (on the order of every six months).

40. Given the rapidly evolving nature of AI technology, its development and integration for the purpose of enhancing military capability promises to pose significant challenges for procurement. AI technology evolves at a pace of days/weeks/months as opposed to military procurement, which normally occurs within Horizons 2 or 3 (5–15+ years). Moreover, at present, the procurement system is most comfortable with known products that help ensure that the government gets value for the investment. Risky endeavours that may fail are not well tolerated. AI research is often slow and beset with failure, which represents opportunity for learning and growth.

41. Data issues involve the life cycle of data, which should be addressed through consultation with the Assistant Deputy Minister (Data, Innovation and Analytics) (i.e. ADM [DIA]) and the Assistant Deputy Minister (Information Management, (i.e. ADM [IM]).

42. The CA does not own all the issues related to AI technology. Consequently it must work with partners and must be able to compromise in order to make gains.

OPERATIONALIZING UNIFIED ACTION:

Joint Inter-Agency Fusion Cells as a Tool to Counter Complex Adversarial Threats

Juan-Camilo Castillo

The second decade of the 21st century has seen the rapid emergence of a variety of challenges to global security. These range from the rise and constant transformation of violent non-state actors (VNSA) flourishing in permissive environments to emerging revisionist powers such as Russia, Iran and China, which have adopted assertive postures, capabilities and doctrines. Their goal is to increase their regional and overall strategic influence over the contemporary security environment.[1] While that shift has by no means been an unexpected phenomenon, it has collided with current operational paradigms that the West has adopted in recent years. Following the initial engagements in Afghanistan and Iraq, the US along with North Atlantic Treaty Organization (NATO) members and other partner countries were granted the space to gather operational experience and better understand the implementation of irregular warfare and counterinsurgency.[2] Nevertheless, adversarial or potentially adversarial actors have managed to equally broaden their capabilities, enhance their flexibility and exploit vulnerabilities of doctrine, systems and practices employed by the West. Moreover, the changing context of current engagements has defied the application of lessons learnt, which in practice could help devise new cost-effective ways to counter these emerging threats.

Among these lessons, the development of the inter-agency or whole-of-government approaches were highlighted as a methodology to not only synchronize effects but also synergize efforts originating from different military and civilian entities present in a common operating space.[3] While that process came with its growing pains due to the shock occasioned by bringing entities with different organizational cultures together, the benefits of developing

Source: Combat Camera

Source: Combat Camera

Source: Combat Camera

multi-capability planning that extended beyond military efforts helped achieve sustainable results.[4] Moreover, in efforts to capitalize on those benefits, security actors such as NATO further adopted a comprehensive approach that entailed cooperating, coordinating or at least co-existing with other actors inhabiting theatres of operations, such as non-governmental organizations (NGO) or civil society[5] agencies. More recently, the US defence community has advanced the notion of unified action, which is focused on the synchronization, coordination, and/or integration of activities by governmental and nongovernmental entities with military operations to achieve unity of effort and meet shared objectives.[6] However, nowadays, the application of these approaches is easier in theory than in practice. Fatigue from long campaigns in Iraq and Afghanistan, plus lurking new threats ranging from insurgencies in North Africa and Southeast Asia to state-sponsored proxies in Syria and Ukraine, have forced NATO members and like-minded countries to explore ways to address emerging security challenges while reducing the transactional cost of deploying several bureaucratically heavy government frameworks in multiple theatres of operations.

In light of the above, the purpose of this piece is to advance the notion of deployable joint inter-agency fusion cells (JIAFC) as a potential tool that can be used by NATO member states, including Canada and other like-minded countries, as part of wider strategies to address emerging complex adversarial threats overseas through unified action. That is achieved by improving the overall degree of coordination and synergy by instruments of national power employed in countering contemporary threats. Thus, this paper will be divided into two sections. First, the paper will discuss the notion of complex adversarial threats as a salient feature of contemporary operational environments and will cover some of the considerations that decision-makers must be aware of when addressing those in the present day. Thereafter, the piece will further present the concept of the JIAFC as a solution to growing operational needs while, at the same time, acting as an enabler to the development of comprehensive responses to emerging security challenges. Ultimately, this model will be presented as a cost-effective addition to the toolkit available to governments when addressing complex security threats or operating in complex environments, particularly in contexts related to asymmetric and hybrid warfare.

The section will also explore some of the challenges that need to be considered in order to materialize JIAFCs as a tool accessible in the toolkit of policy makers and war fighters.

COMPLEX SECURITY THREATS: A PATHOLOGY OF CONTEMPORARY ADVERSARIAL ACTORS

The widely used notion of a complex security threat is a concept whose definition ranges in scope.[7] On one hand, from a political-military perspective, the emergence of what could be defined as a complex threat was greatly shaped by events at the end of the Cold War when the focus of security challenges shifted from the potential of inter-state conflict (both conventional or nuclear in nature) to an array of actors, emerging adversarial capabilities, and growing vulnerabilities that challenge current perceptions on what an acceptable condition of security actually is.[8] Indeed, the notion has become an umbrella term that encompasses adversarial or potentially adversarial actors that are able to employ a wide range of capabilities; their intent or scope is equally diverse and they either depart from or complement existing concepts constituting a threat to security. Actors that are engaged in asymmetrical warfare, terrorism or illicit activities that challenge the legitimacy of state institutions, or that have access to soft power tools to achieve that, could easily fall into this category. In some instances, the concept of complex security threats has gone further from just adopting an actor-centric perspective; it has also included adverse situational conditions that can include bio-security threats, such as pandemics, as well as human-generated phenomena such as large demographic movements and complex humanitarian emergencies.[9] In that light, complex security threats could be defined as entities and/or events that exist in multiple operational domains (physical, information and cognitive) and dimensions of security (military, political, environmental, economic, etc.) that have the capacity to cause harm through those vectors.[10] Nevertheless, within the realm of complex security threats, the salient feature that sets complex adversarial threats apart is the fact that they have both the intent and capacity to deliberately cause harm by exploiting their multi-domain and multidimensional condition.[11] Ultimately, both non-state and state actors with the capacity to contest the security space in such a way could be defined as complex adversarial threats.

As noted by Phil Williams, VNSAs are a common feature of the contemporary security environment that have been bolstered as a result of existing governance gaps found throughout the Westphalian state system and the access brought by globalization to information, resources and commodities.[12] As complex adversarial threats, VNSAs have not only proliferated globally but have also come in different shapes and forms, which range from Islamist insurgencies operating in Iraq, Syria or the Sahel to highly organized criminal organizations with military-like capabilities operating in Central America, Colombia and Mexico. While sometimes these actors are divided in a dichotomy of either seeking to achieve political goals (i.e. insurgencies) or economic goals (i.e. criminal organizations), VNSAs are inherently political since they will challenge the monopoly of force traditionally held by formal state institutions. By doing so, and if they succeed in increasing their stake in the monopoly of violence in a given theatre of operations, this creates space for these actors to start exercising a broad set of functions such as governance, justice administration and even in some cases the delivery of essential services as well as the administration of public goods as they achieve some degree of territoriality.[13] That latter point is key in defining the VNSAs as a complex adversarial threat given that these actors need to adopt asymmetric strategies because of the inherent disparity, in regards to capabilities and resources, that exists between them and formal state institutions. In order to survive as an entity and have any possibility of achieving their objectives, VNSAs will seek to exploit vulnerabilities across different domains, taking advantage of military and socio-political weaknesses held by state actors.[14] In other words, VNSAs will aim to generate kinetic and non-kinetic effects by deploying military, information and other capabilities in the physical and human terrain where the state or any other adversary has a limited footprint. On that note, it is worth mentioning that VNSAs can also mobilize against other VNSAs, as is evident in ongoing armed conflicts between Daesh and Al-Qaeda affiliates in Africa and the Middle East or between different cartels and criminal organizations in the Western Hemisphere.[15] Ultimately, regardless of what other actors are active in the operating space, VNSAs will seek to maximize advantage by carrying out complex activities in multiple domains simultaneously.

While VNSAs may have latched their chances of strategic success to their ability to effectively implement multi-domain operations, nation states have likewise taken notice of some of the lessons learned by non-state actors. According to David Kilcullen, emerging near-peer adversaries were positioned in a way that they could observe how Western forces in Afghanistan and Iraq would experience setbacks as they fought VNSAs implementing complex multi-domain operations while, at the same time, they had the opportunity to observe the responses the West would craft to counteract those challenges.[16] Therefore, the subsequent development and application of multi-domain approaches to operations through hybrid warfare strategies by states has created the opportunity for these actors to engage both as conventional and/or complex adversarial threats. Hybrid warfare is by definition the employment of several multi-domain capabilities, including conventional military forces, proxy non-state actors, diplomatic engagement, cyber operations and information operations under a strategic campaign that frames the overall political objective.[17] For state actors,

Members of 3rd Battalion Royal 22e Régiment take shelter next to a BV-206 vehicle as their convoy comes under a simulated attack during Exercise TRIDENT JUNCTURE in Alvdal, Norway, on 3 November 2018.

Source: Combat Camera

that offers an opportunity to achieve political-military objectives, engaging in operations that can be more cost-effective than limited conventional warfare while at the same time reducing the liability associated with reputational and political risks. In a way, hybrid warfare has offered an opportunity for state actors to reap some of the benefits offered by asymmetric warfare but with the resources needed to bolster the different capabilities employed (unlike VNSAs). Russia has been able to demonstrate how those capabilities can quickly yield strategic effects in specific theatres of operation such as Ukraine, Syria and Libya while at the same time allowing Moscow to challenge the West at a global level in efforts to achieve a perceived balance of power, especially when protecting national interests.[18] Other countries such as Iran have employed similar strategies, with the use of proxies, information operations and cyberwarfare in Iraq, Syria, Lebanon and Bahrain, without engaging in overt conventional conflict.[19]

Even Turkey, a NATO ally, has adopted some of these tactics as it seeks to increase its influence in North Africa, Syria and, most recently, the Caucasus.[20] In the end, as near peer state actors become active in contested theatres of operation, the application of hybrid warfare strategies will become more common. Accordingly, in future, the West will likely find itself engaged in conflicts where several complex adversarial threats, including VNSAs and near-peer state actors, are operating simultaneously—circumstances not different from the situation recently encountered in Syria during the counter-Daesh campaign.

JOINT INTER-AGENCY FUSION CELLS AS RESPONSE TO COMPLEX ADVERSARIES

In the contemporary global operating environment where complex adversarial threats will seek to occupy strategic yet contested spaces, Western and like-minded countries will equally need to achieve dominance through multi-domain operations in order to reach desired political objectives. As indicated in the introduction, there are approaches that advocate for utilizing all instruments of national power in order to achieve identified political, inclusive of military, objectives such as unified action and apply the diplomatic, information, military and economic (DIME) model to the decision-making process.[21] However, over the last twenty years, the implementation of those approaches has not been

Source: Department of National Defence

as straight forward. As noted by Christopher M. Schnaubelt, in the first years of the counterinsurgency campaign in Iraq, there were significant organizational, cultural and operational challenges in creating functional civil–military inter-agency frameworks that were improved with time and offered lessons learned for approaches that would be later applied in Afghanistan.[22] In the latter case, this learning process helped to establish a US-led joint inter-agency task force (JIATF) that helped deconflict different lines of operation in order to achieve unity of effort among various US government partners working on shared counter-terrorism objectives in a complex operating environment.[23] This model has also been applied and approved in other contexts, such as narcotic-interdiction operations that involve different agencies being supported by the military in the Western Hemisphere.[24] If anything, the last twenty years have offered an opportunity to test different configurations and frameworks that aspire to achieve synchronization and integration of effects delivered through different instruments of national power.[25] As noted by George E. Katsos, from a US perspective this process has led to the recent development of new and collaborative doctrine, the 2019 *Joint Guide for Interagency Doctrine*, that not only captures some of the lessons learned by civil and military agency coordination but also provides a guide on various configurations and structures that can be established for future whole-of-government operations.[26]

Within the context of the contemporary operating environment, the rapid establishment and deployment of interagency frameworks continues to be essential to counter complex adversarial threats. Based on the lessons learned from the last few decades, this piece proposes establishing JIAFCs as a standing baseline capability to facilitate joint planning and synchronization of different instruments of national power. A fusion cell is one of the most basic frameworks for agency integration, which seeks to enable information flows across stakeholders in order to "distribute context, thinking, and analysis" across key decision-making nodes.[27] They are structurally lighter, especially in comparison to heavier frameworks such as task forces, and they can be quickly deployed or plugged into future or current operations. Moreover, the 2019 *Joint Guide for Interagency Doctrine* recognizes that some of these basic civil–military structures not only facilitate that much needed liaison function but also can help with sequencing between military formations and civilian agencies as well as establishing a credible footprint in

the information space.[28] Apart from facilitating information flows, the establishment of standing JIAFCs creates a space for civil–military planning where capabilities can be integrated in order to achieve shared or complementary objectives. For that same reason, the make-up of the cells is critical. The right capabilities and functions must be present in order to achieve integration among civil and military stakeholders contributing to the cells. Essential capabilities such as political engagement, intelligence, civil–military operations, information operations, military planning liaison, security force assistance and civilian-led security programs (such as law enforcement capacity building) are needed as part of the framework to synchronize complex multi-domain operations. At the same time, depending on the operational context, objectives, and the threats that are being countered, other capabilities and functions, such as special operations forces or specific conventional military capabilities, can be added in order to make the cell fit for purpose.

It is also essential that the JIAFCs reinforce the principle of the primacy of politics (or more, specifically, policy) when countering complex adversarial threats. As noted above, both VNSAs and adversarial state actors engage in the multi-domain space within the context of a defined political objective. Therefore, it is important that the JIAFCs play a role, at the operational level, in maintaining objective-based coherence as different capabilities and instruments of national power are employed to counter those threats. For the cells to be successful in achieving this core function, they will require some degree of delegation from both military and civilian leaders in order to create a space of collaboration and enable freedom of action. Thus, there has to be a high degree of trust among the stakeholders participating within the JIAFCs, especially in situations where bureaucracy can be an obstacle, while at the same time creating an opportunity for burden sharing among all agencies.[29] This could also help shape how the internal flows, routine operations and transactional processes would take place inside the cells. Normally, when different military and civilian stakeholders participate in inter-agency platforms, they operate on a consensus-based system in response to the different chains of command or management lines that each participating entity is subject to.[30] The consensus-based approach can be quite effective in enhancing whole-of-government situational awareness and allowing the different agencies to understand what the others are doing and factor it into their own decision-making processes. Nevertheless, this may not necessarily guarantee that there will be ongoing opportunities for integrated planning and deep collaboration among inter-agency stakeholders. Therefore, having a vertical management structure where a leadership node, not different from the structures used for domestic incident management, should be established so that it can provide that operational direction and ensure strategic (and therefore policy) coherence when seeking to achieve whole-of-government objectives linked to countering complex threats.[31] Similarly, David Kilcullen highlighted, in response to complex adversarial threats, the need for a new type of civil–military senior official that is able to integrate DIME instruments of national power into a single and coherent strategy by having the necessary resources to do so as well as the policy coverage from government that translates into operational flexibility in theatre.[32] The JIAFCs could work as the structure that could support those senior officials in theatre, as they ensure integration with other leadership elements such as a combatant commander or an ambassador in the country. In the end, the functional goal, so to speak, is to maintain unity of effort in order to advance a coherent strategy to counter complex adversarial threats.

CONCLUSION

Complex adversarial threats are and will continue to be a common feature of the contemporary security environment in the years ahead. VNSAs will likely keep spawning in permissive environments where conflict entrepreneurs are able to mobilize conflict by exploiting real or perceived social, economic and/or political grievances. In addition, revisionist state actors have become more assertive and will likely continue to seek ways to undermine what is perceived as Western hegemony. In this light, it is essential for Western and like-minded countries to utilize all the necessary instruments of national power that they have at their disposal to address emerging threats. To do so, the integration of both military and civilian capabilities will be essential, even though processes of synchronization, sequencing and amalgamated planning remain an ongoing collective learning experience for armed forces and civilian agencies alike. Therefore, the creation of a standing capability that focuses on integration will help governments adapt quickly in contexts where adversaries will seek to remain flexible and exploit simultaneous vulnerabilities across various domains. Fusion cells can create an initial space for coordination and collaboration but, more importantly, can be used as a framework to ensure that there is strategic coherence across all instruments of national power and, to some degree, can serve as a centre of excellence that ensures that that takes place. Moreover, as a basic platform, fusion cells can be shaped or fleshed out accordingly depending on operational needs, the context and the threat being countered. In the end, deployable cells that can lead in integrating different capabilities can help maintain flexibility and set the conditions necessary to achieve strategic superiority against complex adversarial threats in multi-domain battlespaces.

ABOUT THE AUTHOR

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THE LEOPARD TANK REPLACEMENT PROJECT:
DEFENCE PROCUREMENT AGAINST THE ODDS

Lieutenant-Colonel (Retired) Perry Wells
The Royal Canadian Dragoons
(Project Director for the Tank Replacement Project from March 2007 to August 2011)

Source: Wikimedia

Source: Wikimedia

United States Army Stryker Mobile Gun System produced by General Dynamics Land Systems.

Source: Wikimedia

INTRODUCTION

Throughout the early 2000s, as the Canadian Army was shifting toward becoming a multi purpose, combat-capable land force equipped almost exclusively with wheeled vehicles, the number of in-service Leopard C2[1] main battle tanks was slowly being reduced. The gradual phasing out of the Leopard C2 was in anticipation of the acquisition of 66 mobile gun systems (MGS) from General Dynamics Land Systems which mounted a 105 mm main gun on an eight-wheeled light armoured vehicle chassis. By 2006, most of the Leopard C2s were in the process of being decommissioned for disposal, with many waiting to be turned into monuments and museum displays.

It was against this backdrop in April 2006 that the decision was taken to cancel the MGS project, leaving the Army without a dedicated, mobile, direct-fire platform. This cancellation would relegate the Royal Canadian Armoured Corps (RCAC) to a reconnaissance and surveillance role only. The Armoured Corps was getting out of the tank business.

As this was taking place in Ottawa, Canada's war effort in Afghanistan had recently shifted from Kabul to Kandahar in the south. In September 2006, the 1st Battalion Royal Canadian Regiment (1 RCR) Battle Group launched Operation MEDUSA in an attempt to clear the Panjwaii District of Taliban fighters. However, certain aspects of the operation did not go well, and a number of Canadian soldiers were killed and their equipment destroyed. That led to the Battle Group commander, Lieutenant-Colonel Omer Lavoie, to request the immediate deployment of main battle tanks to support future operations. Operation MEDUSA poignantly highlighted the need for a highly mobile (tracked), well-protected, large-calibre, direct-fire capability—namely, a tank. And with that request, the RCAC was back in the tank business.

Source: Combat Camera

A LEOPARD C2 MAIN BATTLE TANK WITH A MINE PLOW ATTACHED TO THE FRONT. THE MINE PLOW CAN BE LOWERED TO PLOW A SAFE LANE OF TRAVEL THROUGH MINEFIELDS.

