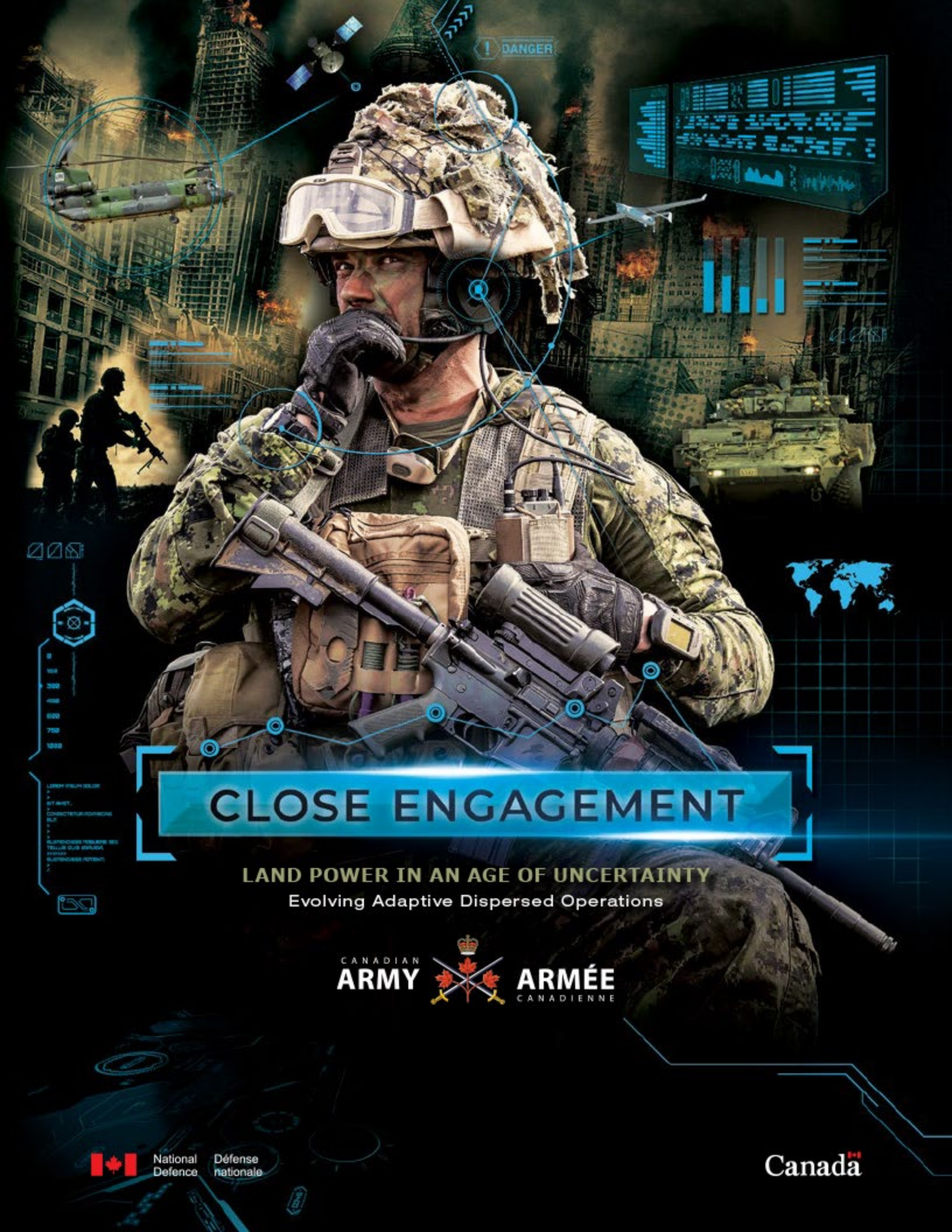

CLOSE ENGAGEMENT

LAND POWER IN AN AGE OF UNCERTAINTY

Evolving Adaptive Dispersed Operations

CANADIAN ARMY ARMÉE CANADIENNE

National Defence Défense nationale

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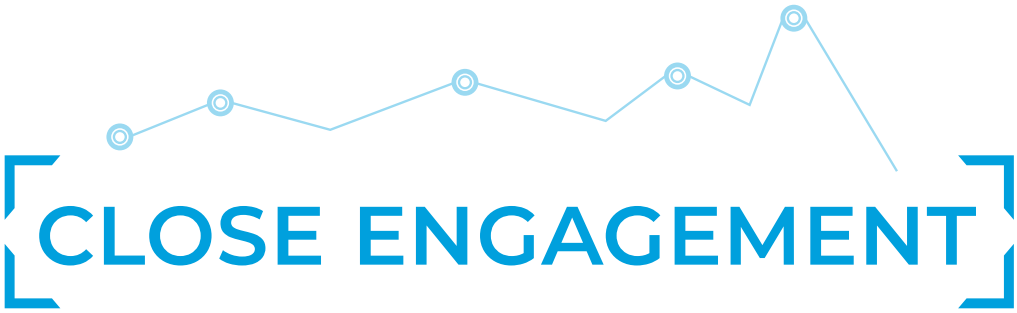

CLOSE ENGAGEMENT

LAND POWER IN AN AGE OF UNCERTAINTY

Evolving Adaptive Dispersed Operations

THE CANADIAN LAND OPERATIONS CAPSTONE OPERATING CONCEPT

CANADIAN ARMY ARMÉE CANADIENNE

Canadian Army Land Warfare Centre
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STRONG. PROUD. READY.
FORTS. FIERS. PRÊTS.

FOREWORD

"War is about people. Understanding the human environment is a key capability required in order to succeed in armed conflict. That said, for the foreseeable future, we need to appreciate that warfare alone will not produce decisive or enduring solutions to conflicts other than tactical, short-term victories. We must have the lethality and skills to ensure tactical success under any circumstances but, by recognizing the importance of human factors to establish a better state of peace, we will increase our ability to affect the security and stability in the conflicts that involve Canada's military. The Canadian Army's new operating concept, *Close Engagement*, provides the Canadian Armed Forces with the framework and the logic, within the land domain, by which it will remain a capable, agile, and adaptive force that can succeed in increasingly challenging circumstances as we approach mid-century."

