



CAF Modernization: The Case for Refocusing on Interoperability

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ABSTRACT

In this project, an interoperability capability framework is proposed as a solution to enhance CAF Modernization and facilitate CAF Digital Transformation. Using CAF C5ISR Modernization as an analogue for overall CAF Modernization, it is revealed that the CAF is missing operational level doctrine and force structures to truly act as a joint force, negatively impacting modernization efforts and potentially be an insurmountable barrier to pan-domain transformation. Interoperability models are proposed to frame this discussion as it forces organizations at all levels to map and define their core business processes. The focus on interoperability also satisfies scrutiny from the future security environment, as it will enable critical information sharing, augment a Whole-of-Government approach, and provide opportunities to diversify internal and external partnerships. With fully interoperable force elements, the CAF can mitigate its doctrinal gaps by rapidly integrating into more capable forces to gain operational experience that it otherwise would not have been able to gain alone.

CAF MODERNIZATION: THE CASE FOR REFOCUSING ON INTEROPERABILITY

If the 20th century was the story of slow, uneven progress toward the victory of liberal democracy over other ideologies—communism, fascism, virulent nationalism—the 21st century is, so far, a story of the reverse.

– Anne Applebaum¹

INTRODUCTION

In March of 2022, then Chief of Army Strategy, Brigadier-General Chris Ayotte, asserted that Digital Transformation was the single most important element to Army modernization in an interview with *Vanguard Canada*. He emphasized that success in this endeavour was the key to the Canadian Armed Forces (CAF) remaining a credible and reliable military². In another Vanguard interview conducted nearly a year later in January 2023, Rear Admiral Zwick, head of the newly formed Chief of Combat Systems Integration (CCSI), affirmed that “Failure to undergo a Digital Transformation will entail existential risk to the CAF³”.

Nearly six months earlier in June of 2022, the *CAF Digital Campaign Plan* was published with little fanfare but with an ambitious declaration that the “CAF will become digitally transformed by 2030”⁴. Reinforced by the Chief of Defence Staff’s announcement of the force’s priorities of reconstitution, culture, operations, and

¹ Anne Applebaum, "The Bad Guys are Winning," *The Atlantic* Nov 15, 2021.

<https://www.theatlantic.com/magazine/archive/2021/12/the-autocrats-are-winning/620526/>.

² "Digitalized Army: The Way of the Future " last modified May 13, accessed 28 Sept, 2022,

<https://vanguardcanada.com/digitalized-army-the-way-of-the-future/>.

³ Terri Pavelic, "Operational Decisions at the Speed of Relevance," *Vanguard Canada* 22 Jan, 2023.

<https://vanguardcanada.com/operational-decisions-at-the-speed-of-relevance/>.

⁴ National Defence and the Canadian Armed Forces, *Canadian Armed Forces Digital Campaign Plan* (Canada: National Defence and the Canadian Armed Forces, 2022)., 10.

modernization⁵, there is a noticeable urgency to refit the CAF to meet the growing operational demand in the face of climate change, adapting to our increasingly capable adversaries, and the ever-changing character of war.

Spurred, in part, by a rapidly changing and hostile operating environment, the CAF appears to be poised to undergo major recapitalization of its core capabilities, such as fighter aircraft⁶ and surface combatant ships⁷, in addition to restoring previously divested capabilities, including ground-based air defence⁸. A question that remains is whether these reinvigorated capabilities will contribute to the CAF's transformation, or if these will remain siloed within their respective services only to see limited use and slow, to no, adoption across the force. A cohesive implementation plan that ties these capabilities together remains illusive and poses the question if there exists a missing framework or unifying capability that will unite these initiatives to provide the credibility and reliability the CAF so desires.

The central question this paper aims to answer is: with the ongoing endeavour of Digital Transformation, what capabilities should the CAF prioritize to achieve its modernization objectives? This paper proposes that the CAF must pivot to becoming coalition Command and Control (C2) interoperability experts to achieve its Pan Domain

⁵ W. D. Eyre, "Chief of the Defence Staff 2023 Focus Areas," (8 Feb 2023). <https://www.canada.ca/en/department-national-defence/maple-leaf/defence/2023/02/chief-of-the-defence-staff-2023-focus-areas.html>.

⁶ Public Services and Procurement Canada, *Canada Finalizes Agreement to Purchase New Fighter Jets for Royal Canadian Air Force*, [2023]).

⁷ "Canadian Surface Combatant," last modified 18 Feb, accessed 11 Apr 23, <https://www.canada.ca/en/department-national-defence/services/procurement/canadian-surface-combatant.html>.

⁸ David Pugliese, "Canadian Army Fast-Tracking Purchase of Air Defence, Anti-Tank Missiles and Counter-Drone Gear," *The Ottawa Citizen (Online)* Feb 7, 2023. <https://search.proquest.com/docview/2774313289>.

aspirations and succeed in the future operating environment. Technology- and partner-agnostic interoperability is an unexploited national capability that will serve to strategically unite the CAF's modernization initiatives and elevate the CAF as a force of choice to Canada's new and existing allies.

As methodology, this Directed Research Project will examine two scenarios that describe potential future operating environments for the CAF to expose common themes that any modern capability must address. Interoperability frameworks will be analyzed along these themes, as well as, scrutinized against the published Government of Canada policy and strategy to assess the feasibility of a realistic outcome. This will be accomplished in three chapters.

Chapter 1 will frame the problem from the perspective of CAF Modernization and discuss the current state of progress, challenges, and key considerations for achieving successful transformation from the perspective of the CAF's C5ISR Modernization challenge. Chapter 2 will frame two scenarios from a Canadian perspective of a future operating environment in 2035, drawing on established research and news articles that inform the potential state of Canada's instruments of national power. This chapter will expose the common themes and propose interoperability as a capability development framework that can unify ongoing CAF modernization initiatives while remaining credible in the eyes of our adversaries and relevant to the objectives of our allies. Chapter 3 articulates which interoperability models align with national and military concepts in order to find synergies and capitalize on in this project's core thesis.

There is an undeniable gap developing between what Canada and its partners expect the CAF to accomplish and the harsh reality of what the CAF can realistically

achieve in light of its current trajectory with regards to equipment, personnel, and organizational challenges. Yet the other side of this coin presents a unique opportunity for the CAF to leverage established defence policy, international pressure to act, and the general goodwill from regular Canadians to shape the outcome of Canada's contribution on the world stage.

CHAPTER ONE: THE PROBLEM WITH JOINT C5ISR MODERNIZATION

A vision without resources is a hallucination.

– Pentagon saying quoted by Thomas L. Friedman⁹

INTRODUCTION

The future of CAF Command, Control, Communications, Computers, and Intelligence, Surveillance, Reconnaissance (C4ISR), or better now known as “C5ISR” with the addition of Cyber, has the potential to propel the CAF as a technological world leader in the on-going fourth industrial revolution. Of the 178 Department of National Defence (DND) major capital projects, 40% are Command, Control, Communications, Computers, and Intelligence (C4I) related, and of the C4I projects, there are roughly 60% of these project that will start initial delivery within the next five years¹⁰. In total, the program represents \$164 billion (CAD) over 20 years in capital acquisitions¹¹ across all DND stakeholders and includes projects ranging from Communications Information Systems (CIS), space, and cyber defence assets, to combat platforms, such as remotely piloted aircraft. As a central component of CAF Modernization, the C5ISR space provides an analogue for the overall discussion.

Of note, Canada’s 2017 Defence Policy, *Strong Secure Engaged* (SSE), includes modernization of key C5ISR systems, including, but not limited to, NORAD Modernization, Intelligence Surveillance Reconnaissance Modernization, Tactical

⁹ Stephen Kotkin, "A Call to Action, for Earth and Profit," *The New York Times*, sec. 157, Sep 7, 2008.

¹⁰ "Projects by Defence Capability Area," last modified 1 Dec, accessed 15 Apr, 2023, <http://dgpaapp.forces.gc.ca/en/defence-capabilities-blueprint/project-dca.asp?dca=C4I>.

¹¹ Office of the Parliamentary Budget Officer, *Planned Capital Spending Under Strong, Secure, Engaged - Canada's Defence Policy: 2022 Update* (Ottawa: Office of the Parliamentary Budget Officer,[2022]), 3.

Command and Control Information System Modernization, Cryptographic Modernization, Electronic Warfare Modernization, and Information Technology Infrastructure modernization. The stakeholders range among the individual CAF services, composed of the Royal Canadian Navy (RCN), Canadian Army (CA), and Royal Canadian Air Force (RCAF), to the Canadian Forces Intelligence Command and Information Management Group. Unfortunately, there is not one entity accountable for C5ISR, and to make matters worse, there is only limited coordination between the responsible stakeholders¹².

It is clear that the next few years of project delivery will provide much benefit to the individual sponsors, but with the world becoming increasingly reliant on data and computing power, an underlying question persists, *is there a unified CAF C5ISR framework connecting these bespoke modernization initiatives?*

LACK OF CAF C5ISR FRAMEWORK

A symptom of a missing unified framework is the CAF's struggle to field a joint operational-level Command and Control (C2) system. Poor obsolescence management¹³, development in silos¹⁴, and the fragmented nature of digital practitioners across the DND¹⁵ have produced negative impacts to operational and tactical commanders.

¹² Stuart Beare, "Championing the Joint Force: A Job for the Public and our Political Leaders – Not just Military Professionals Alone," *The School of Public Policy Publications (Online)* 8 (2015)., 2.

¹³ Ian Coutts, "Modernizing the Army's Communications Backbone," *Canadian Army Today*, 13 Dec 2017.

¹⁴ Department of National Defence, *Evaluation of the Defence IM/IT Programme* Department of National Defence,[2020]., 24.

¹⁵ Canadian Army, *Modernization Vital Ground: Digital Strategy* (Canada: National Defence and the Canadian Armed Forces, 2022)., 12.

This poor history of C2 systems acquisition¹⁶ is nowhere more pertinent than with the CAF's lack of a modern Battle Management System (BMS). A BMS is an integrated system of information acquisition and processing technologies that significantly enhances lower echelon C2¹⁷, whose current iteration as of 2023, is an application called BattleView. A key role of a BMS is to provide a visual representation of the Common Operating Picture (COP) which is built from processing Situational Awareness (SA) inputs related to friendly and enemy force disposition, intelligence, and geospatial information. The BattleView suite was delivered in 2007¹⁸ and developed for the Canadian Army Land Command Support System (LCSS), a system that was designed for static Headquarters (HQs)¹⁹. Due to the static nature of its design, once a commander leaves the Main Command Post (CP), maintaining the commander's situational awareness is extremely tenuous and labour intensive, requiring staff to convert digital products to analog²⁰. This has been clearly demonstrated with BMS incompatibility issues experienced in the author's experience supporting interoperability exercises such as the US-led Joint Warfighter Assessment (JWA) and NATO-led Coalition Warrior Interoperability Exercise (CWIX). In operations, the Commander of the Canadian Army has stated that through observing the current conflict in Ukraine, the number one missing

¹⁶ E. A. S. Gillingham and Canadian Forces College, *Canadian Forces Joint Signal Regiment: A Joint Command and Control Enabler* (Toronto, Ont: Canadian Forces College,[2014]), 5.

¹⁷ Carl W. Lickteig and Army Research Inst For the Behavioral And Social Sciences Alexandria Va, *Design Guidelines And Functional Specifications For Simulation Of The Battlefield Management System's (Bms) User Interface*, 1988), 1.

¹⁸ Paul Pryce, "Taking a Look at the BattleView 360," *NATO Association of Canada* 3 Nov 2015. <https://natoassociation.ca/taking-a-look-at-the-battleview-360/>.

¹⁹ Harry Angel and Chris Ste-Croix, *Task Analysis for Command on the Move* (Toronto: Defence Research and Development Canada,[2014]), III.

²⁰ *Ibid.*, 53.

enabling element for the CAF is C4ISR²¹. Increasingly dated, incompatible, and negatively perceived²², BattleView presents itself as a prime representative for study in order to gain deeper insight on what indicators signal a Force Development failure. A post-mortem analysis on BattleView will also provide insight on why, after almost two decades since its release, the CAF has not replaced or recapitalized their BMS and the implication to CAF modernization.

BattleView Post-Mortem Capability Analysis

In an article published by the Institute for Defense Analyses, Taliaferro et al. define a capability as “the wherewithal to complete a task or produce an effect within a set of specified performance standards and environmental conditions”²³. This definition was developed through the review of five separate nations’ definition of capability, including Canada’s, and further expands that a capability is a time dependent function of doctrine, organization, training, materiel & equipment, leadership, personnel, and facilities²⁴. This will be the basis of analysis for the CAF BMS failure.

The first component to consider is organization, where there is a distinct issue of organizational silos. The Army is the Operational Authority (OA) for LCSS²⁵ and its applications suite, including BattleView, meaning that the CA is accountable for its system requirements definition, operating principles, and standards²⁶. The Army, in conjunction

²¹ Jocelyn Paul, *Component Capabilities: Canadian Army* (Toronto: Canadian Forces College, 23).

²² J. Small and Canadian Forces College, "Command Support Project Performance Factors" Canadian Forces College, 2013), ., 98.

²³ Aaron C. Taliaferro et al., *What is a Capability, and what are the Components of Capability?* Institute for Defense Analyses, [2019]). <http://www.jstor.org/stable/resrep22853.5>, 6.

²⁴ Taliaferro, *What is a Capability, and what are the Components of Capability?*, 7.

²⁵ Department of National Defence, *DND/CAF Communications and Information Systems (CIS) Authority Assignments* (Ottawa: Strategic Joint Chiefs of Staff, 2017a)., A-2.

²⁶ DAOD 6002-0, *Information Technology*, (2012).

with the Technical Authority, determines the system capabilities to be developed, the priority in which they are developed, and the final validation of delivered applications. This system is designed for the land domain and is used primarily for the Force Generation of land force elements in preparation for employment in expeditionary and domestic operations.

For employment in joint coalition environments, the Chief of Defence Staff (CDS) issued an Initiating Directive that mandated the Canadian Deployable Mission Network (CDMN) as the C2 information system used for interoperability with US and NATO²⁷. As per the authority assignments from the Strategic Joints Chiefs of Staff, the OA for CDMN is the Canadian Joint Operations Command (CJOC)²⁸. At the operational level, the intent is for the services to generate force elements to be employed by CJOC, utilizing CDMN as the system for coalition interoperability.

In actuality, the software baseline for CDMN is identical to LCSS and the only change in coalition operations is that the system OA changes from the CA to CJOC. This is a cost-effective method for CJOC to maintain a capability since they can leverage the same Technical Authority (TA) as the CA. The TA is the entity responsible for the routine development and maintenance of a system baseline according to the OA's requirements and each accredited system will have a TA. Although TAs exist for service specific systems, this entity does not exist for the CAF joint community. The TA for CDMN and LCSS is the Assistant Deputy Minister (Materiel) otherwise known as ADM(MAT) and is responsible to maintain the system baseline, through execution of engineering activities, for both the Army and CJOC. In essence, for joint operations where the Force Employer is CJOC, the system

²⁷ Department of National Defence, *CDS Initiating Directive for the Governance of the Canadian Deployable Mission Networking (CDMN) Capability* (Ottawa: Chief of Defence Staff, 2018)., 2.

²⁸ *Ibid.*, A-1.

being used is de facto designed by the Army where the system requirements, operating principles, and standards are determined by the Army and not necessarily focused on joint requirements despite the heavy reliance on air and maritime assets. There are niche programs within LCSS that serve other stakeholders in the air and intelligence domains, but by and large, the system is designed in service of the land domain.

This, in turn, has created a hesitancy in the usage of CDMN for air and maritime entities at the operational level and total irrelevancy at the tactical levels. In addition to this mismatch between system and employment, each service has their own director of requirements. There is no overarching entity that validates overall C2 system requirements from a joint perspective and no oversight across the different Level-1 organizations on how force elements are generated for joint operations²⁹. Furthermore, administrative systems and common systems of record, such as the Defense Wide Area Network (DWAN) and Consolidated Secret Network Infrastructure (CSNI), are managed by an entirely separate Level-1 organization, the Information Management Group under the Assistant Deputy Minister (Information Management) otherwise known as ADM(IM).

The next capability component to discuss is training. For the CAF, operational-level interoperability activities are largely dominated by two C2 system frameworks, the NATO-led Federated Mission Networking (FMN) and US-led Mission Partner Environment (MPE). FMN is defined by the NATO's Allied Command Transformation as, "a governed conceptual framework consisting of people, processes and technology to plan, prepare, establish, use and terminate mission networks in support of federated

²⁹ Department of National Defence, *Evaluation of Joint and Common Force Readiness* Assistant Deputy Minister (Review Services), [2017c)], 13.

operations³⁰". MPE is described by the US Department of Defense as an "operating framework enabling command and control (C2) and information sharing for planning and execution across the full range of military operations³¹". MPE purports to be compatible with FMN, but the US framework is more focused on procedural alignments both internal and external, while the NATO framework is more focused on defining standards and protocols. CDMN is mandated to be interoperable with both frameworks and training for either framework largely follows the same operational readiness progression.

Collective training activities can be roughly sorted into two categorical gateways, one as a lower-level technical validation and the other as a higher-level staff validation. Technical validation consists of informal familiarization training conducted by Command Support elements and progress to coalition-assessed internal and external functional verifications³² to confirm that a system and its maintainers are function within specification. Upon successful completion of these enabling activities, the joint force commander and staff will conduct a staff validation activity to confirm the staff can use the provided systems in accordance with the commander's intent. Complexity significantly increases as more nations participate in these collective training events. Conferences that coordinate levels of ambition, synchronize validation activities, and forward deploy force elements under the same C2 framework demands the time investment of roughly a year in preparation³³. Coupled with on-going overall personnel

³⁰ "Federated Mission Networking," accessed 12 Feb 2023, <https://www.act.nato.int/activities/fmn>.

³¹ Department of Defense, *DOD INSTRUCTION 8110.01 Mission Partner Environment Information Sharing Capability Implementation for the DoD* Office of the DoD Chief Information Officer, (2021).

³² Jason Chor, *Concept of Employment Canadian Deployable Mission Network CWIX*, (2020), 23.

³³ *Ibid.*, 9.

shortages³⁴, deficiencies in specialized technical trades, and an ambitious managed readiness plan, the capacity for joint units to dedicate this time investment is severely strained. Yet the return on this investment cannot be understated as, in the case with FMN, these exercises build on the foundational body of knowledge aggregated over a decade of coalition-level C2 systems development between forty-eight nations during the Afghanistan campaign³⁵.

An informal division of collective training responsibilities has formed between CJOC and the CA. Due to CJOC's purview of operational-level coalition employment, CJOC force elements will attend FMN-led events while the CA, with an obligation for tactical interoperability with the US, will attend MPE centric events. In addition to the capacity issues articulated above, this separation of collective training across different institutions further exasperates the problem of organizational silos and the ability for the institution to appropriately recapitalize BattleView.

In Systems Engineering, system validation relies heavily on end-user feedback to confirm stakeholder requirements are satisfied and to build confidence in the system³⁶. This implies that in order to improve the BMS, the collective training events, in particular the staff validation gateways, are critical for developing and refining the system requirements that drive development. Ultimately, it is the feedback and lessons learned from these collective training activities that inform the next systems' development cycle,

³⁴ Murray Brewster and Richard Raycraft, *Military Personnel Shortage Will Get Worse before it Gets Better, Top Soldier Says* CQ-Roll Call, Inc, 2022).

³⁵ Chad Serena et al., *Lessons Learned from the Afghan Mission Network: Developing a Coalition Contingency Network* RAND, 2014), 6.

³⁶ Alan Faisandier and Rick Adcock, "System Validation," *Guide to the Systems Engineering Body of Knowledge Version 2.7* (31 Oct, 2022), 488-498., 488.

otherwise known as a program increment, which governs the TA's delivery of the next software baseline. In a BattleView case study conducted by Jeremy Small in 2013, a lack of meaningful feedback between the OA, the Army, and the TA, ADM(MAT), is revealed to have had major negative effects on the delivered application³⁷. This key finding will be discussed as part of the examination of the doctrine component of a capability.