On 15 September 2006, the Government of Canada committed to Afghanistan a squadron of 15 Leopard C2 tanks (plus two spares) and two armoured recovery vehicles (ARV) from the Lord Strathcona's Horse (Royal Canadians). A call went out to identify the best Leopard C2s still in active service, plus those slated for disposal, from which to select the tanks that could most easily be readied for immediate deployment to Afghanistan.[2] Not surprisingly, as soon as they arrived, the Leopard C2 tanks provided enhanced protection, deterred insurgent attacks and cleared routes of mines and explosives with their plows, rollers and dozer blades. The superior mobility, protection and firepower of the tank provided the ability to access insurgent positions that were otherwise impassable to wheeled, light armoured vehicles.

But even as the Leopard C2s were being prepared for Afghanistan, it became obvious that they would have a number of deficiencies that would need to be addressed. Namely, the lack of all-round protection against non-conventional 360-degree threats (in particular, rocket-propelled grenades, mines and improvised explosive devices [IED]), issues with internal environmental control, and the progressively worsening obsolescence management issues (e.g. lack of spare parts).

LEOPARD 1 MAIN BATTLE TANK

The Leopard 1 main battle tank was originally designed for operations in a conventional war in the temperate climate of northwest Europe. Therefore, it was poorly suited to the Afghanistan climate where the summer daytime temperature could easily reach above 40 degrees Celsius. Compounding the problem was the hydraulic turret drive system, which was a significant source of internal heating, particularly since it had to cope with moving the additional appliqué armour that had been added to the turret. That combination of solar and equipment heating would cause temperatures of 60 (+) degrees Celsius inside the tank, rendering the crew combat ineffective and causing equipment failures. In addition, Canada's aging Leopard C2 tanks lacked sufficient mine blast and fragmentation protection for the specific threats faced in Afghanistan. The driver's station was particularly vulnerable and could not be effectively protected. Also, the hydraulic fluid used in the hydraulic turret drive was a fire/burn hazard in the event of a mine incident. Finally, the Leopard C2 was at its absolute weight limit regarding automotive performance, and any additional armour, such as a mine blast kit, would severely limit mobility and increase the rate of driveline system failures. Overarching all of that was the fact that the Leopard C2 was at the end of its serviceable life. Industry was to cease support in 2012, which would render it unsupportable by 2015, if not sooner.

LEOPARD 2 MAIN BATTLE TANK

In 1979, the Leopard 2 main battle tank entered service as the Leopard 2A4 with the German Army, and it has undergone several enhancements since. Later versions of the Leopard 2 (such as the Leopard 2A5 and Leopard 2A6) and special purpose vehicles are almost exclusively produced from the initial 3,600 Leopard 2A4s. The Leopard 2 is currently in service with 19 armies worldwide.

LEOPARD 2 – CONFIGURATIONS AND VARIANTS

LEOPARD 2A4
- Base model from which all other Leopard 2 tank variants and special purpose vehicles are derived
- Hydraulic turret drive
- 52 tonnes

LEOPARD 2 TANK DEVELOPMENT

LEOPARD 2A5
- Developed in 1995
- Improved armour
- Electric turret drive
- 59 tonnes

LEOPARD 2A6
- Developed in 2001
- New longer gun
- Electric turret drive
- 60 tonnes

LEOPARD 2A6M
- Developed in 2006
- M = Mine protection
- 62 tonnes

SPECIAL PURPOSE VEHICLE

Note: The two special purpose vehicles represent two distinct variants with their own unique capabilities. It is not an upgrade to go from one to the other.

ARMOURED RECOVERY VEHICLE
- Developed in 1988
- Recovery, towing and repairs/maintenance
- 54 tonnes

ARMOURED ENGINEER VEHICLE
- Prototype developed in 2008
- Obstacle clearance and construction/earthmoving
- 62 tonnes

Source: Combat Camera, Wikipedia

TANKS IN AFGHANISTAN

To address the deficiencies with the deployed Leopard C2, a small but capable team was assembled in the late autumn of 2006 to look at options to quickly replace it with a more sustainable and capable vehicle. That led to the formal stand-up of the Tank Replacement Project in January 2007 with an absolute maximum budget of $650 million.

The Army leadership and project team also saw this as an opportunity to replace the entire fleet of aging Leopard C2s with a modern main battle tank now that the MGS project was cancelled. The Tank Replacement Project therefore had two linked but separate objectives: to replace the Leopard C2s in Afghanistan, and to acquire a new state-of-the-art tank for the RCAC.

The first and most urgent challenge was to identify possible tanks that were immediately available to face the asymmetric threats found in Afghanistan—namely, direct fire (mainly from rocket-propelled grenades, mines and IEDs). A number of options were pursued to include the US M1 Abrams, French Leclerc, Israeli Merkava and German Leopard 2. The only tank that was readily available with the necessary protection was the German Leopard 2A6M, and it was the "M" (mine protection) that tipped the scales in its favour.

Source: KWM Munich

Leopard 2A6M CAN rollout, 2 August 2007 at KMW in Munich.

The next hurdle was to approach Germany about the possibility of leasing, renting or borrowing a squadron of Leopard 2A6Ms. After some lengthy negotiations, the German Army commander eventually agreed to provide Canada with 20 of his recently upgraded Leopard 2A6Ms and two Leopard 2 ARVs. The initial agreement required Canada to pay Germany 10 million euros for the use of their equipment. However, thanks to the intervention of Colonel Tony Battista, the Canadian Defence Attaché in Berlin, that was negotiated to zero and became a no-cost loan. As there were just 70 or so Leopard 2A6Ms in existence worldwide at the time, and Canada now had 20 of them, Germany only agreed to a two-year loan (ending on 1 September 2009). At the time, that was acceptable, as Canada's mandate in Afghanistan was to end at the same time. It is worth noting that one of the reasons Germany agreed to support Canada's request for tanks was that they saw it as a way to fulfill a portion of their commitment to the NATO mission in Afghanistan.

Source: KWM Munich

Canada's ambassador to Germany, Paul Dubois (centre), accepts the ceremonial key to the first Leopard 2A6M CAN from Stefan Krischik, KMW CFO, during the rollout ceremony. Also present are Lieutenant-Colonel Stéphane Siegrist, Project Manager, and Lieutenant-Colonel Perry Wells, Project Director.

As modern and capable as the Leopard 2A6M was, it still needed a number of critical upgrades before it would be ready for operations in an asymmetric theatre of war. In addition to our own in-house research, the Tank Replacement Project also received excellent advice from Denmark, Norway and Sweden on which upgrades to consider. The task of preparing the tanks for Afghanistan was contracted to Krauss-Maffei Wegmann (KMW) in Munich, Germany, and included: an in-depth service check and tune-up; installation of Canadian communications equipment; integration of a cooling system (which included a thermal blanket, turret "umbrella," insulation between the engine bay and crew compartment and crew chiller vests); provision of Canadian-specific storage requirements; improved torsion bars and hydraulic bump stops; an explosion suppression system in the fuel tanks; canister ammunition; enhanced glacis plate armour; and slat armour[3] to the rear and sides of the turret and hull. That long list of items was completed in approximately three months and required KMW to add extra shifts to their work force and incur penalties on other contracts that had to be pushed aside to make room for Canada. The resulting modifications and improvements created the newly designated Leopard 2A6M CAN.

Source: Captain Brian Corbett

First of two serials of Canadian shadow instructors at the Royal Netherlands Army Land Training Centre, Amersfoort.

Similar modifications were done by Rheinmetall Landsysteme (RLS) in Unterlüß, Germany, to the two Leopard 2 Büffel 3 ARVs that were also borrowed from Germany.

Canada is one of only a few armies that mount mine clearance implements (mine rollers and mine plows) on their main battle tanks. The expectation was that implements could also be mounted on the Leopard 2A6M CAN but, after analysis by KMW, it was determined that that would not be possible. It turns out that, unlike the large monolithic plates of thick armour steel that were welded together to form the hull of the Leopard 1, the Leopard 2 hull is modular in design and made up of various "compartments"[4] that have been welded together. As a result, the amount of stress (in particular, torsional stress) the hull can accommodate is reduced as compared to the Leopard 1. That meant that some Leopard C2s would have to remain in theatre while a solution to the mine plow and mine roller problem was found.

LEOPARD 2A6M TRAINING

In parallel to preparing the tanks, the tank crews needed to be trained. As the Royal Canadian Armoured Corps School (RCAC) would not have the ability to train Leopard 2 crews for several years, the Tank Replacement Project reached out to a number of NATO Leopard 2 user nations to see who had the capacity and availability to train Canadian tank crews. Spain, Denmark, the Netherlands and Germany were all considered, with the Panzertruppenschule in Munster, Germany, being the preferred option as they offered a turnkey solution.

The challenge was to develop a training methodology that recognized the fact that the Canadian tank crews had completed all their Afghanistan work-up training on the Leopard C2 and were, in essence, at the "operational readiness" level to deploy. The only thing missing was a "conversion" course to the Leopard 2A6M CAN. However, before any training could take place, turret drills had to be developed that addressed the differences between how German and Canadian tank crews fight a tank. For that task, 24 "shadow instructors" from the RCAC School and across the Armoured Corps were trained over two course serials at the Dutch RCAC School in Amersfoort. Those shadow instructors were responsible for the development of Canadian turret drills and target engagement procedures that they then taught, in conjunction with German gunnery instructors, at the German RCAC School. Canadian shadow instructors (plus German-to-English and/or German-to-French interpreters[5]) were used during each of the subsequent 14 course serials of conversion training.

While the turret crews were learning to fire the main gun, the drivers underwent extensive driver and maintenance training before they were joined up with their turret crew for the last week of training.

A four-week conversion course with the capacity to train 10 crews at a time was put in place. That included a one-week live-fire gun camp at the end of the course. In total, 140 crews (560 all ranks) coming from all Regular Force armoured regiments and some Reserve units were converted to the Leopard 2A6M CAN. A total of 210,000 x 7.62 mm machine gun rounds, 5,740 x 120 mm main armament rounds (including training practice discarding sabot, operational high explosive antitank [HEAT] and training practice HEAT rounds) were fired.

Source: Captain Alain Bernard

Live fire gun camp, Range 6, Bergen-Hohne, October 2010. This was the last of 14 conversion courses run at the Panzertruppenschule.

The cooperation and support shown by the Panzertruppenschule was incredible when you consider that they had to turn over their entire school two to three times a year for four weeks at a time to train soldiers from another nation. Training was of the highest quality and quickly became a matter of immense pride for the German instructors and interpreters.

Technician training was jointly conducted by KMW and RLS over a seven-week period. Materiel support (vehicles and tooling) was provided by the Bundeswehr. Seven weeks was recognized as insufficient time to fully train a technician, and the shortfall was made up by deploying field service representatives (FSR) from industry during the time the Leopard 2s were in Afghanistan.

LOGISTICS SUPPORT

The last piece of the puzzle was logistics support. This was the first time that any nation had deployed the Leopard 2 into high intensity combat (apart from Kosovo as a show of force) and, as such, there were a number of challenges for Canada to overcome, the most serious being the lack of repair parts and the obsolescence of some mission-critical components.

As an example of the operational tempo, in the first 30 months in Afghanistan, each Leopard 2A6M CAN travelled approximately 7,000 km, operated more than 2,700 hours, and fired an average of 120 main gun rounds. By comparison, the German Army was using 15 km/week/tank as its planning figure when scaling for repair parts. That meant that, with only 20 (deployed) tanks, Canada was consuming more parts than Germany would use for its entire fleet of 350 tanks.

The German Army initially agreed to provide logistics support and Leopard 2-specific special tools and test equipment (STTE), often at the expense of supporting their own tank fleet. But even that would not be enough. So, when Canada signed the logistics support agreement with Germany, the purchase of 15 surplus Leopard 2A4 tanks was included as part of the agreement in order to allow Canada to become more self-sufficient in spare parts. That ensured a more ready supply of critical items (such as transmissions, electric turret drives, fire control computers, power electronics, and commander's thermal imaging sights).

Source: Combat Camera

First Leopard 2A6M CAN MBT arrives in Afghanistan on 15 August 2007.

The first Leopard 2A6M CAN MBT deployed to Afghanistan on 15 August 2007, thanks to an incredible feat of cooperation and teamwork by the Tank Replacement Project, the ADM(Mat) himself,[6] Public Works and Government Services Canada, Treasury Board Secretariat, the German Ministry of Defence, German industry (KMW and RLS), various higher headquarters, and countless others. In short succession, three more tanks and the two ARVs arrived in Kandahar, allowing initial operational capability to be declared on 28 August 2007. It took only seven months, as compared to the typical timeline of 15.6 years, to field a new capability, to have Leopard 2A6M CAN MBTs in theatre with trained crews and a logistics support system in place.

Source: Sébastien Provost

Canada formally signs the purchase agreement with the Netherlands on 14 December 2007.

THE DUTCH TANKS

While all that was going on, options to find a new tank for the RCAC were also being considered. After a thorough search of the used tank market, the decision was made to purchase 100 surplus Leopard 2s from the Netherlands— 20 fully operational, combat-ready Leopard 2A6 CAN MBTs (with no mine blast kit) and 80 much older "as is" Leopard 2A4s. A formal purchase agreement between the Netherlands and Canada was signed at Le Régiment de Hull (RCAC) Armoury in Gatineau on 14 December 2007.

Unfortunately, the Tank Replacement Project was unable to purchase a complete "Armoured Corps" with recovery vehicles, spare parts, STTE, training systems, etc. Those shortfalls would need to be tackled at a later date as part of a follow-on or subsequent project.

CANADA EXTENDS ITS MISSION IN AFGHANISTAN

No sooner had the ink dried on the purchase agreement with the Netherlands than Parliament extended the Afghanistan mission to December 2011. When the initial mission end date was 1 September 2009, everything worked out well because the loan agreement with Germany stipulated that Canada must return the tanks and ARVs, in the same condition as they were received, by September 2009. However, the extension created a significant problem for the Tank Replacement Project, because how was Canada going to keep tanks in theatre while still meeting the obligations of the agreement with Germany?

Source: Combat Camera

Armoured soldiers from 3rd Battalion Royal Canadian Regiment Battle Group aboard a Leopard 2 battle tank.

Source: Combat Camera

A Leopard 2A6M Main Battle Tank from Lord Strathcona's Horse (Royal Canadians).

Source: Combat Camera

The sheer size and firepower of the Leopard 2A6M Main Battle Tank makes it a formidable force.

Source: Captain Alain Bernard

During their Leopard 2 conversion course, Sgt Steve Slade, Cpl Trevor Osborne, Tpr Tony Drew and Tpr Ryan Chase were assessed to be the top students in their respective crew position. In recognition of that achievement, they had the honour of being the first Canadian crew to operate the Leopard 2A4M CAN. Here they are accepting the "key" to the first Leopard 2A4M CAN from Frank Haun, KMW CEO, on 7 October 2010.

In the end, Germany agreed to extend the loan for another three years (ending now on 1 September 2012). Not unexpectedly, the German Army commander was very concerned that, after five years in continuous operations, the loaned tanks and ARVs would be in desperate need of a lengthy repair and overhaul before they could be put back into service with the German Army. There was also the added concern that the overall life expectancy of the tanks would be greatly reduced from their time in Afghanistan.

The eventual solution was to upgrade the 20 recently purchased Dutch Leopard 2A6s to the German Leopard 2A6M standard as a "replacement in kind" (as it was coined by the Tank Replacement Project). That switch resulted in Canada keeping the German tanks and Germany getting refurbished tanks that had not suffered battle damage, Canadian modifications, or years of continuous operations in Afghanistan.

The Netherlands' Leopard 2A6 tanks were over 90 percent common with the German Leopard 2A6Ms. The main differences were the lack of mine protection kits and the improved mine-resistant crew seating. Other minor differences included missing storage boxes, a different machine gun, and smoke grenade dischargers. A serious and additional concern was that the Dutch tanks were made (under licence) in the Netherlands and therefore may not be of the same standard and quality as a German-made tank.

The mission extension also meant training would have to continue in Germany and an already complex logistics and supply chain had to be carefully managed to keep the fleet running longer in theatre.

LEOPARD 2A4M CAN

The "replacement in kind" meant the Leopard 2A6M CAN tanks would remain in theatre well beyond the point recommended by KMW for a complete repair and overhaul. To address that looming problem, it was decided to take 20 of the best "as is" Dutch Leopard 2A4s and contract KMW to create the Leopard 2A4M CAN as a second operational squadron. Building on the lessons learned from Afghanistan, plus KMW's own internal research and development into future tank technologies, a comprehensive list of improvements was considered for the Leopard 2A4M CAN.

To create a main battle tank better suited for the asymmetric threats of Afghanistan and possible future battlefields, the key upgrades and modifications included an enhanced protection system designed to cover 360 degrees (based on the Leopard 2A7 Peace Support Operation concept tank); the full Leopard 2A6M mine protection kit; the crew and equipment cooling system used on the Leopard 2A6M CAN; and a digital electric turret drive (as opposed to the analogue turret drive found on the Leopard 2A5 and/or A6). Numerous additional changes were made to greatly enhance the tank's warfighting abilities. The end result,

Leopard 2A4M CAN.

despite being based on the older Leopard 2A4, was a hybrid that, in many ways, was an improvement on the more modern Leopard 2A6 (and should have perhaps been called a Leopard 2A4.5 or Leopard 2A6.5 to distinguish it from all other Leopard 2s.)

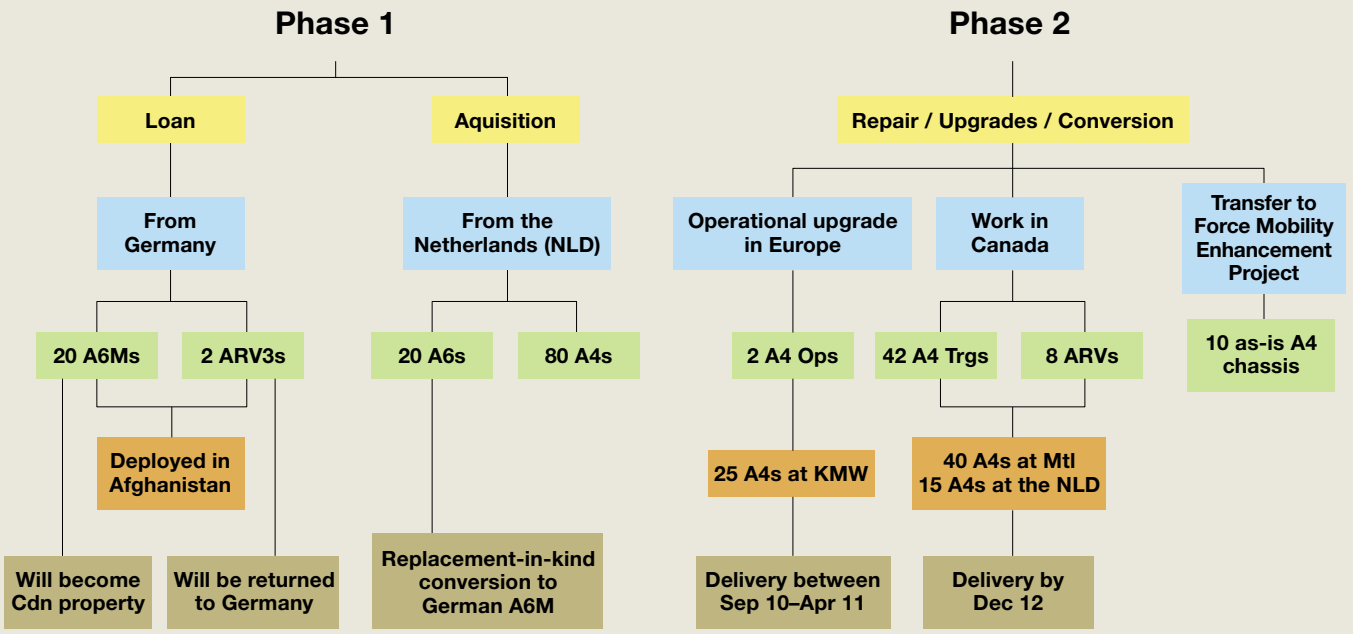
Fielding of the Leopard 2A4M CAN began in December 2010 and allowed the Leopard 2A6M CAN tanks to be rotated out of theatre and sent to KMW for a much needed repair and overhaul.