—General Jonathan Vance, CDS, February 2019

Uncertainty, volatility and lethality are enduring characteristics of the security environment, within which Canadian land forces are expected, and will continue, to perform a broad spectrum of operations in support of Government of Canada objectives.

To prepare for that uncertainty, the Canadian Army (CA) has studied and analyzed potential future trends and their effects upon the security environment and, consequently, the likely operations therein, drawing out the most important implications for force design. Land operations are unique in their complexity, wherein each individual soldier interacts with the environment and amongst populations that will invariably react to them. While the CA is the Centre of Excellence for land operations within the Canadian Armed Forces (CAF), it will always require the support of various commands and alliances, alongside other partners and agencies.

Close Engagement: Land Power in an Age of Uncertainty is the capstone future land operating concept designed to guide the development of Canadian land forces for the next 10 to 15 years. It has been written to nest within Canada's defence policy and the CAF's joint concepts, while providing the necessary underlying philosophy for organizing, equipping, training, and employing Canadian land forces within an integrated CAF joint force. It replaces the 2007 publication *Land Operations 2021, Adaptive Dispersed Operations: The Force Employment Concept for Canada's Army of Tomorrow*, which was designed to serve "not as the end but rather the start point for further debate, design, and development of the Army of Tomorrow."[1] At the core of *Land Operations 2021* was the Adaptive Dispersed Operations concept, which sought not only to guide the development of adaptive land forces, capable of alternately dispersing and aggregating throughout the operating environment, but also to create an increasingly agile and adaptive mindset throughout the Army and with our land operations partners in the CAF. Leaders were challenged to frame operations according to their effects across the moral, physical and cognitive planes and to consider how best to work with joint, interagency, multinational and public partners. *Close Engagement* is a natural evolution of this approach.

Close Engagement is both the title of this concept and one of two core competencies for the CA, the other being close combat. Close combat comprises those combat operations conducted within range of direct fire weapons—it is essential for battlefield success and underpins all other activities. Close engagement is the ability to conduct both lethal and non-lethal activities at the tactical level to create effects that have influence across the physical, moral and cognitive planes within the operating environment; it is necessary for success in a campaign. Close engagement and close combat are not mutually exclusive—often both will be necessary, with the degree of effort shifting between them over the course of a campaign. This operating concept provides the guidance to further develop the close engagement competency across Canadian land forces.

1 Canadian Army, *Land Operations 2021, Adaptive Dispersed Operations: The Force Employment Concept for Canada's Army of Tomorrow* (Kingston: Directorate of Land Concepts and Designs, 2007), 41.

There are three key areas upon which we will focus special attention as our land forces are developed over the next 10 to 15 years:

- **Fostering the culture and tools necessary for interoperability with joint, interagency, and multinational partners.** Land forces need to be able to rapidly integrate with these partners, potentially with little or no notice, to succeed on operations.

- **Organizing, equipping and training balanced, agile and adaptive formations, units and sub-units in order to effectively form and employ empowered combined arms teams.** Adaptability and agility are key factors against which we will assess organizations, systems and processes. The procurement of broadly useful and appropriately adaptive equipment is a necessary condition to ensure robust land forces.

- **Establishing pervasive and robust networks, while preserving the ability to operate effectively in a degraded or austere environment.** Future networks must be designed and implemented to enhance shared understanding (both internally and with partners), the speed of decision making, and, in turn, the effectiveness of our command and control of land forces. This has the cumulative potential for transformational change. Failure to exploit these networks or, conversely, becoming entirely dependent upon them, has potential risks that may negate an advantage or even leave our land forces at a significant disadvantage.

Close Engagement provides Canadian land forces with a future operating concept designed to anticipate new challenges, foster rapid adaption to changing circumstances, and allow land forces to act with the leadership and professionalism that Canadians deserve as we act on their behalf to support peace and security around the world.

Jean-Marc Lanthier
Lieutenant-General
Commander, Canadian Army

PURPOSE

Close Engagement is a conceptual model of how the Canadian Army (CA) should be configured, equipped and trained in the medium term, approximately 10 to 15 years from the date of this publication.[2]

Close Engagement is the capstone operating concept; it is intended to ensure that Army capability development proceeds in a purposeful and coherent manner across the capability components—doctrine, organization, training, materiel, leadership, personnel, facilities and interoperability—to deliver this conceptual model.

> A capstone operating concept is a future concept, primarily used as a guideline for capability development. It describes in broad terms how military forces will operate across the full range of military missions, and it provides the philosophy and basic ideas that guide the development of any lower-order concepts. It also describes how the operational functions (Command, Sense, Act, Shield, Sustain) relate to each other and how they will be integrated into a cohesive operating system.

The *Close Engagement* capstone operating concept applies to all operations across the spectrum of conflict, both in Canada and overseas, and describes how land power will be employed to meet strategic aims.

The goals set out in this document are some what aspirational—they neither presuppose any particular constraint on resources, nor do they assume that resources will be unlimited. It is a reasonable assumption that many of the key capital platforms currently employed by the CA will continue to be employed for the period covered by this concept, albeit modified and augmented by some new capabilities. Over the lifespan of this concept, the extent to which the nation will invest in land operations capabilities will be driven by the strategic context, and the Army leadership will continue to judge which capability enhancements or new developments are essential and which can be taken at risk.

2 Horizon 2, in Canadian Army capability development terms.

Linkages

This concept governs the way the Army will be developed to meet the challenges of the future. All forces deployed by Canada will be joint forces, so this concept will nest within and inform any Canadian Armed Forces (CAF) joint operating concept. It also seeks to align with the operating concepts of the other force-generating pillars—the Royal Canadian Navy (RCN), the Royal Canadian Air Force (RCAF), Canadian Joint Operations Command (CJOC), Canadian Special Operations Forces Command (CANSOFCOM), Military Personnel Command (MILPERSCOM), Canadian Forces Intelligence Command (CFINTCOM) and other central agencies—and to set the conditions for effective collaboration with other government departments, allies and coalition partners.