Reviewing the intersection between Training and Doctrine will reveal the core problem that brings about the lack of a modern BMS. A problem that cannot be solved through organizational restructuring since the underlying incompatibility is caused by the very nature of Canada's penchant for contribution warfare. In Small's study, in addition to the relationship between the OA and TA being "abysmal³⁸", software engineers and Army officers from both organizations stated in interviews that the Army was unable to produce doctrine or Techniques, Tactics, or Procedures (TTPs) that would explain the objectives or operation of a CA BMS. When any feedback was provided, it was often inconsistent, conflicted, and lacked credibility³⁹ because no Level-1 champion for BMS development was ever identified⁴⁰. This is a theme applicable to C5ISR as a whole in the joint domain, where the authorities and leadership over joint force capabilities are ambiguous⁴¹. The failure to produce doctrine for a BMS stems from an overall lack of

³⁷ Small, "Command Support Project Performance Factors" , 75.

³⁸ *Ibid.*, 75.

³⁹ *Ibid.*, 77.

⁴⁰ *Ibid.*, 78.

⁴¹ Beare, "Championing the Joint Force: A Job for the Public and our Political Leaders – Not just Military Professionals Alone," 13.

campaign-level doctrine and the absent obligation to produce CAF Joint Force Commanders.

Shifting away from Force Generation to Force Employment, the method of how CAF force elements are employed within a coalition context will be scrutinized to further illustrate organizational challenges. In accordance with Defence Plan 2018-2023, Canada's concurrent operational remits to domestic operations, NORAD, and NATO include two sustained deployed of 500-1500 personnel where Canada could be the lead nation, a limited deployment of the same size, two sustained deployments of 100-500 personnel, two limited deployments of the same size, a Disaster Assistance Response Team (DART), and a Non-Combatant Evacuation Operation (NEO) team⁴². These personnel limits, in conjunction with the CAF's deployment record since the 2000s, indicate that the largest manoeuvre echelon the CAF could provide to expeditionary warfighting operations is a brigade. This formation is not inherently joint and does not necessitate the training and validation of a Joint Force Commander.

In contrast to CAF Force Employment, the US Army perspective is that a corps is the optimal echelon to achieve convergence with Army and joint capabilities⁴³, a C2 structure two levels higher than a brigade. A US Army division is the principal tactical warfighting formation and the lowest tactical echelon that would employ capabilities from multiple domains, and this is likely limited to large-scale combat operations⁴⁴.

⁴² "Execution - Defence Plan 2018-2023," , accessed 26 Mar 2023, <https://www.canada.ca/en/department-national-defence/corporate/reports-publications/defence-plan-2018-2023/execution.html>.

⁴³ Department of the Army, *FM 3-0 Operations* (Washington, D.C.: Department of the Army, 2022), 2-19.

⁴⁴ *Ibid.*, 2-19.

As Morton Desmond has remarked, Canada offers little utility when it comes to joint capability due to its size⁴⁵, and in some instances may be unhelpful in advancing jointness⁴⁶. For a brigade to train effectively, an information-rich environment at the higher levels is required for the brigade to process, plan, and act against. The study of the CAF BMS problem has exposed the much larger issue where the modernization of C5ISR will be challenged due to the fact that the CAF is unable to develop its tools because it does not have the requisite mandate nor doctrine to define its business processes for joint warfighting.

A BIGGER PROBLEM THAN C5ISR

Extrapolating the post-mortem analysis conducted by Small brings into focus a critical gap in CAF doctrine and organizational structure. The next examination will be into why there is such a disconnect between CAF doctrine and CAF organizational structure, its implications, and what key considerations exist to inform modernization efforts.

The CAF's Missing Operational Level

CAF “jointness” requires a large commitment from Canada, far larger than what can be assumed by the CAF itself. The force structures required for the CAF to achieve jointness reside at the operational levels of warfare. At the operational level, joint planning connects the strategic end state to a campaign designed by the Joint Force

⁴⁵ Desmond Morton and McGill Institute for the Study of Canada, *Understanding Canadian Defence* (Toronto: Penguin Canada, 2003), 209.

⁴⁶ Daniel Vincent and Canadian Forces College, *The Canadian Armed Forces are Not Joint (Yet): An Institutional Analysis of Canadian Jointness* (Toronto, Ont.: Canadian Forces College, 2019), 16.

Commander (JFC) and their staff⁴⁷. This campaign design synchronizes the tactical actions⁴⁸ of interdependent service capabilities to ensure they are aligned with the desired strategic result.

Ian Hope has stated that doctrine-based militaries in peacetime use written doctrine to translate national strategic aims into coherent operational-level concepts that drive capability development⁴⁹. In warfighting, doctrine acts as, “the link between strategic war plans and tactical actions⁵⁰”. Hope posits that the Canadian Army is not doctrine-based but, in fact, capabilities-based as Canada’s strategy for its military is not derived from war plans but instead, from fiscal, material, and political restraints⁵¹.

The CAF’s combat platforms are largely determined by what Canada can afford and this dictates the CAF’s operational commitments⁵². The Canadian approach to defence policy generation has even been characterized as “Walmart Style” due to the tendency to rationalize spending to point of expending only the bare minimum to be admitted into the “international club”⁵³.

With missing force structures at the operational level, the CAF relies on allies or coalition partners to fulfill the functions expected of higher echelons above the brigade

⁴⁷ Department of the Army, *FM 3-0 Operations*, 2-13.

⁴⁸ J. H. Vance, ed., *Tactics without Strategy Or Why the Canadian Forces do Not Campaign*. (Kingston: Canadian Defence Academy Press, 2005), 271-292., 287.

⁴⁹ Ian Hope, "Misunderstanding Mars and Minerva: The Canadian Army's Failure to Define an Operational Doctrine," (December 22, 2001). <https://apps.dtic.mil/sti/citations/ADA382024>, 40.

⁵⁰ *Ibid.*, 40.

⁵¹ *Ibid.*, 41.

⁵² *Ibid.*, 41.

⁵³ Christian Leuprecht and Joel J. Sokolsky, "Defense Policy “Walmart Style”," *Armed Forces & Society* 41, no. 3 (2015), 541-562. doi:10.1177/0095327X14536562. <https://doi-org.cfc.idm.oclc.org/10.1177/0095327X14536562>, 544.

level, traditionally fulfilled by a NATO ally⁵⁴. With this employment construct, uniquely Canadian operational doctrine for full spectrum warfighting may not be a hard requirement, but examples from Canada's past uncover a lost skillset practiced during the Cold War. The Corps 86 concept envisioned an independent Canadian Mechanized Brigade Group as part of a theoretical NATO corps within the NATO operational framework⁵⁵. This doctrine allowed the Army to produce a coherent force development plan based on fighting a defensive battle in central Europe⁵⁶ but this doctrine is no longer practiced in the CAF.

It is evident that in order for the CAF to effectively integrate decision-makers into the operational level in a coalition, these decision-makers must be well-versed in both the operational level doctrine of the lead nation⁵⁷, as well as, that particular doctrine's application within the Canadian strategic and tactical contexts. Jonathan Vance contends that this is an "entirely reasonable" approach since Canadian strategic objectives are not at all concerned with Canadian tactical performance, but the political advantage that comes from being seen to participate⁵⁸. Vance also emphasizes that this approach means that whatever the Canadian contribution is to a coalition, it must first be acceptable to the Canadian public, and must also be acceptable to Canada's military partners⁵⁹.

⁵⁴ Hope, "Misunderstanding Mars and Minerva: The Canadian Army's Failure to Define an Operational Doctrine," , 40.

⁵⁵ *Ibid.*, 10.

⁵⁶ *Ibid.*

⁵⁷ *Ibid.*, 45.

⁵⁸ Vance, ed., *Tactics without Strategy Or Why the Canadian Forces do Not Campaign.*, 271-292, 286.

⁵⁹ *Ibid.*, 286.

This revelation presents two key conditions for the potential solution that mitigates the CAF's jointness problem. As the CAF prioritizes capabilities to modernize, these capabilities must satisfy the first condition that it will survive scrutiny from the Canadian public. The second condition that this capability must satisfy is that it is a relevant and value-added capability desirable for our military partners, that is, it must achieve a level of burden-sharing in the coalition.

The Elephant in the Room – Pan Domain Operations

NATO's adversaries continue to observe the West's actions and evolve their strategies. Anti-Access and Area Denial (A2AD) has become one of the most popular military strategies adopted to deter and counter Western forces from approaching their territories⁶⁰. This is accomplished through creating a layered standoff, or buffer zone, using integrated air defence systems (IADS), ballistic missiles, maritime forces both surface and sub-surface, and most notably, information, space, cyber, and electronic warfare (EW) capabilities⁶¹.

To meet this new paradigm, the US Joint Chiefs of Staff have developed doctrine accordingly to re-align all their instruments of national power, going so far as to update the traditional DIME model to the MIDFIELD (Military, Informational, Diplomatic, Financial, Intelligence, Law, and Development) concept in order to “convey a much broader array of options for strategic use”⁶². This is the core concept behind Multi Domain Operations (MDO).

⁶⁰ Aziz Erdogan, "Russian A2AD Strategy and its Implications for NATO," *Horizon Insights* (June 1, 2018). <https://behorizon.org/russian-a2ad-strategy-and-its-implications-for-nato/>.

⁶¹ *Ibid.*

⁶² Department of Defense, *Joint Doctrine Note 1-18 Strategy* Joint Force Development, 2018), viii.

Other NATO allies, such as the United Kingdom, have followed suit with the UK Ministry of Defence (MoD) publishing their Integrated Operating Concept that drives the MoD Strategic Command's approach to Multi Domain Integration (MDI). Additionally, while not yet at the Whole of Government (WoG) level, the Australian Army has released the Accelerated Warfare Statement⁶³, resonant with the same concepts espoused in US MDO.

The Canadian equivalent will be known as Pan-Domain operations with a Pan-Domain Force Employment Concept (PFEC) in draft, awaiting national level approvals. As of the writing of this project, the PFEC is only available to the Canadian Defence Academy for discussion. Aligned to the US MDO and UK MDI concepts, the PFEC will challenge the CAF to consider new perspectives in the application of military capabilities across all domains of national power⁶⁴. This is undoubtedly a novel approach for Canada and will require buy-in from the WoG.

The subsequent question becomes, *Can Canada achieve Pan-Domain awareness if the CAF hasn't mastered joint?* In an interview with the Association of the U.S. Army, Lieutenant-General Eric Wesley, Deputy Commander of the Futures and Concepts Center, United States Army Futures Command, remarked that "you can't fight MDO if the joint force isn't well integrated⁶⁵". Wesley stressed that the joint force operating in an integrated manner was fundamental and the lens of which MDO 2028 was developed⁶⁶.

⁶³ Rick Burr, *Accelerated Warfare Statement* (Australian Army, 2020), 1.

⁶⁴ Department of National Defence, *Pan-Domain Force Employment Concept - Prevailing in a Dangerous World (Draft)* (Ottawa: CJOC, 2022e), 4.

⁶⁵ Daniel Roper, *Army Matters Special Edition: Multi-Domain Operations – Joint and Allied Integration (Podcast)* (Association of the U.S. Army, 2019).

⁶⁶ *Ibid.*

This presents a real challenge to CAF modernization that requires clearly articulated doctrine and organizational structures to inform and prioritize the most urgent capability domains to develop. Without a strong joint foundation, the leap to Pan-Domain awareness may prove impossible within a strictly Canadian force structure. One possible mitigation is leveraging the CAF's ambition to digitalize through the Digital Transformation Campaign Plan and its ambition to develop, train, and equip a digital force with Pan-Domain Operations as part of its core design.

THE VOODOO MAGIC OF DIGITAL TRANSFORMATION

From the perspective of digital practitioners across the CAF, the release of the CAF's Digital Campaign Plan in 2022 was much anticipated and a welcomed acknowledgement of the Digital Transformation challenge the DND was facing. Despite this acknowledgement, many significant obstacles lie ahead with no clear solution in sight, challenging the success of the CAF's digital ambition.

What is Digital Transformation?

Many in the CAF still believe that Digital Transformation is the act of leveraging emerging and disruptive technologies to maximize efficiency; this is a limited understanding of the concept. Digital Transformation is not simply the acquisition and integration of new technologies, but is a transformation of an organization's people⁶⁷,

⁶⁷ Haroon Abbu et al., "Measuring the Human Dimensions of Digital Leadership for Successful Digital Transformation: Digital Leaders can use the Authors' Digital Leadership Scale to Assess their Own Readiness and Ability to Accelerate Digital Transformation," *Research Technology Management* 65, no. 3 (2022), 39-49., 39.

culture⁶⁸, structure⁶⁹, and most importantly, a fundamental transformation of its core business processes⁷⁰.

Transformation does not look like business-as-usual but the discovery of novel processes and new organizational competencies⁷¹. In a survey of over 4,800 executives from businesses spread across 129 countries and 27 industries, MIT Sloan Management Review and Deloitte found that digitally immature organizations will focus on individual, non-integrated, technologies and have digital strategies focused mainly on operations⁷². Conversely, they found that digitally mature businesses developed strategies aimed at transforming the entire business⁷³ that fundamentally change the business processes across the whole organization. Sean Roche, formerly the first Deputy Director for Digital Innovation at the Central Intelligence Agency (CIA) described the concept in an interview as retiring the old 1968 Chevy Camaro in favour of a brand-new Tesla. The notion of fixing the carburetor is no longer valid as none exist⁷⁴.

⁶⁸ Nataliia Trushkina et al., "Digital Transformation of Organizational Culture Under Conditions of the Information Economy," *Virtual Economics* 3, no. 1 (Jan 27, 2020), 7-38. doi:10.34021/ve.2020.03.01(1). <https://doaj.org/article/93b857cf3edf4bf593c958d9e2e572ee..> 9.

⁶⁹ Malte Ackermann, Sabrina Schell and Susanne Kopp, "How Mercedes-Benz Addresses Digital Transformation using Holacracy," *Journal of Organizational Change Management* 34, no. 7 (Nov 9, 2021), 1285-1299. doi:10.1108/JOCM-12-2020-0395. <https://www.emerald.com/insight/content/doi/10.1108/JOCM-12-2020-0395/full/html..> 1287.

⁷⁰ Alessia Correani et al., "Implementing a Digital Strategy: Learning from the Experience of Three Digital Transformation Projects," *California Management Review* 62, no. 4 (Aug 2020), 37-56. doi:10.1177/0008125620934864. <https://journals.sagepub.com/doi/full/10.1177/0008125620934864..> 37.

⁷¹ Javis Ebua Otia and Enrico Bracci, "Digital Transformation and the Public Sector Auditing: The SAI's Perspective," *Financial Accountability & Management* 38, no. 2 (2022), 252-280. doi:<https://doi.org/10.1111/faam.12317>. <https://doi.org/10.1111/faam.12317..> 257.

⁷² Gerald C. Kane et al., "Strategy, Not Technology, Drives Digital Transformation," *MIT Sloan Management Review and Deloitte University Press* 14, no. 1-25 (2015)., 1.

⁷³ *Ibid.*, 3.

⁷⁴ David Perry, *Lessons Learned on Digitization (Podcast)* (Canadian Global Affairs Institute, 2022).

For warfighters, this means the Digital Transformation comes down to the application of new ideas and new institutions, combined with well-trained and well-educated people⁷⁵; the technologies alone are not decisive, but it is the new ways of thinking and the new ways of organizing that are⁷⁶.

Why Digital Transformation for the CAF?

The threats to Canada's, and the West's, way of life is not restrained to the traditional warfighting domains of land, sea, and air⁷⁷. Canadians need to have confidence that their military can adequately defend their interests in an ever-changing world. Grey zone activities below the threshold of war require a robust approach in the traditional domains, as well as in non-traditional domains for threats to be effectively detected, disrupted, defended, or deterred⁷⁸.

The US's technological supremacy is convincingly being contested by autocratic rivals, as China gains momentum with their integrated approach to technology, weapons, and economic development⁷⁹. Chinese national policies such as "Made in China 2025"

⁷⁵ Mick Ryan, *War Transformed: The Future of Twenty-First-Century Great Power Competition and Conflict* (La Vergne: Naval Institute Press, 2022), 5.

⁷⁶ *Ibid.*, 154.

⁷⁷ C. J. J. Mialkowski, "Modernizing for Future Conflict," *Canadian Army Today* 16 Jan, 2022. <https://canadianarmytoday.com/modernizing-for-future-conflict/>.

⁷⁸ HM Government, *Global Britain in a Competitive Age the Integrated Review of Security, Defence, Development and Foreign Policy* Government of the UK,[2021]), 69.

⁷⁹ Dennis J. Blasko, "'Technology Determines Tactics': The Relationship between Technology and Doctrine in Chinese Military Thinking," *Journal of Strategic Studies* 34, no. 3 (Jun 1, 2011), 355-381. doi:10.1080/01402390.2011.574979. <https://www.tandfonline.com/doi/abs/10.1080/01402390.2011.574979>, 355.

and “Artificial Intelligence Development Plan” seek to achieve Chinese technological independence⁸⁰ and elevate China to the world leader of Artificial Intelligence by 2030⁸¹.

As retired Australian Major-General Mick Ryan states in his book, *War Transformed*, early adopters of this evolving technology while in its nascent state will gain a significant military advantage in future warfare⁸². It is in this context that Canada, and its allies, must defend their national prosperity, prosperity that is based on the stability of the Rules Based International Order (RBIO)⁸³. As stated by General Wayne Eyre, the Chief of Defense Staff, failure for Canada to work with our allies in doing so will mean that Canada’s reputation will suffer⁸⁴.

Yet Canadians puzzlingly appear to be unwilling to compete in this milieu and the damage to the nation’s reputation is evident. A leak revealed that the US has assessed Canada to have widespread military deficiencies which are causing harm to Canada’s ties with its security partners and allies⁸⁵. Furthermore, pursuing Digital Transformation is not just a question of a nation’s external reputation but of public trust in government. The Organisation for Economic Co-operation and Development (OECD) stated in their

⁸⁰ Nitin Agarwala and Rana Divyank Chaudhary, “‘Made in China 2025’: Poised for Success?” *India Quarterly* 77, no. 3 (Sep 1, 2021), 424-461. doi:10.1177/09749284211027250. <https://journals.sagepub.com/doi/full/10.1177/09749284211027250>, 424.

⁸¹ Huw Roberts et al., “The Chinese Approach to Artificial Intelligence: An Analysis of Policy, Ethics, and Regulation,” *AI & Society* 36, no. 1 (2021), 59-77. doi:10.1007/s00146-020-00992-2. <https://link.springer.com/article/10.1007/s00146-020-00992-2>, 59.

⁸² Ryan, *War Transformed: The Future of Twenty-First-Century Great Power Competition and Conflict*, 154.

⁸³ Murray Brewster, “As 2023 Dawns, Canada’s Top Soldier Confronts a Long List of Worst-Case Scenarios,” *Cbc3* Jan, 2023a. <https://www.cbc.ca/news/politics/wayne-eyre-year-end-interview-1.6695469>.

⁸⁴ *Ibid.*

⁸⁵ Amanda Coletta, “Trudeau Told NATO that Canada Will Never Meet Spending Goal, Discord Leak Shows,” *The Washington Post* 19 Apr, 23. <https://www.washingtonpost.com/national-security/2023/04/19/canada-military-trudeau-leaked-documents/>.

Framework for Digital Talent in the Public Sector that a proactive approach to developing a digital workforce is critical for building public trust⁸⁶.

Beyond power and competition, Digital Transformation has tangible benefits for the warfighter. US DoD has prominently used the Uber rideshare analogy to describe the desired end state for the US Air Force led development of Joint All-Domain Command and Control (JADC2)⁸⁷. This analogy likens a military target and its persecution by a weapons system to an Uber rider and Uber driver, respectively. The rider requests a ride, and the Uber algorithm selects the optimal driver based on sensor data collected by both parties' cellphones. In the same way, a commander selects a target and algorithms select the optimal asset, kinetic or non-kinetic, to engage the target⁸⁸. This level of integration can only be accomplished with a common data platform that has high availability in which all sensors and actors are connected to.

