



CONFERENCE OF DEFENCE ASSOCIATIONS INSTITUTE

# FORCE DEVELOPMENT

**The Future of Land Warfare and the Canadian Army**

Report - October 2024



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### On the Cover

Combat Camera / Flickr

“Exercise MAPLE RESOLVE”

Photo by Lieutenant Joffray Provencher, Canadian Forces Combat Camera,  
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# Introduction

The CDA Institute is a non-partisan registered charity organization that aims to advance informed debate on national security issues, particularly those that pertain to national defence and the Canadian Armed Forces. We aim to foster a fact-based and rational approach to dialogue on the topics of Canadian defence, security, and foreign policy.

In recognition of the incredible complexity of sustaining defence capabilities, including timely defence procurement, the CDA Institute has initiated the 'Force Development Series,' comprised of multidisciplinary roundtables and reports as a contribution to the national discussion on defence policy. On August 8<sup>th</sup>, 2024, the CDA Institute hosted *The Future of Land Warfare and the Canadian Army*. Participants reflected on the status of Canada's ground forces amidst the Ukraine war.

The objective of the event was to address the future of land warfare and its implications for the Canadian Army. Topics covered during the event included the lessons learned from Russia's invasion of Ukraine, Canada's current capabilities, the impact of technological evolution on the modern battlefield, and how to address some of the deficiencies that the Canadian Army currently faces.

This report summarizes the discussions held during the event, providing a comprehensive overview of the key points made by the invited experts. The report aims to promote better understanding and informed debate about the challenges associated with sustaining this critical capability for Canadians. Complying with the Chatham House rule, the report does not attribute any comments to individuals.

Special thanks to our Rapporteur, Michael Shirley,  
PhD Candidate in International Affairs, Carleton University

# Executive Summary

This report provides a detailed summary of the future of land warfare, it discusses the lessons that can be extracted from Russia's invasion of Ukraine, and it situates the capabilities of Canada's army in the context of future conflicts. The Canadian Army faces several obstacles if it hopes to successfully contend with the challenges of modern and future warfare.

The nature of war has not changed but its character has evolved. Russia's invasion of Ukraine has shown how technological advancement, and the proliferation of unmanned aerial vehicles (UAVs) has necessitated the use of dispersal on the battlefield. Sound, electromagnetic frequencies, and scent can now alert an enemy to one's position. Dispersal, however, comes with its own set of challenges as it becomes increasingly difficult for dispersed units to exploit breakthroughs of an enemy's frontline.

This report identifies the importance of survivability, coordination, innovation, and scalability on the contemporary battlefield. Forces must be able to survive against a myriad of evolving technologies which can seek them out, they must be able to communicate and coordinate with their allies, and they must be interoperable so that they can scale appropriately to any scenario.

Canada is ill-prepared to deal with the challenges of contemporary modern and future land warfare. Personnel shortages, lethargic procurement, and a severe lack of funding threaten the capabilities of Canada's army. This is further complicated by a relative lack of political commitment to the Canadian Armed Forces (CAF), which reduces Canada's military options, the credibility of its diplomatic and information options, and allies' interests in economic options that may benefit Canada. Despite these challenges, the Canadian Army is not short on talent and competence.

This report outlines several strategies which could improve the readiness of the Canadian Army for land warfare: reverse engineer the needs of the army to reform procurement procedures, implement machine learning to enable more efficiency, and provide consistent and clear messaging from the CAF to Ottawa to ensure that the appropriate funding is made available to support required capabilities.

The CAF faces significant funding challenges that negatively affect its ability to coordinate and scale Canada's operations. Army team members are not sufficiently trained to increase their survivability in a contemporary conflict, and most are insufficiently prepared to adapt and innovate. The Canadian Army may mitigate its personnel shortages by repurposing some members and relying increasingly on machine learning. This takes training and commitment, but the benefits include the facilitation of a more prepared and capable Canadian Army.

For future discourse, the report proposes three key questions:

- 1) What is the sustainability of the CAF's capabilities required to affect the land domain during longer-duration conflicts?
- 2) How does the Army define Joint All Domain Command and Control (JADC2) and IAMD Integrated Air and Missile Defence (IAMD) and does their definition fit within the overall strategic vision of the CAF and other environments?
- 3) How will Canada's forces contend with operating in a disrupted, denied, intermittent, and limited (DDIL) C4ISR environment?