PRINCIPLES

The following principles underpin this concept:

- Land power is the capability to generate and employ combat power on land. Land power is an essential component of the legitimate application of force in support of a nation's strategic aims. It includes the capabilities that operate on land (i.e. within the human environment) to understand, influence, coerce, exercise control and destroy resistance. In the CAF context, effective land power will be generated by joint forces. The Army will normally contribute the preponderance of those forces, but the RCN, the RCAF, CJOC, CANSOFCOM, MILPERSCOM and other force generators will also play an essential role.

- Land power will continue to be essential to the maintenance of national defence and the exercise of sovereignty. It assists in maintaining a cohesive international system that supports Canadian interests. That includes the requirement to contribute land forces to alliance collective defence.

- Combat-effective, multi-purpose land forces will continue to provide the government with effective options that enable the achievement of Canadian national objectives.

- Due to the vast size of our country and the global nature of our national interests, the Canadian land forces will remain an expeditionary force, deployable over long distances both for domestic and international operations.

- With the exception of operations to evacuate Canadian non-combatants from a theatre of war during international operations, the Canadian land forces will almost invariably act as part of an alliance or multinational coalition.

- In order to generate land power for employment at home and abroad, the Army will need to continue to invest in the core capabilities required for success in combat operations.

- The Army structure is based on deployable formations (brigade groups and a division headquarters). The ability to operate at brigade group level is essential to ensure that Canadian land forces are interoperable with other CAF capabilities, allies and coalition partners, as it is the lowest level of headquarters that can integrate and synchronize joint effects. A brigade group consists of a headquarters that can command two to four manoeuvre units and employ enablers, integral combat support and combat service support (CSS) assets and supporting air and maritime assets.

- The Army will continue to be a "One Army" team comprising the Regular Force, the Army Reserve, the Canadian Rangers and civilian personnel.

- Canadian land force elements will be scalable, agile and responsive, able to deploy at any level from individual or small team up to brigade group in order to serve the nation's needs.

FUTURE LAND OPERATING ENVIRONMENT

Assessment of the future land operating environment (FLOE) provides the opening backdrop to the *Close Engagement* concept. There is general consensus that the FLOE will be complex, dynamic, volatile and highly uncertain. It will be marked by multiple threats and challenges. Those threats and challenges will be diverse, ranging from armed conflict and wars involving increasingly capable state and non-state adversaries in possession of ever more sophisticated and lethal technologies, to state instability and collapse, to humanitarian crises and disasters, both natural and human-caused.

"THERE IS GENERAL CONSENSUS THAT THE FLOE WILL BE COMPLEX, DYNAMIC, VOLATILE AND HIGHLY UNCERTAIN."

Both the complexity of the FLOE and, in turn, the challenges it presents to land forces arise from a variety of destabilizing factors. Those factors include the availability of the Internet and social media as means of mobilizing and empowering groups harbouring grievances and radical ideas; resource scarcities; the impacts of climate change; shifts in the balance of political, economic and military power; rapid and sometimes unsustainable population growth; economic inequality and youth unemployment; the presence of weak states and ungoverned spaces in the developing world; and the proliferation of sophisticated and lethal technologies among an ever wider range of state and non-state actors. The rise of global migration and resultant diasporas contributes to potential disruption. The effects of these challenges will be amplified by the rapidly increasing concentration of people in vast urban areas. In contrast to historical urbanization trends, the continuation of current trends will result in ever larger cities that are exponentially more congested, cluttered, contested, connected, and constrained.[3] Canada and its partners and allies will seek to reduce instability using all of the levers of national power, including military power. The CAF and the Army will face a considerable challenge in developing forces that will be effective and relevant in facing the full spectrum of potential operations.

3 NATO, Joint Military Operations in an Urban Environment, Draft Capstone Concept, vol. 12, 11 July 2018, page 7.

Whereas the *Close Engagement* concept focuses primarily on overseas, expeditionary operations, it acknowledges the fact that globalization, social connectivity, climate change and empowered non-state actors are working to blur the distinction between homeland and overseas threats. That underlines the growing importance of a comprehensive approach to homeland defence and international operations.

Adversaries

Canada shares with our allies and partners the belief that a rule-based international order and peaceful mechanisms for the settlement of disputes lead to increased security and well-being for all nations. The number and diversity of potential adversaries to that view will continue to increase in the future, as a result of growing global competition for power and influence based on ideology, ideas, identity or interests of state or non-state actors. Such adversaries will be increasingly adaptive, ever more empowered by greater access to advanced technologies, and capable of employing a range of traditional and non-traditional strategies aimed at evading the strengths of Canada and its allies while exploiting our vulnerabilities. That will be manifested in armed conflict—whether conventional, unconventional or hybrid—and also in transnational criminal activities. An adversaries' primary mode of operating will be to attempt to undermine multinational objectives and legitimacy by creating an enduring narrative, supported by state-directed or captive media agencies. They will also rely on the circulation of false news on traditional and social media, the hacking of databases, cyberattacks, and the employment of Internet "troll armies." These actions will be carried out from anonymous, non-attributable sites, frequently obscured within urban environments. Therefore, identifying and confirming the perpetrators will remain a significant challenge. Indeed, not only are urban operations expected to become more frequent, but they may well pose the highest degree of challenge, owing to their human, environmental, geographic and physical complexities. Operations in major cities have the potential to absorb land forces well beyond those likely to be available; thus, this challenge on the physical plane must be countered by a greater emphasis on influence activities that can generate effects on the moral and cognitive planes. Unconventional operations will be used to undermine public support while operating below the threshold that would trigger a decisive response. Where that fails, adversarial use of countermeasures will be more common. The growth of anti-access, area

denial and anti-space asset systems is intended to erode the capacity of alliance and coalition forces to achieve military overmatch and confound multinational efforts to operate effectively in theatres of interest. That may extend to the use, or threat of use, of weapons of mass effect in order to manipulate the risk of escalation.