In 2022, during an interview with Canadian Army Today, Major General Mialkowski, Deputy Commander CA, stated that the current field force structure is based on Cold War-era threat concepts and that Canadian Army Modernization will re-structure forces under the concept of Adaptive Dispersed Operations (ADO)⁸⁹. The main thrust of the ADO concept is the rapid aggregation of a dispersed land force to dominate the battlespace in a point in time⁹⁰. The dispersion of small land elements serves to provide

⁸⁶ OECD, *The OECD Framework for Digital Talent and Skills in the Public Sector* (Paris: OECD Publishing,[2021]), 6.

⁸⁷ John R. Hoehn, *Congressional Research Service Report: 'Joint all-Domain Command and Control - Background & Issues for Congress'* Congressional Research Service,[2022]), 1.

⁸⁸ *Ibid.*

⁸⁹ Mialkowski, "Modernizing for Future Conflict,"

⁹⁰ Department of National Defence, *Land Operations 2021 : Adaptive Dispersed Operations : The Force Employment Concept for Canada's Army of Tomorrow* (Kingston, Ont: Directorate of Land Concepts and Design, 2007), 21.

situational awareness over a larger area, are harder to detect, and increases their survivability⁹¹. The key to enabling this is the ability for manoeuvre elements to be networked⁹², both internally within its tactical elements and externally with allies, to facilitate the constant communication required to effectively gather, process, and understand information faster than the adversary⁹³.

Although the Canadian Army adopted this concept in 2007 with the publishing of *Land Operations 2021: Adaptive Dispersed Operations*, the Army does not yet have this capability. This method of warfare is proven to still be effective by way of the Ukrainian forces' excellent performance against the Russian invasion of 2022, as remarked by Lieutenant-General Paul, Commander CA, in a separate interview with Canadian Army Today⁹⁴.

Digital Transformation will “elevate the trade craft⁹⁵” not only for the land force, but for all elements across the department. Roche recounts the CIA's struggle, untangling the various IT systems that buried its analysts in data, forming silos of information and processes along the limits of a particular system. It was estimated that 60% of an analyst's time was spent gather data and converting and formatting data, but a conscious shift to a private, top-secret, cloud in 2013 produced time-saving effects that led to transformative reorganizations two years later⁹⁶. The streamlining of processes, the

⁹¹ Department of National Defence, *Land Operations 2021 : Adaptive Dispersed Operations : The Force Employment Concept for Canada's Army of Tomorrow*, 21.

⁹² *Ibid.*, 22.

⁹³ Mialkowski, "Modernizing for Future Conflict,"

⁹⁴ "From Ukraine with Urgency: How the Lessons of Conflict are Shaping the Army Agenda." *Canadian Army Today* 31 Jan, 2023. <https://www.canada.ca/en/army/services/line-sight/articles/2023/01/from-ukraine-with-urgency.html>.

⁹⁵ Perry, *Lessons Learned on Digitization* (Podcast)

⁹⁶ *Ibid.*

automation of data collection, and the automation of data formatting will undoubtedly increase efficiency, but the increase of situational awareness across the department will also positively impact effectiveness. So, what's stopping the CAF?

Obstacles to Digital Transformation

The CAF's Digital Campaign Plan in its current state is aspirational at best. Like *Land Operations 2021*, almost two decades later, the Army is still struggling to implement strategy that was innovative for its time. In a study conducted by the University of California Berkley on three major firms undergoing digital transformation, including the cellular giant Vodafone, UC Berkley found that a leading reason for failure in transformation is a disconnect between strategy formulation and strategy implementation⁹⁷. The transformation strategy must define the guiding objectives for the creation and appropriation of value, or otherwise the core business processes, while implementation must translate the objectives to a concrete plan consisting of a set of actions⁹⁸.

Along this front, the CAF, DND, and Government of Canada (GoC) are exhibiting cohesion issues in organizational structure and governance as multiple organizations are moving on different vectors simultaneously. This section will address the deficiencies with organizational cohesion at the levels of government, department, and the Armed Forces.

⁹⁷ Correani, "Implementing a Digital Strategy: Learning from the Experience of Three Digital Transformation Projects," 37-56, 38.

⁹⁸ *Ibid.*

As the Berkley study highlighted, effective strategy implementation requires a cohesive, holistic approach, with well-defined objectives and scope. Viewing the scope from the perspective of organizational structure, the challenge begins at the government level as the GoC program does not appear to be concerned with national security or defense matters. Released in 2022, Canada's Digital Government Strategy and associated roadmap⁹⁹ demonstrates a narrow focus on only the digital service delivery of government services to Canadians. This is critically important to gain and maintain the public trust as previously mentioned by the OECD framework¹⁰⁰ and sets the tone for other governmental department as reflected in the digital initiatives for the Department of Justice¹⁰¹. However, Canada's Digital Transformation Office is established under the Treasury Board Secretariat of Strategic Communications and Ministerial Affairs¹⁰². Reminiscent of a public affairs organization, and neither a function of capability nor technology development, the CAF must look elsewhere for its strategic guidance with respect to national defence and security.

At the Department level, the Deputy Minister and CDS mutually issued the *DND and CAF Data Strategy* in 2019, a vital piece of guidance defining high-level roles for the ADMs¹⁰³, as well as a short glossary of definitions. Consistent with the findings of the Berkley study, the articulation of an organization's relationship with data and the

⁹⁹ "Canada's Digital Government Strategy," last modified 29 Mar, accessed 1 Apr, 23, <https://www.canada.ca/en/government/system/digital-government/digital-government-strategy.html>.

¹⁰⁰ OECD, *The OECD Framework for Digital Talent and Skills in the Public Sector*, 6.

¹⁰¹ Department of Justice, *Digital Transformation Strategy 2021-24* Minister of Justice and Attorney General of Canada, (2022).

¹⁰² "About the Digital Transformation Office," last modified 20 Jun, accessed 5 Apr, 23, <https://www.canada.ca/en/government/about/about-digital-transformation-office.html>.

¹⁰³ Department of National Defence, *The Department of National Defence and Canadian Armed Forces Data Strategy* Department of National Defence, (2019b), 19.

identification of organizational roles is a crucial element to transformation¹⁰⁴. The glossary of the *DND and CAF Data Strategy* also provides the beginning of a common lexicon for Digital Transformation, without which would hinder the ability for objective discussion¹⁰⁵. Although a valuable tool, there is still much to expand as when compared to the gold standard for digital services lexicon which is the NATO Consultation, Command, and Control (C3) Taxonomy. NATO C3 Taxonomy provides a generic framework across the alliance that defines digital services based on core business processes¹⁰⁶ and serves to establish a common understanding of business processes across NATO partners.

Although still nascent, a missing piece of this strategy is what Roche would describe as the “data curation” strategy, which is the ability to understand the life-cycle, destination, and accountable entities across enterprise process¹⁰⁷. This requires a holistic understanding of the digital workflows within the DND and its gaps and contact points internally and externally with Other Government Departments (OGDs). This monumental task remains to be completed but is critical in building, the much-overused term, “digital fabric” of the DND. This level of understanding is not to be confused with the DND’s legal obligations with the retention and protection of data and information systems prescribed in the 6000 series of the Defence Administrative Orders and

¹⁰⁴ Correani, "Implementing a Digital Strategy: Learning from the Experience of Three Digital Transformation Projects," , 37-56, 45.

¹⁰⁵ Christian Bartelheimer et al., "Systematizing the Lexicon of Platforms in Information Systems: A Data-Driven Study," *Electronic Markets* 32, no. 1 (Mar 1, 2022), 375-396. doi:10.1007/s12525-022-00530-6. <https://link.springer.com/article/10.1007/s12525-022-00530-6>, 392.

¹⁰⁶ North Atlantic Council, *Consultation, Command and Control Board (C3B) C3 Taxonomy Baseline 5.0*, 2021), 7.

¹⁰⁷ Perry, *Lessons Learned on Digitization (Podcast)*

Directives (DOADs). Instead, a department-wide data curation strategy requires enterprise-wide workflow mapping drawn from a deep understanding of the Department's business processes and supporting data structures, a skillset in short supply.

As of 2017, the Strategic Joint Staffs' authority assignments for information systems has outlined 29 different information system components operating in the CAF¹⁰⁸. The ability to map these workflows must be driven by commanders, who understand their core business processes, and supported by systems engineers who understand the underlying technical means. This is a complex and daunting task, but not impossible to complete, as in the example provided by Roche, the CIA had to conduct agency-side system rationalization in order to realize the full potential of the data residing on multiple bespoke systems¹⁰⁹.

Continuing the analysis of the department level, the Deputy Minister introduced the Digital Transformation Office on December 6, 2022. This is a dramatic reorganization of several Assistant Deputy Minister (ADM) level organizations, including ADM (Data, Innovation, Analytics), ADM (Information Management) (IM)¹¹⁰, and the Directorate of Knowledge and Information Management¹¹¹. This is more welcomed news for Digital Transformation practitioners, but with such a significant structural change, it is unlikely that guidance and direction, which aligns the Department and CAF to government

¹⁰⁸ Department of National Defence, *DND/CAF Communications and Information Systems (CIS) Authority Assignments*, A-1.

¹⁰⁹ Perry, *Lessons Learned on Digitization* (Podcast)

¹¹⁰ ADM (Information Management) has been re-named ADM (Chief Information Office) as part of the DND Digital Transformation effort.

¹¹¹ "Message from the Deputy Minister regarding the Digital Transformation Office," last modified 6 Dec, accessed 3 Feb, 23, <https://www.canada.ca/en/departement-national-defence/maple-leaf/defence/2022/12/message-deputy-minister-digital-transformation-office.html>.

objectives, will be produced in a timely manner. Therefore, the CAF must again, look elsewhere for guidance in the interim.

Finally, at the CAF level, the Vice Chief of Defence (VCDS) is the champion for Digital Transformation¹¹². The Chief of Combat Systems Integration, reporting directly to the VCDS, has been entrusted as stewards of the seminal *CAF Digital Campaign Plan* and is appointed the lead of the Operational Data Domain¹¹³.

Conditions for success remain ambiguous. At all levels, the objectives, workflows, and policy interpretation are unclear as to the nature of the relationship between the digital champions, resulting in an unanchored CAF strategic vision outlined in the *CAF Digital Campaign Plan*. This relationship needs to be defined as a survey of Ukrainian business conducted in 2020 found that cohesion in vision, information exchange, transparency, and cooperative interaction among departments were indicators of successful transformation¹¹⁴.

From a CAF governance perspective, a lack of cohesion can be observed in the individual services' release of Force Development strategies. At the operational levels, the individual services have developed isolated Future Employment Concepts (FOCs) or modernization strategies of diverging priority. Just a cursory look at the sequence of which these guiding documents were released, highlights its disjointedness. In the absence of an overarching Digital Transformation strategy, the Royal Canadian Navy (RCN) and Royal Canadian Air Force (RCAF) released their future operating concepts,

¹¹² Pavelic, "Operational Decisions at the Speed of Relevance,"

¹¹³ *Ibid.*

¹¹⁴ Trushkina, "Digital Transformation of Organizational Culture Under Conditions of the Information Economy," , 7-38, 26.

*Leadmark 2050*¹¹⁵ and *Future Air Operating Concept*¹¹⁶, both in 2016. Following this, in 2019, the Canadian Special Operations Forces Command (CANSOFCOM) released their *Future Operating Concept Handbook*¹¹⁷ and in 2020, the CA released the fourth edition of the *Canadian Army Modernization Strategy*¹¹⁸. The follow-up digitally focused *Canadian Army Digital Strategy* was released in 2022, but before the *CAF Digital Campaign Plan*, and this strategy document is the only Force Development strategy that mentions the CAF-level guidance¹¹⁹. Despite the sequencing of all the separate guidance, this was certainly the correct course of action considering the amount of capital projects entering implementation that benefited from partial guidance over none at all.

As a result of this, a detailed look at the lines of effort, objectives, and mission statements across these documents makes it clear that significant realignment is required for harmonizing the overall direction of Force Development activities. Four common objectives can be identified between the Navy, Army, Air Force, and Special Operation Forces that align with the CAF's campaign plan¹²⁰. These objectives are the unanimous desire to increase Situational Awareness (SA), establish unity of effort, adopt a digital-first approach to Design and Development, and for CAF Force Development activities to enable a digitally capable CAF¹²¹.

¹¹⁵ Royal Canadian Navy, *Canada in a New Maritime World Leadmark 2050* (National Defence, 2016).

¹¹⁶ Royal Canadian Air Force, *Future Concepts Directive Part 2: Future Air Operating Concept* (National Defence and Canadian Armed Forces, 2016).

¹¹⁷ Canadian Special Operations Forces Command, "Future Operating Concept Handbook," (1 April, 2019).

¹¹⁸ Canadian Army, *Advancing with Purpose: The Canadian Army Modernization Strategy*, 4th ed. (National Defence and the Canadian Armed Forces, 2020).

¹¹⁹ Canadian Army, *Modernization Vital Ground: Digital Strategy*, 2.

¹²⁰ Jason Chor, *The CAF Digital Campaign Plan: Digital Transformation in Jeopardy (Service Paper)* (Toronto: ,[2023]), 2.

¹²¹ *Ibid.*, 6.

Upon further comparison of the services' objectives, a deficiency within the *CAF Digital Campaign Plan* is uncovered. Although a Line of Effort (LoE) for the campaign plan is to enable Pan-Domain Operations¹²², a core tenant of MDO that is the WoG approach¹²³, is missing and instead focuses on integration only at the CAF level. The individual CAF services work and rely heavily with OGDs and other instruments of national power in both domestic and expeditionary operations. In particular, Aid to Civil Power and Search & Rescue operations necessitate integration of RCAF and RCN force elements with the Canadian Coast Guard, federal, provincial, and municipal governments^{124,125}. All services leverage Defence Research and Development (DRDC) Canada, academia, and industry^{126,127}. Clearly the cohesive vision across all services is lacking and, more importantly, buy-in at the governmental levels.

If the gravity of the Digital Transformation problem at hand is to be taken seriously, CCSI must be empowered to monitor, enforce, and enshrine the *CAF Digital Campaign Plan* across Force Development activities across the CAF. This will need to be reflected in the following implementation plans among the services.

¹²² National Defence and the Canadian Armed Forces, *Canadian Armed Forces Digital Campaign Plan*, 17.

¹²³ Department of the Army, *FM 3-0 Operations*, 6-19.

¹²⁴ Royal Canadian Air Force, *Future Concepts Directive Part 2: Future Air Operating Concept*, 19.

¹²⁵ Royal Canadian Navy, *Canada in a New Maritime World Leadmark 2050*, vi.

¹²⁶ Canadian Army, *Modernization Vital Ground: Digital Strategy*, 18.

¹²⁷ Canadian Special Operations Forces Command, "Future Operating Concept Handbook," , 18.

CONCLUSION

In an article reported by the CBC, Canada's Chief of Defence Staff, General Eyre stated that, "The military we have today is not the one we need for the future"¹²⁸, necessitating the urgency for the CAF to undergo modernization. A review of DND capital projects brings to light the centrality of C5ISR and the technology buttressing this modernization. Without stringent adherence to a department-level modernization strategy that enables information sharing at all levels, the outcome of these modernization initiatives is brought into question.

Digital Transformation in itself is not voodoo magic that will drive CAF modernization efforts. Digital Transformation and digitalization are merely the pre-requisites to withstand the threats of the future operating environment, informed by Canada's closest allies and their MDO ambitions. MDO, characterized by a Whole-of-Government approach, exposes the Government of Canada's lack of strategic vision, manifesting in a lack of alignment in organizational structure and cohesion in digital governance at all levels. The DND, without clarity regarding national-level digital objectives, fights an uphill battle to prioritize and spend the funds allocated to its capital programs outlined in SSE. The CAF, who has never been mandated to lead operational-level campaigns, struggles to identify its digital priorities, resulting in ineffective and irrelevant Command and Control applications developed at the tactical levels.

¹²⁸ Murray Brewster, "Military Personnel Shortage Will Get Worse before it Gets Better, Top Soldier Says," *CBC News* 6 Oct, 2022. <https://www.cbc.ca/news/politics/eyre-shortage-directive-1.6608107>.

In this milieu, the CAF must navigate, identify, and develop both its digital and force modernization aspirations. Knowing that the acquisition of new technology alone will not modernize the CAF, the ensuing question becomes, *is there a capability framework that will enable the CAF to bridge its doctrinal gaps, provide experience, and facilitate its modernization?* Furthermore, this investment must also survive not only the scrutiny of the political class, but the scrutiny of the Canadian public and Canada's security partners.

The following chapter will analyze two future scenarios to draw key considerations in which this capability framework must address in addition to the considerations identified in this chapter.

CHAPTER TWO: EXAMINATION OF THE FUTURE ENVIRONMENT

No less than in the past, the “rest” beyond the G20 has to be convinced that order allows universal benefits. No less than in the past, irresponsible actions of great power—both old and new—have to be restrained.

– Andrew F. Cooper¹²⁹

INTRODUCTION

In October 2022, the CDS, General Eyre, told a Commons committee that the West was already at war with China and Russia. Eyre stated that it was “a year like no other in my career” and that the future will look back at 2022 as, “a turning point in the global order”¹³⁰. Eyre further expanded that in this great power competition, Canada’s security guarantee of its North was “tenuous”, meanwhile the CBC remarked that it was unprecedented to hear the CDS speak so uncompromisingly in a public forum¹³¹. This sentiment is supported by the former Commander of the CA, retired Lieutenant-General Leslie, who added in a CBC interview that, “the world is much more dangerous than it’s been in any other time during my lifetime, far more dangerous than the Cold War¹³²”. Additional reinforcement can be found from the former Singaporean Permanent Representative to the United Nations and Distinguished Fellow at the Asia research

¹²⁹ Andrew F. Cooper, "Testing Middle Power's Collective Action in a World of Diffuse Power," *International Journal (Toronto)* 71, no. 4 (Dec 1, 2016), 529-544. doi:10.1177/0020702016686384. <https://www.jstor.org/stable/26414056>, 544.

¹³⁰ Murray Brewster, "As 2023 Dawns, Canada's Top Soldier Confronts a Long List of Worst-Case Scenarios," *CBC News* 3 Jan, 2023b. <https://www.cbc.ca/news/politics/wayne-eyre-year-end-interview-1.6695469>.

¹³¹ *Ibid.*

¹³² Murray Brewster, "More than a Decade Ago, the Army had a Plan to Rebuild. it Went Nowhere," *CBC News* 7 Jan, 2023c. <https://www.cbc.ca/news/politics/canadian-armed-forces-equipment-procurement-ukraine-latvia-1.6706444>.

Institute, Kishore Mahbubani , who declared “that history has turned a corner” and that the 2020 COVID-19 pandemic marked the beginning of the “dawn of the Asian century”.

As early as 2014, the CAF acknowledged this trend in its *Future Security Environment 2013-2040*, proclaiming that power in national forms such as economic, political, and military will be much more diffuse in the future¹³³. NATO’s *Strategic Concept 2022* forecasted that authoritarian actors would increase the sophistication of their attacks through the use of cyberspace, space, information, human migration, energy and economic domains to ultimately challenge the alliance’s interests, values, and way of life¹³⁴.

The geopolitical landscape has significantly changed since the publishing of the DND’s *Future Security Environment 2013-2040* during which events such as the COVID-19 pandemic, Russian invasion of Ukraine, and technological rise of China have shaped modern norms and political discourse. Despite this, the nature of war hasn’t changed as a violent human endeavour, but what’s in constant flux is the character of war¹³⁵. As the *Future Security Environment 2013-2040* became the cornerstone to many of the CAF’s future operating concepts, this chapter aims to explore current political, sociocultural, technological, and military trends to isolate key considerations for capability development from the vantage point of CAF modernization and Digital Transformation.

¹³³ Department of National Defence, *The Future Security Environment 2013-2040* (Department of National Defence, 2014), xiii.

¹³⁴ NATO, *NATO 2022 Strategic Concept* (NATO, [2022a]), 3.

¹³⁵ Department of National Defence, *The Future Security Environment 2013-2040*, 89.

To achieve that aim, this chapter will study current trends that will have an effect out to 2040, divided into three sections. The first exploring the future possibility of an isolationist Canada where Canada's inward-focused behavioural indicators are analyzed. The second section will shift to look at the atmospherics of a greater international dialog, where the great powers are engaged in dangerous competition and Canada's position within that order. Finally, the chapter will close with extracting the military implications for a capability in which the CAF must develop to be successful in either scenario.