LEOPARD 2A4 TRAINING TANK

With support to operations in Afghanistan in hand, it was time to address what to do about Canada's long-term armour needs, particularly how to create a training capability and the necessary logistics infrastructure in Canada.

Of the 80 Leopard 2A4s purchased from the Netherlands, 40 were shipped to Canada and placed into temporary storage at 25 Canadian Forces Supply Depot until a repair and overhaul contract could be put in place. The other 40 Leopard 2A4s remained in Europe in case they were needed to support other aspects of the project. (For example, in order for KMW to select the best 20 tanks to build the Leopard 2A4M CAN, 25 "as is" Leopard 2A4s were sent to Munich.)

Canada's first "as is" Leopard 2A4 touches Canadian soil at the port of Montreal on 14 November 2008.



Source: Lieutenant-Colonel Stéphane Siegrist

Tank Replacement Project graphic explaining where the tanks came from and the intended end state.

Treasury Board mandated that, to the extent possible, all work on the Leopard 2A4s had to be done in Canada. That led to a contract being awarded to Rheinmetall Canada, in Saint-Jean-sur-Richelieu, on 25 August 2010 to conduct a basic repair and overhaul on the Leopard 2A4s, creating the Leopard 2A4 Training variant. Regrettably, there were insufficient funds to do any sort of upgrade or attempt to standardize the fleet in some way.

CANADIAN LEOPARD 2 FAMILY OF VEHICLES

The early direction to the Tank Replacement Project was to field 40 fully operational tanks (which was achieved with the 20 Leopard 2A6M CANs and 20 Leopard 2A4M CANs), 42 training tanks (Leopard 2A4 Trg) and eight ARVs, along with the associated training and logistics support.

It should be noted that, in addition to the Tank Replacement Project, there was also the Force Mobility Enhancement Project running in parallel. That $376.4 million project would eventually field 18 armoured engineer vehicles (AEV), an additional four ARVs, and a suite of tactical mobility implements (to include 16 x mine plows, 16 x mine rollers and 18 x dozer blades) for the main battle tanks.

Ten of the Leopard 2A4s purchased from the Netherlands were transferred to the Force Mobility Enhancement Project so that they could be converted into AEVs.

The final end state of the Tank Replacement Project and Force Mobility Enhancement Project is a fleet of 112 Leopard 2s of all configurations.

The above figure was used by the Tank Replacement Project to explain the project and where the tanks came from and the intended end state.

TANK REPLACEMENT PROJECT SUMMARY

By all accounts, the deployment of the Leopard 2 main battle tanks to Afghanistan was a huge success and is best summarized by an 8 December 2007 quote from the Globe and Mail: "That young kid called home and said, 'Mom, I wouldn't be alive if it had been any other vehicle but a Leopard 2.'"

The first time a Leopard 2 of any nation fired in combat occurred on 11 October 2007 when a Canadian Leopard 2A6M CAN crew (C/S 32B [12 RBC]) achieved a first round hit on a Taliban mortar position at 1,600 metres with a HEAT round.

The first engagement by the Leopard 2A4M CAN took place on 21 January 2011.

In the first three years of continuous operations, there were 32 mine and/or IED incidents involving Canadian Leopard 1s and Leopard 2s. A total of nine Leopard 1s and five Leopard 2s were destroyed.

Regrettably, with the limited budget, it was not possible for the Tank Replacement Project to field a cohesive and common fleet of tanks for the RCAC. The RCAC ended up with three different types of main battle tanks, with all the attendant training and logistics problems. But, as the then Chief of Staff of Land Forces Western Area, Colonel Dave Anderson, astutely pointed out during a briefing in February 2011—"It may be a dog's breakfast… but at least it's breakfast."

ABOUT THE AUTHOR

Lieutenant-Colonel (Retired) Perry Wells, CD, retired in August 2015 after 35 years of service with the Royal Canadian Dragoons. He served in Germany, throughout Canada, in the United Kingdom and at NATO HQ in Brussels. He deployed to Bosnia-Herzegovina in 1996 and Afghanistan in 2006. Lieutenant Colonel (Retired) Wells holds a Master of Defence Studies from the Royal Military College of Canada and a Master of Science in Gun Systems Design from the Royal Military College of Science at Shrivenham. Toward the end of his military career, he spent close to 12 years with the Director of Land Requirements in Ottawa in a number of positions, most notably as the Project Director for the Tank Replacement Project from March 2007 to August 2011. He was awarded a CLS Commendation for his efforts with the Tank Replacement Project. Mr Wells currently works as a senior project manager at the National Research Council of Canada in Ottawa.

ENDNOTES

1. The upgraded Canadian Leopard C2 was fielded in 1999 and is an up-armoured Leopard 1A5 with a thermal imaging gun site.

2. While some of the Leopard C2 tanks that eventually deployed to Afghanistan were identified for disposal, none had been converted to monuments , contrary to popular belief.

3. Conventional add-on-armour was the preferred option but proved too heavy (and time-consuming to install), so a compromise of slat armour was selected.

4. These compartments contain the "secret recipe" passive amour modules or blocks that provide the Leopard 2 with its superior protection.

5. Approximately 50 dedicated and truly outstanding interpreters were required to support the training in Germany.

6. Brigadier-General (Retired) Dan Ross was ADM(Mat) and a key proponent of the Tank Replacement Project. He was instrumental in skillfully and tactfully guiding the Project through the complex Government of Canada approval process.

ROYAL CANADIAN ARMOURED CORPS MEMBERS OF THE TANK REPLACEMENT PROJECT (2006–2011)

I would like to thank the former members of the Tank Replacement Project for their input to this article.

Major Alain Bernard	**12e Régiment blindé du Canada**
Lieutenant-Colonel Alan Bolster	**Royal Canadian Dragoons**
Lieutenant-Colonel Brian Corbett	**Lord Strathcona's Horse (Royal Canadians)**
Captain Scott Franklin	**Royal Canadian Dragoons**
Lieutenant-Colonel Perry Wells	**Royal Canadian Dragoons**
Major Mike Wionzek	**Royal Canadian Dragoons**

(Rank at the time of retirement from the CAF)

A Paratroop/Marine Infantry Arctic Contingency Force for Canada?

Major (Ret'd) Les Mader, MMM, CD, RCA

In modern times, foreign interest in Canada's Arctic Archipelago and the Northwest Passage dates from at least 1969 with the tanker SS *Manhattan's* round trip through the passage. Foreign interest has expanded since then, and the resources that are believed to be contained in the region have grown increasingly accessible.[1] That means that Canada must consider how to protect its sovereignty there; if it does not, this country will, sooner or later, have to clean up other nations' Arctic disasters (environmental or otherwise) and/or see a valuable part of its territory lost, with the resultant loss of international respect and authority.

Some possible ways to protect Canada's Arctic sovereignty are as follows:

a. Airborne surveillance using long-range patrol aircraft and drones;

b. Surveillance using Coast Guard vessels and the Royal Canadian Navy (RCN)'s small fleet of HARRY DEWOLF Arctic and offshore patrol vessels (AOPV);

c. The installation of garrisons in the Canadian Arctic;

d. The use of parachute-delivered land forces to respond to incidents; and

e. The development of a seaborne landing force capability that is also able to respond to incidents.

The establishment of sufficient Arctic garrisons would be prohibitively expensive. Employing only surveillance forces would likely leave the Canadian government as a hapless spectator to future sovereignty violations. Responding to such violations with parachute-delivered land forces could be very quick. However, once on the ground, such forces have very limited mobility and are constrained by the equipment that they can carry and the support that can reach them. Supporting the above options with a seaborne landing force capability would give Canada a far greater ability to respond to the specifics of each incident or crisis.

Source: Combat Camera

The creation of such a seaborne landing force could be very elaborate and expensive. It is very unlikely that the Canadian government will wish to invest the required funds, given the deficits that it has incurred because of the COVID-19 pandemic. Fortuitously, in an article in the *Canadian Naval Review*, Colonel (Ret'd) Brian Wentzell argued for the creation of just such a capability using only existing Canadian Armed Forces (CAF) resources or ones that are already being procured.[2] His solution would permit the deployment of up to 330 Canadian soldiers to an Arctic crisis using four RCN ships and their seven helicopters and four small landing craft.[3] His suggested solution could be implemented with minimal costs. The landing force portion of his proposal is a single infantry battalion that has been adapted to become a specialized amphibious unit; the model of the 2nd Battalion of the Royal Australian Regiment (2 RAR) is suggested.[4]

I believe that this landing force proposal is not the best fit for Canada. This paper will outline a different approach to providing the basic contingency infantry forces required to protect Canada's Arctic sovereignty. The discussion will be presented using the following outline: operational concept; force structure; individual training; and collective training. It will not discuss the myriad of related details, such as unit establishments, command relationships of amphibious operations, equipment specifications, annual training plans, budgets, training standards, and potential changes to uniforms.

The fundamental philosophy underlying this proposal is that, in the Arctic, relatively small groups of well-trained, properly-supported infantry can have an effect beyond proportion to their size. The proposed contingency infantry units would have three key roles. The first and most unique for Canada would be to provide platoon-sized landing parties to be carried by AOPVs during their Arctic deployments. These platoons would be available to support their ships in responding to a developing crisis. The British deployment of Royal Marines to South Georgia in 1982 in reaction to a sovereignty violation is an example of such a response.[5] At the same time, the platoons would allow the CAF to develop procedures and experience with embarked marine infantry. Providing the ability to deploy additional marine infantry during a crisis would be the second role for these units. Finally, their third role would be to deploy parachute-delivered infantry forces when required, either to work with the seaborne landing teams or to respond to a different crisis. The employment of marine infantry companies would also give Canada experience relevant to the conduct of sea-based non-combatant evacuation operations (NEO).[6]

The heart of the Army's Arctic contingency force structure would be three specially trained infantry battalions. These could be provided by converting Canada's non-mechanized Regular Force infantry battalions (3 RCR, 3 PPCLI, and 3 R22^{e}R) into fully-fledged light infantry battalions that can deploy paratroop and marine infantry company groups, as well as any task force command and support elements needed, when and where required. The units could also still deploy as traditional light infantry battalions when necessary.

Having three such units, geographically dispersed in their current locations across Canada, and still under the full command of their current brigades, would greatly facilitate the provision of the required paratroop and marine infantry forces while simplifying routine training, taskings, domestic operations, and administration. The latter point is very important on account of the need to post personnel to and from the battalions fairly often, as the physical demands of their training and operations will take a toll on their members. This approach has the benefit—which already exists with the Army's current paratroop companies—of expanding the pool of infantry who could serve in marine infantry companies by affording the opportunity to all Canadian Regular Force infantry soldiers to serve in such sub-units while remaining within their regimental family and without having to be posted to distant garrisons.

The battalions' ability to prepare and deploy those forces would be eased by a modest increase in strength. An additional 100 personnel per battalion should allow each battalion to be able to simultaneously deploy a paratroop company group, a marine infantry company group, and the command and support elements needed to lead an ad hoc task force, if required, unhindered by personnel who are absent as a result of injuries, illness, or training.

The possibility of having two or more ad hoc task forces responding to a (potentially geographically dispersed) Arctic crisis at the same time raises the requirement for a coordinating formation headquarters (HQ). The existing brigade HQs do not really meet this need, as they will still have their command responsibilities for their mechanized units. Therefore, the creation of a new brigade HQ—HQ 3rd Special Service Force (3rd SSF)[7] —would be appropriate. Its commander, staff, and small signals squadron would have operational command and control of any land force that was part of an Arctic crisis response or deployed on an exercise preparing for such an eventuality.

Those forces could include paratroop and marine infantry task forces and any elements assigned from existing combat support and service support units. Practical experience with 3rd SSF-led exercises and operations would indicate whether tasking supporting units was adequate or whether new dedicated 3rd SSF-assigned support units needed to be established.

Source: Department of National Defence

The HQ 3rd SSF should be located in Kingston, Ontario, in order to facilitate coordination with the CAF's deployable headquarters for contingency operations—HQ 1st Canadian Division–and the routine posting in and out of its staff officers and signals squadron personnel. That location also has the advantage of being close to the Trenton transportation air base and to two of the three light infantry battalions (3 RCR and 3 R22eR). In peacetime, the primary roles of HQ 3rd SSF would be as follows: acting as an "informed consumer" for the development and refinement of paratroop and marine infantry doctrine, tactics, techniques, and procedures; and acting as the higher/planning headquarters for paratroop and marine infantry training exercises.

This article will not discuss the individual training of Canadian paratroopers; the Army has over 52 years of experience preparing such soldiers. The basis of training for the new marine infantry would be that which has given Canada fit, highly proficient light infantry for over 130 years. To that should be added the following marine-infantry-specific skills: the planning, command, and support of amphibious operations; the conduct of amphibious landings using helicopters and landing craft; swimming; ship board living; Arctic survival and navigation; the training given to naval boarding parties; marksmanship with both long-range accurate rifles (for use in the open, featureless Arctic) and short-range boarding party weapons; and a confirmation-of-stamina exercise. The list should be considered tentative; it will be refined when actually required. The need to train marine infantry skills will likely necessitate a small increase in the number of personnel posted to the relevant Army and RCN schools.

As above, this article will not discuss the collective training of paratroop companies and task forces; the Army's decades of experience stand it in good stead for such training. The fundamental collective training for the marine infantry would be that which is already conducted by light infantry companies. To those basics should be added at least the following: company-sized amphibious landings; naval boarding operations; and the conduct of raids, patrols, and static surveillance in Arctic-like terrain. That unit-level training would provide the basis for HQ 3rd SSF-organized exercises. Those could include the following: an AOPV-based marine infantry platoon conducting raids and patrols against a small enemy force that has perhaps been parachuted into the exercise area; a marine infantry company landing in Nunavut; and exercises as complex as an ad hoc paratroop task force jumping into Gagetown to link up with an ad hoc marine infantry task force that has helicoptered in from RCN ships sailing in the Bay of Fundy.

Climate change means that Canada will face challenges to its Arctic sovereignty as foreign entities seek to profit from the North's increasingly-accessible resources and maritime routes. Responding to those challenges will require that Canada has both Arctic surveillance capabilities and the means to react to what that surveillance discovers. Such a reaction capability should be both rapid and multifaceted in order to permit a range of responses that can be tailored to the specifics of an evolving crisis. Having a seaborne marine infantry force to work alongside Canada's existing paratroop companies will provide such a response capability. The existence of two such diverse response units, and the geographic expanse of Canada's North, argue for the creation of a dedicated formation HQ to control the Army's Arctic crisis response operations. Such a capability can be established—at least initially—without having to develop all of the normal formation support units. Creating such a dedicated HQ and modifying Canada's light infantry battalions as proposed above would provide the CAF with the opportunity to learn about, develop, and expand its paratroop and marine infantry capabilities. Those enhancements would serve Canada well for contingency operations in both the Arctic and elsewhere. It is hoped that the CAF will make the modest initial investments suggested and start trials of embarked marine infantry deployments as soon as HMCS HARRY DEWOLF begins its Arctic patrols.

ABOUT THE AUTHOR

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7. In the Canadian context, the first Special Service Force was the World War II "Devil's Brigade," while the second was the Petawawa-based formation of the late 20th Century. This article proposes a new formation, numbered sequentially in the SSF chronology and consistent with the naming of Canada's existing brigades.

Source: Combat Camera

WHERE THE HELL ARE THE DRONES?

Why Every Gunner Should Be a Remote Pilot

Captain Conway Hui, CD, P.Eng.

INTRODUCTION

It is great to see that the Canadian Armed Forces (CAF) and the Royal Canadian Artillery are finally embracing remote piloting with some deployment of relatively modern systems. However, people with the necessary skills and qualifications are limited and few in number, and small unmanned aircraft systems (SUAS) are even more scarce and unable to meet demand.[1] The CAF could do much more to keep pace with evolving methods of warfare, which already includes widespread use of small drones.

Future warfare will, with certainty, include drones in very large numbers. The arsenal of modern militaries and recent regional skirmishes have demonstrated that. The CAF must not lag behind; however, traditional procurement methods cannot hope to keep pace with this type of technology. In this article, I propose that the Regular and Reserve Artillery Corps, combined with an expedited procurement process, be used to rapidly expand CAF remote piloting capabilities, build drone awareness, and become a centre of excellence for use of commercial off-the-shelf drones in modern warfare.

SMALL DRONES AND THE MODERN BATTLESPACE

This article focuses strictly on small, rotary-wing, "quadcopter"-style drones, which are low cost, commercially available, and being developed at a very fast pace. Normally operating strictly in visual line of sight (VLOS), these small drones have a payload capability of just a few kilograms. Larger, fixed-wing and fully autonomous drones—which are often armed and the subject of much ethical combat debate—are outside the scope of this paper.

These small commercial drones have been used extensively in combat in many recent conflicts, making them a new and integral part of modern warfare. Russian-backed rebels in Eastern Ukraine were among the first to be armed with many types of drones,[2] forcing Ukraine to start its own, home-built drone program to respond.[3] In Iraq, what had begun with ISIS using commercial drones for surveillance in 2015 quickly evolved into drone use with weapons.[4] ISIS armed those drones with grenades and began widespread use in 2016. This became the "first" use of "armed drones against the US."[5] Even the recent fighting in Yemen has continued the use of cheap, commercial drones in combat as surveillance and attack mechanisms.[6] The Canadian Press agrees: drones are now a part of modern warfare.[7]

It's possible that many militaries, including our own, dismiss this use of commercial drones as just "toys" for lower technology militaries. The Donetsk conflict has shown that to be wrong, with both sides turning to commercial or austerely-manufactured drones for extensive battlefield intelligence, surveillance, target acquisition, and reconnaissance (ISTAR). With that information being critical to the military decision-making process, the above conflicts have used any available means to gain an advantage in ISTAR. Overlooking this trend in very recent fighting would be negligent and put a fighting force at a significant disadvantage in a skill that can take some time to develop. So why is the use of drones so limited across the CAF? Let's first look at the use of small drones in other militaries.