The diverse and varied ends, ways and means employed by adversaries are likely to lead to rapid changes in the character of conflict. Left inadequately challenged, adversaries will not only achieve their aims, but they will also become more accomplished at challenging alliance and multinational forces. The need to respond effectively as part of a comprehensive approach (political, economic and military) is compelling.

Humanitarian Disasters

Human-induced and natural disasters, and their societal impacts, will also represent a significant challenge in the FLOE. Such events (arising from earthquakes, tsunamis, environmental and industrial accidents, the effects of armed conflict, etc.) will threaten both state and societal stability. Left unaddressed, they will generate complex humanitarian crises, the effects of which will likely increase the likelihood of instability, insecurity and conflict. Again, the CAF will need to be able to respond effectively as part of a comprehensive approach.

To summarize, conflict over the next 10 to 15 years will take place in the context of the following trends:

- increasingly rapid technological change;
- an increase in the number of actors willing and able to use organized force to achieve their objectives;
- an ever more pervasive globalized information and social media environment;
- increasing resource shortages and population movements driven by climate change;
- rising economic inequality;

- weapons systems with radically increased lethality;
- greater power and reach of transnational organized crime;
- democratization of advanced weaponry;[4]
- greater proliferation of evolved hybrid threats;
- increased likelihood of great power / regional power conflict, whether directly or by proxy, including an increased risk of nuclear conflict; and
- more rapid emergence and escalation of conflicts.

"THE MOST SALIENT CONCLUSION THAT CAN BE DRAWN ABOUT THE FLOE, AND ONE WE SHARE WITH OUR MAJOR ALLIES, IS THAT AGILITY, VERSATILITY AND THE ABILITY TO ADAPT RAPIDLY ARE THE MOST IMPORTANT DEFENCES AGAINST THE UNPREDICTABLE SHAPE OF FUTURE CONFLICT."

These trends suggest that the character of land operations will evolve in unpredictable ways that will present new and complex challenges. Moreover, future conflict will be increasingly shaped by the need to deal with complex problems that cannot be solved through victory on the battlefield.

The FLOE presents a major challenge for capability development: which conflict do we prepare for? The spectrum runs from combined arms warfare against a peer opponent, to counter-insurgency, to actions against transnational criminal gangs, to countering terrorism, to upstream capacity building as part of conflict prevention. It will be very difficult to judge the correct balance of investment against uncertain risks.

Moreover, the CA experience in Afghanistan has forcibly reminded us of the fact that a determined, thinking adversary will find clever ways to avoid our strengths, attack our vulnerabilities and contest our narrative at a global level. We cannot predict which new variant of conflict will arise, and we may not always have the luxury of choosing which wars to fight, nor can we predict how a future conflict might unfold as the contestants strive to adapt their methods to neutralize their opponents' strengths and attack their vulnerabilities. The most salient conclusion that can be drawn about the FLOE, and one we share with our major allies, is that agility, versatility and the ability to adapt rapidly are the most important defences against the unpredictable shape of future conflict.

4 Advanced weapons normally held only by the military forces of major powers will be increasingly available to small states and non-state actors.

LAND OPERATIONS REQUIREMENTS

Today's Canadian land forces have the following characteristics:

- a conventional, multi-purpose force with proven combat effectiveness;
- an increasingly network-enabled medium land force augmented by light and heavy forces; and
- a modular force with a proven ability to group any combination of force elements into a cohesive team.

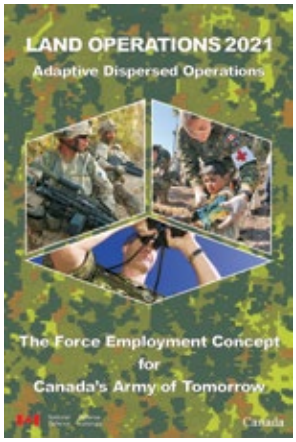
These forces are well positioned to evolve, ensuring that the Army continues to be a relevant and useful force to meet Canada's needs.

Analysis of the FLOE indicates that the following headline requirements must shape capability development over the next 10 to 15 years:

- Proficiency in core combat skills must be sustained, as it is the bedrock capability that will enable our forces to carry out a wide range of tasks in potentially hostile environments.
- We will need to understand and adjust to changing conditions faster than adversaries. That will require efforts to improve in the following areas:
  - » the versatility of our personnel;
  - » the adaptability of our equipment, organizations and processes; and
  - » our ability to develop a shared understanding.
- We will need to be able to deploy and employ scalable, self-sustainable, and interoperable force packages capable of full-spectrum operations.
- We will need to be able to deal with shock and uncertainty. That will require efforts to increase the resilience of personnel and organizations and the durability of equipment.

- We will need to be able to operate in a dispersed manner in the following situations:
  - » in major combat operations, to reduce the risk to the force from area attack systems (artillery and rocket fires);
  - » in stability operations, to provide security over a wide area;
  - » in humanitarian operations and disaster relief (HODR), to be able to provide assistance to multiple, widely separated centres of population; and
  - » in stability and domestic operations, to lessen the impact of our presence on vulnerable populations.
- We will need to be able to concentrate force at the decisive point and time in order to achieve the following objectives:
  - » Stabilize local crises and confront aggressors.
  - » Achieve decisive victory in close combat.

ADAPTIVE DISPERSED OPERATIONS



Close Engagement evolved from the previous concept, *Land Operations 2021: Adaptive Dispersed Operations*, and retains a number of the key tenets of that concept that have proved valid during operations.

The central idea of the *Adaptive Dispersed Operations (ADO)* concept was that the fielding of advanced voice and data networks would allow land forces to create and sustain an advantage over adversaries. Shared access to information and coordination in the creation of effects would enable widely dispersed teams to conduct synchronized, interdependent actions,

connected by an operational design and aimed at achieving a desired end state. Such a force would be able to operate in a widely dispersed manner yet aggregate rapidly to concentrate combat power at the key place and time. Its goal would be to create and exploit opportunities, control the tempo of operations and overwhelm the adversary's understanding.