AN ISOLATIONIST FUTURE

The Canadian Perspective on Foreign and Defence Policy

As a key consideration outlined in chapter one, future CAF capabilities must be acceptable to Canadians. Contradictorily, the iconic quote from Ontario Liberal Member of Parliament, David Mills is a representation of the Canadian viewpoint that still holds true today:

In a country situated as we were not likely to be involved in war, and having a large demand upon our resources for ordinary public improvements, it was highly desirable to have our military affairs conducted as cheaply as possible.¹³⁶

Canadians continue to perceive that Canada has no existential threats to its direct safety and security¹³⁷. A further extrapolation of this idea from Canadian senator and member of cabinet Raoul Dandurand, is that Canadians live in a fireproof house, far from any flammable materials¹³⁸, was both pervasive in 1924 and in the recent history of

¹³⁶ House of Commons, *Debates*, [1875]), 153; quoted in Nossal (2020, p.18).

¹³⁷ Thomas Juneau, Philippe Lagassé and Srdjan Vucetic, *Canadian Defence Policy in Theory and Practice* (Cham: Springer International Publishing, 2019), 86.

¹³⁸ Adam Chapnick, "On Protocols and Fireproof Houses: The Re-Emergence of Canadian Exceptionalism," *International Journal (Toronto)* 61, no. 3 (2006), 713. doi:10.2307/40204199.

Canadian politics. National interest rests with domestic security, made possible through geography¹³⁹ and the stability of the Canada-US relationship¹⁴⁰.

With roughly 80 percent of Canada's goods, representing \$1.3 trillion Canadian dollars, being incorporated into US supply chains¹⁴¹, the Canada-US relationship is paramount to Canada's prosperity. As the US remains the only state able to project power and influence events at the global level¹⁴², the US is the implied security guarantor of Canada, further propagating the myth of a fireproof house. The effect of this is that successive governments could, and did, cut defence spending across the 1970s to mid-1990s with no consequences from the Canadian public¹⁴³.

Canadian defence policy statements are driven by a change of government and not by a change in the security environment¹⁴⁴. The current defence policy, SSE, was published in 2017 coinciding with Prime Minister Trudeau's Liberal government established in 2015, with a subsequent defence policy review anticipated for 2024. A different direction that the UK took towards defence policy was to integrate defence and foreign policy into the *Integrated Review* published in 2021 and succeeding *Integrated Review Refresh* in 2023. A more comprehensive approach, this ensures that national

¹³⁹ Juneau, *Canadian Defence Policy in Theory and Practice*, 12.

¹⁴⁰ *Ibid.*, 87.

¹⁴¹ "Canada-United States Relations," last modified 22 Mar, accessed 1 Apr, 23, <https://www.international.gc.ca/country-pays/us-eu/relations.aspx?lang=eng>.

¹⁴² Department of National Defence, *The Future Security Environment 2013-2040*, xi.

¹⁴³ Juneau, *Canadian Defence Policy in Theory and Practice*, 86.

¹⁴⁴ "Canada's Defence Policy Statements: Change and Continuity " last modified 22 Sept, accessed 19 Feb, 2023, <https://hillnotes.ca/2022/09/22/canadas-defence-policy-statements-change-and-continuity/>.

security and foreign policy objectives are aligned to better respond to “a more contested and volatile security environment¹⁴⁵”.

As with the case of SSE, the defence policy lacks the linkage to a wider WoG approach¹⁴⁶ and this creates dissonance at the operational level. The national Canadian objective at the strategic level is participation as an ends unto itself, that is, commitment of the CAF is an instrument of “alliance politics”¹⁴⁷. This was the circumstance with Canada’s contribution to the NATO campaign in Afghanistan as the Chretien, Martin, and Harper governments’ motives were to improve a faltering relationship with the US and NATO¹⁴⁸. The consequence of this motive is that national objectives are not represented at the operational level in Canada’s key alliances. Although the CAF regularly receives international recognition for their efforts, the tactical actions of the Canadian contribution to a greater allied campaign end up serving other multilateral initiatives¹⁴⁹.

The perilous implication to “alliance politics” is that governments are less concerned with the performance of the CAF or its capabilities, but more concerned with the political benefits in service of domestic politics. Canadians, in turn, rarely vote according to foreign policy platforms¹⁵⁰, despite liberal internationalism being a core

¹⁴⁵ Government of the United Kingdom, *Integrated Review Refresh 2023: Responding to a More Contested and Volatile World*, [2023]), 2.

¹⁴⁶ Juneau, *Canadian Defence Policy in Theory and Practice*, 85.

¹⁴⁷ *Ibid.*, 90.

¹⁴⁸ *Ibid.*, 86.

¹⁴⁹ *Ibid.*, 91.

¹⁵⁰ "The Peril of Ignoring Foreign Policy in Election Coverage," last modified 9 Sept, accessed 8 Mar, 23, <https://policyoptions.irpp.org/magazines/september-2019/the-peril-of-ignoring-foreign-policy-in-election-coverage/>.

component of the Canadian identity¹⁵¹. Contentious foreign policy issues, of which Canadians are ambivalent to, benefits governments that know their decisions on specific foreign policy issues will not result in electoral retribution¹⁵². As Canadian foreign policy expert, Kim Nossal, wrote in 2015, of the 41 Canadian elections since confederation, “foreign policy is not an issue that will drive electoral outcomes¹⁵³”.

In a study by Roland Paris, director of the Graduate School of Public and International Affairs at the University of Ottawa, Canadians still strongly support peacekeeping as a symbol of Canadian liberal internationalism and an example of the country’s most positive international responsibility¹⁵⁴. Even though Canada has not contributed major troop formations to UN peacekeeping in over two decades, Paris explains this as a metaphor for the Canadian desire to play a constructive international role in conflict management¹⁵⁵, a feature that Nossal reasons as part of the liberal internationalist approach¹⁵⁶.

This implies that the CAF must not only avoid using foreign policy narratives to justify capabilities, as Canadian interest are waning in such regard, but also that the capabilities being pursued must produce a visible, domestic benefit that appeals to the Canadian identity as liberal internationalists.

¹⁵¹ Roland Paris, "Are Canadians Still Liberal Internationalists? Foreign Policy and Public Opinion in the Harper Era," *International Journal (Toronto)* 69, no. 3 (Sep 1, 2014), 274-307. doi:10.1177/0020702014540282. <https://www.jstor.org/stable/24709320>, 306.

¹⁵² Kim Richard Nossal, Stéphane Roussel and Stéphane Paquin, *The Politics of Canadian Foreign Policy, Fourth Edition* (Montréal, CA: McGill-Queen's University Press, 2015), 127.

¹⁵³ *Ibid.*, 128.

¹⁵⁴ Paris, "Are Canadians Still Liberal Internationalists? Foreign Policy and Public Opinion in the Harper Era," , 274-307, 287.

¹⁵⁵ *Ibid.*, 304.

¹⁵⁶ *Ibid.*, 277.

Environmental Trends and the Arctic

The imminent effects of climate change will have significant impacts on Canadians and the CAF; this section will discuss two considerations of these effects. Briefly, the first consideration is that the current climate change trajectory will see increased demand and frequency for the CAF to conduct domestic operations in response to climate emergencies¹⁵⁷. In 2010, requests to the CAF for aid to civil power averaged two per year, that rose to four requests per year starting in 2017 and then seven requests just in 2021¹⁵⁸.

With the CAF undergoing a significant personnel shortage¹⁵⁹ and increased demand for military presence in the Indo-Pac region¹⁶⁰, the ability for the CAF to execute domestic humanitarian assistance contingency plans is unlikely to be accomplished without significant cooperation from OGDs and local governments.

The second consideration is the effect on climate change in Canada's arctic regions. *Canada's Arctic and Northern Policy Framework* claims that the Canadian North is warming at a rate three times higher than the global average¹⁶¹. Between melting sea ice and technological advancements, Canada's Arctic is becoming more accessible¹⁶², making research, minerals extraction, and the establishment of a more reliable global

¹⁵⁷ Library of Parliament, *The Canadian Armed Forces Responding to Domestic Emergencies: Some Implications* HillNotes,[2021]).

¹⁵⁸ Haley Ritchie, "Disaster Response is Straining Canada's Military. Training Citizens might be the Solution," *The Narwhal* 6 Mar, 2023. <https://thenarwhal.ca/canada-disaster-military/>.

¹⁵⁹ Brewster, "Military Personnel Shortage Will Get Worse before it Gets Better, Top Soldier Says,"

¹⁶⁰ Government of Canada, *Canada's Indo-Pacific Strategy* (Ottawa: His Majesty the King in Right of Canada,[2022a]).

¹⁶¹ Government of Canada, *Canada's Arctic and Northern Policy Framework* Her Majesty the Queen in Right of Canada,[2019]), 4.

¹⁶² *Ibid.*, 4.

shipping route a substantial opportunity to boost Canadian prosperity if managed appropriately.

An accessible and prosperous Arctic is undeniably favourable for Canadians, but paradoxically, the harshness of Canada's North is one of the key enablers for Canada's strategic security. With a ground invasion unlikely to succeed in such a demanding environment, Canada's northern flank is secured at little cost. With a long history of Canadian neglect of its the Arctic region¹⁶³, it was the US military that viewed this territory as critical for the defence of the US mainland against the threat of Soviet long-range bombers and ballistic missiles¹⁶⁴.

Fearing the prospect of de facto US control of Canadian territory¹⁶⁵, Canada and the US jointly constructed the Distant Early Warning (DEW) line in 1957¹⁶⁶ and established the North American Aerospace Defense (NORAD) Command in 1958¹⁶⁷. NORAD brought significant funding from the US to Canada, in exchange for continental defence, as well as the preservation of Canadian sovereignty¹⁶⁸. The DEW line was eventually replaced with the North Warning System in the 1980s while Ottawa's focus throughout was on maintaining the image of Canadian control of the Arctic¹⁶⁹.

¹⁶³ Adam Lajeunesse, "The Distant Early Warning Line and the Canadian Battle for Public Perception," *Canadian Military Journal (Ottawa)* 8, no. 2 (July 1, 2007).

<https://search.proquest.com/docview/225470523..>, 58.

¹⁶⁴ Juneau, *Canadian Defence Policy in Theory and Practice*, 15.

¹⁶⁵ Lajeunesse, "The Distant Early Warning Line and the Canadian Battle for Public Perception," , 53.

¹⁶⁶ *Ibid.*, 54.

¹⁶⁷ Juneau, *Canadian Defence Policy in Theory and Practice*, 15.

¹⁶⁸ *Ibid.*

¹⁶⁹ Lajeunesse, "The Distant Early Warning Line and the Canadian Battle for Public Perception," , 58.

The Russian invasion of Ukraine has re-ignited fears of direct conflict with Russia and, with the North Warning System on the verge of obsolescence¹⁷⁰, Canada has announced in June 2022 the NORAD Modernization project including an estimated \$36.6 billion (CAD) over 20 years¹⁷¹. The NORAD Modernization project will see leading-edge technological upgrades to sensors, such as over-the-horizon radar, surveillance satellites, communications systems, and weapons systems.

These upgrades will be critical in maintaining positive relations with the US and in strengthening continental security. The project also brings significant human resource costs, in the form of equipment training, procurement processing overhead, and infrastructure build, both physically and technologically, that will undoubtedly impact an already personnel-strained CAF.

Fortunately, there is a governmental-level framework that can be assessed for capability development considerations. As a response to the growing international interest in the circumpolar Arctic, the GoC released *Canada's Arctic and Northern Policy Framework* in 2019 as a collaborative effort with local governments, northerners, Indigenous governments, and OGDs including the DND. The framework provides a shared vision of economic development, research, defence, reconciliation with Indigenous groups through the strengthening of Indigenous communities, and finally, a restoration of "Canada's place as an international Arctic leader"¹⁷². The ambitious

¹⁷⁰ Paul Tukker, *The DEW Line at 65: Future Unclear for the North's Aging Radar Sites* (CQ-Roll Call, Inc, 2022).

¹⁷¹ Department of National Defence, *NORAD Modernization Project Timelines*, [2023]).

¹⁷² Government of Canada, *Canada's Arctic and Northern Policy Framework*, 2.

roadmap lays out 8 goals and 63 discrete objectives where defence themes can be extracted.

One notable theme is the desire for pan-domain awareness in the Arctic and the ability to maintain a comprehensive common operating picture, bolstered by information sharing and enhanced coordination across OGDs, government, and research partners¹⁷³. Specifically reflected in several overarching goals and subsequent objectives, stakeholders from the CAF, Royal Canadian Mounted Police, Canadian Border Services Agency, and Canadian Coast Guard seek to strengthen their shared situational awareness¹⁷⁴. Domain awareness will rely on internal cooperation from Canadian security agencies but external partnerships will also play a large role in the areas of research, economic development, and governance to realize this vision. Partnership with the scientific community and local communities will be vital in the collection and dissemination of knowledge¹⁷⁵. Research data pertaining to infrastructure monitoring, weather, and climate data collection¹⁷⁶ emphasize the requirement for a digital fabric and a WoG approach.

International partnerships are the final theme to be extracted from *Canada's Arctic and Northern Policy Framework*. Of the Arctic states, Canada is but one of eight members of the Arctic Council, with the others being Denmark, Finland, Iceland, Norway, Russia, Sweden, and the US. As of 2023, official observers of the Arctic

¹⁷³ Government of Canada, *Canada's Arctic and Northern Policy Framework*, 41.

¹⁷⁴ *Ibid.*, 41, 51, 75, 81.

¹⁷⁵ *Ibid.*, 47.

¹⁷⁶ *Ibid.*, 44.

Council include 38 nations and organizations, including China as of 2013¹⁷⁷.

International partnerships will be essential for credibility in multilateral forums¹⁷⁸ if Canada wishes to take a leadership role. A challenging role with the added complexity of geopolitical tensions as expressed by a joint Arctic Council statement, sans Russia, was released suspending council meetings indefinitely as a direct consequence of the Ukraine invasion¹⁷⁹.

China's inclusion as an Arctic Council Observer brings additional implications for Canada and the CAF. China has already been discovered using undeclared, unauthorized, dual-use sensors in sovereign airspace¹⁸⁰ and waters¹⁸¹ to monitor North American activities. David Wright, Associate Professor of History at the University of Calgary, writes in a US Naval War College article that China has spent considerable diplomatic, human, and naval capital to secure a position in the "Arctic game" to ensure access to resources and shipping routes¹⁸². With this provocative behaviour, China's impetus in the Arctic cannot be ignored and evaluation of an observer's legitimate interests will require strong diplomatic communication channels.

¹⁷⁷ "Arctic Council Observers," , accessed 18 Apr, 23, <https://arctic-council.org/about/observers/>.

¹⁷⁸ Government of Canada, *Canada's Arctic and Northern Policy Framework*, 50.

¹⁷⁹ Government of Canada, *Joint Statement on Arctic Council Cooperation Following Russia's Invasion of Ukraine* (Ottawa: Global Affairs Canada, 22).

¹⁸⁰ The Economist, "The Lessons from the Chinese Spy-Balloon," *The Economist* (London) (Feb 7, 2023). <https://www.economist.com/china/2023/02/07/the-lessons-from-the-chinese-spy-balloon>.

¹⁸¹ Robert Fife and Steven Chase, "Canadian Military found Chinese Monitoring Buoys in the Arctic," *The Globe and Mail* (Online) Feb 21, 2023. <https://search.proquest.com/docview/2778461351>.

¹⁸² David C. Wright, *The Dragon Eyes the Top of the World: Arctic Policy Debate and Discussion in China* US Naval War College Center for Naval Warfare Studies,[2011]),. 32.

Whitney Lackenbauer et al. warn of the danger from focusing too heavily on the “conflict school”¹⁸³ of domestic alarmist rhetoric in their book, *China’s Arctic Ambitions and What They Mean for Canada*. Lackenbauer et al. argue that the sole perception of China as a threat is flawed and counter-productive to maintaining Canada’s agenda in Council discussions¹⁸⁴. Linda Jakobson and Jingchao Peng state in a Stockholm International Peace Research Institute policy paper, that the Chinese Government’s interest in the Arctic is said to be:

First, to strengthen its capacity to respond appropriately to the effects that climate change in the Arctic will have on food production and extreme weather in China; second, to secure access, at reasonable cost, to Arctic shipping routes; and third, to strengthen China’s ability as a non-Arctic state to access Arctic resources and fishing waters.¹⁸⁵

China’s objectives have congruencies with Canada’s interests, and Lackenbauer et al. further suggest that in the above matters, Chinese interests can be managed and harnessed for productive purposes¹⁸⁶. China does not necessarily need the Arctic Council to pursue their national objectives¹⁸⁷ but China’s signal to join as an observer is an opportunity to include China in the global discussion and to avoid governance challenges in the future¹⁸⁸. Lackenbauer et al. suggest that this framework may even serve as a model of ocean governance for the South China Seas¹⁸⁹. A foundation of international cooperation in trade and resource development will be required for enforcing a

¹⁸³ P. Whitney Lackenbauer et al., *China’s Arctic Ambitions and what they Mean for Canada*, Vol. no. 8 (Calgary, Alberta: University of Calgary Press, 2018)., 16.

¹⁸⁴ *Ibid.*, 144.

¹⁸⁵ Linda Jakobson and Jingchao Peng, *China’s Arctic Aspirations*, Vol. 34 (Solna, Sweden: SIPRI, Stockholm International Peace Research Institute, 2012)., 1.

¹⁸⁶ Lackenbauer, *China’s Arctic Ambitions and what they Mean for Canada*, 174.

¹⁸⁷ *Ibid.*, 144.

¹⁸⁸ *Ibid.*, 152.

¹⁸⁹ *Ibid.*, 15.

sustainable regulatory framework in the Arctic as Canada is unlikely to establish these conditions on its own¹⁹⁰. Success in Canada's Arctic future requires flexibility to work with international partners both traditional and non-traditional, particularly in facilitating mutual support between the Arctic states¹⁹¹.

Lackenbauer et al. highlights the main implication for the CAF is that defence of the Arctic must be a part of a broader WoG approach, subordinate to Canada's wider Northern strategy¹⁹². The CAF must continue to develop its domain awareness, but the CAF has little value in defending sovereignty unilaterally¹⁹³ as the pertinent issues in the Arctic are not the Chinese Navy, but environmental degradation, criminal activity, search and rescue, and disaster relief¹⁹⁴. Environmental and Arctic considerations constrain the ability for Canada to respond to expeditionary operations focused on international foreign policy objectives¹⁹⁵. Without course correction, there will be a natural tendency to focus inwards due to a lack of capacity.

Canadian Defence Spending and Political Impacts

In an interview with the CBC, Canadian Foreign Affairs Minister Mélanie Joly was questioned on Canada's response to NATO General Secretary Stoltenberg's declaration that the alliance considers the 2% ratio of Gross Domestic Product (GDP) expenditure on defence as a floor and not a ceiling. Joly responded that Canada would

¹⁹⁰ Lackenbauer, *China's Arctic Ambitions and what they Mean for Canada*, 6.

¹⁹¹ *Ibid.*, 172.

¹⁹² *Ibid.*, 173.

¹⁹³ *Ibid.*

¹⁹⁴ *Ibid.*

¹⁹⁵ Library of Parliament, *The Canadian Armed Forces Responding to Domestic Emergencies: Some Implications*

“step up our game” in the upcoming policy review of SSE¹⁹⁶. This section will build upon the previous considerations regarding defence policy and dissect Canada’s defence spending behaviour to ascertain the level of Canada’s isolationism and its implications for CAF modernization.

David Perry, president of the Canadian Global Affairs Institute, asserts that for Canadian defence policy, “dollars are policy”¹⁹⁷. Perry further elaborates that capital expenditures, in particular, are an indication of the CAF’s technological level of sophistication¹⁹⁸. Historically, Canada has behaved as “easy riders” with respect to defence spending, where Canada rides the line just above “free riding” by allocating the minimum amount of its considerable treasure before being admonished by its allies¹⁹⁹. A prominent term used by Canadian defence analysis to describe this phenomenon is the “commitment-capability gap” in that the military’s allocated resources are rarely sufficient to meet Ottawa’s policy objectives²⁰⁰. This is poised to change with SSE as it is the first time a Canadian defence policy has been published with projected defence allocations²⁰¹.