## General Trends: The Ukraine War and Its Implications for Modern Warfare

The nature of war does not tend to change, however, the character of war – how armies fight, where and when the fighting occurs, and with what weapons and leadership techniques – does. The character of the war in Ukraine is where we can derive most of our general trends.

Reliance on camouflage and silence across the electromagnetic sphere have returned to the battlefield. While these Cold War-era tactics are tried and true, they have become complicated in the context of modern warfare. Technology greatly improves a forces' ability to detect and strike targets. Moreover, Western forces previously operated on battlefields in which they maintained air superiority – this can no longer be assumed to be the case. The proliferation of drones, integrated air defence systems, and electronic warfare have levelled the field. Air superiority may only be possible in the future for specific periods and in specific locations through carefully synchronized effects in many domains.

The Ukraine war has taught us that dispersion is key to survival on the contemporary battlefield. Sound, technology, and even scent may alert the enemy to one's position. To gain and retain initiative required to win, effects and forces must be concentrated when necessary to take and hold ground. This presents three key takeaways that modern ground forces must emphasise: survivability, coordination, and scalability.

Forces need to survive their competitors' sensors and effectors. To gain and retain initiative, even while dispersed for survivability, forces must retain situational awareness and bring effectors to bear. This requires detection capabilities, long range fire, and air defence systems which provide defence against drones, missiles, and rockets.

Ground forces must be able to communicate and coordinate with their allies. This requires long range and redundant communication systems that allow for communications to run from the frontlines to the rear – redundancy also counters against modern electronic threat. An integrated digital system that provides ground forces with the proper situational awareness is key to targeting and survival.

The complexity of today's battlefield also demands sustained training budgets that promote unit interoperability. This requires a modern force structure with a tailored reserve force that is trained on common equipment.

The Ukraine war has demonstrated another key challenge for modern armies: how to restore tactical and operational levels of manoeuvre. Russia and Ukraine have been unsuccessful here largely because modern states can only seem to generate enough combat power to man continuous defensive positions with no open flanks. Break in operations have become so costly that it has not been possible to break out because contemporary battlefield sensor and strike capabilities inhibit the survivability of the forces need to break out in depth before being counter attacked. Forces may need to coordinate dispersed local breaches to establish a cumulative effect.

Artificial intelligence (AI) has yet to replace capable ground forces on the battlefield but does act as a force multiplier. Some panelists believe that battlefields in the very near future will see armies confronted with tens of thousands of drones as the cost of producing the technology decreases, and that the Ukraine war offers a preview of this. For example, the Russians have combined technology with traditional strategies to supplement their capabilities. They use a Tactical Reconnaissance Strike Complex (TRSC) to track, target, and strike the Ukrainians. TRSC utilizes the coordinated employment of high-precision, long range weapons which are linked to real-time intelligence data and precise targeting provided to a fused intelligence and fire-direction centre. They

synthesize this system with artillery and drones for indirect fire and reconnaissance. The system keeps costs (both economic and casualties) low and can maximize losses on the other side.

Electronic warfare will continue to proliferate on the battlefield, but this requires high levels of bandwidth – especially for dispersed operations. Operators will need to be able to utilize their offensive and defensive tools while also accessing open-source intelligence (OSINT) tools to conduct meaningful intelligence operations. If successful, forces can utilize intelligence to support dynamic and deliberate targeting. However, this requires more sensors than what a brigade currently has.

Experts offer caution about the extent to which our military and government leaders should apply the ‘lessons’ learned from Russia’s war in Ukraine to every combat scenario. Instead, we should take the broader lessons we learn from the conflict and apply them to our training, our procurement methodologies, and integrate them into our vision for the future of Canada’s ground forces.

## Situating Canada in Modern Warfare

A key priority of the Commander of the Canadian Army is to modernize the force. Currently, the army sponsors 49 capital equipment projects, which are estimated to cost \$24 billion. Implementation of these projects will contribute to modernizing the army’s equipment, command and control, and readiness. These projects intend to bridge the army’s capability gaps and ensure long-term viability.