The experience of combat in Afghanistan suggests that the central idea of *ADO* is valid, but it also highlights that some of its precepts were overly optimistic. *ADO* overestimated the extent to which technology would enable land forces to consistently choose the time and place of engagements. The enduring goals of *ADO* that are retained in the *Close Engagement* concept are the following:

- **Agility.** Having the ability to plan and conduct operations at a rapid tempo puts adversaries at a disadvantage. Agility also implies a rapid ability to successfully adapt to changing operational conditions.

- **Connectivity.** It will continue to be a fundamental requirement to leverage networked capabilities to

  - » provide commanders with the information necessary to develop shared understanding;

  - » provide combat units with access to the full range of lethal and non-lethal effects; and

  - » provide support units with connectivity to materiel management and distribution systems, real-time asset tracking and reach-back to sustainment support organizations.

- **Modularity.** Creating and integrating force groupings with optimized capabilities for a specific task, and rapidly reallocating assets when the task is complete, will be critical to the effective and efficient accomplishment of missions.

- **Adaptive Dispersion.** Land forces must be able to employ coordinated actions by widely dispersed teams to achieve effects in support of an operational design (e.g. stability or security operations) but, more importantly, they must retain those dispersed element's ability to aggregate rapidly to concentrate combat power.

- **Integration.** Working effectively with joint, interagency, multinational and public (JIMP) partners to generate lasting solutions to conflict will be the norm.

COMBAT AND ENGAGEMENT

"THE 'CLOSE ENGAGEMENT' CONCEPT RECOGNIZES THE ESSENTIAL ROLE OF CULTURAL AND HISTORICAL UNDERSTANDING, INTELLIGENCE-GATHERING, INFLUENCE ACTIVITIES, MEDIA OPERATIONS AND PERSONAL ENGAGEMENT IN THE CONDUCT OF LAND COMBAT."

Land combat, while enabled by a wide range of supporting activities, is primarily conducted by soldiers on the ground. The purpose of land combat is to achieve tactical victories, which can contribute to or defend mission success during stability operations and set the conditions for operational success in war. The ultimate responsibility of land forces—the capability that only land forces provide—is to defeat opposing land forces in battle.

Conflict, however, is a profoundly human activity. Engagement, that is to say, the whole range of interactions between Army leaders and soldiers and other actors in a situation, also contributes to mission success across the entire spectrum of conflict by influencing people—including allied military forces, partners in the comprehensive approach, host nation governments, local authorities and even adversaries—in order to create the conditions for a stable and sustainable outcome.

Engagement consists of two aspects:

- Mission activities conducted by soldiers and leaders "among the people" that lead to understanding and an improved ability to influence people, assist them and, where necessary, exercise control over them by violent or non-violent means.

- Gaining understanding, coordinating activities and shaping the perceptions of partners, including allied forces, Canadian and host nation government partners, non-governmental organizations and the media.

Engagement activities can include information gathering, key-leader engagement, civil–military cooperation (CIMIC), the provision of security, collaboration with development agencies and host nation governments, and efforts to influence the key actors in a situation.

The FLOE will be characterized by intense competition played out simultaneously on the physical, moral and cognitive planes. That competition will include active attempts by all players to shape the public narrative using both facts and misinformation. Non-combatant civilians are likely to play an active role. While land combat may still occur in remote areas where engagement with people outside of one's own force is minimal, in most circumstances human interaction will be a key feature of military operations. With that in mind, it is essential that we train for and plan to conduct engagement as an integral part of our operations across the spectrum of conflict.

Close engagement is defined as "the ability to equally apply, at the tactical-level, both lethal and non-lethal effects at close range to influence the physical, moral and cognitive planes within the operating environment.... [C]lose engagement is predicated on an ability to effectively engage in close combat when required, but focusing on close engagement underscores the necessity of being able to create a broader range of effects within the operating environment to ensure operational and strategic objectives."

—B-GL-007-000/JP-009, *Canada's Future Army Volume 2: Force Employment Implications*

The *Close Engagement* concept recognizes the essential role of cultural and historical understanding, intelligence-gathering, influence activities, media operations and personal engagement in the conduct of land combat. Sustained changes in behaviour will come about as a result of changes in perceptions and understanding. Although the destruction of enemy capabilities may be required, and we must never pretend otherwise, the success of military actions must be measured by the effects on human behaviour generated by the synergy of combat action and engagement.

CLOSE ENGAGEMENT: THE CAPSTONE CONCEPT

The CA will continue to be a conventional, combat-effective, multi-purpose, medium force augmented by light and heavy forces. The main evolutionary enhancements that need to occur over the next fifteen years are in the following key areas:

- **Connectivity.** The Army will continue to pursue both greater networked communications and an integrated and pervasive data environment. This will facilitate near real-time shared situational awareness for distributed planning and timely execution. Intelligence products, command support tools and access to lethal and non-lethal fires will need to be provided, within previously impossible timelines, to lower levels of command. Networked communications will be exploited to further support the ability of land forces to operate in a widely dispersed posture for force protection or area control, yet concentrate rapidly for concentrated effect. CSS functions will be enabled by data systems that generate a common sustainment operating picture and improve the coordination, planning and execution of replenishment and maintenance operations. Total asset visibility and access to real-time consumption data will allow reduced holdings and predictive replenishment. Network systems must be more intuitive and user-friendly, reducing integration challenges, training burden and skill fade. Capability development must balance the requirement to make networked systems more effective while reducing their vulnerability to interference by hostile actors. Those objectives will not be reconciled without considerable effort.

- **Agility.** Canadian land forces must be able to respond quickly to changing conditions and act with greater speed than our adversaries. This will be achieved, in part, through enhanced decision-support tools, which enable commanders to plan and execute operations more rapidly as indicated above but will also require improvements in training and equipment. Training must continue to emphasize and build the ability to rapidly transition from small task-organized force elements to larger combined-arms groupings. Vehicles and associated equipment must balance inter- and intra-theatre mobility with the requirement to operate in difficult terrain, including urban centres.