STATE OF SMALL DRONES IN OTHER MILITARIES

United States

The 2020 US Department of Defense (DoD) budget allocated 0.4% for unmanned systems. That works out to $3.7 billion,[8] or about 15% of Canada's entire defence budget! I will return to those budget numbers later.

With deep pockets, all branches of the US military deploy some form of drone. For small "Group 1" drones, the US is estimated to operate over 5,700 vehicles.[9] However, what is relevant to this discussion is the widespread use of Chinese-made Da-Jiang Innovations (DJI)-brand drones for special operations that have come under fire in Washington because of security risks. Such use demonstrates that, even with the considerable budget and technological capability of the US DoD, some elements are still, today, turning to inexpensive, off-the-shelf commercial drones for important military operations.[10]

Russia

In the past decade, Russia has come a long way in developing its drone arsenal.[11] Though still lagging behind the US, the Russian military has significant armed and unarmed drone experience developed in the Ukraine and Syrian conflicts, and they are now learning to use imported components to develop and assemble their drones. Reports are that, even today, Russia is launching multiple drones daily in the Donbass.[12]

Source: Adobe

Finland
For a country of just 5 million people, Finland's military has a very active drone program. They have recently acquired 150 DJI phantom off-the-shelf drones and put a call out to civilian drone pilots to potentially recruit for a military "drone reserve" unit.[13] The Finns appear to be following a very fast path to adopting small commercial drones and generating remote piloting capability, likely as a result of their proximity to Russia.

Australia
Last year, Australia did something similar to what is being proposed in this paper: deploy commercial, off-the-shelf drones across their Army in order to build drone awareness. Their announcement sparked immediate interest across their armed forces, with people contacting the colonel in charge directly to "be the drone guy in their regiment."[14] This is the closest example to what is being proposed in this paper; in fact, the CAF should more closely examine the Australian program and understand its impact and results in order to improve our own deployment of commercial drones.

MILITARY APPLICATIONS FOR CURRENT SMALL COMMERCIAL DRONES

Civilian use of drones is exceeding expectations.[15] Though most of the growth is with hobbyists, continued advances in battery and sensor technology have kicked off and continue to fuel new developments in autonomous and remote piloted commercial applications. The following highlights what small commercial drones are capable of today and how they relate to military tasks:

Supply Delivery. Amazon[16] and even Uber[17] are currently testing drone delivery of meals and goods to their residential customers. Airspace regulators in a few countries are allowing limited trial of these technologies beyond VLOS. However, even "semi-autonomous" operation within VLOS could have military applications: such systems could easily be adapted to move a small amount of critically needed supplies from one combat service support echelon to another much quicker than by ground.

For example, consider recent Federal Aviation Administration (FAA)-approved commercial operations to support urgent civilian medical supply delivery via drone. Imagine if you could quickly ferry, without further risk to lives, life-saving medical supplies from Role 3 to Role 2 medical facilities or directly to soldiers on the front lines?

Inspection, Survey, Surveillance. TV shows and movies have many more aerial shots than they used to as film crews no longer have to rent expensive helicopters to get overhead shots—they use quadcopters with stabilized camera gimbals.[18] Camera, sensor, and recording technology has been miniaturized considerably to make that possible. Drones are also increasingly used in precision geospatial survey as well as law enforcement surveillance. Payloads can include precision global position system sensors, light detection and ranging sensors, and thermal cameras to help with detailed measurement of land or identification and tracking of targets. Construction companies also use drones to inspect project progress or conduct infrastructure inspection. That is the largest use of small commercial drones today and there are obvious links to military applications in both training and combat environments.

Each of the applications require skilled human pilots operating in VLOS. In the civilian world, demand for those types of pilots is growing annually.[19] This means that there is a secondary benefit for future soldiers and the Canadian economy in creating a stream of highly trained remote pilots transitioning to civilian employment after military service. There may even be a possibility of Army-trained remote pilots and crew supplementing shortfalls in the Air Force.[20] The training plan proposed below also ensures easy transfer of accreditation to the civilian world.

How Can the Canadian Armed Forces Catch Up?
The US DoD example of spending 0.4% of their budget on unmanned systems creates a budget allocation of approximately $100 million. What is proposed here is using just a tiny fraction of that hypothetical allocation to enable widespread "drone literacy" in the CAF.

The three viable options below require a new "rapid" method of procurement and deployment of commercial equipment in the CAF with minimal evaluation. These options also cost approximately $1,500 per off-the-shelf system.

Option A
Outfit every unit in the Canadian Army with one small commercial drone system at a total cost of approximately $500,000 in hardware.

Though this would give every trade and unit opportunity to gain remote piloting skills, it could be very challenging in terms of logistics and technical service/support. There is also a very high probability of misuse of these systems, making this the riskiest option.

Option B
Outfit only Artillery Regiments with one small commercial drone system at a total cost of approximately $50,000 in hardware.

While this is the lowest cost, it also risks being least effective as learning curves may be steep and units may struggle to share the skill among many interested soldiers with only one system. It is also risky from a redundancy standpoint, as the loss of a drone means a significant setback in the overall development of remote piloting in the Army.

Option C
Outfit all Regular and Reserve Artillery Regiments with three small commercial drone systems and one full set of repair parts at a cost of approximately $200,000 in hardware. Put another way, this represents an approximate cost of $5,000 per regiment.

Outfitting Artillery Regiments makes sense for this style of skill development, as small commercial drones can integrate well with other Artillery battle tasks:

a. **Gun Area Reconnaissance.** The small drones can be an optional tool for reconnaissance (recce). Even with a very modest 12-km range, an entire map grid square artillery manoeuvre area could be overflown three times from the edge of the grid square. Most drones would complete this in a single 20–30 minute mission, providing a record of the mission and updated ISTAR to higher headquarters.

b. **Forward Observation.** Air operations-like drills could be conducted using a small drone instead of having to request an aircraft. That would significantly reduce risk to forward observation officers (FOO), as it would enable them to be located away from the front lines or remain with the supported arms commander while still having "eyes" on the target zone for fewer resources than current SUASs.

c. **Light Urban Search and Rescue.** This is the hidden bonus/benefit. Reserve units, now tasked with light urban search and rescue (LUSAR) would gain a force multiplier with a small drone fleet at their disposal. For example, the drone crews could conduct rapid damage assessments faster and with less risk to soldiers. Of course, search and rescue would benefit in two ways: the drones could survey difficult-to-reach places and, if properly equipped, could deliver life-saving supplies to those same difficult-to-reach places just as civilian SAR crews are doing today.

d. **Support to Other Arms and Civil Powers.** Once established as a rapidly-deployable aerial surveillance resource, the Artillery would become valuable in many combat and non-combat operations.

Option C is a modest investment and provides enough hardware for the most suitable soldiers to develop a core competency in remote piloting.

WHY GUNNERS MAKE GREAT REMOTE PILOTS

Canadian gunners are already employed today as remote pilots, but let me reinforce why even Reserve Artillery soldiers will make great remote pilots:

- **Knowledge of airspace control and conflicts.** Many Reserve gunnery officers and non-commissioned officers already possess this skill and will be able to easily interact with any air traffic control or airspace coordination centre in the area of operations. This includes knowledge of time-based coordination, altitude (above-ground-level) ceilings, and various fire support coordination lines. For those who don't have this knowledge, drone training would make them aware of airspace coordination and serve as a first step towards further developing skills in this area.

- **Operation of electronics and communications equipment.** Artillery Reserve gunners today already operate equal or more technical equipment than other combat arms trades. The skill required is not only the ability to adapt to new technology but also to maintain it and troubleshoot solutions when things go wrong. Reserve gunners would excel at adopting drones into their repertoire.

- **Maps and target location in a land combat environment.** A drone crew must know where they are, where their targets are, and how best to plan a successful aerial mission. They must also be aware of cover and concealment, as they are a scarce resource. These are skills already entrenched in Artillery FOO parties.

- **Meteorology.** This is another skill that pilots must possess and gunners have an awareness of. Though drones are absolutely unable to fly in very foul weather, moderate winds and visibility might not hinder a crew already experienced in undertaking recce, radio, and fire missions in these conditions.

Our Army Reserve gunners share many of the above skills with their Regular Force counterparts who are already being trained in SUAS operations. But how difficult will it be to train Reservists in flight operations?

HOW TO TRAIN GUNNERS AS REMOTE PILOTS

I propose that the best way to train our new remote pilots and crew is to send them through the existing Transport Canada advanced drone pilot certification program. This well-developed certification first starts with a "ground school" leading to a fairly comprehensive knowledge test. The material here includes theory of flight, meteorology, civil aviation regulations, radiotelephony, and remote-piloting-specific rules. Transport Canada then requires an evaluation-by-flight review.[21]

Source: Combat Camera

A member of the 4th Artillery Regiment (General Support) prepares to test BlackJack, a Small Uncrewed Air Vehicle, at CFB Gagetown in Blissville, New Brunswick, on 14 March 2019.

The Artillery Reserve version of this course, including additional Artillery-specific material, could be run in about six training days.

EVEN DRONES HAVE CONSTRAINTS

Leaving aside procurement issues for a separate discussion, the main challenge facing Artillery soldiers becoming drone crew would be training—both training time, currency requirements, and other tasks.

The Reserve Artillery Regiments already have busy schedules and a long list of tasks. Would adding drones to that list be too much for them to handle? On the contrary, I believe it could boost interest in the Artillery and attract more applicants. In the Reserve, the drones would be a welcomed platform to aid in all existing tasks and bring new attention to the Artillery. In fact, not needing to go to a training area to fly is a huge benefit and increases the flexibility of drone crew training.

The harsh Canadian winters will also limit drone training—batteries have notoriously short runtime in below-freezing temperatures, and high winds, rain, and fog hinder any flight operations. That should not dissuade the Canadian Army from developing drone awareness and remote piloting, as the computer-assisted flight capability of drones is improving every year.

Security of drones has also been a hot topic in the civilian and military worlds, particularly since the most capable commercial drones come from a supplier—DJI—with links to the Chinese military. However, DJI as well as their competing companies have promised to produce a "government" version. More secure drones are on the way.

LONG TERM

What is proposed here is simply a short-term procurement of small drones for our military in order to build awareness and start developing remote piloting skills. As pieces of technology, this procurement would eventually become obsolete, so regular, planned replacements must occur. At current rates of technological development, it is recommended that platforms have a maximum eight-year life.

CONCLUSION

There are no longer any excuses to drag our feet on developing a small drone capability, as the benefits are many. For a relatively minor expense in our enormous defense procurement program, we can outfit every Regular and Reserve Artillery unit with small drones. Training material already exists thanks to our colleagues at Transport Canada. Artillery Reserve units can and must also use these small drones for LUSAR, becoming an invaluable "eye in the sky." As with our weapons, vehicles, and other systems, the drones themselves can become a benefit for recruiting.

Lastly, remote piloting skills now have real world applications such that the job skills generated, and their overall economic benefit, should be a definite consideration.

One doesn't need a detailed cost/benefit analysis to see the overwhelming advantages of an inexpensive deployment of commercially available small drones across the Canadian Artillery. What's needed is the right people in our organization to agree and take action. This article is aimed at sparking the debate before the CAF falls too far behind the rest of the world.

ABOUT THE AUTHOR

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No. 1 Field Ambulance and The Second World War, 1939–45

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INTRODUCTION

Much has been written about the history of Canada's fighting forces in World War II, but little about the medical forces that supported them. Yet a common thread in the stories of all our fighting forces—whether they served at home or abroad—was the need to care for their casualties. For this vital task, Sir Andrew MacPhail declared, "the field ambulance is the essential battle formation."[1] In order to shed some light on the contributions made by the field ambulances during the war, this article presents the story of one of those units: No. 1 Field Ambulance (Active) of the Royal Canadian Army Medical Corps.

WORLD WAR II: MOBILIZATION

With fighting on almost every continent and over 40 million deaths worldwide, World War II was the largest and bloodiest war in history.[2] It was precipitated by Germany's expansion campaign of 1938–39: the annexation of Austria[3] and the Sudetenland in 1938,[4] then the invasion of Czechoslovakia in March 1939 and of Poland[5] on 1 September of that year. Britain and France declared war on Germany on 3 September 1939 after it refused to cease its attack on Poland. In Canada, the government proclaimed that a state of "apprehended war" existed,[6] ordered immediate mobilization and summoned Parliament. Seven days later, Canada officially declared war on Germany. However, given Japan's actions in the Pacific and the Canadian public's reluctance to go to war again, the government stated that its primary task was "the defence of Canada"[7] and planned for only a "limited war effort."[8]

No. 1 Field Ambulance was not mobilized until three years into the war, after Germany had achieved domination of Europe[9] and Japan had seized control of much of

Southeast Asia.[10] Then, under authority of Headquarters Letter K.S. 461 (AQ) dated 10 February 1942, No. 1 Field Ambulance (Reserve) in Kingston, Ontario, received approval to establish No. 1 Field Ambulance (Active).[11] During that same general period in the war, Japan attacked Pearl Harbor[12] and occupied the islands of Attu and Kiska off the coast of Alaska.[13]

to Wainwright, Alberta, to participate in Exercise BUFFALO. On the day the troops returned from Wainwright in early September, the unit received a visit from Her Royal Highness Princess Alice and the Governor General.[14]

Source: Library and Archives Canada
Source: Wikimedia
Source: Getty Images

TERRACE

September 1942–October 1943. After spending three months training at Borden, Ontario, No. 1 Field Ambulance arrived in Terrace, British Columbia, on 18 September to join the 8th Division as part of Canada's Home War Establishment. There, the unit relieved No. 6 Field Ambulance of its responsibility for a main dressing station and the provision of medical officers for Prince Rupert, Prince George and armoured train runs. In early November the main dressing station moved into hardstand (more permanent infrastructure), and by late November the unit had completed its war establishment. The workload at the main dressing station remained low throughout this period, with a daily census of about 20 patients. On 6 April 1943, an alarm sounded warning of a Japanese force approaching the BC coast, but the alarm was later found to be false. Over the summer, the unit sent troops

VANCOUVER ISLAND

October 1943–January 1945. After being relieved by No. 28 Field Ambulance, No. 1 Field Ambulance moved to Port Alberni, British Columbia, with a company located in Courtenay. Training during this period focused on combined operations, from infantry tactics to boat drill. On 15 January 1944, the unit reconsolidated at Patricia Bay, British Columbia, to continue training.[15] Then, in response to a growing shortage of infantry reinforcements overseas,[16] the unit received notification on 14 April that its Active personnel would be called up for overseas duty. Over the next six months, heavy recruiting efforts within the unit led to more than 150 troops volunteering to go "Active" for overseas service—more than half the unit's war establishment.[17] During that period, the Allies launched Operation OVERLORD, the largest amphibious operation in history, which heralded the beginning of the end of the war in Europe.[18]

Source: Library and Archives Canada
Source: Wikimedia

IMAGE CAPTIONS

1. 1938: Adolf Hitler, German Chancellor and Nazi Party Leader.
2. 7 December 1941: Japan attacks the United States at Pearl Harbor, crippling the US Pacific Fleet and killing 2,300 US service personnel. The US responded by declaring war on Japan, thus ending two years of neutrality and entering World War II.
3. 1942: Rising anti-Japanese sentiment in British Columbia led to forced relocations of 22,000 Japanese Canadians from BC's west coast to internment camps such as this one at Lemon Creek, BC.
4. Main gate of Auschwitz II – Birkenau concentration camp. Over six million Jews and five million other targeted groups were killed by the Nazis in concentration/extermination camps.
5. 1941: Recruitment poster.
6. The Governor General, Earl of Athlone, and Her Royal Highness Princess Alice, circa 1946.
7. 1942: 14th Infantry Brigade Headquarters at Terrace, British Columbia.
8. 6 June 1944: Approximately 150,000 Allied soldiers invade Normandy, France, on D-Day. Of the 14,000 Canadians involved in the landings; more than 1,000 were killed or wounded.
9. 18 April 1945: Unexploded incendiary balloon found off Point Roberts, British Columbia. It was one of 9,000 such balloons launched by Japan against the United States and Canada.
10. May 1945: Victory in Europe celebrations in Toronto.
11. 6 August 1945: The first atomic bomb, code-named "Little Boy," is dropped on Hiroshima, Japan, by the United States, instantly killing over 70,000 people. (Photo taken from the B-29 bomber Enola Gay, which dropped the bomb.)

On 29 June, the unit moved to Wainwright, Alberta, to conduct training over the summer. On 24 August, the unit moved to Nanaimo, British Columbia, where training became more infantry-oriented. In late October, the unit dispatched 57 personnel to Prince Albert, Saskatchewan, to join the Army's Dry Cold Test Force, known as Force ESKIMO. Force ESKIMO conducted a 40-day winter exercise in January–February 1945 involving 1,700 military personnel. No. 1 Field Ambulance's personnel operated an advanced dressing station for the exercise, seeing a total of almost 200 patients.[19]

As the infantry shortages overseas grew to become a national crisis,[20] the unit received orders on 18 November to cease medical training and begin infantry training immediately. Two days later, it was announced that No. 1 Field Ambulance and many other units on the Home War Establishment would be disbanded and that "all men of operational age and pulhems [physique, upper extremity, lower extremity, hearing and ears, eyes and vision, mental capacity, emotional stability] [we]re to be remustered into infantry."[21] Three days later, the Canadian government brought in limited conscription—including an Order in Council that authorized the dispatch of 16,000 soldiers serving in Canada at the time for service overseas.[22]

THE END OF THE WAR

On 27 November 1944, the unit moved into the lines of the 1st Battalion Oxford Rifles and began full-time infantry training. By 14 December, the unit strength in Nanaimo had been reduced to 57, and on 31 January 1945 the unit was reduced to nil strength except for the personnel in Force ESKIMO. After Force ESKIMO completed its exercise, the remaining personnel of No. 1 Field Ambulance were either posted out to another unit or joined one of the outgoing drafts.[23]

In Europe, Germany finally surrendered to the Allies on 8 May 1945.[24] In the Pacific, however, Japan fought on for another four months, eventually surrendering on 2 September 1945 after two atomic bombs were dropped on the Japanese cities of Hiroshima (6 August) and Nagasaki (9 August).[25]

CONCLUSION

Since the end of World War II, the face of war has continued to change, yet the need to care for our casualties remains. In Canada, this vital task continues to be fulfilled at home and abroad by our field ambulances. So, while our fighting forces are rightfully deserving of Canada's utmost praise, Sir Robert Borden once reminded us, "Let the Nation also give its tribute to those who consecrated their service to the care of the wounded."[26]

ABOUT THE AUTHOR

Captain (Navy) J. A. (Jeff) Biddiscombe, MMM, CD, is the Commander of 1 Health Services Group, based in Edmonton. His areas of interest include the history of the Royal Canadian Medical Service.