The DND is at a historical precipice, where defence spending, predicated on SSE’s twenty year model beginning in 2017, is set to increase up to 70% in fiscal year 2026/2027 to \$32.7 billion (CAD)²⁰², which is an overall order of magnitude larger than

¹⁹⁶ Murray Brewster, "NATO is Getting Ready to Twist Canada's Arm on Defence Spending," *CBC News* 7 Apr, 23. <https://www.cbc.ca/news/politics/nato-canada-defence-spending-1.6804733>.

¹⁹⁷ Juneau, *Canadian Defence Policy in Theory and Practice*, 63.

¹⁹⁸ *Ibid.*, 69.

¹⁹⁹ *Ibid.*, 17.

²⁰⁰ *Ibid.*, 87.

²⁰¹ *Ibid.*, 65.

²⁰² "Canada’s Defence Policy Statements: Change and Continuity "

the decade previous²⁰³. Even with these historic increases, several challenges to Canada's spending habits exists which include the public criticism of not spending enough, and the issue of whether or not the DND can actually spend its projected allocation.

The Globe and Mail editorial board criticized Canada's lack of spending, pointing out that "Canada is by far the lowest NATO contributor" among the Group of Seven (G7) nations²⁰⁴. Published in the *Secretary General's Annual Report 2022*, NATO evaluates the Canadian contribution as 1.29% of GDP in 2022, 1.28% in 2021, and 1.42% in 2020²⁰⁵. A Library of Parliament publication released in 2022, projects GDP expenditure to 1.48% for 2024/2025²⁰⁶; a figure still short of the 2% guideline.

A report published by the Office of the Parliamentary Budget Officer in 2022 found that Canada would need to increase overall expenditures by \$75.3 billion over the next five years to reach 2%²⁰⁷, a number the federal government has no intention of reaching. Supporting this decision, a poll conducted in same year by Leger, the largest Canadian-owned market research company, reported that roughly half of the respondents thought the federal government had allocated the correct amount to the defence budget, 34% wanting to spend more, and 18% wanting to spend less²⁰⁸.

²⁰³ David Perry, *Strong, Secure, Engaged so Far* Canadian Global Affairs Institute, 2018).

²⁰⁴ "Budget 2023: Canada's Indefensible Military Spending," The Globe and Mail, last modified Mar 23, accessed 9 Apr, 23, <https://search.proquest.com/docview/2789650754>.

²⁰⁵ NATO, *NATO Secretary General's Annual Report 2022*, [2023]), 159.

²⁰⁶ Anne-Marie Therrien-Tremblay, *The NATO 2030 Initiative: Overview and Implications for Canada* (Ottawa: Hill Studies, [2022]), 7.

²⁰⁷ Christopher Penney, *Canada's Military Expenditure and the NATO 2% Spending Target* (Ottawa: Office of the Parliamentary Budget Officer, [2022]), 4.

²⁰⁸ "The 2022 Federal Budget and CPC Leadership Race," last modified 13 Apr, accessed 9 Mar, 23, <https://leger360.com/surveys/legers-north-american-tracker-april-13-2022/>.

Canada's decision to spend less than 2% may have been in line with Canadian public opinion, but Canada's closest ally, the US, has their doubts about the wisdom of this decision. As part of a highly publicized leak of classified Pentagon documents known as the "Discord Leaks", the Washington Post reported that the Pentagon had assessed Canada's "enduring" defense shortfalls as harming ties with security partners and allies. The Pentagon assessed that the CAF could not conduct a major operation while simultaneously maintaining its NATO leadership role in Latvia and aid activities to Ukraine without a change in public opinion²⁰⁹.

International opinion beyond the Five Eyes is also notable. In a speech delivered in Montreal, France's Ambassador to Canada, Michel Miraillet, criticized Canada's "weak defence effort", claiming that Canadians have forgotten the memory of their past commitments²¹⁰.

Another example of Canada's diminishing influence is its exclusion from the Australia, United Kingdom, and US (AUKUS) security pact conceived to counter China's growing presence in the Indo-Pacific, a region that Canada has expressed interest in through the publication of *Canada's Indo-Pacific Strategy*. Former Minister of National Defence, Peter MacKay, attributes the exclusion directly to the GoC not meeting the NATO's spending guideline²¹¹. Prime Minister Trudeau has marginalized the pact, claiming its utility mainly in the acquisition of nuclear submarines, but this has been

²⁰⁹ Coletta, "Trudeau Told NATO that Canada Will Never Meet Spending Goal, Discord Leak Shows,"

²¹⁰ Brewster, "NATO is Getting Ready to Twist Canada's Arm on Defence Spending,"

²¹¹ Sean Boynton, "Chinese Spy Balloon Puts 'sharp Focus' on Why Canada must Modernize Military," *Global News* 19 Feb, 2023. <https://globalnews.ca/news/9495152/canada-military-china-balloons-russia-mackay/>.

refuted by various defence experts²¹². Commander Canadian Joint Operations Command, Vice-Admiral Auchterlonie expressed concerns regarding the ability to access advanced technology provided by the pact²¹³. Perry voiced that the pact was a venue to “make serious investments to deal with serious problems”²¹⁴. The CBC reported that the exclusion could stem from a perception by Canada’s allies as not believing Ottawa was serious about countering China²¹⁵. This is in spite of the GoC’s release of the Indo-Pacific Strategy which Paul Mitchell, former Director of Academics at the Canadian Force College, describes as a strategy without concrete objectives²¹⁶.

The release of Canada’s *Budget 2023 A Made in Canada Plan* brings some good news as the plan preserves the overall budget allocation for capital projects set forth by SSE but introduces some ambiguity that will need to be addressed in the defence policy update. For example, the budget announced a 15% reduction in professional services and travel, as well as a 3% reduction of “eligible spending by departments and agencies by 2026-27”²¹⁷ but mentioned the CAF was exempt from these reductions.

Perry remarked in his podcast that although capital funding is exempt from these reductions, the language used to separate the CAF from the DND brings uncertainty on whether the exemptions cover the entirety of the department or just the CAF. Especially

²¹² Amanda Connolly, "Was Canada Invited to Join AUKUS? Officials Mum but Stress no Interest in Subs," *Global News* 16 September, 2021. <https://globalnews.ca/news/8196164/aukus-defence-deal-canada-china-relations/>.

²¹³ Lee Berthiaume, "Canada on Sidelines as U.S., Britain, Australia Move Ahead on New Security Deal," *The Canadian Press* Mar 14, 2023. <https://search.proquest.com/docview/2787270101>.

²¹⁴ *Ibid.*

²¹⁵ *Ibid.*

²¹⁶ *Ibid.*

²¹⁷ Government of Canada, *Budget 2023 A made in Canada Plan*, [2023a]), 183.

important in Vote 1 Operations and Maintenance funding²¹⁸ as the DND makes up close to a quarter of Vote 1 spending for the government writ large²¹⁹. A reduction to DND professional services capacity may have an impact for the ability for the CAF to spend and any attempt to reduce the overall federal program is inevitably going to impact the defence budget²²⁰.

This sets the stage for the discussion of the next challenge of whether the DND can spend its budget allocation described in SSE. Perry remarks that there is a current lack of evidence that the DND can do so²²¹. A separate Office of the Parliamentary Budget Officer publication flagged “lapsed” spending, where spending is less than requested in the estimates, as a regular occurrence for the DND with respect to SSE²²². From 2017 to 2021, a cumulative shortfall of \$10 billion was identified and concluded that the DND was suffering from significant delays in spending²²³. The product of these delays means that the DND will be required to spend the shortfall in future years, further accelerating an ambitious spending regime. The report calls into question whether the government would be able to manage the increased procurement activity that, in 2027, will surpass capital expenditure by three-fold over any given fiscal year in the past two decades²²⁴.

²¹⁸ David Perry, *Budget 2023 and Defence (Podcast)* Canadian Global Affairs Institute, 2023).

²¹⁹ *Ibid.*

²²⁰ Eugene Lang, "Use it Or Lose it: SSE and DND's Chronic Underspensing Problem," *Canadian Global Affairs Institute* 1 May, 2018.
https://www.cgai.ca/use_it_or_lose_it_sse_and_dnd_s_chronic_underspending_problem.

²²¹ Perry, *Budget 2023 and Defence (Podcast)*

²²² Office of the Parliamentary Budget Officer, *Planned Capital Spending Under Strong, Secure, Engaged - Canada's Defence Policy: 2022 Update*, 5.

²²³ *Ibid.*, 5.

²²⁴ *Ibid.*, 8.

In addition to SSE capital funding being exceptionally ambitious, another reason for the lapse spending is the insufficient capacity, cumbersome processes, and institutional structure of Canada's defence procurement system²²⁵. Eugene Lang, Adjunct Professor at Queen's University, School of Policy Studies, wrote that procurement reform starts within the DND itself²²⁶. While the DND relies on OGDs, specifically, Public Services and Procurement Canada (PSPC), Innovation, Science and Economic Development Canada (ISED), and Treasury Board Secretariat (TBS), these departments are not incentivised to assist the DND in spending its capital²²⁷. These institutions have a duty to the Canadian public to ensure transparency and economic benefit to Canadians and are unlikely to modify these controls for the benefit of the DND.

The DND has made strides with PSPC to reform procurement for lower risk and low-medium complexity projects in an effort to provide the capacity for TBS to manage higher risk and complexity projects. Through the risk-based defence procurement pilot conducted between 2018 to 2020, \$2.5 billion was spent and considered a success²²⁸ with an extension of the program proposed to 2025²²⁹. Lang cautions that procurement reform that focuses on low-medium complexity will not resolve the challenges posed by SSE's complex, high-value equipment projects and that the DND's window to take advantage of SSE's generous funding allocation is quickly closing²³⁰.

²²⁵ Perry, *Strong, Secure, Engaged so Far*, 5.

²²⁶ Lang, "Use it Or Lose it: SSE and DND's Chronic Underspending Problem," , 4.

²²⁷ *Ibid.*, 3.

²²⁸ Government of Canada, *Evaluation of the Risk-Based Defence Procurement Pilot Project* Government of Canada,[2023c]).

²²⁹ Government of Canada, *Procurement of Capabilities* Government of Canada,[2022b]).

²³⁰ Lang, "Use it Or Lose it: SSE and DND's Chronic Underspending Problem," , 4.

This section examined Canada's isolationist behaviours to extract themes that will inform considerations towards CAF modernization. The GoC's practice of alliance politics implies that the Canadian military's expeditionary approach will emphasize partnerships and participation with interoperability as a capstone enabler.

Although Canada may be the lowest defence spender as a percentage of GDP among the G7 nations with a wide commitment-capability gap, the DND is on the cusp of unprecedented budget allocations in the past 40 years. Here, a WoG approach is critical for CAF modernization. The significant capital allocation is proportional to the CAF's technological sophistication; therefore, the CAF needs to continue to develop genuine, transparent, internal partnerships²³¹ with PSPC and TBS to both rapidly and effectively conduct procurements. In an expanded viewpoint, climate change will challenge the CAF's capacity and disaster response will only be successful through partnerships with Public Safety, municipal, and local governments.

While Canada's Arctic ambitions imply that traditional partnerships, like NORAD, are indispensable, non-traditional partnerships with the Arctic states are equally as important for Canada to establish an Arctic leadership role. Pan-domain situational awareness is desired not only for security but also for research and economic development, stressing the requirement for a real-time WoG information sharing program.

Albeit if Canada becomes increasingly inward focused, the theme of a WoG approach reverberates in this examination. Interoperability between internal GoC

²³¹ Lang, "Use it Or Lose it: SSE and DND's Chronic Underspending Problem," 4.

organizations and even international partners will be necessary to achieve national objectives in this scenario.

DANGEROUS COMPETITION

In an US Army University Press panelist interview regarding China, Geoff Babb, Professor of Military History, US Army Command and General Staff College, posed the question, “Do you really want to go to war with one-fifth of mankind, with nuclear weapons, in their home court?”²³²

Babb’s sentiment portrays the gravity concerning the current state of great power competition that is exhibiting signs of alarming escalation. This section will examine this current environment, Canada’s role within it, and the implications to CAF Modernization. With the common international refrain that the 21st Century will be the “Asian Century”²³³, the discussion will emphasize China’s impetus in their attempt to reshape the world order in the domains of technology, geopolitics, and military.

Technology, Economic Policies, and the PLA

In Chris Miller’s *Chip War*, he posits that the Second World War was won through steel and aluminum, the Cold War with nuclear weapons, and the fourth industrial revolution through computing power²³⁴.

²³² *Near Peer: China (Understanding the Chinese Military) (Video)*, Youtube Video, directed by Army University Press 2022)

²³³ Jonathan Woetzel and Jeongmin Seong, "We've Entered the Asian Century and there is no Turning Back," *World Economic Forum* 11 Oct, 2019. <https://www.weforum.org/agenda/2019/10/has-world-entered-asian-century-what-does-it-mean/>.

²³⁴ Chris Miller, *Chip War: The Quest to Dominate the World's most Critical Technology* (New York ; London ; Toronto ; Sydney ; New Delhi: Simon & Schuster, 2022)., 19.

The Chinese Communist Party (CCP) in 1993 witnessed the first Gulf War and concluded that “networked” precision strike capabilities represented a Revolution in Military Affairs that they were ill-equipped to counter, driving research and modernization activities for the People’s Liberation Army (PLA)²³⁵. The rapid modernization of the PLA has been remarkable since this revelation.

As early as 2005, *The Science of Military Strategy*, an authoritative text modified and published occasionally by the PLA Academy of Military Science, acknowledged that future war wasn’t just a military endeavour, but also involved “non-military” forces such as political, economic, diplomatic, culture and other forces²³⁶. In 2013 the CCP established the Military-Civilian Fusion Leading Small Group under the principles of civil-military integration which focused on technology transfers between industry and military²³⁷.

In 2015, the Chinese Central Military Commission published the Strategic Guiding Principle, *Winning Informatized Local Wars*. This was an evolution in their military doctrine that elevated information as an instrument to win wars against technologically superior adversaries²³⁸. With a broad definition of “information”, the PLA doctrinal concept of information dominance extends beyond information warfare to integrate cyber, space, and electromagnetic domains, all enabled by advanced

²³⁵ Edmund J. Burke et al., *People's Liberation Army Operational Concepts* (Santa Monica, CA: RAND Corporation, 2020). doi:10.7249/RRA394-1. https://www.rand.org/pubs/research_reports/RRA394-1.html, 4.

²³⁶ Burke, *People's Liberation Army Operational Concepts*, 13.

²³⁷ Agarwala, “Made in China 2025”: Poised for Success?”, 424-461, 452.

²³⁸ Burke, *People's Liberation Army Operational Concepts*, 7.

information systems²³⁹. The centrality of information for “War Control”, the ability to set and maintain the pace of escalation, depended on information dominance, an operational concept²⁴⁰. In a 2020 US Department of Defense (DoD) annual report to congress, the DoD assessed that China has reached parity with, or even exceeded, the US in certain areas of military modernization, particularly in shipbuilding, land-based ballistic missiles, and integrated air defence systems²⁴¹.

A stark contrast between the West and China can be found in their technology industries and associated economic objectives. The Western approach to the privatized technology industry has been de-centralized, allowing for industry-led standards to compete and flourish in a largely open market²⁴². China, on the other hand, enacts industrial policies through a state-led strategic approach, especially in the development of technical standards²⁴³. Brookings scholar, Melanie Sisson, wrote that China’s approach provides more strategic clarity on how and for what purposes technology is to be used and the direction for the US and like-minded partners is to articulate this strategic clarity as well²⁴⁴.

China’s ambitious *Made in China 2025* (MIC25) policy, released in 2015, aims to transform China into a manufacturing superpower, through the modernization of its manufacturing sector to strengthen domestic markets and further increase global

²³⁹ Burke, *People's Liberation Army Operational Concepts*, 8.

²⁴⁰ *Ibid.*, 10.

²⁴¹ Department of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2020* Department of Defense,[2020]), 38.

²⁴² Hilary McGeachy, *US-China Technology Competition: Impacting a Rules-Based Order* (Sydney: United States Studies Centre,[2019]), 1.

²⁴³ *Ibid.*

²⁴⁴ Ryan Hass et al., "U.S.-China Technology Competition A Brookings Global China Interview," *Brookings*, 23 Dec, 2021, .

expansion²⁴⁵. In 2019, the Mercator Institute for China Studies evaluated the program to be successful in some areas but challenged in others. For example, China has been successful in aligning private domestic technology companies with national goals²⁴⁶, the quality of Chinese-made technology products is now perceived to be on par with foreign brands²⁴⁷, and China is now considered to be “setting the pace” for many emerging technologies²⁴⁸. Conversely, this policy has antagonized foreign competitors operating within China and binds the CCP’s legitimacy to continuous economic growth²⁴⁹.

Another program of note is the Artificial Intelligence Development Plan released in 2017 that purports to propel China to world leader in artificial intelligence (AI) by 2030 where they predict a \$150 billion (USD) dollar industry will emerge²⁵⁰. A Harvard Business Review news article assessed that China has taken the lead in publishing AI research papers, but also noted that research alone will not provide an enduring advantage. The nature of the CCP’s information control limits the ability for businesses to access the training data, particularly transnational data flows, required to train AI²⁵¹.

²⁴⁵ Jost Wübbeke et al., "Made in China 2025," *Mercator Institute for China Studies* (December 1, 2016). https://kritisches-netzwerk.de/sites/default/files/merics_-_made_in_china_2025_-_the_making_of_a_high-tech_superpower_and_consequences_for_industrial_countries_-_76_seiten_1.pdf, 6.

²⁴⁶ Max J. Zenglein and Anna Holzmann, "Evolving made in China 2025," *Mercator Institute for China Studies*, no. 8 (1 Jul, 2019). https://kritisches-netzwerk.de/sites/default/files/merics_-_evolving_made_in_china_2025_-_chinas_industrial_policy_in_the_quest_for_global_tech_leadership_-_2._juli_2019_-_80_seiten.pdf, 52.

²⁴⁷ *Ibid.*, 43.

²⁴⁸ *Ibid.*, 9.

²⁴⁹ *Ibid.*, 8.

²⁵⁰ Roberts, "The Chinese Approach to Artificial Intelligence: An Analysis of Policy, Ethics, and Regulation," 59-77, 59.

²⁵¹ Daitian Li, Tony W. Tong and Yangao Xiao, "Is China Emerging as the Global Leader in AI?" *Harvard Business Review* 18 Feb, 2021. <https://hbr.org/2021/02/is-china-emerging-as-the-global-leader-in-ai>.

An aspect worthy of inspection is the nature of the well funded, state-led strategic approach in the development of technology standards. Standards are considered the bridge between technology and the market, establishing norms and specifications for manufactures to build against²⁵². Technical and social standards will lay the groundwork for China's dream of building a "Digital Silk Road²⁵³", but the Achilles heel of the MIC25 is its reliance on foreign-designed technology²⁵⁴. Often widely accepted technology standards, set forth by organizations such as the International Organization of Standardization (ISO) or Institute of Electrical and Electronics Engineers (IEEE), will contain usage of existing patents that demand a royalty. China finds this unfairly disadvantages them and is making efforts to develop alternative standards²⁵⁵. In terms of new standards, China appears to be gaining ground for its brand of fifth generation (5G) communications specifications²⁵⁶. These standards will bring substantial financial benefits to the organizations that hold the patents, like Huawei²⁵⁷, and must be intensely scrutinized as Chinese State Owned Enterprises (SOEs) are fully aligned with China's techno-authoritarianism²⁵⁸.

²⁵² Hilary McGeachy, *US-China Technology Competition: Impacting a Rules-Based Order*, 4.

²⁵³ Jonathan E. Hillman, "Techno-Authoritarianism: Platform for Repression in China and Abroad," *Center for Strategic and International Studies* 17 Nov, 2021. <https://www.csis.org/analysis/techno-authoritarianism-platform-repression-china-and-abroad>.

²⁵⁴ Zenglein, "Evolving made in China 2025," , 24.

²⁵⁵ Hilary McGeachy, *US-China Technology Competition: Impacting a Rules-Based Order*, 6.

²⁵⁶ *Ibid.*, 8.

²⁵⁷ *Ibid.*, 8.