With consideration of the 49 current projects and the challenges to deter, defend and defeat in the modern land domain, one can see the great importance of Indirect Fires Modernization (IFM), Long Range Precision Strike (LRPS), Ground Based Air Defence (GBAD) and Domestic Arctic Mobility and Survivability (DAMS). IFM, which

could result in modern self-propelled howitzer and mortar systems, relates to Canada’s commitment to provide the CAF with the ability to accurately strike targets for greater effect at greater distances. This will significantly improve the protection of our deployed personnel by providing them with the capability to strike enemy positions from a great distance and in a great number of directions. Canada has also committed to acquire long-range missile capability for the Canadian Army to enable our forces to shoot at greater ranges than our adversaries in combat.

Although the army had low level air defence capabilities at the end of the Cold War, there is intent to field modern ground-based air defence systems that provide tactical air defence protection to friendly forces by defending against rocket, artillery, missile, bomb and related threats. To improve its domestic arctic mobility and survivability, the army intends to replace the current BV206 fleet with a fleet of medium-sized, high-mobility, amphibious vehicles whose utility will grow in importance as the Arctic continues to open and states vie for influence in the region.

A key element of DND’s Defence Resource Business Modernization programme that will benefit the army’s force management, force sustainment, force generation and force employment and be considered within force development is the Modernization and Integration of Sustainment Logistics (MISL) project. With implementation scheduled for completion in 2028, MISL will integrate functionality of various stand-alone logistics systems and enhance current resource management information functionalities into a robust SAP ERP for warehousing and distribution within the defence supply chain. The resulting asset visibility will support timely decision making and force readiness.

Canada’s army, despite its focus on modernization, these new projects, and its demonstrated mastery of obtaining unsourced equipment through bottom-up methods, faces several key challenges that will obstruct its ability to operate successfully in a contemporary conflict. Many of

these challenges originate from the paucity of government funding.

A large percentage of the army's vehicle fleet is not serviceable, and the army is struggling to service those which are still operational; the government's procurement of major weapons systems underperforms; and the Canadian government has reprofiled, rescoped, or rescheduled some \$19 billion CAD that could have been used to boost the CAF's capabilities.

Panelists debated that improving the army's messaging could result in appropriate policy coverage and sustainable funding. Being as DND's operating budget decreased by \$901M from FY 23/24 to FY 24/25, army modernization cannot advance without the positive reception of the army's messages.

Canada's hesitancy to spend on defence has drawn the ire of some of its allies in NATO. The country has pledged to meet its spending commitment of 2 per cent GDP toward defence, but it continues to delay on the promise. Funding is not enough to establish meaningful deterrence in the Canadian Arctic; thus, Canada continues to rely heavily on the United States for Arctic security.

## Addressing Canada's Challenges

The Canadian Army faces a personnel crisis which further complicates the challenges it faces. Some argue that the centralization of the recruitment process has needlessly complicated the process. It could be more effective if each branch oversaw its own recruiting process. The same can be said about the procurement process. There is a gap between the decision-making procedures and the realities of certain situations.

Currently, domestic deployments to national disasters are negatively affecting operational readiness for warfighting. Those who are slated to

go to Europe are expected to go fight forest fires and then return to their training.

Indeed, there is an efficiency problem that is endemic across the CAF. Some panelists argued that the personnel issue may be addressed simply by repurposing and cross training CAF members, combined with the use of artificial intelligence to fill in gaps. Others argued that the concept of mobilization is key to solving Canada's military personnel crisis.

Key to the future of the Canadian Army relates to training and adaptation. This requires forces to be trained before they even step foot on the battlefield – improvisational learning under fire is not likely to ensure long-term battlefield success. Yet the training should also attempt to account for (if not simulate) the duress that operates will face in a war zone. The Enhanced Forward Presence Battlegroup in Latvia offers an opportunity for Canada to train its ground forces in this way.

Troops should also be trained for worst-case scenarios, such as the use of a Weapons of Mass Destruction (WMD), chemical and biological warfare, and for the event of nuclear war. They should develop principles of campaign design which account for these contingencies. For this, the army can look to the American example.

The next major conflict is likely to see the wholesale integration of AI into every aspect of military planning and execution. AI will help process large amounts of data into meaningful and accurate intelligence which will greatly speed up the planning process and the accuracy of targeting. The Canadian Army must adapt and train for these eventualities. They are at the first step of understanding how to utilize AI when they should be much further along.