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Source: Combat Camera

SYNCHRONIZING THE GEARS:

A Conceptual Framework for Integrated Force Generation from the *One Army* Team

Lieutenant-Colonel C. W. Hunt

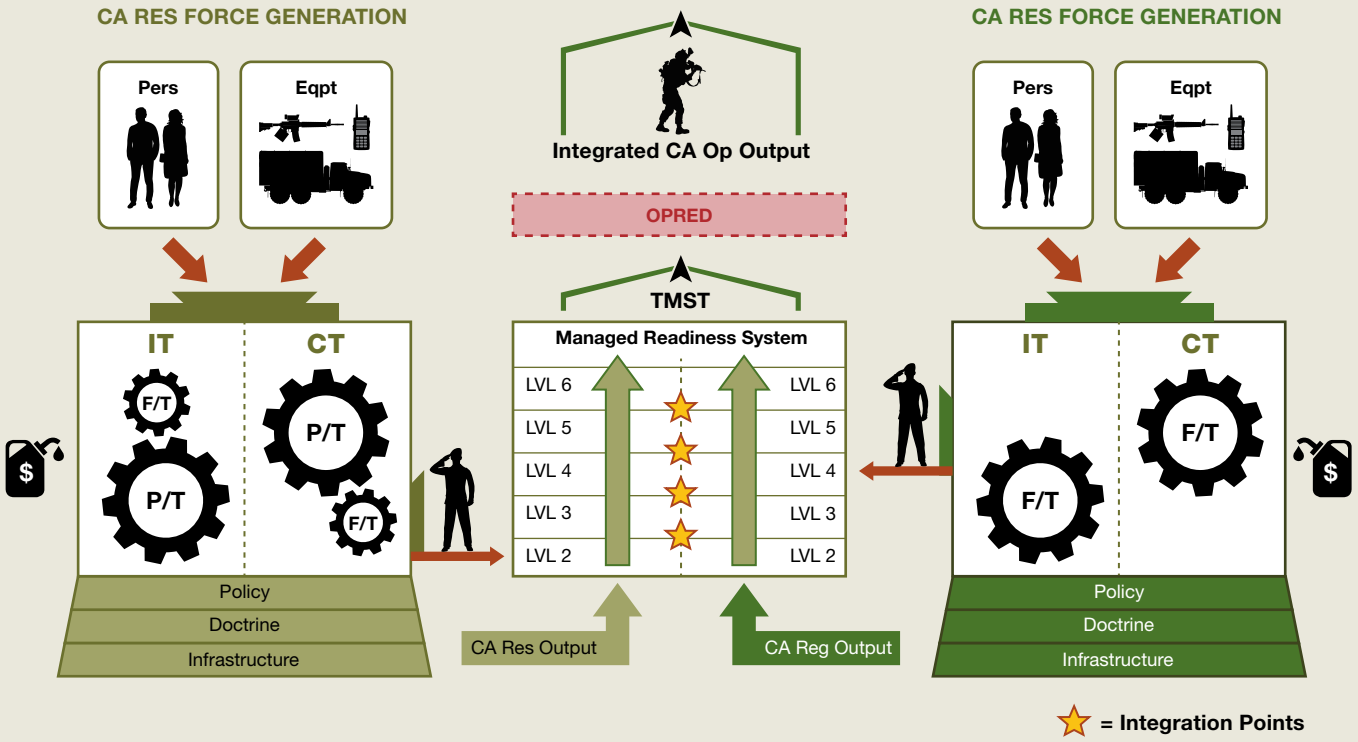

Figure 1: Component Force-generation[4]

INTRODUCTION

In the preface to the Canadian Army Modernization Strategy (CAMS), Lieutenant-General Wayne Eyre wrote about "the importance of *One Army*, with Regular, Reserve, Ranger, and civilian components operating as part of an integrated whole."[1] He further set out that "[t]wo central initiatives in this document will improve the way we build and consume readiness (Managed Readiness Plan) and alter our force structure (Force 2025) which will have far-reaching impacts on our Army."[2]

The CAMS emphasizes integration and indeed specifically defines integration of the Regular and Reserve Forces as follows: "Integration occurs when Regular and Reserve components are mutually supporting. Together they provide sustained land power in sufficient mass to successfully conduct concurrency of operations. Through development of F2025, the Canadian Army will define how and when the Regular and Reserve components will train and work together to produce integrated Army outputs."[3] This paper will offer a conceptual integrated *One Army* force-generation framework for operations in order to contribute to Force 2025 development efforts.

MOVING TO AN INTEGRATED FORCE-GENERATION MODEL

The Canadian Army's historical and current approach to force-generation can be described as component-based. The Regular and Reserve components largely conduct their own individual and collective training activities separately and have separate equipment fleets and training calendars (see Figure 1).

Reserve contributions to force-generation for expeditionary operations consisted of individual augmentees from 2005 to 2020, until the *Strengthening the Army Reserve* initiative started to change the Army's approach towards *One Army* force-generation by integrating mission-tasked (MT) Reserve sub-sub units into expeditionary forces. The concept was successfully piloted in 2020 when 41 Canadian Brigade Group (41 CBG) contributed an Army Reserve mortar platoon to the NATO Enhanced Forward Presence (eFP) Battle Group in Latvia under Operation REASSURANCE. This capability was generated from scratch with approximately 24 months' notice. Furthermore, the vast majority of the individual and collective training for the mortar platoon was conducted while members remained on Class A service.[5] The Reserve Force has generated formed elements of platoon, sub-unit, and territorial battalion group size to contribute to joint task forces for a variety of domestic operations over the last decade.[6] Nevertheless, *One Army* integration remains a relatively new concept with additional definition work underway following the release of CAMS. In March 2021, Director General Army Reserve, Brigadier-General Nic Stanton, hosted *One Army* integration focus groups involving senior leaders from Regular and Reserve components as well as Army HQ staff developing the adapted managed readiness

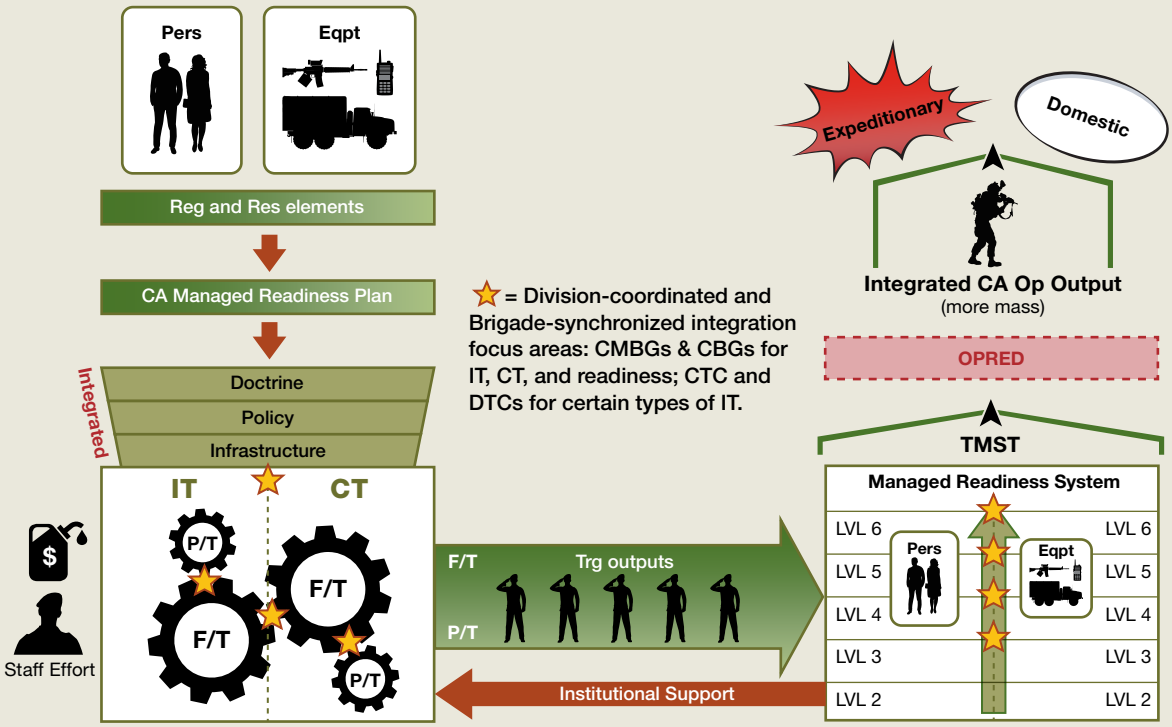

Figure 2: One Army Force-generation

plan (MRP) and Force 2025. A revised conceptual framework (see Figure 2) for integrated force-generation was developed and briefed to Army Council on 9 April 2021.

Figure 2 summarizes the shift in approach to force-generation. Both Regular and Reserve elements are specifically assigned tasks in the MRP. Canadian Army HQ determines the MRP, which may include deliberate force mix decisions for specific missions and capabilities. Doctrinal and policy factors, as well as required infrastructure (i.e. ranges and training areas) will shape how Regular and Reserve elements are put through the training system. Regular and Reserve elements may have part-time and/or full-time components to their individual training (IT) and collective training (CT) in order to optimize resources and training outputs.[7] Currently, May to August is commonly referred to as "Reserve summer training"; however, a more unified approach to "integrated summer training" should lead to better economies of scale and optimization of resources and training outputs for both components. In practical terms, the division-coordinated and brigade-synchronized integration focus areas include the following:

- Division headquarters (HQ) identify training priorities, tasks, and calendar dates for integrated courses and activities such as integrated division and brigade training events (DTE/BTE) to their Canadian Mechanized Brigade Group (CMBG) and CBGs through their operating plan and other orders based on MRP and local requirements.
- The CMBG and CBG HQs then synchronize resources (including required personnel and equipment), deployment/redeployment details, and additional guidance required through their own operating plans and other orders to units based on division direction received.
- Regular and Reserve units plan and execute assigned training within the integration direction provided by the respective brigade HQs, including command relationships of elements.

The integration focus areas identified above are doctrinally consistent with coordination involving multiple formations but, in practice, individual CMBG and/or CBG preferences for scheduling courses or activities often derail integrated training. The planning cycles in Regular CMBGs and units are often much shorter than in Reserve CBGs and units because they do not require the longer advance notice and predictability that Reserve soldiers do. Because those planning "gears" often turn at different speeds, the division HQ's coordination and oversight role is more critical as a "clutch" to ensure that the gears synchronize as needed to support each other and that each gear is controlled deliberately to drive the force-generation engine smoothly to maximize its output and optimize its economy. Collaborative effort amongst G5 and G3 staffs within a division and between the division HQ, CMBG and CBG HQs are critical for *One Army* integrated force-generation.

The MRP is based on a three-year cycle of a *build, contingency, and committed* process for each division. This three-year cycle is challenging to sustain within Regular CMBGs and results in high personnel tempo for members. A three-year cycle is not sustainable in Reserve units; however, a six-year cycle may prove to be successful. Half of the Reserve mission elements in a division could be synchronized with each three-year cycle so that there is consistency in the number of Reserve elements integrated for force-generation in each cycle. The proposed divisional integrated force-generation cycle in Figure 3 is a logical extension of the current force-generation cycle; indeed, for the Regular Force, there is no change. Reserve units would have predictability knowing that they are responsible for generating their mission task sub-sub unit for two years of high readiness (*contingency* and *committed*) within a six-year cycle. During other *build* years, they would still provide individual augmentees to Regular units or to reinforce other Reserve units' mission task elements.

Figure 3 illustrates what an integrated lead mounting division force-generation cycle could look like with Regular and Reserve "gears" at three- and six-year cycles respectively. During the *build* phase, Reserve mission task elements scheduled for higher readiness would complete additional training by integrating with designated units in the CMBG. During the *contingency* phase of the cycle,

LEAD MOUNTING DIVISION ELEMENT	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
Reg Unit Z	Build	Contingency	Committed	Build	Contingency	Committed
Reg Sub-unit Z1	Build	Contingency	Committed	Build	Contingency	Committed
Res Unit Y	Build 1	Build 2	Build 3	Build 1	Build 2	Build 3
Res Unit Y MT Plt/ Tp 11	Build 1	Build 2	Build 3	Build 4	Contingency	Committed
Res Unit W	Build 1	Build 2	Build 3	Build 1	Build 2	Build 3
Res Unit W MT Plt/ Tp 11	Build 4	Contingency	Committed	Build 1	Build 2	Build 3

THREE-YEAR FORCE-GENERATION CYCLE (REGULAR UNIT)	
Cycle Phase	**Activities**
Build	• Level 1 to 6/7 training.
Contingency	• Continuation training, 30–45 days' notice to move (NTM) for NATO Response Force or other tasks.
Committed	• Likely deployed for six months.

PROPOSED SIX-YEAR FORCE-GENERATION CYCLE (RESERVE UNIT)	
Cycle Phase	**Activities**
Build 1	• IBTS, offensive ops Level 2/3 BTS. DTE Level 3 Live. Class A. • Up to sub-unit on 72 hours' NTM for dom ops.
Build 2	• IBTS, defensive ops Level 2/3 BTS. DTE Level 4/5 dry. Class A. • Up to sub-unit on 72 hours' NTM for dom ops.
Build 3	• IBTS, focus on PCFs and specialist courses using CMBG kit while CMBG elements committed. DTE Level 3 live or Level 4 dry. Class A. • Up to sub-unit on 72 hours' NTM for dom ops.
Build 4 (MT element)	• DTE Level 3 live, then participate in CMBG Level 4/5 live and Level 6/7 dry. 60–90 days of Class B required.
Contingency (MT element)	• 90 days' NTM. Class A. • Up to 20 days Class B for continuation training. • Placed on Class B if NTM reduced below 90 days. Class C at 45 days or less NTM.
Committed (MT element)	• Same as contingency. • Committed task for MT Plt/Tp should have been identified in MRP years in advance. • Class C for operations or high readiness (including replacement pool), or Class B if committed tasks are simply training support.

Figure 3: Proposed Lead Mounting Division Integrated Force-Generation Cycles

Reserve mission task elements that recently completed high readiness training could be maintained on Class A service at 90 days' notice to move (NTM). However, they should be placed on Class B service if the NTM is lowered below 90 days to allow participation on theatre-mission-specific training and to allow civilian employers sufficient notice to backfill deploying Reserve soldiers. At 45 days' NTM, Reserve mission task elements should be placed on Class C service because they are required to be at the same readiness as Regular Force contingency elements. Class B and C funding for contingency Reserve mission task elements should be controlled at Canadian Army HQ or Canadian Joint Operations Command to ensure consistency in tying NTMs to operational requirements and risks. During the *committed* phase, Reserve mission task elements' missions should have been identified in previous years' MRPs. Specific readiness tasks for domestic operations should be assigned to Reserve units for all phases, as they can provide significant elements locally and regionally, and federal and provincial job protection legislation has been enacted across the country that addresses deployment on domestic operations.[8]

This predictable force-generation cycle would enable Reserve units to career-manage their personnel to prepare them for high readiness with appropriate career and technical courses years in advance. It would also enable Reserve soldiers to better manage their military careers in conjunction with their civilian careers. The certainty of Reserve military employment tied to specific readiness levels would alleviate historical problems with inconsistent approaches to Class B and C contracts. The personnel tempo represented by this cycle is actually similar to the Regular Force in some respects. For individual Regular members, especially officers and WOs, the three-year cycle is often broken up by rotations through institutional postings at schools, headquarters, support staff to a Reserve unit, recruiting, etc. Reserve members often spend a much higher proportion of their overall career within the same unit, so a longer cycle would be required to be sustainable, even before factoring in their civilian careers.

IMPLICATIONS FOR FORCE 2025

The integrated *One Army* force-generation framework and proposed integrated force-generation cycle help facilitate Force 2025 structural and mission task planning by providing some certainty. Basically, there must be a pairing of mission tasks across multiple units or multiple sub-units within a large unit in order to sustain a mission task sub-sub unit in each three-year Regular Force generation cycle. This proposal would not only provide predictable timelines and requirements for Reserve units and soldiers, but predictable Reserve force-generation outputs for the Army as well.

ABOUT THE AUTHOR

Lieutenant-Colonel C. W. Hunt has served in the Canadian Army for over 27 years, with time spent evenly between Regular and Reserve components. He has served in a variety of command and staff positions in both tank and reconnaissance squadrons, as well as at the unit and formation level. LCol Hunt served on Operation KINETIC Roto 0 in Kosovo, on TF 1-06 in Afghanistan, and on several domestic operations. LCol Hunt commanded The King's Own Calgary Regiment, and was Deputy Commander 41 CBG. He is currently the armoured advisor (Reserve) for 3rd Canadian Division.

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KOREA

AND THE ENDURING EXPERIENCE OF CANADA'S SOLDIERS

Lieutenant-General Wayne Eyre

The following chapter was penned by Lieutenant-General Wayne Eyre while he was Commander of the Canadian Army, and is excerpted from the commemorative photo book KAPYONG 70: A Tribute to the Canadian Veterans of the Korean War *published by the Embassy of Canada to Korea to mark the 70th Anniversary of the Battle of Kapyong and to honour the sacrifice and courage of Canadian veterans of the Korean War.*

Source: Library and Archives Canada

Source: Library and Archives Canada

Sgt. Prince (2nd from left) and other officers of the PPCLI's 2nd Battalion are briefed by their commanding officer before setting out on patrols in Korea in March 1951. As second in command of a rifle platoon, Prince participated in and led several night patrols and raiding parties.

The 70th anniversary of the Battle of Kapyong warrants commemoration of the very real achievements of our Canadian soldiers during the Korean War. It also offers a time for reflection and the opportunity to connect the achievements of our past with the experience of the present, putting current military service in a deeper context.

As a junior officer posted to the 2nd Battalion, Princess Patricia's Canadian Light Infantry (2 PPCLI) in the late 1980s, my formative years in the Army were steeped in the regimental lore of Kapyong. From veterans sharing their stories in the mess, to the mementos and artefacts that surrounded us, and the history lessons so important for regimental indoctrination, the battle was part of our DNA. Thus the opportunity to visit the battlefield itself several times, first while on exercise in 2012, and then while stationed in Korea several years later, was akin to a pilgrimage and precipitated thinking on how we as soldiers characterize our own operational service.

Source: Library and Archives Canada

The first members of 426 Sqdn to fly to Korea on a familiarization flight chatting with F/L Omer Levesque, from Montreal, at an air base in Korea.

Every war in a far-off land is different, but there are some Canadian soldier experiences that are enduring. Many have remained unchanged in the seven decades since Kapyong, as our soldiers deployed on multiple missions around the world. We are fortunate to have not had to physically defend our country at home from enemy aggression for a very long time, but rather we put our soldiers at risk around the world to defend others. This root commonality results in many similar experiences: the frenzied preparations before setting off, the team-building, the good-byes; the complex mixture of emotions while deploying — apprehension, excitement, fear, thirst for adventure, uncertainty, impatience, even boredom; the assault on the senses upon arrival — unfamiliar languages, dress, food, smells, all indicative of a foreign culture; and, in the worst of circumstances, the spilling of Canadian blood into foreign soil.