- **Adaptability.** A rapidly changing operating environment, where technological change is measured in months and the information environment changes in minutes, requires a force that can adjust to potentially very large changes, both foreseen or unforeseen, in the configuration, application, location, usage or environment of the land force.

- **Integration.** Military and non-military elements will continue to be combined and applied to achieve a common goal through coordinated and complementary efforts. Greater investment in the development of engagement skills should exploit our existing culture and aptitude for cooperative work with military partners, civilian populations, media agencies and other actors, in support of a comprehensive approach.

- **Robustness.** The land force must be effective across a range of conditions. Therefore, the Army must reinvest in key capabilities to ensure that Canadian land forces are prepared for combat operations, alongside allies, against a peer competitor. While this implies continued physical hardening for much of our equipment, there is also a requirement to protect against other emerging threats (such as threats within cyberspace) and even thrive in adverse conditions.

The Army will continue to be organized, trained and equipped in order to be rapidly deployable in scalable packages to meet the demands of future missions. Those packages could range from a single individual or a small team helping to train foreign armies, to a task force employed in a peacekeeping or peace support role, to a brigade group for major combat operations, to the entire Army for major domestic HODR. If the strategic situation demands it and lead time is available, considerably larger forces could be generated.

A continual focus on developing a deeper understanding of politics, economics, societies and sources of instability and conflict in Canada and worldwide will be needed to allow Canadian land forces to be better prepared to deal with crises as they occur and better able to generate an understanding of local conditions once deployed.

Implications for Land Forces

Canadian Mechanized Brigade Group Headquarters. Canadian Mechanized Brigade Group Headquarters (CMBG HQ) will act as a central command, control and coordination element that commands up to four manoeuvre units (five in extremis), of which one or more may be from allied forces. The CMBG HQ will command integral combat support and CSS capabilities, control aviation assets, and employ higher-level land and joint assets to shape and synchronize battlefield activities. The headquarters will be configured to enable the brigade to operate effectively within a Canadian or allied division, or a multinational force. It will be based on a mobile, protected core headquarters with the ability to expand.

"THE ECAT WILL BE THE CONCEPTUAL ORGANIZATION MODEL FOR ALL SUB-UNITS—COMBAT, COMBAT SUPPORT, CSS AND MISSION-SPECIFIC."

Each brigade will have a CSS unit that will be able to manage, control and coordinate logistics operations for the formation. That unit will also have the capability to coordinate sustainment support for the brigade (or subordinate units) from higher formations. The CSS unit will have the ability to generate tailored elements capable of providing logistics close support to battle groups (BG) as well as to sub-units depending on the mission parameters and the commander's priorities.

Units. Units, whether their role is combat, combat support or CSS, will typically command three to six sub-units on operations. Unit headquarters will have a robust intelligence and planning capability and will develop plans for execution by their assigned forces. Units will command and control tactical operations, and access and employ capabilities to shape those operations. Unit headquarters will have sufficient staff capability to simultaneously conduct current operations, plan for subsequent operations, control medical support and some CSS functions, and monitor surveillance and reconnaissance feeds, analyze information and produce both information and intelligence relevant to formation, unit and sub-unit operations. Depending on their mission, unit headquarters may operate surveillance assets, which are likely to be a mix of autonomous unmanned aircraft systems (UAS)[5] and ground systems. Units will be able to augment sub-unit echelons as necessary from their own administrative support organizations.

5 Defence Terminology Standardization Board, record 44145, 24 Jan 2012.

Combat arms units have typically held some combat and combat support elements centrally. Those elements (anti-armour, mortars, reconnaissance, etc.) are often given BG missions such as flank security or are assigned temporarily to combat teams. In dispersed operations, if the threat level indicates that one sub-unit needs to have capabilities such as long-range direct fire and short-range indirect fire, then it seems likely that the majority will as well, so there is an argument for increasing the numbers of such systems. On the other hand, some capabilities may need to be held at unit level to cover gaps between sub-unit areas of operations (AO). Further concept development and experimentation will be needed to determine the proper mix of capabilities between unit headquarters and sub-units.

Sub-units. The primary combat element of Canadian land forces will remain based on a central core of a sub-unit that is organized and re-organized as required by its current set of tasks: the empowered combined arms team (ECAT).[6] The ECAT will be the conceptual organization model for all sub-units—combat, combat support, CSS and mission-specific (e.g. provincial reconstruction teams or security force capacity building elements). Operations will be conducted by a network of combined arms teams, each of which will be based on an enhanced sub-unit headquarters that commands platoon-sized manoeuvre and effects elements. The baseline configuration of an ECAT will likely comprise the headquarters, an integral route surveillance/clearance capability and a CSS echelon. For training and on operations the team will be task-organized and may include up to eight subordinate elements.[7]

The specific mix of elements under command (infantry platoons, armoured troops, gun batteries, transport platoons, engineer sections or troops, electronic warfare (EW) elements, CIMIC teams, psychological operations detachments and other effects-generating elements) will vary widely. ECATs, using the core of a sub-unit headquarters, can be grouped for tasks across the spectrum of operations. Typical roles for an ECAT would be area security, offensive and defensive operations, engagement tasks and resupply missions, but the organization could undertake any task if the appropriate mix of subordinate elements were available.

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6 This terminology is intended to assist the capability development community in differentiating from current combined arms groupings at the sub-unit level; it is not intended to become a doctrinal term.

7 This might include up to five manoeuvre (combat arms) elements and several enabling elements. The number of elements that can be handled effectively (i.e. the span of control) will depend upon the situation.

The key capabilities of the ECAT will include the ability to access all land and joint enablers through an integral lethal and non-lethal effects coordination cell and an intelligence cell. Training and equipment will allow the ECAT to reconfigure rapidly, attaching and detaching subordinate elements with minimal delay. The headquarters will provide first-line support to any attached elements through its integral CSS echelon, and will operate a network hub that provides situational awareness, communications and access to central data sources to all attached elements.