²⁵⁸ Hillman, "Techno-Authoritarianism: Platform for Repression in China and Abroad,"

The Indo-Pacific and Taiwan Dilemma

This clash of approaches to the technology industry is currently playing out in the field of semiconductors, the manufacturing of which has been steadily moving to East Asia since the 2000s, and as of the late 2010's, accounts for 80% of the world's integrated circuit fabrication²⁵⁹. Semiconductor usage is ubiquitous in the information age where there is an unending appetite for both data and the requisite computational power to make sense of it. Roughly 1.15 trillion semiconductors were shipped globally in 2021, representing \$555.9 billion (USD)²⁶⁰ with a projected market capitalization of \$1 trillion (USD) by the end of 2030²⁶¹. These semiconductors are used in everyday items, from toasters and cell phones, to state-of-the art weaponry such as fifth-generation fighter aircraft and missile guidance systems.

To inhibit China's aspiration, the US has enacted the Creating Helpful Incentives to Produce Semiconductors (CHIPS) Act that intends to boost US semiconductor manufacturing and, along with existing export bans, deny China's access to US-designed, leading-edge technology regardless of where it is are manufactured²⁶². In retaliation,

²⁵⁹ Henry Wai-chung Yeung, "Explaining Geographic Shifts of Chip Making Toward East Asia and Market Dynamics in Semiconductor Global Production Networks," *Economic Geography* 98, no. 3 (May 27, 2022), 272-298. doi:10.1080/00130095.2021.2019010. <https://www.tandfonline.com/doi/abs/10.1080/00130095.2021.2019010>, 273.

²⁶⁰ Semiconductor Industry Association, "Semiconductor Industry Association: Global Semiconductor Sales, Units Shipped Reach all-Time Highs in 2021 as Industry Ramps Up Production Amid Shortage," *Semiconductor Industry Association* Feb 14, 2022. <https://www.semiconductors.org/global-semiconductor-sales-units-shipped-reach-all-time-highs-in-2021-as-industry-ramps-up-production-amid-shortage/>.

²⁶¹ "The Semiconductor Decade: A Trillion-Dollar Industry," last modified 1 Apr, accessed 1 Dec, 22, <https://www.mckinsey.com/industries/semiconductors/our-insights/the-semiconductor-decade-a-trillion-dollar-industry>.

²⁶² "FACT SHEET: CHIPS and Science Act Will Lower Costs, Create Jobs, Strengthen Supply Chains, and Counter China," United States Government, last modified Aug 9, accessed 2 Nov, 2022, <https://www.whitehouse.gov/briefing-room/statements-releases/2022/08/09/fact-sheet-chips-and-science-act-will-lower-costs-create-jobs-strengthen-supply-chains-and-counter-china/>.

China will likely attempt to counteract the US and its partners by testing their resolve with Taiwan²⁶³.

Miraculously, a single company in Taiwan, the Taiwan Semiconductor Manufacturing Company (TSMC), accounts for 90% of the world's advanced semiconductor production²⁶⁴. For the time being, Taiwan has complied with the US export bans²⁶⁵. US President Biden has unambiguously stated that the US military would defend Taiwan in the event of a Chinese invasion²⁶⁶, a marked departure from the US' history of "strategic ambiguity" over the matter²⁶⁷.

Predictably, this situation has angered China²⁶⁸ and increased cross-strait tensions. Since the end of World War II, China has always viewed Taiwan as its domestic territory. Chinese President Xi Jinping has staked the CCP's legitimacy on reunification²⁶⁹, reinforced in his "China Dream" address given in 2019. Again hardening his stance during the 20th Party Congress in 2022, Xi articulated "reunification" as the heart of

²⁶³ Hass, "U.S.-China Technology Competition A Brookings Global China Interview,"

²⁶⁴ "China/Taiwan/Republic of China: Can Taiwan's Silicon Shield Protect it Against China's Aggression?" *Asia News Monitor* May 12, 2021. <https://search.proquest.com/docview/2524971485>.

²⁶⁵ The National Post, "Taiwan Says its Chip Firms Will Adhere to New US Rules Blacklisting China Supercomputing Entities," *National Post (Online)* Apr 14, 2021. <https://search.proquest.com/docview/2512587266>.

²⁶⁶ David Brunnstrom and Trevor Hannicutt, "Biden Says U.S. Forces would Defend Taiwan in the Event of a Chinese Invasion," *Reuters* Sep 19, 2022. <https://www.reuters.com/world/biden-says-us-forces-would-defend-taiwan-event-chinese-invasion-2022-09-18/>.

²⁶⁷ Hoo Tiang Boon and Hannah Elyse Sworn, "Strategic Ambiguity and the Trumpian Approach to China-Taiwan Relations," *International Affairs (London)* 96, no. 6 (Nov 9, 2020), 1487-1508. doi:10.1093/ia/iiaa160. <https://search.proquest.com/docview/2471025119>, 1489.

²⁶⁸ Milton Ezrati, "Beijing is Furious," *Forbes* 17 Oct, 2022. <https://www.forbes.com/sites/miltonezrati/2022/10/17/beijing-is-furious/?sh=76ab60d37535>.

²⁶⁹ Dalton Lin, "'One China' and the Cross-Taiwan Strait Commitment Problem," *The China Quarterly (London)* 252 (Dec, 2022), 1094-1116. doi:10.1017/S0305741022001369. <https://dx.doi.org/10.1017/S0305741022001369>, 1104.

national revival²⁷⁰, under the “one country, two systems” model where Taiwan independence crosses China’s red lines.

The US-China relationship has experienced major setbacks and steady decline due to events such as US House Speaker Nancy Pelosi’s visit to Taiwan, the Chinese “spy balloon” incident, and Taiwanese President Tsai Ing-wen’s visit to the US. China has retaliated with military drills in the Taiwan Strait that are increasing in scope and intensity. In response to the Pelosi visit, the PLA conducted a three-day exercise that simulated a blockade of the island including encircling it with twelve navy ships, hundreds of aircraft, and mock aircraft carrier strikes²⁷¹.

In a 2023 Telegraph report, UK diplomatic sources speculated that China has a 48-hour window to invade Taiwan before an international consensus could be formed²⁷². Kevin Rudd, current Australian ambassador to the US, outlined in his book *The Avoidable War*, ten potential scenarios in the Indo-Pacific region in which he found that half of the scenarios included armed conflict²⁷³.

In one of the scenarios, where Xi’s industrial and economic strategies achieve success in the region, Rudd concluded that “on the balance of probabilities, Xi’s current

²⁷⁰ Amber Wang, "China Puts Taiwan Reunification Strategy at Heart of National Revival Plans," *South China Morning Post-GChina* Jul 7, 2022. <https://www.scmp.com/news/china/politics/article/3184502/china-puts-taiwan-reunification-strategy-heart-national-revival>.

²⁷¹ Eric Cheung, "A Weapons Stockpile and Asymmetric Warfare: How Taiwan could Thwart an Invasion by China -- with America's Help," *CNN Commentary* Apr 16, 2023. <https://search.proquest.com/docview/2801355217>.

²⁷² Dominic Nicholls, Elliott Daly and Josh Bourne, "Xi Jinping's 48-Hour Plan to Invade Taiwan - Defence in Depth" *The Telegraph* 7 Apr, 2023. <https://www.telegraph.co.uk/world-news/2023/04/07/china-taiwan-invasion-war-usa-russia-ukraine-xi-jinping/>.

²⁷³ Kevin Rudd, *The Avoidable War*, First edition ed. (New York: PublicAffairs, 2022), 318-340., 340.

prospect for success appear reasonable²⁷⁴”. Although this success would be predicated on three conditions, the first is if China could maintain sustainable growth, the second is if China could close the US-China technology gap, and the third was if the US could rally a broader coalition in light of its divided democratic government²⁷⁵.

The best-case scenario Rudd claims is a successful joint US-Taiwan deterrence of China but was only possible if an effective deterrence of both kinetic and non-kinetic effects were established, specifically in the cyber domain²⁷⁶. A common theme between the invasion scenarios being a massive cyber attack preceding any physical attack²⁷⁷.

The most likely scenario outlined by Rudd was US-China limited war in the South China Seas initiated by an unintentional act, such as collision between military air or maritime assets, with the potential to escalate to full out war²⁷⁸. A dangerous precedence was set in 2001 when a US Navy EP-3 signals intelligence aircraft was involved in a mid-air collision with a Chinese J-8 fighter jet. The collision killed the Chinese pilot and forced the EP-3 to land in Chinese territory where a diplomatic crisis ensued. The US were successfully able to negotiate the release of the US Navy crew after ten days of detainment and eventually retrieved the aircraft approximately a month later. The US’ success was, in part, due to China’s unusual decision to carry out a risk-adverse, accommodative approach, controlling domestic anti-American sentiment from

²⁷⁴ Rudd, *The Avoidable War*, 318-340, 336.

²⁷⁵ *Ibid.*, 336.

²⁷⁶ *Ibid.*, 326.

²⁷⁷ *Ibid.*, 320.

²⁷⁸ *Ibid.*, 328.

spiraling²⁷⁹. Rudd warns that, with the current deterioration of US-China bilateral relations, the outcome of a similar event may be much different than in 2001²⁸⁰.

The continued souring of relations is evident with the debut hearing convened in February 2023 by the newly formed US House Select Committee on the CCP, otherwise known as the “China Committee”. The bipartisan committee began with the opening remarks that the US-China relationship was not “a polite tennis match” but that fundamental freedoms were at stake, and this was “an existential struggle over what life will look like in the 21st century”²⁸¹.

China’s Foreign Ministry panned the hearing as “Cold War thinking” and that US lawmakers were using the hearing for “political self-interest”²⁸². The verbiage used during the hearing certainly seems to reflect China’s accusation as some US critics, such as Jude Blanchette, Freeman Chair at the Center for Strategic and International Studies, remarked on a podcast that the hearing was a total embarrassment. Blanchette stated that according to the hearing, “you would think that the US is a pathetic, weak, scared nation” which is a misrepresentation of the problem that vastly underestimated the strength of the US and overestimated the capabilities of China²⁸³. Blanchette added that the usage of the

²⁷⁹ Kai He, *China's Crisis Behavior: Political Survival and Foreign Policy After the Cold War* (Cambridge: Cambridge University Press, 2016), 66-84., 83.

²⁸⁰ Rudd, *The Avoidable War*, 318-340, 328.

²⁸¹ Scott Wong, "Bipartisan China Committee Holds First Hearing on 'Existential Struggle' with Beijing," *NBC News* 28 Feb, 2023. <https://www.nbcnews.com/politics/congress/bipartisan-china-committee-hold-first-hearing-tension-us-beijing-rcna72476>.

²⁸² Cate Cadell, "At House Hearing on Chinese Communist Party, Bipartisan show of Concern," *Washington Post.Com* Mar 1, 2023. <https://www.washingtonpost.com/national-security/2023/03/01/select-committee-ccp-china-gallagher/>.

²⁸³ "Jude Blanchette on the Select Committee and the American Moral Panic Over China," last modified 9 Mar, accessed 9 Mar, 2023, <https://thechinaproject.com/podcast/jude-blanchette-on-the-select-committee-and-the-american-moral-panic-over-china/>.

term “existential struggle” was impractical and unacceptable as this would imply the defeat of one side or the other, following with, “I don’t know what that looks like outside of World War III”²⁸⁴.

There are loud indications that both the US and China are reinforcing their war footing. During an interview with CBS in February 2023, CIA Director William Burns said that Xi commanded the PLA to be ready to invade Taiwan by 2027. This is in line with a prediction made in 2021 by US Admiral Phil Davidson, then Commander Indo-Pacific Command, who discussed during a senate hearing that the invasion threat was going to manifest “in the next six years”²⁸⁵, a period some have now dubbed the “Davidson Window”²⁸⁶. Burns also confirmed US intention to expand their military presence in the Philippines to increase their reaction time in the event of an invasion²⁸⁷.

US General Mike Minihan, Commander Air Mobility, released a memo to his command to prepare for a “China fight” in 2025²⁸⁸. The US DoD has sought to distance themselves from Minihan’s calculation, stating that the comments do not represent the department’s views on China and re-iterated the focus of working alongside allies and

²⁸⁴ "Jude Blanchette on the Select Committee and the American Moral Panic Over China,"

²⁸⁵ Mallory Shelbourne, "Davidson: China could Try to Take Control of Taiwan in ‘Next Six Years’," *US Naval Institute* 9 March, 2021. <https://news.usni.org/2021/03/09/davidson-china-could-try-to-take-control-of-taiwan-in-next-six-years>.

²⁸⁶ Jerry Hendrix, "Closing the Davidson Window," *RealClear Defense* 3 July, 2021. https://www.realcleardefense.com/articles/2021/07/03/closing_the_davidson_window_784100.html.

²⁸⁷ Olivia Gazis, "CIA Director William Burns: 'I Wouldnt Underestimate' Xi's Ambitions for Taiwan," *CBS News* 3 Feb, 2023. <https://www.cbsnews.com/news/cia-director-william-burns-i-wouldnt-underestimate-xis-ambitions-for-taiwan/>.

²⁸⁸ Mike Tsukamoto, "Read for Yourself: The Full Memo from AMC Gen. Mike Minihan," *Air & Space Forces Magazine* 30 Jan, 2023. <https://www.airandspaceforces.com/read-full-memo-from-amc-gen-mike-miniham/>.

partners to preserve peace in the Indo-Pacific²⁸⁹. Regardless of the accuracy of the prediction, Minihan's urgency is understandable as he describes the role of Air Mobility Command to enable the Joint Forces to project their combat power, a critical component to lethality²⁹⁰. Minihan stressed creativity in tackling one of the key gaps to their strategy, Command and Control²⁹¹, a common challenge across the Five Eye partners as multi-domain strategies are being developed.

China's Influence and Nuclear Deterrence

China's geopolitical influence is growing not only as a regional power, but to other continents as well. The Economist estimates that, as of 2019, the world owes China's banks roughly \$1.6 trillion (US) or 2% of global GDP²⁹². A motivation behind this generosity is captured in China's Belt and Road Initiative (BRI) that seeks to reinvigorate the Silk Road for the 21st Century²⁹³. According to Christoph Nedopil Wang, Associate Professor at Fudan University, as of 2022, 148 countries have joined the BRI by signing Memorandums of Understanding with China including countries from Africa, Europe, Central and East Asia, the Middle East, and Latin America²⁹⁴. The BRI has three

²⁸⁹ Chris Gordon, "Pentagon Distances itself from Minihan Memo Suggesting Possible War with China in 2025," *Air & Space Forces Magazine* 29 Jan, 2023. <https://www.airandspaceforces.com/pentagon-distances-itself-mini-han-memo-possible-war-china-2025/>.

²⁹⁰ "'Untethered' Air Force General: 'When You Kill Your Enemy, Every Part of Your Life is Better'," last modified 23 Sep, accessed 8 Mar, 2023, <https://taskandpurpose.com/news/air-force-general-mike-mini-han-mobility/>.

²⁹¹ *Ibid.*

²⁹² The Intelligence, "*The Map of Overseas Lending is being redrawn*"—China's Belt and Road Initiative Shifts (Podcast) *The Economist*, 2023).

²⁹³ Hong Yu, "Motivation Behind China's 'One Belt, One Road' Initiatives and Establishment of the Asian Infrastructure Investment Bank," *The Journal of Contemporary China* 26, no. 105 (May 4, 2017), 353-368. doi:10.1080/10670564.2016.1245894. <https://www.tandfonline.com/doi/abs/10.1080/10670564.2016.1245894>, 355.

²⁹⁴ Christoph Nedopil, *Countries of the Belt and Road Initiative* (Shanghai: Fanhai International School of Finance, [2023]).

assessed purposes, modernization of Asian infrastructure²⁹⁵, expansion of China's global business operations, and the improvement of inter-regional connectivity between Beijing and its western land-locked regions²⁹⁶.

US officials, including former Vice-President Pence have criticized the BRI as “debt trap diplomacy”, depicting the program as a predatory lending scheme to gain controlling stakes in important foreign infrastructure²⁹⁷. A journal article published by Johns Hopkins University in 2020 refutes this account for African countries, finding that there were no asset seizures, but that China preferred to address debt restructuring on a bilateral basis²⁹⁸. One of the authors, Deborah Brautigam followed up with an article in *The Atlantic* calling the “Chinese Debt Trap” a myth²⁹⁹.

Among other concerning aspects of the BRI is the “Digital Silk Road” component and its efforts to create a digital export market for Chinese technology products. It is estimated that Chinese companies have installed internet and mobile systems in at least 38 countries which, as discussed in the previous section, could result in Chinese standards becoming the de facto standard in that region³⁰⁰.

²⁹⁵ Yu, "Motivation Behind China's 'One Belt, One Road' Initiatives and Establishment of the Asian Infrastructure Investment Bank," , 353-368, 357.

²⁹⁶ *Ibid.*, 358.

²⁹⁷ US National Archives, *Remarks by Vice President Pence on the Administration's Policy Toward China* (Washington: trumpwhitehouse.archives.gov,[2018]).

²⁹⁸ Kevin Acker, Deborah Bräutigam and Yufan Huang, "Debt Relief with Chinese Characteristics," *Working Paper no. 2020/39. China Africa Research Initiative, School of Advanced International Studies, Johns Hopkins University, Washington, DC.*, no. 39 (1 June, 2020).
doi:<http://dx.doi.org/10.2139/ssrn.3745021>, <https://ssrn.com/abstract=3745021>.

²⁹⁹ Deborah Brautigam and Meg Rithmire, "The Chinese 'Debt Trap' is a Myth," *The Atlantic* Feb 6, 2021.
<https://www.theatlantic.com/international/archive/2021/02/china-debt-trap-diplomacy/617953/>.

³⁰⁰ Hilary McGeachy, *US-China Technology Competition: Impacting a Rules-Based Order*, 7.

On the diplomatic side, a surprising Saudi-Iran rapprochement, brokered by China in March 2023, highlighted the nation as a growing political actor beyond Asia and a regional counterbalance to the US³⁰¹. Starting in 2015, Saudi Arabia and Iran have been engaged in a proxy war in Yemen. This war has been fought between Iran-backed Houthi rebels and Saudi Forces. Diplomatic ties were officially cut in 2016 and had remained closed despite a UN-mediated truce negotiated with the support of the Biden administration in 2022³⁰².

As part of the China-brokered rapprochement, both Saudi Arabia and Iran have agreed to mutually reopen embassies and Iran has committed to cease further attacks targeting Saudi Arabia interests, as well as discontinue support to Yemeni militant groups³⁰³. The Chinese position was possible because of the close ties China has with both countries and unlike the US, does not criticize either country for human rights abuses³⁰⁴. Saudi Arabia also perceives China as having leverage over not just Iranian diplomats, but Iranian security officials as well, specifically those within the Islamic Revolutionary Guard Corps³⁰⁵. Considered by the Saudis as an increasingly unreliable ally, the US has threatened consequences against de facto ruler of the Saudi Kingdom,

³⁰¹ Vivian Nereim, "Saudi Arabia and Iran Agree to Restore Ties, in Talks Hosted by China," *The New York Times* Mar 10, 2023a. <https://www.nytimes.com/2023/03/10/world/middleeast/saudi-arabia-iran-reestablish-ties.html>.

³⁰² The White House, *Statement by President Biden on the Extension of the UN-Mediated Truce in Yemen* (Washington: Federal Information & News Dispatch, LLC, [2022]).

³⁰³ Peter Baker, "Chinese-Brokered Deal Upends Mideast Diplomacy and Challenges U.S.," *New York Times (Online)* Mar 11, 2023. <https://search.proquest.com/docview/2785573708>.

³⁰⁴ Vivian Nereim, "Saudi Arabia and Iran Agree to Restore Ties, in Talks Hosted by China," *The New York Times* Mar 10, 2023b. <https://www.nytimes.com/2023/03/10/world/middleeast/saudi-arabia-iran-reestablish-ties.html>.

³⁰⁵ Yasmine Farouk, "Riyadh's Motivations Behind the Saudi-Iran Deal," *Carnegie Endowment for International Peace* 30 Mar, 2023. <https://carnegieendowment.org/2023/03/30/riyadh-s-motivations-behind-saudi-iran-deal-pub-89421>.