The commitment to the first tasks once on the ground often demands introspection as the danger becomes more immediate, and one asks, "Am I ready?" In a sterling example of moral courage, the Commanding Officer, Lieutenant-Colonel Jim Stone, answered collectively for the 2 PPCLI in saying, "No." In a lesson that resonates through to the present, despite the pressure from the United Nations Command to immediately commit the battalion to combat, he demanded several weeks of training to ensure it was ready after the long sea voyage to Busan.

In a volunteer Army, now as it was then, the reasons our soldiers sign up and deploy are many. Often it is out of a sense of service and duty to the country — doing one's part. For others, it is adventure, and in some cases for the pay. Regardless, at some point there will invariably be questions as to the larger purpose — why are we here, and, sometimes in hindsight, was it worth it?

Irrespective of their reasons for signing up, soldiers want to succeed. They want their efforts to be of value and be valued by others. Our veterans of the Korean War have that tangible sense of collective achievement. Veterans who return to the country they fought to defend see the vibrant, dynamic democracy that the Republic of Korea has become, arising out of the destruction of war to become an economic and technological powerhouse. It is a country that remembers, one that is so grateful for those that came from afar in its time of greatest need. What Korea has become, and the manner by which it remembers those that played a role in its survival, puts our veterans' service and sacrifice in context and offers meaning to what they went through.

The Korean War provides a clear analogy to the purpose of the deployments for the contemporary Canadian soldier. We want our troops to be able to return to a distant country 30, 40, or 50 years hence as veterans themselves, able to proudly say that they were part of making it a better place. Their part, however big or small in the overall effort, played a part in making it, and our world, better. It reframes their current experience when they can picture their future selves saying, "It was worth it."

In some parts of the world where we have deployed it can be difficult to envision such a success half a century or more from now. I expect that in the devastation of the Korean War, our veterans likely had similar sentiments, but absent their efforts, a chance for a better future would not have even existed. History will be the judge of outcomes – but we must serve knowing we have done our part.

Our soldiers who left Canada seven decades ago for an unknown country on the other side of the world called Korea should be celebrated and their service and achievements commemorated. There are aspects to the experience of a Canadian soldier leaving our relatively affluent and peaceful country behind to travel to the world's hotspots as familiar to contemporary soldiers as they were to their khaki-clad forebears in the early 1950s. The experiences of our Korean War veterans not only continue to provide useful lessons for the modern soldier but also a long-term example for how we give meaning to service. We need to continue to remember their sacrifices and emulate their example.

Source: Library and Archives Canada

On August 17, 1950, as the Korean crisis deepened, the Canadian government authorized the recruitment of the Canadian Army Special Force. Many of the recruits like the young men pictured were veterans of the Second World War and yet volunteered a second time to fight.

Source: Library and Archives Canada

The 2nd Battalion, PPCLI on board a ship for Korea, November 1950.

Source: Combat Camera

OPINION:

NOTES ON BEING AN OPERATIONS OFFICER

Major Jeff Caselton

While acting as an adjutant of a Gurkha battalion (bn) prior to the Second World War, John Masters described his job as "preparing the operations orders that would convert the Colonel's battle plans into exact details—boundaries, objectives, tasks, fire support, troops allotted, and so on."[1] Things have changed over the years—adjutants no longer manage operations, and they've been miserable ever since—but Masters' comment remains relevant today, and conversion of the Colonel's desires into details is now the purview of the operations officer (Ops O). The creation of a separate position to manage unit operations, the subsequent growth of the Operations cell (Ops cell), and the more recent removal of combat support platoons from the Ops O's command may indicate that the position is growing in complexity.

The issues that affect Canadian Army units are magnified when there is a lack of understanding at the Ops O level, resulting in the inefficient use of limited resources. Much writing has been devoted to the Ops O's tactical duties, and that topic will be covered towards the end of the article. Much less has been written about the Ops O's employment in garrison, which is what this article will focus on. This is an opinion piece that will unpack the role of the Ops O at the

> **One should constantly assess which portfolio (tactical employment, operations/training, tasks or equipment) is the most important at any given time, and weigh their efforts and emphasis accordingly.**

unit level, but some deductions may apply elsewhere. It must be noted that this article was somewhat difficult to write; as with anything written based on one's own experience, it is limited to what has been observed, learned and executed. The author does not claim ownership of any concepts described herein, as they are the result of discussions with many people, making attribution difficult. This article is an attempt to collate these ideas, not claim them. The suggestions enclosed do not pretend to provide the complete answer, and they should merely serve as a starting point for future discussion, debate and action. Some of this article's content has a "shelf life," as procedures and tools will change with time, but if it makes even one person's transition to Ops O a little easier, it will have been a success.

NOTES ON ASSUMING THE ROLE AND INITIAL INTERACTIONS WITH THE COMMANDING OFFICER

The Commanding Officer (CO) determines the division of labour among a unit's principal staff officers, including how the Ops O fits into the picture. Each CO will have opinions shaped by their experiences, and those views will almost certainly differ from one CO to another. Personalities within the unit are a key consideration: the Deputy Commanding Officer (DCO) or

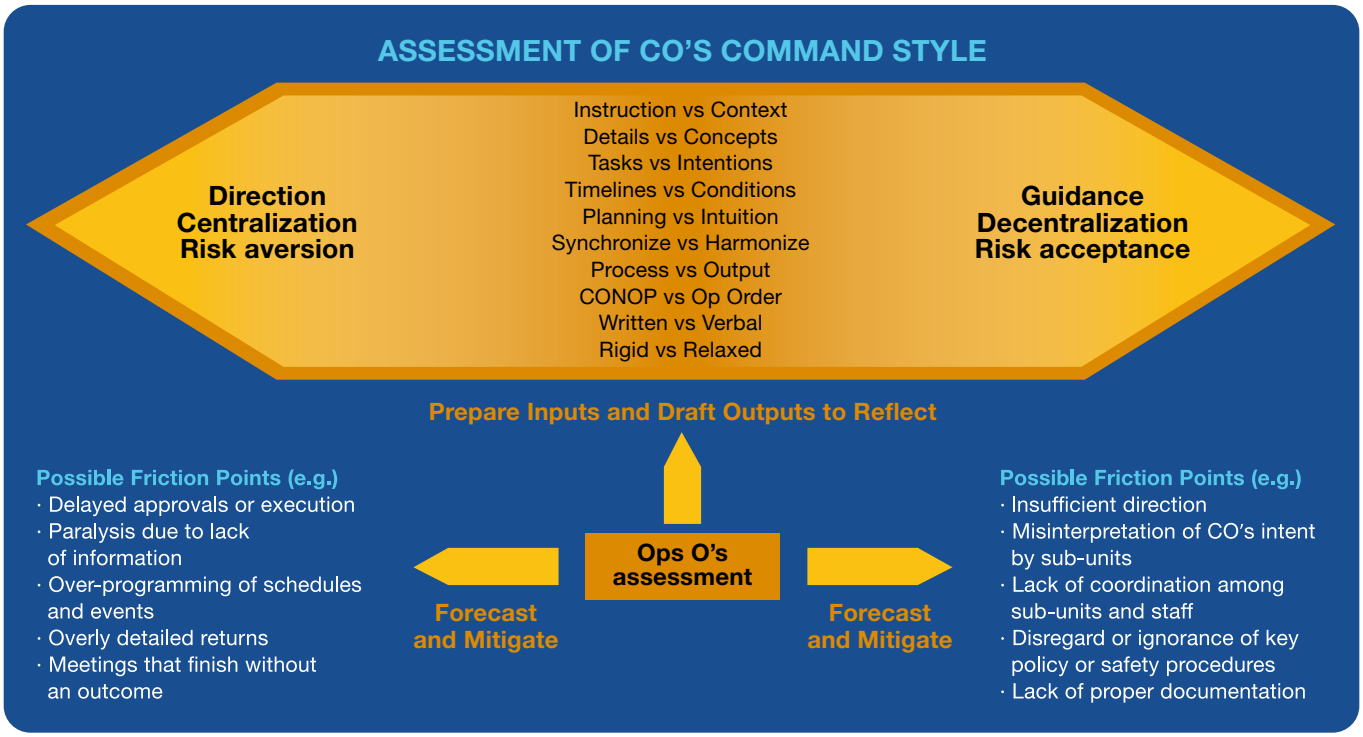


Figure 1: Operations Officer's Assessment of Commanding Officer's Command Style (Example)

another principal staff officer may play a greater role in planning than expected, or they may delegate certain duties altogether. The CO is perhaps the largest determining factor in how the Ops O will be employed. If such a discussion is not directed from the top down, then the Ops O should attempt to force it from the bottom up. The Ops O must carefully weigh the pros and cons of addressing the CO directly one on one, or of having a discussion with the other staff principals and, as a group, presenting the CO with a suggested way forward. The Ops O needs to understand their arcs before they can do their job.

Determine the CO's command style. Consideration of the factors in Figure 1 helps determine how the Ops O engages with the CO, and these factors should be reassessed throughout the term of appointment. It is important to note that any style factors on the extreme left or the extreme right of the spectrum, with the wrong conditions present, can become negative: there is such thing as a CO being too accepting of risk. The purpose behind thinking through these factors is to ensure that inputs and outputs are shaped to reflect the CO's wishes. An understanding of the CO's command style will enable an Ops O to forecast where and when friction points could arise so that they can be addressed in advance. A good Ops O will make sure that their CO is happy with the work and the products, a better Ops O will ensure that friction areas which arise naturally as a result of their CO's style will be covered, and the best Ops O will do both.

The process of attempting to understand the CO and confirming one's role as a principal staff officer will set the framework for an Ops O to start thinking about their craft.[2] There are a minimum of four subjects within the Ops portfolio that should be considered: tactical employment, operations/training, external tasks and equipment. If an Ops O knows when and how they must provide inputs and produce outputs, and is aware of the CO's expectations for both, then they will be in a good starting position. This information is necessary before one can manage the Ops cell staff properly.

NOTES ON MANAGING THE OPERATIONS STAFF

One should constantly assess which portfolio (tactical employment, operations/training, tasks or equipment) is the most important at any given time, and weigh their efforts and emphasis accordingly. In garrison, the Assistant Ops O is positioned well to deal with the day-to-day running of operations, extending out to approximately two weeks. That leaves the Ops O unencumbered to focus on the month-to-month or quarterly plan and specific portfolios as required. An Ops O must have the self-discipline to avoid being drawn into the Assistant Ops O's space. If they find themselves managing the day-to-day schedule during routine garrison activity, they probably need to re-evaluate their priorities, provide more freedom and additional context to the Assistant Ops O, detach from the current situation, and return to addressing longer-term targets. If a unit finds itself in a reactive posture, one of the first things to look for is the presence of the above condition. It must be corrected as quickly as it is identified.

Positional roles are a good starting point for determining staff duties and responsibilities, but they must be reviewed. Duties must be adjusted to account for individual personalities and abilities, and whether the Ops cell has too many or too few personnel. Another factor to consider, specifically for the Operations Sergeant Major (Ops SM), is how the Regimental Sergeant Major (RSM) or Drill Sergeant Major / Quartermaster Senior Instructor intends to manage the unit manning process. This assessment of strengths and weaknesses versus roles and responsibilities should be conducted as soon as possible after assuming the Ops O position, and any changes should be captured and issued in the Professional Development Review (PDR-1), Part One, especially if the change in responsibilities is significant. This last point will seem redundant to anyone except those who have had to search for a completed PDR-1.

NOTES ON OPERATIONS CELL SYNCHRONIZATION

It is often difficult to find time to hold a formal Ops synchronization meeting in the traditional sense. Short and sharp coordinating meetings (coord), which take less time but are held more frequently, are a good mechanism for managing staff outputs. The method advocated here is to hold a quick coord prior to CO's prayers[3] and a subsequent coord after the bn orders group. The objective of the first coord is to update and inform the Ops O on Ops cell status, issues and concerns, and allow them to provide initial direction. The objective of the second coord is to provide a reverse situation report and context to the Ops staff and reaffirm priorities and direction. Additional guidance will almost certainly be needed throughout the remainder of the week, but this can take place in a one-on-one setting. Competing priorities will make it hard to hold these coords at the same time each week. The coords can be shifted within the schedule so long as the objective behind each coord is still achieved.

The coords should take place in an open, shared work area—sometimes called the Ops bullpen—unless a sensitive topic precludes this. Walls within an operations centre do little to promote privacy and much to prevent effective communication. Conducting the coord in the shared work area allows all members not actively participating in the discussion to listen and gain context without having to cease working; one should strive to complete the necessary coordination with the least possible disruption to productivity.

The rough agenda for these coords should begin with the Ops O confirming the CO's priorities, followed by an update on upcoming events. These opening comments should also set internal priorities for the completion of upcoming tasks. This update is essential and provides the context within which decentralized decisions and actions can be made. The remainder of the meeting should see the key Ops staff providing updates on their ongoing projects, any decisions or actions needed (from the CO or the Ops O), and any other points that need to be tracked. The Ops O should provide additional guidance, confirm priorities and intentions, and make decisions where able. The focus of the coord should change between the Ops O and Ops staff portions of the update, depending on the objective of the coord.

The scenario below provides an example of what could occur during a cell coord: *During their turn to speak, the Ops SM says they are working on manning for next month, even though the manning isn't complete for a higher-priority event set to happen in two weeks. When asked why they switched their efforts, the Ops SM indicates that they cannot complete the task because multiple sub-units' returns have not been submitted. The Assistant Ops O has already tried to pull the returns but confirms that this was also unsuccessful. In this case, the Ops O decides to speak with sub-unit commanders to confirm why returns weren't submitted. The Ops O learns that the intent is unclear and that sub-units are not sure what returns they should provide. The Ops O confirms the intent (if unsure) with the CO during prayers, then provides the updated direction to the sub-units so that they can complete the return. The Ops SM waits for the returns, then realigns their efforts with the higher-priority task*. In many cases, when the Ops staff have shifted away from their priorities, they have done so because of an obstacle they cannot address. Holding more frequent coords ensures that such obstacles are addressed quickly, in a structured manner, and keeps the Ops cell aligned with the right priorities. By holding these coords at the right time with the right audience, the Ops O will be well informed enough to speak at bn orders, obtain a decision from the CO at prayers, or quickly realign priorities without having to put additional effort into prepping for those engagements.

NOTES ON BATTALION BATTLE RHYTHM

The battle rhythm is the engine that drives the unit and ensures that routine is maintained. An Ops O should do everything they can to ensure that the rhythm is respected. The unit battle rhythm must nest within the formation battle rhythm, but there is some flexibility on how this can be achieved. There is a tendency in units to spread battle rhythm events throughout the week, but this method often forces the sub-units to focus too much on the up-and-out (external to unit demands), and dilutes their efforts to focus down-and-in (internal command and leadership). One option that should be considered is holding the key update and decision meetings (prayers, battalion orders group, and battalion manning meeting) at the beginning of the week, and the key coordination meetings (Logistics Operations or Adjutants and Quartermaster's [A&Q] meeting) towards the end of the week. This method ensures that sub-units have several days each week where they can truly focus down-and-in, and it also ensures that they have sufficient time, unhindered by bn engagements, to prepare unit returns.

New problems rarely need their own meetings, and an Ops O should not fall into that trap. For example, the micro schedule for the unit fall training plan should be developed at the tail end of the A&Q meeting, as it will require the same participants, rather than adding another meeting to the schedule. An extra meeting would serve only to disrupt the battle rhythm and over-program the schedule. A very common complaint is that units schedule too many meetings and that the staff cannot prepare properly because they are spending too much time in meetings. Linking upcoming planning, discussions and briefings to existing battle rhythm events is one of the best ways to prevent this problem.

Not every task needs its own order. Some Ops Os prefer to receive a written order accompanied by a CO's signature before they act, but this over-reliance on written direction is detrimental to the effective running of a unit. Formal written orders take a great deal of time and effort to produce and, if they are used as the primary means of issuing direction, they can lead to unnecessary delays and inaction at the sub-unit level. It is also inefficient to write an independent order for every event. One recommended solution is to develop the habit of drafting and issuing a quick confirmatory order following the completion of the CO's orders group. These orders should be written using Outlook email so that they can be sent quickly to the CO for approval (this could be as simple as the CO hitting Reply and adding the word "approved" to the email chain) and then distributed. This method seems like additional work, but it often saves the Ops cell from having to draft multiple instructions and leads to less staff effort in the long term. The addition of the title "Confirmatory Orders" also helps to reinforce that written orders are not to be considered the executive; orders have already been issued orally during the bn orders group, and commanders should be well into the coordination and execution of their tasks by the time the email order is released. The end result is a weekly email[4] (similar to routine orders) that captures the CO's comments, has the CO's electronic approval and can be distributed quickly to the remainder of the bn's leadership. In situations where an additional order is required, or an instruction was produced by another sub-unit, a link to these products should be included in the weekly email order, and these extra products should be treated as annexes. Time spent searching for information will be reduced, and situational awareness will improve at all levels as sub-unit staff will know where to look for the latest information. Perhaps most importantly, the implementation of these procedures will foster a climate within the unit that prioritizes speed of thought and execution through oral direction, while still ensuring that the appropriate written documentation is completed.[5] As the unit becomes more and more comfortable executing oral direction, the frequency of these orders may be reduced.

NOTES ON PLANNING

The Ops O is responsible for conducting much of the planning and analysis at the bn level in garrison. The DCO or Plans Officer (Plans O) is responsible for drafting the initial calendar of events, but it is the Ops cell that contains the staff who can provide answers to questions such as the following: How many internal courses should be run? When will the bn have the most personnel available to conduct collective training? Who has priority in the training area during a given time? For this reason, the Ops O and staff are best suited to clarify the details of the programming of events into the calendar once initial concepts and general themes have been decided.

If the unit decides to employ another major outside of the DCO as the Plans O, it is essential that the breakdown of responsibilities be understood by both parties. This relationship should be part of the initial direction from the CO when deciding the division of labour between the principal staff officers. A common method for delineating Ops O / Plans O responsibilities is the absolute ownership method (e.g. the Plans O owns all activities beyond 60 days, and the Ops O owns all activities within 60 days). This method of having the Plans cell own all events beyond a fixed date is not advocated, because the Plans cell is often too small to manage the workload. The deadlines for unit movements, bookings and real-life support may be overlooked because the Plans cell has too many remits, and the personnel who do the bookings are brought into the process too late.[6] A Plans-to-Ops handover at D minus 60 days is useless if movements and accommodations need to be booked at D minus 90 days. Another drawback to this planning method is that it forces the Plans O to take ownership of events, such as Primary Combat Function training cycles, that are better suited to the Ops cell.