ECAT will be capable of conducting combined arms manoeuvre as part of a unit or brigade operation but, in most circumstances short of major combat, they will operate with greater autonomy. For stability operations, HODR and domestic sovereignty operations, the ECAT conducting mission tasks (i.e. Command, Sense and Act tasks) will typically operate in a dispersed manner within a non-contiguous, non-linear AO, with ECAT headquarters operating at distances of 20 kilometres or more from the unit headquarters.[8] ECAT with a sustainment or combat support mission will need to support operations over those distances.

Combat Service Support. Canadian land forces will be sustained by modular CSS elements at all levels from formation to sub-unit. In principle, land forces will be designed to avoid the need for distribution layers between the CSS unit (service battalion) and the sub-unit. Real-time monitoring of a common logistics operating picture and the use of predictive planning tools will allow the CSS staff to coordinate and prioritize resources. That will enable the provision of precise sustainment to dispersed elements, and allow the Land Equipment Management System (LEMS) staff to predict repair parts requirements and maintenance workloads across the formation. Combat supplies and repair parts will increasingly be delivered by autonomous land and air systems or groupings of robotic and human operated platforms. All mobile repair teams (MRT), recovery teams and sustainment assets will need to be network-enabled. In higher-threat situations, CSS assets delivering support and sustainment may need to

8 This is a planning figure for the Design/Build pillars of capability development. It represents the minimum requirement. There have been a number of recent instances where Canadian sub-units have successfully operated at greater distances from their unit headquarters. On operations, commanders will continue to determine their force posture based on the mission, terrain and threat level. See Section 9 for a more detailed treatment of this point.

be grouped under an ECAT structure together with the combat elements necessary to ensure force protection. Where the threat is lower, CSS assets will be able to deploy independently but will still need the ability to defend themselves and request fire support.

The foundation of LEMS execution within land forces will remain MRT and recovery teams. Those scarce resources, regardless of grouping or command affiliation, will be able to respond to repair recovery requests throughout the AO. The use of a networked communication system connecting all LEMS capabilities will enable the allocation of the right MRT with the right priority at the right time. The system will be enabled by the prioritized and timely distribution of repair parts and facilitated to the greatest extent possible by just-in-time delivery. LEMS will be required to focus on the equipment operational capabilities related to the "move, fight, communicate" aspects. Those critical aspects for equipment sustainment will be readily visible, traceable and manageable within the common logistics operating picture, which will be integrated with the materiel management system to ensure asset visibility.

LEMS assets will have technical autonomy sufficient to sustain equipment in a dispersed environment by employing precise diagnostic tools, while some MRTs will have an additive manufacturing capability in order to manufacture a limited number of simple repair parts. Units will have a greater ability to adapt and customize equipment, conduct technical investigations, provide forensics, and design and test equipment modifications when required. Within unit-level maintenance platoons, a land equipment engineering capability will be present to provide just-in-time engineering and increase the commander's ability to take advantage of the full technological capability of their land equipment.

The logistics system will move toward a more self-sustaining model by accessing domestic or existing infrastructure, adopting water recovery and purification technologies, and using alternate energy sources in order to reduce vulnerability, resource consumption and the size of the support requirement. The force will strive to operate with a minimal environmental impact and, where possible, will rely on local resources.

HUMAN DIMENSION: DEVELOPING SOLDIERS AND LEADERS

"SOLDIERS AND THEIR LEADERSHIP WILL REMAIN THE MORAL, INTELLECTUAL, EMOTIONAL AND SOCIAL FOUNDATION UPON WHICH UNIT COHESION IS ESTABLISHED."

The CA will continue to rely on the quality of its soldiers and leaders to operate effectively in the FLOE. Soldiers and their leadership will remain the moral, intellectual, emotional and social foundation upon which unit cohesion is established. A robust Army culture based on shared values, a strong ethos, strength in diversity, mutual respect, and trust and confidence in fellow soldiers, leaders and the establishment will be essential aspects of maintaining a resilient, adaptive and agile force. Strong support for military families will also be a key part of building resilience. Canadian soldiers will increasingly reflect the ethnically diverse Canadian population, and will continue to uphold Canadian values and beliefs at home and abroad. The Army Reserve will maintain its key role, providing an interface between Canadians and their Army. They will be expected to maintain the highest levels of professionalism and ethics. Popular support for the CA will remain directly linked to its credibility, and will depend on the level of trust and confidence the Army holds within the broader public sphere.

Future land operations are anticipated to place sustained physical and greater cognitive demands on Army members. This may necessitate improved skills and knowledge in soldiers. Information overload and the pervasiveness of information and communication systems will increase the complexity of the operating environment and challenge decision-making at all levels. Automated pre-screening, filtering and analysis of information will be increasingly necessary. Artificial intelligence is likely to become ubiquitous and more capable of rendering automated and autonomous decisions. Lethal systems that can operate autonomously will continue to be fielded for specific applications, such as defence against indirect fire,[9] but the most likely advances in capability over the next 20 years will involve human–machine pairing. That concept will bring new cognitive and psychological challenges. On the positive side, the next cohorts will likely be more educated and informed, and technology will be more prominent

9 For example, the Close-in Weapons System in service with the Royal Canadian Navy.

as an enabler to assist, facilitate and accelerate cognition, knowledge and understanding. Advances in scientific understanding of brain function, psychological research and a focus on the roles of nutrition and sleep, as well as on spiritual and physical fitness, may provide methods of enhancing emotional stability and mental resilience, enabling soldiers to be more adaptable in body, mind and spirit. A greater integration of human resources, doctrine and technology will be required to assist soldiers in making sound and timely decisions.

The dangers of the FLOE will demand greater resilience in soldiers—that is, the ability to overcome challenges and bounce back from adversity. Programs that deal with comprehensive soldier fitness and recovery will increase in importance. Personal enhancement technologies, both cognitive and physical, are becoming more prevalent within society. As a result, human potential and capabilities are certain to evolve. Technological, medical and pharmaceutical research and development will continue to provide means to enhance resilience and other human abilities. As adversaries take advantage of emerging technologies in order to out-perform our soldiers, there will be increasing pressure for the CA to do likewise. Ultimately, societal concerns over the ethical issues that such technologies could raise will require formal debate.