Canada is not currently poised to equip its troops with modern weapons with enough ammunition to be operationally successful. The procurement process is slow and is often outpaced by technological innovation. One step in the right direction is to invest in the country's ammunition produc-

tion capabilities so that it is not at the behest of its allies.

Decision makers will be faced with difficult choices regarding what to sustain due to a lack of funding. They should look to prioritize survivability, coordination, innovation, and scalability in these decisions. For example, they should expedite the availability of aerial and heavy support systems as well as command and control frameworks that enable soldiers to fight and survive.

Investment in all arms is necessary for contemporary warfighting. Combined arms are the key to successful operations. Drones, and the cyber environment must combine with infantry, cavalry, and artillery in the modern environment. Armour is still a vital component to any military's ground forces.

Tanks must be mobile, sustainable, and reasonably heavy armoured with the capability to fight threats on the ground and in the air. This involves plating on vehicles, cages, jamming and masking equipment, and reactive armour. Moreover, armoured reconnaissance is still necessary for when the electromagnetic environment has been compromised.

The Canadian Army's mobility capabilities have severely atrophied. The army's military engineering equipment is generally based on 1970s concepts and technology, although some equipment is newer. Its armoured engineer vehicles cannot lay and recover fascines, and it does not have an assault bridging capability. Other than several sets of mine ploughs and rollers, and many dedicated soldiers, the army has insufficient mechanized and no explosive line charge systems to breach explosive obstacles such as minefields.

One can also suggest that the army's lack of tanks, mechanized infantry, self propelled artillery fires, ISR, EW, recovery, and other capabilities mean that it is unable to conduct opposed combined arms breaching operations at even the combat team level, let alone scale such manoeuvre to support breaching, break in or break out forces. The army's counter-mobility is also neg-

atively affected by obsolescence, lack of equipment, and policy. The army only has single impulse anti-tank mines, but not modern mines that can be controlled and initiated by other means, such as magnetic impulses.

The army also does not have any mine layers, be they mechanical, scattering, or other, so must rely on very slow methods of laying mines by hand. The lack of these and other counter mobility capabilities will impede the protection of Canada's land forces and reduce its abilities to shape adversaries to manoeuvre to where our forces can best deter, defend against, attrit, or defeat them.

From these perspectives alone, let alone the regeneration of ready capabilities after equipment are acquired, Canadian Army elements may not be able to survive, coordinate, or scale to battle group level defensive, transitional, and offensive operations on current battlefields without assistance from allies. It needs to recapitalize its mobility and counter mobility capabilities before considering transformational modernization.

The Canadian government also made cuts to its intelligence software tools. It cut its subscription service to software which provided OSINT tools to intelligence operators effectively limiting their capabilities. Canadian intelligence technology does not have the protectional mobility it requires to survive on the battlefield.

Panelists argued that the Royal Canadian Artillery (RCA) need to invest in capabilities that improve their survivability, coordination, and scalability. To improve survivability, the RCA needs: to reinvest in self-propelled howitzers so that they may quickly shoot across rough terrain; the proper systems – including radars and drones – to detect incoming direct fires; long-range fires to engage with the opponent's indirect fire capabilities; gunners in the joint terminal attack controller (JTAC) role to be able to call upon close air support; and air defence systems to provide aerial defence against drones, missiles, rockets, and fast air and rotary systems



In order to enhance survivability, prevent fratricide, and limit civilian casualties and damage, the RCA requires the ability to coordinate and communicate with Allies. This is done through the Fire Support Coordination Centres and is enabled through long-range, redundant communications systems and an integrated digital system. The communications systems must be able to go from forward observers and JTACs through unit headquarters and up to higher headquarters. The redundancy aspect is required to counter any threat posed by an opponent's electronic warfare capabilities. Additionally, an integrated digital system accelerates response times by providing proper situational awareness and near instantaneous transmission of orders.

The RCA, alongside the rest of the Canadian Army, needs to be able to train and equip its units to be interoperable from the detachment to unit level. This requires a modern force structure that tailors its reserve forces to reinforce its regular force units. The gunners, for example, of the reserve force need to be familiar and capable of reinforcing through months-long training.