One way to address these issues is to switch to a mixed ownership planning method where responsibilities, via a fixed timeline, define ownership between Plans and Ops (see Figure 2 for an example of the difference between the absolute and mixed ownership method). In this method, the Plans O is responsible for programming the general themes onto the yearly calendar, in addition to the detailed planning of key events. The Ops O is responsible for the planning and execution of the routine events throughout the year, and for the execution of key events once handed over from the Plans O. A key event is defined as an event that will take significant planning effort to accomplish, and it will be executed at company plus to unit level. A few examples of key events include company live-fire ranges as part of yearly training objectives, and any force-on-force training (company against company or larger) at the unit level.

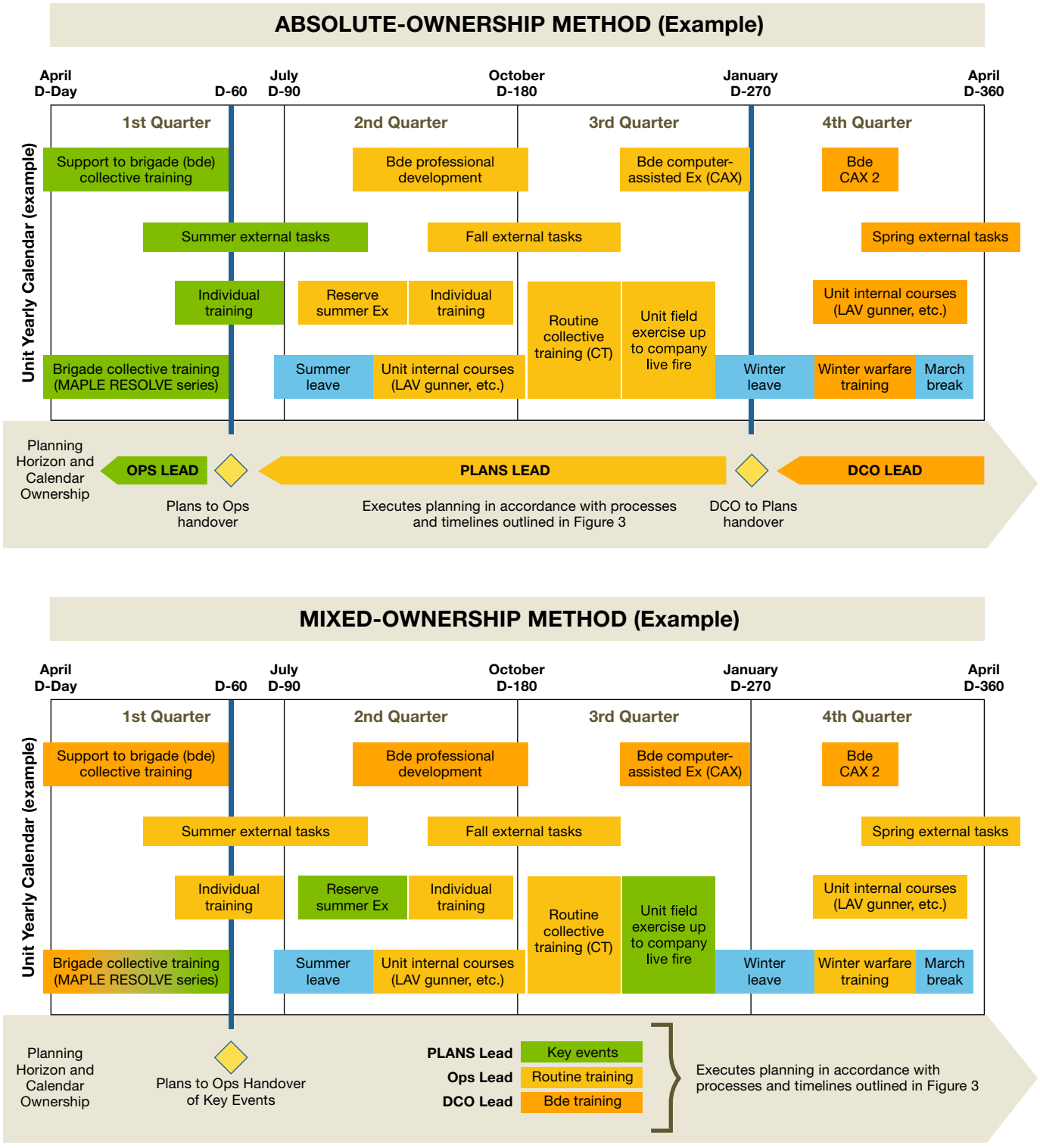


Figure 2: Absolute-Ownership and Mixed-Ownership Methods of Planning (Examples)

The mixed-ownership method allows for a better distribution of the workload between Plans and Ops. The Plans cell becomes free to focus on the bigger, more complex events and to conduct the in-depth analysis and coordination required. The Ops cell is thus enabled to take early ownership of routine training and events, giving it ample time to forecast the necessary requirements. This method plays to the strengths resident in each of the cells.

An understanding of the unit's planning method and processes in garrison is essential if the Ops cell wishes to avoid being in reactive mode throughout its tenure. Figure 3 provides an example of how a unit could break down the planning timelines. The figure shows how the ownership of an event is transferred between Plans and Ops, and it also provides a recommendation for the pairing of planning conferences with existing meetings to respect the battle rhythm. If no Plans O is employed, then the Ops O must discuss these processes with the DCO.

NOTES ON DEVELOPING PLANNING PRODUCTS

There are only three valid reasons for an Ops O to produce staff work: assisting the CO in making a decision (briefs), assisting the CO in implementing a decision (orders), or informing a higher headquarters (HQ) so that HQ staff can do the same for their commander (returns). One should always attempt to reach a decision or issue direction with the least amount of product possible; an Ops O should get good at explaining problems and options orally to the CO. If the CO's command style is such that they prefer to operate using a written product, then products should be designed so that they can be repurposed quickly to support execution. Adding the CO's signature block to the bottom corner of a quad slide or a contingency operation slide is just one example of how to quickly turn a briefing product into an orders product. This sounds simple, but often individuals will develop multiple products to brief their CO and then, upon approval, draft new products for execution. This is wasted effort, and it should be avoided where possible.

NOTES ON GETTING THE COMMANDING OFFICER TO MAKE DECISIONS

One of the Ops O's jobs is to inform the CO when they will need to make decisions. Most COs aim to make quick decisions and provide ample planning time to their staff, but there will be times when this may not be possible and, in principle, the CO should never be forced to make a decision before they have to. Many briefs that end without a decision can be traced back to the neglect of this principle. This failure is often the fault of the Ops O, because they are seeking too big a decision too early in the planning process without a full understanding of all the factors. A much more effective method of getting approvals is to request small decisions that move the yardstick forward, based on clearly explained restraints, constraints and opportunities. Seeking small decisions also significantly reduces unnecessary staff effort, as everyone understands when certain decisions will be made. For example, a CO may wish to hold off making a decision on the order of battle (ORBAT) for an upcoming brigade (bde) collective training exercise until several decisions have been made at formation level. The exercise is still several months away; however, the unit movement table is due in the next three weeks, and the unit is unable to bring all its vehicles. In this case, the movement plan becomes the constraint that forces a smaller decision. Rather than trying to get the CO to make a decision about the specific ORBAT, the Ops O should frame the issue as a decision about the overall force composition, which can be task-tailored into an ORBAT later. All too often, staff will waste time and effort producing multiple ORBATs, hoping to find the right answer even though the CO is still missing the required info to make an informed decision. Using a generic force composition that focuses on capabilities, versus a specific ORBAT, enables the CO to decide without overcommitting. This decision provides sufficient detail for the movement table to be completed on time and sets the conditions for a discussion on the exact ORBAT at a later date. Aim for small decisions, understand and inform the CO when they must be made, and build flexibility into the CO's plan.

NOTES ON TASKS, MANNING, SETTING PRIORITIES AND FORECASTING

Perhaps one of the most sensitive subjects in Ops is the relationship between tasks and manning. Tasks are often managed by the Ops O, but the act of actually assigning troops to tasks is managed by the RSM and is often delegated to the Ops SM. The Ops O and Ops SM must sit down immediately after assuming their positions to determine how this will be managed. The words "stay out of tasks; manning is NCO business" lose their sting quickly after a few dressings-down from the brigade G3 for incorrect returns. That is not to say that the Ops O should be closely involved in tasks and manning. On the contrary: the Ops O needs to set the right conditions so that manning can occur. These conditions include, but are not limited to, setting priorities, identifying the correct procedures when deciding not to fill tasks, identifying what tasks the Ops SM has the authority to fill (individual up to section?), identifying what size tasks require higher discussion (platoon and up?), and identifying the bn elements to be protected from tasks so that they can execute other commitments. The Ops O should never get involved in the process of filling tasks, but they are ultimately responsible for ensuring that tasks are filled. The best mechanism for achieving this result is setting the correct framework and enabling the Ops SM to do their job. The sergeant(s) major do everything within their power to fill these tasks, and an Ops O must see to it that they are enabled to do so.

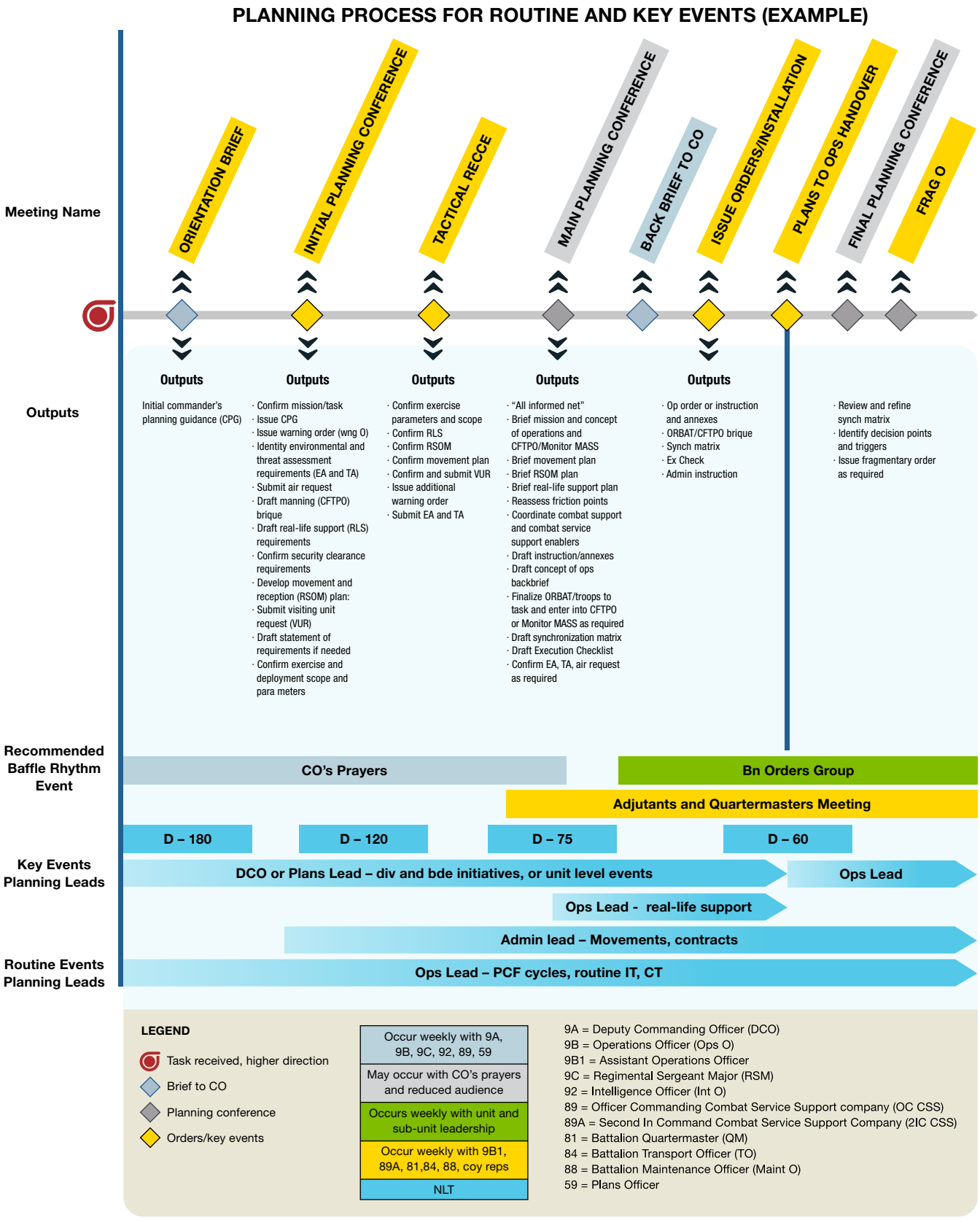


Figure 3: Planning Process for Routine and Key Events (Example)

Being able to forecast accurately is an essential skill within Ops. Good forecasting can be defined as identifying future requirements with precision. An Ops cell that can forecast effectively will have the right personnel and equipment available when needed. Forecasting seems to be a fairly simple process until one tries to forecast and manage tasks at the same time. For example, the bn may need to maintain a 2:1 ratio of crew commanders per section for an upcoming collective training cycle. It is obvious that the bn will need to run a number of courses to make this happen. What is less obvious is how many personnel need to be qualified and when the courses can be executed. These questions are difficult to answer and often require a lot of back-and-forth discussion with sub-units. With the questions answered, the Ops cell then works with sub-units to identify and load personnel onto the courses for execution.

This seems like a lot of work for a couple of courses, but it is absolutely necessary given the current volume of external tasks in the Army. All too often, courses are planned and executed without putting the necessary effort into forecasting, making it almost impossible to ensure availability of the right personnel or equipment. Individuals are quick to blame any issues that arise on external tasks or last-minute changes, but the reality is that few external tasks are true surprises, and most tasks come with ample warning. It is more likely that the unit Ops cell did not forecast the training requirements early enough, and that the members who should have been protected for training were assigned to different tasks outside the unit and were thus unavailable when needed. That is not unpredictability; it is bad planning. Forecasting and identifying requirements, based on the CO's guidance and objectives, enables the Ops cell to program courses and training into workable calendar dates and provides sub-units with the information they need to protect personnel from tasks when they are required for training.

Instability and unpredictability in the soldiers' schedule has a significant effect on morale. Short-notice tasks, although not as many as one would think, are still sent to units from time to time. One of the best methods for addressing these tasks is to prepare for them, and this can be done by establishing a short-notice tasking pool. Creating this tasking pool and placing members on standby gives them a chance to prepare, since the task, when received, is no longer short-notice. These pools help to foster resiliency, as instability and unpredictability are reduced in the unit over the long term.

Source: Combat Camera

NOTES ON WORKING WITH HIGHER HEADQUARTERS

Learn and understand how to employ the Army's official tools (Monitor Mass and Canadian Forces Task Plans and Operations). These tools are essential to streamlining reporting, and they will cut down the amount of time and effort it takes to produce returns once implemented and enforced across the unit. Determine which tool the HQ uses to generate its best personnel sourcing reports (a search function that determines a member's availability) and prioritize the updating of information within that system. Keeping the system up to date will reduce the number of line-by-line returns that the unit is required to generate for the higher HQ. There will still be many returns, but the unit will have done what it can to enable the higher HQ to inform itself.

Learn and advise the HQ's information management (IM) plan. It is often under-prioritized. A coherent, user-friendly and easily understood IM plan at the unit and formation levels will drastically reduce needless staff work and ensure ready access of information to enable planning and routine operations. Reports and returns that could take days to staff in a degraded IM environment can be resolved in a matter of minutes if both unit and formation IM processes are synchronized and streamlined. It is worthwhile to train and dedicate personnel to this unwieldy task in order to free up the staff to work on problems and projects that are more important. An IM directive needs to be more than just "how to use SharePoint." It needs to direct how information flows, what formats will be used, and when returns are required.

Learn to be a team player within the formation. An Ops O can and should look to provide solutions or options for their higher headquarters. At the end of the line, no matter how technical, procedural or bureaucratic the system is, the Ops Staff function—up, down and laterally—is still a human endeavour and relies upon strong relationships and leadership. Do not sour the unit's or the CO's reputation by refusing to be part of the team; that will end in distrust and a firmer hand from the higher HQ, and other units will be less inclined to provide help when needed. The method to avoid becoming "that unit" in the formation is simple: build relationships with fellow Ops Os and the formation staff, be seen to share in hardship,[7] be punctual in reports and returns, and communicate: pick up the phone or go to visit peers in person from time to time.

Stay informed. An Ops O must know their unit in excruciating detail and must also know the bde plan and stay abreast of tasking demands or changes to the Ops Plan. In addition, they must periodically check up on the division for pressures from the training centres, other bdes and emerging domestic operations. An Ops O should refresh themselves on their own unit daily, their higher formation bi-weekly, and divisional pressures monthly. By staying informed, an Ops O will retain the ability to forecast effectively.

NOTES ON TACTICAL EMPLOYMENT

An Ops O must understand how the CO prefers to command in a field setting; this may differ from their style in garrison. The CO's command style should form the core of all discussion and decisions on command post (CP) layouts and Ops procedures. An Ops O must know the answers to certain questions, such as the following: Does the CO prefer to command forward from their Tactical Command Post (Tac CP) or more rearward from the main CP? Does the CO prefer to issue direction face-to-face or over the radio? Conducting another assessment using Figure 1, but from a tactical perspective, will help the Ops O decide what is to be done.

As a rule, always try to issue orders and conduct coordination as far forward as possible. The impact of pulling sub-unit commanders rearward needs to be weighed against the risks of concentrating leadership too far forward. Ensure that someone (battle adjutant?) is identified to capture and relay any direction that the CO issues face-to-face with their sub-unit commanders. If the CO prefers to issue orders in this manner, the CP could find itself constantly struggling to maintain situational awareness. Having someone present to record and relay intimate commander-to-commander discussions and decisions allows the CP, and other sub-units, to remain informed.

The layout of the CP is a subject that would probably merit its own article. The following notes are in reference to a "fighting" CP. The Ops O needs to prepare the CP staff adequately, ensuring that they have gone through all their drills, before they operate with the rest of the bn. The CP's ability to develop and share a common operational picture (COP) is of the utmost importance because it enables command decision making, coordination of fires and manoeuvre, and shared understanding of the battle space. Products developed by the staff that do not contribute to the COP are a distraction. Build redundancy into the COP if CPs need to move, tactically or administratively. Breaking down barriers to communication in the CP to better facilitate the COP could be as simple as individual seat placement (looking inward versus outward). The use of fires to shape the battle space is one of the most important effects a unit CP can provide. To this end, the CP should privilege the interactions between intelligence, surveillance, target acquisition and reconnaissance; fires; and an individual empowered to make decisions. CP layout should enable these communications.

Understand when the Ops O's voice needs to be on the radio. A good rule of thumb is to be available during shaping operations, active during the decisive op, and absent during sustaining and routine ops; rest cycles are important. Personal call signs should be used only in extremis; sub-units need to trust and default to call sign zero when reporting.[8] The Assistant Ops O is usually more than capable of controlling routine operations, and this divide allows the Ops O to detach once the decisive op is complete and refocus on the next tactical movement.