Mohammed bin Salman, for the murder of journalist Jamal Khashoggi and limiting oil production to benefit Russia in the Ukrainian conflict³⁰⁶. Whether this development will lead to enduring peace remains to be seen but Daniel C. Kurtzer, former US ambassador to Israel and Egypt, reflects that “the regional order is changing”³⁰⁷.

With regards to the Ukrainian conflict, both Ukrainian President Zelensky^{308,309} and French President Macron³¹⁰ have called upon China to mediate the conflict. In what some critics have called grandstanding³¹¹, the Chinese Ministry of Foreign Affairs released a position paper outlining twelve vague points regarding the “Political Settlement of the Ukraine Crisis”³¹². Although unlikely to occur any time soon, an Associated Press article suggests possible motivations for China to mediate the conflict. Chinese success in Ukraine further increases China’s rising diplomatic influence, in particular, increasing the relationship with Europe and potentially driving a wedge between the US and Europe³¹³. For the time being, the Kremlin has stated that there were

³⁰⁶ Baker, "Chinese-Brokered Deal Upends Mideast Diplomacy and Challenges U.S.,"

³⁰⁷ *Ibid.*

³⁰⁸ Yun Sun, "The War in Ukraine: China as the Mediator?" *Stimson* 15 Apr, 2022.

<https://www.stimson.org/2022/the-war-in-ukraine-china-as-the-mediator/>.

³⁰⁹ Mimi Lau, "Ukraine Renews Calls to China to Mediate in War with Russia," *South China Morning Post* May 1, 2022. <https://www.scmp.com/news/china/diplomacy/article/3176169/ukraine-renews-calls-china-mediate-war-russia>.

³¹⁰ Ivan Lidarev, "Mediating the Russia–Ukraine War a Risky Role for China," *East Asia Forum* 22 Feb, 2023. <https://www.eastasiaforum.org/2023/02/22/mediating-the-russia-ukraine-war-a-risky-role-for-china/>.

³¹¹ Alexander Gabuev, Vita Spivak and Yanmei Xie, *What's Behind Xi Jinping's Visit to Moscow?* (Podcast)Carnegie Endowment for International Peace, 2023).

³¹² "China's Position on the Political Settlement of the Ukraine Crisis," last modified 24 Feb, accessed 24 Feb, 2023, https://www.fmprc.gov.cn/mfa_eng/zxxx_662805/202302/t20230224_11030713.html.

³¹³ Joe McDonald, "Analysis: China's Ukraine Plan Mixes Peace, Self-Interest," *AP Online* Apr 27, 2023. <https://apnews.com/article/china-russia-ukraine-envoy-0d2e546b5dcf099db0161f2ffa99bcb8>.

“no prospects” for Chinese intervention³¹⁴ as neither Russian nor Ukraine are ready for negotiations and that military options still exist to better their bargaining positions.

In a disturbing move, China has accelerated their modernization and expansion of its nuclear forces. In accordance with annual Pentagon reports to US Congress, China has doubled its arsenal from 200 warheads in 2020³¹⁵, to 400 in 2022³¹⁶. The PLA plans to complete nuclear forces modernization by 2035 where the US DoD predicts the Chinese will have accumulated a stockpile of 1,500 warheads³¹⁷.

Andrew Krepinevich, founder and former president of the Center for Strategic and Budgetary Assessments, writes that a pillar of deterrence, parity, cannot be achieved in a tripolar system. Parity, where competing states have an equal number of nuclear forces and no one state enjoys a significant advantage, has a stabilizing effect in the bipolar system currently comprised of the US and Russia. In a tripolar system, none of the states are able to match the combined arsenals of its two rivals, triggering an arms race with no end³¹⁸.

China’s move to build a nuclear arsenal comparable to the US’ and Russia’s indicate the start of parity destabilization, adding to the already destabilizing effects of

³¹⁴ John Haltiwanger, "The Kremlin Throws Cold Water on China Mediating Peace in Ukraine as Macron Urges Xi to 'Bring Russia to its Senses'," *Business Insider* Apr 6, 2023. <https://www.businessinsider.com/macron-asks-xi-help-ukraine-kremlin-says-no-chance-peace-2023-4>.

³¹⁵ Department of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2020*, xi.

³¹⁶ *Ibid.*, ix.

³¹⁷ *Ibid.*, xi.

³¹⁸ Andrew Krepinevich, "Andrew Krepinevich on how China's Nuclear Ambitions Will Change Deterrence," *The Economist (London)* (Jan 31, 2023). <https://www.economist.com/by-invitation/2023/01/31/andrew-krepinevich-on-how-chinas-nuclear-ambitions-will-change-deterrence>.

Russia halting their participation in its last nuclear treaty with the US³¹⁹, Iran's departure from the Obama administration nuclear deal of 2015³²⁰, and North Korea's provocative ballistic missile and nuclear drone tests³²¹.

CONCLUSION

The outlook of the global security environment is increasingly dangerous and turbulent, but it is clear from this examination that, at all levels, the CAF cannot, and will not, go it alone. In matters of defense and security, Canada will rarely act unilaterally and CAF force elements will always be committed alongside partners, whether they be international coalitions or civilian agencies.

The common themes of diversifying partnerships, information sharing in support of domain awareness, and a whole of government approach to leverage all instruments of national power underpins every action the nation decides to take regardless of an inward or outward nexus. This is a result of the changing character of warfare influenced by technological evolution, climate change, and the collective trajectory of both allies and adversaries. For effective CAF modernization, all the capabilities being delivered in the following years must address to these themes.

From the discussion of Canada's isolationist tendencies, the CAF is at an inflection point in its modernization journey, with many capabilities promised in SSE

³¹⁹ Bill Chappell, "What Happens Now After Russia Suspends the Last Nuclear Arms Treaty with the U.S.?" *National Public Radio* 22 Feb, 2023. <https://www.npr.org/2023/02/22/1158529106/nuclear-treaty-new-start-putin>.

³²⁰ David E. Sanger, "United States Enters a New Era of Direct Confrontation with Iran," *New York Times (Online)* Nov 24, 2022. <https://www.nytimes.com/2022/11/24/us/politics/iran-protests-ukraine-nuclear-enrichment.html>.

³²¹ Kelly Ng, "Kim Jong Un Oversees Launch of Nuclear-Capable Underwater Drone - State Media," *BBC News* 24 Mar, 2023. <https://www.bbc.com/news/world-asia-65060884>.

progressing, but only a limited window where politics and economics align to spend the funds allocated. The delivery of new capabilities will indicate the technological readiness of the CAF but can only be realized through genuine cooperation with OGDs. Climate change will stretch the capacity of CAF and increase the interdependency between defence, Public Safety, and local governments. Meanwhile, as the nation's Arctic ambitions gradually come into focus, a WoG approach towards community, research, and economic development will be crucial if Canada wants to take a leadership role among the Arctic states.

Finally, in the backdrop of grand strategic competition, international partnerships will be indispensable to contain the credible challenges to the Rules Based International Order, namely China, and to safeguard Canadian values and the Canadian way of life. Participation in the international standards community, guided by national level industrial strategies, has the potential to bring prosperity to the nation, strengthen the CAF's relationship with industry, and offset the modernization initiatives of adversarial states. As a middle power, Canada alone is unable to resist Chinese influence in the Indo-Pacific region, so building partnerships and integrating with like-minded regional actors is the key to operating in the region.

As our closest allies are rapidly modernizing to paradigm-shifting concepts such as MDO/MDI, pace setters like China are advancing equally as fast. These concepts reach far beyond individual tactical platforms and instead encompass all the warfighting domains so that a credible, strategic deterrence can be mounted. In the face of run-away nuclear proliferation, Canada and its military must instill a sense of urgency in its modernization activities and rapidly understand its desired role in a pan-domain coalition.

All these goals can only be achieved if the CAF is well integrated within itself and interoperable with traditional and non-traditional partners.

CHAPTER THREE: THE CASE FOR INTEROPERABILITY

If you want to have global influence, you need to solve global challenges.

– Jude Blanchette³²²

INTRODUCTION

This chapter proposes that CAF Modernization requires a re-alignment against an interoperability model in order to resolve the C5ISR Modernization obstacles discussed in Chapter One and survive Chapter Two's future security environment challenges while respecting Canada's unique approach to foreign policy.

To build the case for an interoperability model, in Chapter One, it was discussed that the lack of expertise in campaign planning created a vacuum of operational level requirements to guide technical design critical for C5ISR Modernization. The start state of Digital Transformation must be based on the business processes at all levels of the organization and will not be successful unless the organization develops a cohesive vision.

This chapter will demonstrate that adapting an interoperability model as part of the CAF's capability development process will benefit CAF Modernization and Digital Transformation. Usage of such models will standardize how the CAF describes and perceives its own workflows and serve as a conceptual foundation for a data fabric that can be extended to partners both internally and externally.

³²² Kaiser Kuo, *The United States' China-Centered Existential Crisis (Podcast)* (Chapel Hill: The China Project, 2023b).

Chapter Three is divided into two sections that will discuss interoperability and its applicable models, the reasons why this approach is acceptable to Canadians, and finally, why the approach is value-added for Canada's security partners.

INTEROPERABILITY AS A CAPABILITY DEVELOPMENT FRAMEWORK

What is it? Why now?

The commonly agreed NATO definition of interoperability is “the ability to act together coherently, effectively and efficiently to achieve Allied Tactical, operational and strategic objectives” and consists of the human, procedural, and technical dimensions³²³. A Whitehall Paper, published by the Royal United Services Institute for Defence and Security Studies, stated that NATO had identified deployability, flexibility, sustainability, mobility, survivability, and interoperability as fundamental military qualities. Yet, interoperability is different because it is not a discrete concept but enhances the other qualities in efficiency and effectiveness³²⁴. This is also similar but broadened in the CAF *Capability Based Planning Handbook's* definition of a “Measure of Capability”, where the group of measurable attributes used to assess a capability are lethality, survivability, reach, persistence, responsiveness, interoperability, and awareness³²⁵.

Interoperability is not just a technical term but encompasses multiple dimensions. The Whitehall Paper introduces the seminal concept of multinational interoperability as a

³²³ Vanessa Hegykozi and Rob Trabucchi, *Expanding Interoperability Integrating Interoperability Tools in Multinational Exercises* NATO, 2022).

³²⁴ The Whitehall Papers, "The Dimensions of Interoperability," *Whitehall Papers* 56 56, no. 1 (Jan 1, 2003), 29-33. doi:10.1080/02681300309414756. <https://www.tandfonline.com/doi/abs/10.1080/02681300309414756>, 30.

³²⁵ Department of National Defence, *Capability Based Planning Handbook (Version 9)* (Ottawa: Chief Force Development, 2019a), 49.

concept that consists of four dimensions, broken down as organizational, behavioural, logistical, and technical. The behavioural dimension is further sub-divided into the categories of strategic concepts, doctrine, and culture³²⁶. Truly interoperable forces are required to be interoperable in all four dimensions. There is strength in the diverse nature of a multinational coalition, as the spectrum of cultures and strategic viewpoints carries more political weight than a few homogeneous partners³²⁷.

The importance of interoperability can be attributed to many factors discussed in the previous chapters but isn't unique to the CAF. The Australian Defence Science & Technology Organization identified five reasons why interoperability between military forces was becoming more urgent, this being the increased tempo of operations, diversity of operations, range of partners, short notice ad-hoc deployments, and government expectations³²⁸.

These reasons mirror those for the CAF, for instance, the increased tempo of operations due to climate change and decreased capacity of the CAF requires an increased collaboration from security partners. Canada's Indo-Pacific and Arctic objectives will necessitate long-term cooperation with non-traditional partners, and the reactionary nature of Canada's foreign policy usually means that the CAF is generally committed to coalitions with little preparation time.

³²⁶ The Whitehall Papers, "The Dimensions of Interoperability," , 29-33, 31.

³²⁷ *Ibid.*, 32.

³²⁸ Terry Moon, Suzanne Fewell and Hayley Reynolds, "The what, Why, when and how of Interoperability," *Defense & Security Analysis* 24, no. 1 (1 Mar, 2008), 5-17. doi:10.1080/14751790801903178. <https://www.tandfonline.com/doi/abs/10.1080/14751790801903178>, 6-7.

Willingness to incorporate new technology, the existing level of technological sophistication, and the rate of doctrine development were also identified by the Australian study as potential barriers that affect a nation's ability to be interoperable. In the case of the CAF, it is well positioned in the first factor, as the CAF both is willing and has access to new technologies to incorporate. With the large number of SSE capital projects as an indication of technological sophistication, the CAF is also set to progress quickly in that factor.

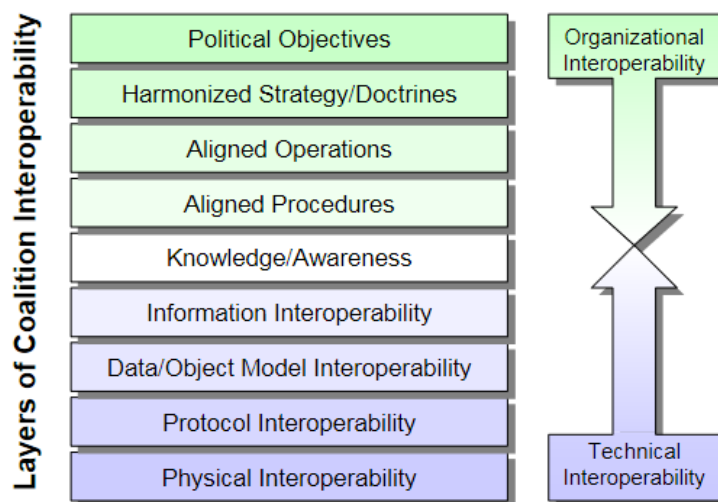
However, it is in the final factor of joint doctrine development that challenges can be found for the CAF. In a 2017 evaluation of the Defence Capability Development Program conducted by the Assistant Deputy Minister (Review Services), the development of joint doctrine was assessed to be only partially successful. Due to a lack of expertise, the CAF's joint doctrine was found to be obsolete and had exceeded the recommended review cycle of five years³²⁹. This result is not a surprising outcome particularly as the CAF struggles to be truly joint, as previously discussed in Chapter One.

Interoperability Models

The US DoD and NATO have developed many models to assess interoperability. These models range from system specific engineering references to non-technical models with different levels of conceptual development. The models can be roughly organized on a spectrum of technical to non-technical, with the latter focused more on

³²⁹ Department of National Defence, *Evaluation of Defence Capability Development Program* Department of National Defence,[2017b]), 16.

organizational interoperability. Andreas Tolk, Adjunct Professor at Old Dominion University, provides a wide-aperture overview in *Introducing a Reference Model for Measures of Merit for Coalition Interoperability* as seen below in Figure 3.1.



© 2002 VMASC

Figure 3.1 -- The Layers of Coalition Interoperability

Source: Tolk, *Introducing a Reference Model for Measures of Merit* .. 18 [page 18?](#)

Tolk's Layers of Coalition Interoperability (LCI) reference model provides an overview of the multiple layers that comprise the coalition interoperability discussion and is complementary to the majority of existing models. The lower levels of the model describe technical interoperability, focused on characterizing C5ISR systems, while the Knowledge/Awareness layer acts as a transition to the organizational layers above.

Although progress can lead in one layer, all the layers are interdependent and an uneven approach, if not compensated by a partner, will reduce the cohesion of the whole

coalition. Maximizing the ratings in all layers produces an organization that is greater than the sum of its parts³³⁰.

An example to this, albeit negative, are the CAF C2 mission networks discussed in Chapter One. Much valuable work has been conducted by the engineers at CJOC, ADM(MAT), and NATO under the Federated Mission Networking (FMN) initiative, which works in the physical, protocol, data, and information layers. The overall end product, CDMN, generally suffers due to a lack of expertise at the organizational layers with the second-order effect being absent operational requirements and third-order effect of uninformed software development. Alignment at the procedural, operations, and doctrine layers is sorely needed to course correct C2 systems capability development. Without this alignment, the DND data fabric will not be realized.

The Tolk model is a good starting frame of reference across the defence department to uncover gaps between internal departmental partners, but other models exist that are better suited for narrower fields of view.

In a DRDC study of interoperability frameworks, it was noted that empirical data in the application of these models were very sparse, and even rarer was any Canadian literature regarding interoperability evaluation³³¹. The DRDC researcher noted that the US developed models were generally more focused on a technical systems interoperability within the DoD while the models from Australia and the UK apply a non-

³³⁰ Andreas Tolk, "Introducing a Reference Model for Measures of Merit for Coalition Interoperability" Old Dominion University, 17 Jun 2003, 1 Jun 2003), 18.

³³¹ Philip Bury, *Coalition Interoperability Measurement Frameworks Literature Survey* Defence Research & Development Canada,[2011]), v.

technical lens to multinational and interagency relationships³³². In the study, literature from nineteen models developed by the US, UK, Australia, and NATO were reviewed and four models were recommended for further exploration by the DND. Of these four models, one was technical in nature and three were organizationally focused³³³.

For a technically focused systems evaluation, the recommended model was the US DoD developed Levels of Information Systems Interoperability (LISI) with the reference guide depicted in the Figure 3.2 below.

Nature of Operational Information Interaction	Corresponding Interoperability Level	Implications				
		P	A	I	D	
Cross-Domain Interactive Manipulation	Enterprise	4	Enterprise Level	Interactive	Multiple Topologies	Enterprise Model
Shared Applications & Databases	Domain	3	Domain Level	Groupware	World Wide Networks	Domain Model
Complex Media Exchange	Functional	2	Program Level	Desktop Automation	Local Networks	Program Model
Simple Electronic Exchange	Connected	1	Local/Site Level	Standard System Drivers	Simple Connection	Local
Manual Gateway	Isolated	0	Access Control	N/A	Independent	Private

Figure 3.2 — LISI Reference Model

Source: US DoD, Architecture Framework Version 2.0, D-8.

In this model, an interoperability assessment is conducted by comparing the level of information exchange against four attributes. A system ranges from isolated, the lowest form of interoperability, to enterprise, the highest, and are assessed through the

³³² Bury, *Coalition Interoperability Measurement Frameworks Literature Survey*, 39.

³³³ *Ibid.*, 67.

attributes of Procedures, Applications, Infrastructure, and Data, otherwise known as **the** PAID attributes.

Following the LISI model, developed in 1998, was the Australian-led Organisational Interoperability Maturity (OIM) model that extrapolated the LISI interoperability levels to OIM organizational levels. This translated the LISI rating system designed for technical systems to a method of assessing organizations for a more people-centric approach. The assessment attributes shifted from the PAID model to Preparedness, Understanding, Command Style, and Ethos³³⁴. The examples used for an “independent” level of interoperability, the lowest form of interoperability, is the relationship between the Australian Defence Force (ADF) and a Non-Governmental Organization (NGO)³³⁵. The highest level of interoperability, the unified level, is likened to a homogenous organization such as the ADF’s Headquarters Joint Operations Centre. This translation is depicted in Figure 3.3.

³³⁴ Clark Thea and Richard Jones, *Organisational Interoperability Maturity Model for C2* (Canberra: Defence Science and Technology Organisation,[1999]), 8.

³³⁵ *Ibid.*, 6.

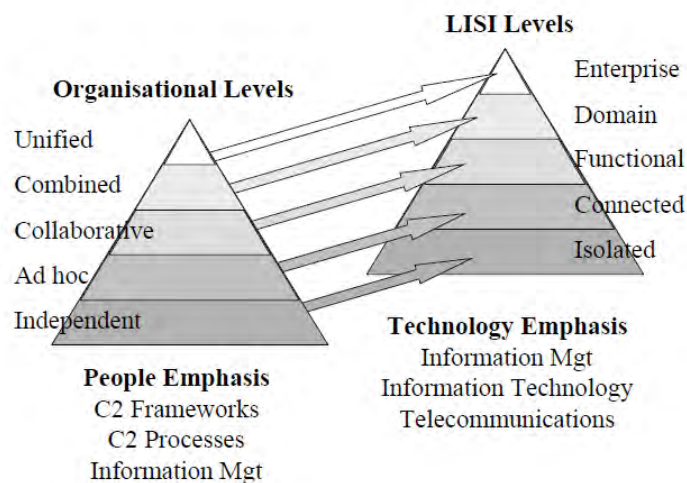


Figure 3.3 — Alignment between Organisational Model and LSI

Source: Clark et al., Organisational Interoperability Maturity Model for C2, 8.