The RCA must also be equipped in such a way that reserve gunners require minimum time to integrate into regular force units – they require systems with common gun-alignment and computing systems to facilitate this. Budgets and ammunition allocations, therefore, must be devised in such a way that gunners are consistently trained to a sufficiently high degree to allow integration into joint and combined operations at any time.

Canada must focus on enabling the capabilities of C4ISR. To do so, Canada must focus on interoperability with our allies in 5-eyes nations, especially the US, and NATO. Commanders, staffs, and signallers on the battlefield require the proper training to successfully wield the wide scope of C4ISR capabilities and they require the systems to be simple – the inherent complexity of information technology (IT) is not a useful tool on the battlefield. The cyber domain is an incredible

asset for C4ISR purposes, but it is a fragile and vulnerable target which opponents will hope to strike.

In order to maximize the effectiveness of C4ISR infrastructure, and to properly harness the power of data, it is essential that the Canadian government establish common standards and data structure to enable some degrees of interoperability with allies from the start. This modern network must also be designed in such a way that its inherent complexity is kept away from the battlefield so that users and signallers are able to optimize their capabilities through simplicity – though it must be noted that this would require having large, reliable pipes running from the battlefield to the rear.

The creation of this new system must take place simultaneously in numerous major and minor capital projects while also accounting for the rapid pace of IT development. Canada's procurement processes are not currently well designed to field technology capabilities that become obsolete after three years.

All this must be accomplished with a mobile and effective headquarters (HQ). Drones can easily acquire targets swiftly which necessitates mobility. HQ mobility has always been a necessity, both to move alongside the battle and to be better positioned to influence it, but the challenges of modern warfare have greatly exacerbated this need. The army needs to account for this and come up with solutions that help HQ continue to provide services while mobile. This may require twin locations or other redundancy options. This also means that ground forces must be equipped to handle challenges in energy management – in its generation, storage, and distribution.

In terms of the cyber domain, networks make attractive targets. Cyber-attacks are to be expected and thus Canada's networks must be secure, robust, and resilient. They must be able to maintain their services in a degraded environment and they must be able to recover quickly.

Synergies which are developed in a single, robust, and redundant supply chain using integrated IT platforms for the planning, control, and conduct of replenishment systems would offer one of the most efficient responses to this challenge. This would be a system of systems that are interconnected and can be controlled in a holistic manner. This would bring requirements, procurement, delivery, storage, transportation, sustainment engineering, personnel administration and services, rations, dining and quarters all within one system.

Finally, sustainment is often overlooked. Of the key challenges the sustainment team faces is that there are never enough mechanics or equipment. The army must do more to attract young, keen mechanics, technicians, and engineers to bolster its sustainment capabilities. Moreover, it must do more to provide for the department. Every request for more ammunition money was turned down meaning that sustainment had to turn to acquiring the equipment of Canada's allies through the NATO system. Their initiative is commendable but should not be a necessity.

Panelists also spoke to the missed opportunities that the Canadian government is not currently exploring. Canada will always work as part of a multi-national coalition and it will contribute what the government, on the advice of the Chief of Defence Staff, will commit. In many instances, this will be a joint contribution which will require a full national supply chain or pipeline in addition to a coalition supply chain for common items. In the event of a war, Canada will need to procure equipment much more rapidly from a military-industrial complex designed by a government which understands the risks it faces.

## Conclusion

The war in Ukraine has demonstrated that Canada does not yet have the full capabilities to adequately operate in the context of modern war.

While Canada's army is made up of a capable and powerful fighting force, they are ill-equipped to contend with the challenges of a contemporary battlefield.

Canada's readiness for a contemporary conflict appears bleak. The CAF is short on personnel, equipment, and funding to even sustain what it does have. It is crucial for the Canadian government and decision makers in DND and the Army to address the Army's shortcomings before it is too late. Failure to do so means sending members of the CAF underprepared to defend their country. Canada's adversaries are on the prowl and Canada can hardly defend its own northern territory.

For further discussion, the following questions were identified by those in attendance:

- 1) What is the sustainability of the CAF's capabilities during longer-duration conflicts?
- 2) How does the Army define Joint All Domain Command and Control (JADC2) and IAMD Integrated Air and Missile Defence (IAMD) and does their definition fit within the overall strategic vision of the CAF and other environments?
- 3) How will Canada's forces contend with operating in a disrupted, denied, intermittent, and limited (DDIL) C4ISR environment?