Know who has been delegated authorities to make decisions. Battle drills should have a clearly identified step covering delegation of authorities with or without conditions. If something is unclear, ask. Few things are worse than an Ops O implementing decisions or committing resources outside of their approval jurisdiction. The exception would be an Ops O failing to make a decision because they couldn't reach the CO. In those situations, an Ops O must operate from mission command and make a decision based on their CO's intent and their own understanding of the COP.

GENERAL NOTES

In most units, the Ops O is considered a field grade officer.[9] In this capacity, their prime interlocutors within the unit are the sub-unit commanders. For this reason, an Ops O should avoid calling sub-unit commanders "Sir." This act of deference places the Ops O at an unnecessary disadvantage and, depending on the nature of the sub-unit commander, can make it more difficult to advocate and argue on the CO's behalf. It is recommended that the Ops O address sub-unit commanders by their position or title; the Ops O still pays the proper respects, but without yielding any ground. The CO can help to resolve any issues, or prevent them altogether, by clearly explaining the framework within which the sub-unit commanders should engage with the unit's A-level captains.[10] Sometimes sub-unit commanders need to be reminded that the Ops O works for the CO, not for the sub-units. On the other hand, many sub-unit commanders and Ops Os are great friends, having progressed through training together, and maintain more personal relations; this section does not apply to them.

CONCLUSION

Hopefully, this article has provided some extra context regarding the Ops O appointment for those who may assume the role in the future. The Ops O is still very much responsible for turning the CO's desires into details, but the role has expanded greatly over the years and will likely continue to grow in complexity. Consistent with the objective of staff brevity advocated herein, I will close by saying that the Ops O's life in garrison, training and operations is never dull. Get comfortable "living in draft," share early and share often, remember that you are still a leader, and execute on oral direction. Good luck.

ABOUT THE AUTHOR

Major Jeff Caselton is currently the Officer Commanding Hotel Company of 2nd Battalion, The Royal Canadian Regiment. He spent two years employed as an Operations Officer, during which time he deployed on Op REASSURANCE 1801 and supported Op LENTUS 19 (New Brunswick flooding operations).

ENDNOTES

1. J. Masters, *Bugles and a Tiger: My Life in the Gurkhas* (London: Orion Publishing Co., 1954).

2. The process can be summed up as an attempt to determine how the CO intends to enable mission command. If Mission Command = Trust + Shared Understanding, then one of the Ops O's key functions is ensuring the shared understanding component of the equation.

3. "Prayers" is an old term for Commander's Update Brief, where each principal staff officer updates the CO on their current priorities, issues and next steps, and in return the CO provides guidance, adjusts priorities and makes decisions.

4. The Canadian Army can be described as a mobile device–centric organization. Anything that facilitates functioning from a mobile device alone without having to access a desktop or printer is an enabler.

5. The process of capturing the key notes and distributing the outcomes of the meeting should be considered for every battle rhythm event. Appointing a bn scribe as a secondary duty is one method for accomplishing this. A running electronic, published on ACIMS, with sub-unit concerns, CO's decisions and CO's direction will ensure shared awareness across the unit.

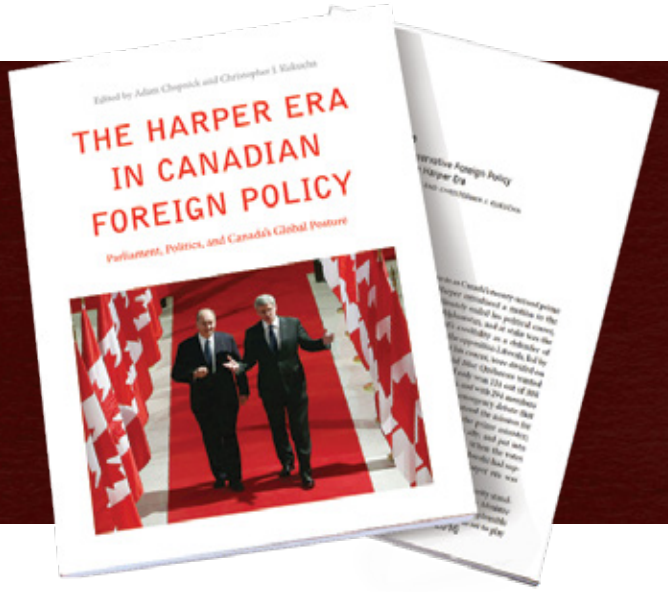
6. The issue is often compounded further by the division of labour between Ops and the Combat Service Support (CSS) Company. The roles between Ops and CSS for coordination/bookings must be clear.

7. There are tasks that an Ops O must protect their unit from and tasks that, while costly, will do much to improve the unit's standing and possibly reduce the overall task demand over time.

8. Sub-units will come to identify the Ops O's voice regardless. They must come to trust their controlling station, not the Ops O, to solve their problems. This is especially important when a battle group is formed and new elements are attached that have not previously worked with the unit.

9. Ops Os once held the rank of Major in infantry battalions.

10. The Ops O, Adjutant and Second-in-Command Combat Service Support Company are all considered A-level Captains in an Infantry battalion, and the Ops O and Adjutant are usually considered to have field grade officer status.



THE HARPER ERA IN CANADIAN FOREIGN POLICY: Parliament, Politics, and Canada's Global Posture

BIBLIOGRAPHICAL INFORMATION:
CHAPNICK, Adam, and Christopher J. KUKUCHA, eds.
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Reviewed by Peter Gizewski, Strategic Analyst, Defence Research and Development Canada, Centre for Operational Research and Analysis (DRDC–CORA).

The election of the Federal Liberal Party as Canada's government in 2015, after almost ten years of Conservative rule under Prime Minister Stephen Harper, gave rise to considerable speculation about the future course which Canada would pursue in world affairs. Certainly, the character and rhetoric of the newly elected government fuelled expectations of marked change. Backed by a strong majority in Parliament and a cabinet boasting considerable experience, a new, charismatic Prime Minister seemed bent on pursuing a gentler, more cooperative approach to foreign affairs, one which accorded more comfortably than Harper's with Canada's traditional self-image and values.

Yet, if the past is prologue, continuity often trumps substantial change. Moreover, majority and minority status in the House is of little importance in terms of the character of the government's decisions.

Such an assessment gains credence from this book's excellent examination of Canada's foreign policy during the Harper years. With contributions from a number of leading scholars and analysts of Canadian politics and foreign policy, and covering a range of key topics in Canada's foreign relations, it explores, first, the extent to which the Harper government differed from its predecessor on matters of foreign policy and, second, whether the government's standing in the House impacted the character of its policies.

Overall, the evidence presented by the volume's contributors is generally negative on both counts. Although the Harper government clearly adopted a more assertive, hard-nosed, realist stance on a number of foreign policy fronts than its predecessor, differences tended to be more rhetorical than substantive—a fact clearly evident in policy areas such as investing in the military, contributing to the allied effort in Afghanistan and managing the US–Canada relationship.

Source: Wikipedia

In addition, on these and other policy positions adopted, the impact of the government's standing in Parliament was marginal at best. To be sure, the Harper government adopted a somewhat more assertive tone during its majority period, yet its policy positions themselves did not change appreciably.

The reasons provided for such findings are numerous, but structural factors are seen as particularly significant. In general, Canada must react to the international system far more than it can shape or have an impact upon it. Thus, key tenets of foreign policy tend to endure regardless of who is in power. Long-standing agreements, both bilateral and multilateral, with trusted and often powerful allies create norms and expectations that must be followed. And the interests and standard operating procedures of large departmental bureaucracies create path dependencies in terms of policy which are not easy to override. Given such realities, it is difficult to contest Norman Hillmer's observation that "[t]he way ahead for Canadian foreign policy is often what has gone before."

Source: Wikipedia

As for the relatively minor importance of the government's standing in the House, explanations must be more nuanced. As Denis Stairs points out, the constitutional power to conduct foreign relations lies squarely with the executive, placing the opposition parties in Parliament at a distinct disadvantage should they wish to topple the sitting government on matters of foreign policy. That fact can thus determine how tightly the limits on the parliamentary role can be drawn.

Still, government strength in the House *has* had some influence in the more distant past. John English notes that minority status likely had an appreciable impact on the governments of both Lester B. Pearson and Pierre Elliott Trudeau. Indeed, this was particularly evident in the face of a New Democratic Party whose stance on issues such as the Vietnam War and the "American Empire" generated tendencies toward economic nationalism and criticisms of US policy on the part of the government, which likely would have been avoided had its parliamentary standing been more secure.

Yet times were different then. In contrast to the Pearson–Trudeau years, the New Democrats posed few serious threats and offered no compelling opportunities to the Harper Conservatives. Moreover, in the face of an environment marked by new, often transnational, security threats, economic crises and new waves of immigration, Canadian society became far more willing to subscribe to conservative views of law and order—at home and abroad—and the need for fiscal austerity. Beyond that lie differences in leadership itself. One point which resonates throughout the book is the degree to which Harper's own views and personality may have been crucial to the style and substance of the policies adopted. Harper was relatively vocal in his beliefs and well versed in the intricacies of parliamentary procedure, and it appeared that both the Prime Minister and his government were far more apt to govern as if they had a majority, even when they did not.

Turning to the present, it may be somewhat premature to make definitive judgments regarding differences between the current government and its predecessor, given that Justin Trudeau's government has yet to complete its second term. Still, its record thus far accords well with the main conclusions of the contributors to this volume. Indeed, Liberal rhetoric notwithstanding, the realities of the international arena have thus far yielded more policy continuity than change. Although the Trudeau government has been more vocal in addressing issues of climate change and more aggressive in support of Syrian refugees than the Harper Conservatives, its actions on issues such as Ukraine and Mali and its approach to relations with the United States have seemed more in line with conservative sensibilities than a significant divergence from them. On the international trade front, Liberal initiatives appear similar as well—a fact borne out by the government's securing of an agreement negotiated by the Harper Conservatives with the European Union as well as in its efforts to negotiate bilateral trade deals in Asia, efforts which began with the signing of the first Asian free-trade deal with South Korea during the Harper years. Even on the climate change file, it can be argued that thus far the Harper and Trudeau governments have differed more in style than in substance, with the Liberal government in fact largely sticking to the emissions targets proposed by its Conservative predecessor.

Whether future actions will follow a similar pattern remains to be seen. Yet, if the conclusions reached in this well-written and thoroughly researched study of the Harper years are any indication, broad continuity in the course of Canadian foreign relations would not be particularly surprising. The practical results of the current government's foreign policy thus far appear less like a significant break from the past and more like Stephen Harper with a smile.

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A Hermeneutic Analysis of Military Operations in Afghanistan

BIBLIOGRAPHICAL INFORMATION:
LAWLESS, Garrett J., Philippe CONSTANTINEAU and Ali DIZBONI.
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A Hermeneutic Analysis of Military Operations in Afghanistan may have a title that sounds esoteric to some readers, but ultimately it offers some well-grounded and accessible critiques of common approaches to building intercultural understanding and attempting "hearts and minds"—type campaigns in counter-insurgency operations. To this end, the three authors of the book—Garrett J. Lawless, who served an eight-month tour in Afghanistan, and Professor Philippe Constantineau and Associate Professor Ali Dizboni, both of whom teach in the Department of Political Science at Royal Military College of Canada—use the coalition operations in Afghanistan in the decade and a half after 9/11 as a case study. They suggest that a hermeneutic approach may be applicable in such situations in the future, not only as a tool for analyzing recent events.

At 78 pages, the book is relatively brief, but it nonetheless packs in a fair amount of theory as well as some useful historical background and details. The study is broken into seven chapters, whose titles summarize the main points of discussion: an introduction, "A Very Brief History of Afghanistan," "The Issue of Culture," "From Philosophical Hermeneutics to Hermeneutical Philosophy," "Philosophical Hermeneutics and Hermeneutical Philosophy," "Applications," and a conclusion. From the standpoint of strategic planners and Army operators, as well as academics attempting to analyze military experiences in counter-insurgency operations, the middle chapters are likely of the most interest, although for those less familiar with the history of the country or the background to the coalition operations, the "very brief" history of Afghanistan provides a good summary.

Lawless, Constantineau and Dizboni introduce their critiques in the third chapter, "The Issue of Culture." In it, they argue that the main academic approaches that have influenced military ideas about counter-insurgency are anthropology, systems analysis, and behavioural science. Again providing some historical background, such as mentioning how in its early stages as a field of study, anthropology "contributed significantly to the successful expansion and consolidation of British power during the era of empire," they acknowledge that there were good reasons for approaches from each of these fields to have been incorporated into Western military ideas about nation building in failed states. Yet they also find that "all such approaches failed to fully grasp how and why people come to think and feel the way that they do about situations."[1]

The authors comment that anthropological approaches such as gathering ethnographic information and building cultural knowledge have proven to be strategically useful in various situations, such as in US-led counterinsurgency operations in Iraq, but that "specific recommendations promulgated tend to be prohibitively general,"[2] and pre-deployment cultural sensitivity courses for military personnel are both expensive and time-consuming, as well as "rushed and oversimplified." Noting that "other elements within the defense community feel that there are other, more effective ways to increase the normative value of the ethnographical information currently compiled,"[3] the authors use these criticisms to lead into a discussion of behavioural science.

They define what they mean by behavioural science clearly: "The difference between a behavioral science (such as psychology) and a social science (such as anthropology) is the degree and intent of abstraction applied to a sample of collected empirical data."[4] In terms of military operations, they state that this difference means that "instead of simply developing a positive relationship with a local population, a very specific relationship is instead attempted, whereby the local population is brought to want to do the will of the occupying force."[5] As with methods based in anthropology, behavioural science approaches include effective and morally and ethically supportable actions such as providing

humanitarian relief and essential services, but they expand into nation-building-type activities and attempting to delegitimize insurgents in the eyes of the local population while encouraging the population to feel grateful to the occupying forces. The authors find that "economic development is perhaps the most important line of operation"[6] but conclude that there remain two major strikes against behavioural science–based approaches. First, "the behavioral science approach is impeded in the same way as the anthropological approach, in that soldiers are generally not trained to develop the sorts of critical thinking skills required to develop this controlling capability."[7] Second, "this approach is much more intensive on civilian organizations with the specific expertise required to develop highly functioning economic and governmental infrastructures, and until a reasonably stable peace environment is established in Afghanistan, or any other future target population, it will be too dangerous for civilian workers to perform many of these crucial activities."[8]

Turning to systems analysis, Lawless, Constantineau and Dizboni argue that "as it applies to operations in insurgent environments, [systems analysis] attempts to accomplish the same cultural effects as behavioral science, but with a more mechanical approach to studying and modifying the ethnographic information produced from anthropological analyses."[9] Later in the same section they provide an interesting analogy: "A systems approach to culture modification is similar to the example of the neural network, except that instead of adjusting the mathematical weights of the network itself… one instead adjusts the inputs given to the culture so as to produce whatever cultural outputs correspond to what is desired."[10] Nonetheless, this analysis of systems theory also leads them to negative conclusions: First, that, "[u]nlike [a] computer program designed to recognize colors, a society's cultural preferences toward one system of government or another are much more complex"[11] and, second, that "it remains unclear how these complex mathematical models can be translated onto the battlefield in a manner that provides clear direction about what actions should or should not be taken on the ground."[12]

Summarizing their critique of these three approaches, the authors write that each of them recognizes culture as the key to unlocking the "levers" that "move" a population, and that "each attempts to use culture as a medium for moving these levers."[13] They then return to the point that none of these approaches provide a full understanding of "how and why people come to think and feel the way that they do [about] things in the first place."[14] They argue that, in contrast, the study of hermeneutics is precisely about developing this kind of understanding.

Warrant Officer Al Verzyl, a Preventive Medicine Technician, stops by the market to check out the local vendors at Camp Phoenix, Kabul, during Operation ATTENTION.

Colonel Stephan Plourde speaks to one of the artists working at the Afghan Centre for Contemporary Art in Kabul on September 30, 2013 during Operation ATTENTION.

Source: Combat Camera

Operational Mentoring and Liaison Team (OMLT) member, WO Ouellet gives out markers to the Afghan children in the village of Nakonay.

The authors acknowledge that the lexicon and style of the subject of hermeneutics may be unfamiliar to many, but that this "does not mean that the content itself is inaccessible or unimportant."[15] As with their brief history of Afghanistan, they provide an effective overview of hermeneutics in the fourth chapter, "From Philosophical Hermeneutics to Hermeneutical Philosophy." The presentation is clear enough that a reader unfamiliar with the subject is able to grasp the basics with relative ease. This, and the similarly titled following chapter, "Philosophical Hermeneutics and Hermeneutical Philosophy," demonstrate that hermeneutics is a viable alternative to anthropology, behavioural sciences, and systems analysis as an approach to attempting intercultural understanding. The authors argue that in overall terms philosophical hermeneutics "pursues two broad questions that are fundamental to any efforts to transform a society." The first of these "focuses on the culture of individuals within a society i.e. how does a person interpret the world around them and how this, in turn, affects the manner in which they come to think and act."[16] The second "emerges from the first, in that it asks how two individuals from dissimilar cultures, thinking and acting as differently as they do, can reach common understanding through communication."[17]

In short, their analysis suggests that there are no shortcuts to achieving intercultural understanding—it is a long-term process that cannot necessarily be accomplished in the timeframe of primarily military-backed nation-building "hearts and minds" campaigns. Thus, the book falls into a category of works on counterinsurgency that are more pessimistic about the chances for operational success, although the three authors are not as pessimistic about the long-term chances for different regions of the world to integrate their world views enough to understand one another in order to avoid conflict in the long run. The main criticism of their analysis that this reviewer would consider justified bears a similarity to their criticisms of approaches based in anthropology, behavioural sciences and systems analysis: at the stage to which it is currently developed, such analysis does not tell us precisely where a cut-off in military operations should be made; a complex theory is difficult to translate onto the battlefield.

For example, Lawless, Constantineau and Dizboni describe 9/11 as "the greatest aggression against the USA since the Japanese attack on Pearl Harbor in 1941."[18] They agree that military intervention to apprehend Al-Qaeda leaders and to remove the Taliban government was necessary, but in their sixth chapter, "Analysis," they detail the difficulties faced by the West in terms of trying to modify or transform a culture in a country such as Afghanistan. They appear to be recommending an earlier exit strategy rather than a prolonged nation-building campaign, followed by other forms of intercultural engagement, but further analysis would be required to narrow the recommendations. Nonetheless, *A Hermeneutic Analysis of Military Operations in Afghanistan* provides an original alternative to other theoretical approaches to counter-insurgency and offers a solid foundation for further research and practice.

ENDNOTES

1. Lawless, Garrett J., Philippe Constantineau and Ali Dizboni, *A Hermeneutic Analysis of Military Operations in Afghanistan* (New York: Palgrave Macmillan, 2017): 13.
2. Ibid., 17.
3. Ibid., 19.
4. Ibid.
5. Ibid., 20.
6. Ibid., 22.
7. Ibid.
8. Ibid.
9. Ibid.
10. Ibid., 23.
11. Ibid., 24.
12. Ibid.
13. Ibid.
14. Ibid., 25.
15. Ibid., 31.
16. Ibid., 39.
17. Ibid.
18. Ibid., 57.