In 2004, a UK-led model called the Non-Technical Interoperability (NTI) model, further extrapolated the OIM model, and introduced additional fidelity to the OIM assessment attributes. These refinements were developed through workshops that consisted of land, air, and maritime representatives and included a new a rating scale for the sub-attributes called the Multinational Force Cooperability Matrix. The model is depicted in Figure 3.4 below.

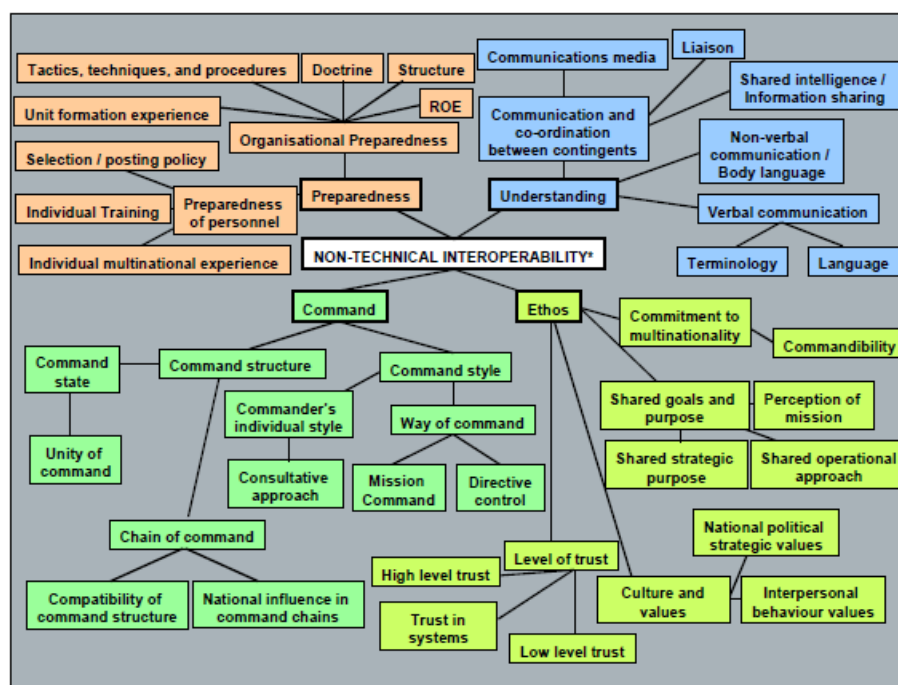


Figure 3.4 — The non-technical interoperability framework

Source: Stewart et al., Non-technical Interoperability in Multinational Forces, 7.

These models all represent an approach to discuss and assess interoperability within the CAF, DND, GoC, and international partners. Applying the Tolk model across the CAF operational level will aid in identifying gaps between the services to begin the work of developing a holistic prioritization of capabilities to be developed.

A concurrent effort of applying more technical or systems centric models, such as LISI, will be required to facilitate information sharing among the services to improve decision-making and integrate collective action at the tactical levels. This is the first step towards creating a data fabric.

At the DND enterprise level, using the LCI model as a starting point to map departmental workflows will provide OGDs a clearer picture of its core business

practices and opportunities for other OGDs to plug in. Applying more organizationally focused models, such as the OIM or NTI models, at the higher GoC level will provide more transparency and align understanding, which ultimately increases trust.

CAF Modernization will benefit greatly from the use of models, as Tolk recommends, given that maturity models will aid decision makers in understanding the mechanism of an existing process in order improve the current structure³³⁶.

The current DND *Capability Based Handbook* references interoperability only in a single place, as a component of a Measure of Capability (MOC)³³⁷ in the definitions section. In the capability assessment portion of the handbook, interoperability is completely missing in favour of the sustainability and deployability attributes, that are to be individually assessed by a Force Employer and not the Joint Capability Planning Teams. This is indicative of the stovepiped approach to DND capability development.

IS A FOCUS ON INTEROPERABILITY ACCEPTABLE TO CANADIANS AND CANADA’S PARTNERS?

Canada’s History of Multilateralism

A defining feature of Canada’s international reputation as a middle power is its preferred approach of multilateral cooperation³³⁸. Murray et al., describe multilateralism as a “cornerstone of Canadian foreign policy since World War II³³⁹” that provided Canada with flexible policy options. Multilateralism in itself grants middle power states

³³⁶ Tolk, "Introducing a Reference Model for Measures of Merit for Coalition Interoperability" , 8-9.

³³⁷ Department of National Defence, *Capability Based Planning Handbook (Version 9)*, 49.

³³⁸ Robert W. Murray and Tom Keating, "Canada, Multilateralism and Multipolarity: Navigating the Emerging Order," in *The Palgrave Handbook of Canada in International Affairs* (Switzerland: Springer International Publishing AG, 2021), 93-116., 100.

³³⁹ *Ibid.*, 93.

the ability to influence much larger states which otherwise would have acted unilaterally^{340, 341}. Canada has leveraged its position as a middle power to pursue normative initiatives such as human rights, environmentalism³⁴², and reconciliation through the peaceful settlement of disputes³⁴³.

These motivations are not entirely altruistic as states will not trade sovereignty for maintaining the liberal international order, but Canada's approach consistently chooses multilateralism when it intersects with national interests³⁴⁴. Yet, with like-minded nations' pursuit of shared norms, multilateralism is directly linked to the strengthening of the international order³⁴⁵.

As a trading nation, Canada's multilateral entrepreneurialism allows a Canadian voice in international forums, many of which Canadians helped to establish³⁴⁶, and is crucial for Canada's prosperity. According to World Bank data, as of 2020, Canada's Trade to GDP ratio was 61%, reaching a peak of 83% in 2000³⁴⁷. Canada's multilateral approach clearly is within the national interest.

Canada's steadfast political support of normative international bodies, such as NATO, is likely to remain unchanged³⁴⁸. Multilateral interoperability is a core tenant of

³⁴⁰ Paris, "Are Canadians Still Liberal Internationalists? Foreign Policy and Public Opinion in the Harper Era," , 274-307, 275.

³⁴¹ Cooper, "Testing Middle Power's Collective Action in a World of Diffuse Power," , 529-544, 531.

³⁴² Murray, "Canada, Multilateralism and Multipolarity: Navigating the Emerging Order," in , 93-116, 93.

³⁴³ Paris, "Are Canadians Still Liberal Internationalists? Foreign Policy and Public Opinion in the Harper Era," , 274-307, 275.

³⁴⁴ Murray, "Canada, Multilateralism and Multipolarity: Navigating the Emerging Order," in , 93-116, 96.

³⁴⁵ *Ibid.*, 99.

³⁴⁶ Paris, "Are Canadians Still Liberal Internationalists? Foreign Policy and Public Opinion in the Harper Era," , 274-307, 277.

³⁴⁷ "Trade (% of GDP) - Canada," , accessed 25 Apr, 2023,

<https://data.worldbank.org/indicator/NE.TRD.GNFS.ZS?locations=CA>.

³⁴⁸ Murray, "Canada, Multilateralism and Multipolarity: Navigating the Emerging Order," 93-116, 113.

NATO, and thus, political, economic, and military interoperability with Canada's partners is unlikely to change as well.

Canada as a World Leader in Technology Development

As China prioritizes technology development in the three strategic areas of space, artificial intelligence (AI), and quantum computing³⁴⁹, Canada and its multilateral approach has a large role to play.

Canada houses some of the world's most well-known semiconductor designers such as TSMC, Samsung, Advanced Micro Devices (AMD), Qualcomm, and Intel³⁵⁰. With a TSMC Design Center located in Ottawa, AMD's campus has been long established in Markham, and Intel's Design Center in Vancouver³⁵¹, leading chip designers are within arm's reach of Canadians.

In Oxford Insights' *Government AI Readiness Index*, Canada has consistently been a world leader in AI development, ranking 6th of 194 nations in 2019³⁵², 7th in 2021³⁵³, and 5th in 2022³⁵⁴. In a report published by Accenture and the Canadian Institute for Advanced Research, Canada ranked 4th in AI Skills migration and three Canadian universities, the Universities of Toronto, Alberta, and Montreal, were ranked in the top

³⁴⁹ Namrata Goswami, "China Prioritizes 3 Strategic Technologies in its Great Power Competition," *Diplomat (Rozelle, N.S.W.)*, Apr 21, 2023.

³⁵⁰ Philippe Ferland, "Why Canada is the Solution to the Global Semiconductor Shortage," *Invest in Canada* 27 Oct, 2021.

³⁵¹ Ferland, "Why Canada is the Solution to the Global Semiconductor Shortage,"

³⁵² Hannah Miller and Richard Stirling, *Government Artificial Intelligence Readiness Index 2019* Oxford Insights,[2019]),. 7.

³⁵³ Pablo Fuentes Nettel et al., *Government AI Readiness Index 2021* Oxford Insights,[2022]),. 61.

³⁵⁴ Annys Rogerson et al., *Government AI Readiness Index 2022* Oxford Insights,[2022]),. 8.

25 Machine Learning programs globally³⁵⁵. Canada holds an important role pioneering norms and standards for a technology that will define the fourth industrial revolution.

This leadership position is not guaranteed as the AI field is becoming more congested and countries accelerate their efforts in AI due to its application becoming increasingly pervasive in society. Canada's current position was made possible by early investment in the field, publishing its national strategy in 2017, the *Pan-Canadian AI Strategy*, a first of its kind³⁵⁶. In a report published by Council of Canadian Academies, Canada's early strategy focused on research and talent recruitment which showed success but will need to broaden its aperture towards other actors in the research ecosystem³⁵⁷. Additionally, the report noted that education programs skewed heavily in robotics and automation while the international community is diversifying in other AI sub-fields³⁵⁸.

Canadians make up a significant portion of the global technology industry in the disruptive fields of AI, space, and quantum and joint research opportunities should be sought out to bolster the CAF's modernization initiatives.

NATO and Latvia

In June 2020, NATO outlined their *NATO 2030* initiative and released a subsequent joint Summit Communiqué that consisted of eight proposals³⁵⁹. Of these eight proposals, two stand out in particular to Canada's strengths in the context of

³⁵⁵ Nabilah Chowdhury et al., *Pan-Canadian AI Strategy Impact Assessment Report* Accenture & CIFAR,[2020]), 4.

³⁵⁶ Council of Canadian Academies, *Leaps and Boundaries - the Expert Panel on Artificial Intelligence for Science and Engineering* (Ottawa (ON): Council of Canadian Academies,[2022]), 17.

³⁵⁷ *Ibid.*, 18.

³⁵⁸ Council of Canadian Academies, *Leaps and Boundaries - the Expert Panel on Artificial Intelligence for Science and Engineering*, 18.

³⁵⁹ NATO, *Brussels Summit Communiqué* (Brussels: NATO,[2021]).

capability development. The first proposal of note is NATO's goal of fostering technological cooperation, with an emphasis on promoting interoperability, and the second is the strengthening of training and capacity building activities with partner countries.

The following year, the *NATO 2022 Strategic Concept* was published where various similar CAF Modernization issues were echoed. Under the core task of Deterrence and Defence, the desire to establish multi-domain forces, with enhanced C2 and situational awareness, was articulated³⁶⁰. NATO also expressed their desire to expedite their Digital Transformation and adapt a modernized command structure³⁶¹. NATO's objectives directly aligned with CAF objectives.

Canada is presented with a unique opportunity to execute these initiatives with their allies deployed in the Republic of Latvia as part of NATO's enhanced Forward Presence (eFP) mission that was established following the Warsaw Summit of 2016. According to the Forward Presence factsheet, the battlegroup led by Canada, otherwise known as a Framework Nation, consists of 11 NATO countries for an approximate total of 1887 personnel³⁶². The countries committed to this endeavor represent one third of the NATO allies³⁶³. Canada is on the frontier of NATO doctrine, where detailed tactical doctrine does not exist at the battlegroup level for this level of diversity³⁶⁴.

³⁶⁰ NATO, *NATO 2022 Strategic Concept*, 6.

³⁶¹ *Ibid.*, 7.

³⁶² NATO, *NATO's Forward Presence Factsheet* NATO,[2022b)], 1-2.

³⁶³ Department of National Defence, *Joint Declaration between the Ministry of Defence of the Republic of Latvia and the Department of National Defence of Canada Concerning Augmented Forward Presence Latvia* Department of National Defence,[2022c)].

³⁶⁴ *Ibid.*

In a joint declaration between the Latvian and Canadian Ministers of Defence, made in June of 2022, both countries announced their commitment to the mission and to surge the multinational battlegroup to a brigade-sized element³⁶⁵. As the complexity ramps up to this scale, the CAF must consider an interoperability framework that will guide capability development in areas beyond technical, such as social and cultural, cohesion.

The current multinational battlegroup is a prime use case for the LISI and LCI models to provide a detailed understanding of interoperability frictions and guide collective training objectives. Using a recognized interoperability framework, that is already familiar with NATO allies, to map this unique progress will provide valuable insight back to the alliance and serve as model for other states to emulate.

It is imperative that the CAF adopt a systematic approach to improve interoperability in order to reduce “tempo drag”, outlined in the supplementary literature of the NTI model. Tempo drag occurs in multinational coalitions with high incompatibility, spurred by a lack of mutual understanding, which undermines the coalition’s effectiveness and decision-making speed³⁶⁶. Incompatibility can be formed in many ways, from communications systems limitations, foreign disclosure policies, to national strategic restraints. These effects must be mitigated through collective training and can be informed by applying interoperability models to isolate frictions prior experiencing them on the battlefield.

³⁶⁵ Department of National Defence, *Canada and Latvia Sign Joint Declaration to Augment NATO’s Enhanced Forward Presence Latvia* Department of National Defence,[2022a]).

³⁶⁶ K. Stewart et al., *Non-Technical Interoperability: The Challenge of Command Leadership in Multinational Operations* QinetiQ Ltd,[2004]), 6.

The eFP mission serves Canada's multilateral interests well, raising its status with the North Atlantic Council³⁶⁷. As published in a NATO Defence College paper, "NATO remains Canada's most important multilateral institution precisely because it acts as a force multiplier for Canada's core interests³⁶⁸".

Interoperability vs Interchangeability

Referring to the AUKUS deal, US Chief of Naval Operations Admiral Mike Gilday called it a "strategic stroke of brilliance", adding that it "puts all three countries working in lockstep with advanced capabilities to put us in a position where we're not just interoperable, but we're interchangeable"³⁶⁹. This marks a shift in thinking beyond interoperability. Reinforced by the Commanding Officer of the USS Gerald R. Ford, US Navy Captain Lanzilotta, stated "We want interoperability, we want interchangeability with our partners" prior to Carrier Strike Group departing on operations in the Atlantic of which Canada is a participant³⁷⁰.

This concept has been endorsed by both the UK and French Navies as a necessary increase in trust between partners that results in an asymmetric advantage³⁷¹. UK First Sea Lord, Admiral Ben Key, articulates that interchangeability, "is the ability to operate

³⁶⁷ Alexander Lanoszka, Christian Leuprecht and Alexander Moens, "Canada as Framework Nation," *Lessons from the Enhanced Forward Presence, 2017-2020* no. 14 (1 Nov, 2020), 45-52. <https://www.ndc.nato.int/download/downloads.php?icode=667..> 52.

³⁶⁸ Lanoszka, "Canada as Framework Nation," , 45-52, 52.

³⁶⁹ Megan Eckstein, "What have the AUKUS Partners Spent the Last Year Doing?" *Defense News* 7 Sept, 2022. <https://www.defensenews.com/naval/2022/09/07/what-have-the-aukus-partners-spent-the-last-year-doing/>.

³⁷⁰ US Navy Press Office, "Gerald R. Ford Carrier Strike Group Departs for First Deployment," *US Navy* 5 Oct, 2022. <https://www.navy.mil/Press-Office/News-Stories/article/3179931/gerald-r-ford-carrier-strike-group-departs-for-first-deployment/>.

³⁷¹ Xavier Vavasseur, "US Navy, French Navy and Royal Navy See Eye to Eye on Interoperability " *Naval News* 24 Jan, 2023. <https://www.navalnews.com/naval-news/2023/01/us-navy-french-navy-and-royal-navy-see-eye-to-eye-on-interoperability/>.

at a quicker cycle of decision making than the adversary, that is absolutely key to being able to secure operational advantage". The example upheld was the successful trials of UK, US, and French aircraft operating from each other's carriers³⁷². Admiral Pierre Vandier, Chief of Staff French Navy, is quoted in amplifying the focus of interoperability beyond mechanical or digital means, but conceptually, with establishing operational standards and procedures³⁷³.

This news confirms that Canada's allies are aiming to achieve the highest levels of interoperability possible, to the point of interchangeability, a concept that Canada is well positioned to leverage. Canada's NATO allies appear to be willing to cover the CAF's doctrinal and capability gaps as long as the force elements that the CAF provides are fully interoperable. These opportunities must be exploited to bring in operational level experience that will reinvigorate CAF joint doctrine and inform pan-domain doctrine development.

CONCLUSION

This chapter has introduced powerful interoperability models that are already being used by our closest allies to guide their capability development efforts. The Canadian technology industry is shown to be well poised for assisting the CAF's C5ISR modernization and Digital Transformation journey, a common aspiration faced by all NATO partners. Canada's unique position as a NATO Framework Nation in the eFP

³⁷² Xavier Vavasseur, "US Navy, French Navy and Royal Navy See Eye to Eye on Interoperability " *Naval News* 24 Jan, 2023. <https://www.navalnews.com/naval-news/2023/01/us-navy-french-navy-and-royal-navy-see-eye-to-eye-on-interoperability/>.

³⁷³ *Ibid.*

mission both challenges and provides unprecedented opportunity for the CAF to lead multilateral cooperation, a value that is a part of the nation's history and identity.

Applying the interoperability models at all levels of the DND will unquestionably provide value by framing CAF Modernization gaps to improve internal integration, as well as strengthen Canada's contribution to coalition operations.

CONCLUSION AND RECOMMENDATIONS FOR FUTURE RESEARCH

The lessons gleaned from the CAF's struggle to modernize C5ISR reveal gaps at the operational level that impede the CAF's ability to act as a joint force and threaten the success of the CAF's pan-domain ambitions. This is not a problem that Digital Transformation can resolve until a firm understanding of the organization's core business practices is identified and addressed. Due to the siloed nature of CAF capability development, an overarching capability framework is required to understand the relationship between each subordinate organizations' business processes in which transformation can be enacted.

SSE sowed the seeds for CAF Modernization, which is beginning to bear fruit as substantial capital projects will enter implementation in the following years. Based on Canada's traditional approach to defence policy, the window to capitalize on these efforts is narrow, so transparency and genuine cooperation with OGDs is required to exploit the limits of SSE funding. As each new capability creates new data, these outputs need to be aligned to build the CAF's digital fabric, but this integration work, again, requires a cohesive implementation plan guided by a capability framework.

The three predominate themes of a WoG approach, information sharing, and a diverse set of partnerships must be addressed to endure the potential outcomes of the future security environment. In this environment, Canada as a middle power nation, becomes increasing reliant on collaboration and multilateral partners both internally and externally to achieve its national objectives. Allies and adversaries are both leveraging pan-domain approaches in modern strategic competition and the first to master this approach will possess a considerable advantage.

The integration of interoperability concepts into the CAF's core business processes are both acceptable to Canadians and deeply valued by their partners. The Canadian liberal internationalist identity is preserved, and the increased cooperation contributes value to eyes of the CAF's security partners. Being fully interoperability with more capable allies provides opportunities to bring in operational level experience, while applying these lessons to less capable forces will strengthen the overall coalition.

Further research is required to select the optimal models to apply at the appropriate level of organization and how these models will interact with the capability development model. Development of joint and pan-domain doctrine that leverages the participation of fully interoperable, multinational, force elements also warrants further study. Additionally, the extension of these concepts to the governmental levels will necessitate adaptation of the models to suit Canada's unique political character.

The CAF is on the precipice of unprecedented change in its culture, its thinking, and its technology. As the world becomes increasingly proliferated and multipolar, Canada's strength is in its ability to make friends and create partnerships, the most effective way to check the irresponsible actions from great powers. Canada and the CAF cannot and will not go it alone, it is time to re-evaluate our modernization trajectory to reflect that reality.

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