The *Close Engagement* operating concept will require the establishment of a balanced force with a built-in capacity to rapidly adapt to operational change driven by an uncertain, complex and dynamic operating environment. That will enable human-centric operations based on a sound understanding of conflict and conflict resolution, executed through close engagement within a comprehensive approach to achieve national objectives.

While the creation of adaptive soldiers and tactical operating concepts will allow Canadian land forces to win future battles, the conditions for tactical success must be set in its institutional capacity. As a result, careful consideration will need to be given to designing force development and force generation institutions that support the *Close Engagement* operating concept.

Ultimately, institutional investment in technology *and* the human dimension will be necessary for success in future operations. Employed forces will need to leverage the best technology, as well as advances in human science, including training and educational technologies. That will include the ability to improve soldier effectiveness and resilience, and to inoculate soldiers to the dangers of operating in smaller and more isolated teams when that is necessary. Technology alone is not a panacea, so part of operational effectiveness will continue to be the ability of land forces to operate when access to space-based assets and the electromagnetic spectrum is compromised.

The operating environment will continue to be a competitive one, and Canadian land forces will not be able to dominate in all the relevant domains. That will be particularly true for the social and cognitive aspects of the human domain. But it must also be recognized that access to technology has been, and will continue to be, even more democratized. The proliferation of advanced capabilities will provide adversaries with the ability to create significant effects in unforeseen ways. The Army must retain the agility to be able to respond effectively to those emerging threats.

BATTLEFIELD GEOMETRY

Consistent with *ADO*, land forces must be ready to operate while dispersed over wide areas and yet retain the ability to aggregate quickly when necessary. Efforts are underway to analyze the time and space challenges of wide dispersion, with a view to establishing realistic limits thereto. Answers to the following questions will help inform that analysis: How far can an ECAT operate from its parent headquarters, and for how long? How long should it take to regroup (attach or detach subordinate elements) and aggregate or de-aggregate at each level of command? How will the range of our indirect fire capabilities affect the relative risks of dispersion? How will we sustain operations? What are the acceptable timelines for a casualty, from point of wounding to stabilization and, in turn, surgery and treatment? Over what ranges will our voice and data networks need to operate, and what richness of data can we expect at the farthest of those ranges, especially in a contested or degraded electromagnetic environment?

In 2008, in support of *Force 2021*, a study was conducted to examine the limits of dispersion[10] of a BG. It involved examining the major limiting factors to dispersion in different operational contexts in order to determine the maximum extent to which sub-units could disperse and still remain supported by direct and indirect fire support; casualty evacuation; resupply; command and control; and the ability to call on reinforcements. Efforts are underway to expand this work to understand the limits of dispersion of a brigade group.

Technological and procedural advances, likely to be available soon, may offer the potential to extend the limits imposed by existing equipment capabilities; for example, casualty evacuation and indirect fire support. The results of the analysis of the limits of dispersion at the brigade group level will be used to inform the Army as to where an investment in a capability would have the highest value, allowing a given force, conducting a given operation, to mitigate risk out to the limits of dispersion. Any determination of the limits of dispersion should also include consideration of the robustness and redundancy of the force rather than just the ability to disperse ever more widely. The Army should remain cautious of ever-greater dispersion, as any significant increase in dispersion entails higher levels of complexity and risk. Regardless of the results of a determination of the limits of dispersion, a balance must be sought between the degree of dispersion against the risks of reducing the ability aggregate quickly.

THE BATTLE OF SANTA MARIA, 2035

This vignette is one of the products developed by participants in the Army of Tomorrow Working Group of February 2017. It describes a plausible future in which the CAF are contributing to a stability operation in South or Central America. Seeking to capitalize on the weak host nation government of Tierra Natal, an aggressive neighbouring state with advanced military capabilities attempts to "liberate" the disputed western province. The coalition force needs to shift from the stability mission to prepare for major combat operations.

10 DRDC CORA (2008) *Bounding the Force Employment Concept*, Technical Memorandum 2009-003.

The future technologies described in this vignette are likely to be available to armed forces by 2035.

The night shift intelligence operator in the B Company command post, monitoring the surveillance network and local social media feeds, detected a possible change in behaviour across the border. She chatted with neighbouring intelligence operators in the rest of the BG as well as the forward detachment of the intelligence company at brigade group headquarters. At the request of the G2, the brigade group re-tasked some of the brigade's surveillance assets and intelligence company forward asked for imagery from the national command centre. In a short time, the intelligence company analysis centre back in Edmonton was able to confirm the massing of enemy forces on the border. An assessment of the adversary's likely course of action was developed and issued. In the meantime, the officer commanding (OC) B Company issued a warning order to his subordinate organizations based on his intelligence operator's concerns.

At 0700 hours, the brigade commander conducted a virtual conference with the BG commanding officers (CO), issuing orders to the CO 2nd Battalion to conduct a guard battle to maintain contact with advancing enemy forces and draw them into a kill zone where fires, armour and coalition attack helicopters would mass to destroy the lead enemy battalion task force. As the 2nd Battalion BG moved to assembly areas, the brigade reconnaissance (recce) squadron would move to cover the gaps, supported by persistent air surveillance assets moving in from the eastern provinces. While coordinating measures were being discussed, the BG COs were already on the move, re-joining the conference from their tactical command post.

By 0730 hours, a full regrouping was underway. Non-combat assets left the forward companies to join the BG echelon. C Squadron detached its CIMIC assets in a protected location and re-attached all four Leopard tank troops, linking up with an armoured engineer troop and a route surveillance troop along the way as it moved to its assigned battle positions. As the sub-units reached their designated rendezvous points, they were joined by CSS convoys with support packages tailored to their predicted requirements.

The commander of 1 Military Police Platoon received information on his forearm screen detailing routes to be kept open for civilian traffic and others that were to be reserved for military movements. He sent the local police chief a graphic on his cellphone and, using an automated translator, discussed how they could make this plan work.

6 Platoon Commander received a warning order from her OC through her bone conduction plate as she was conducting a meeting with a local leader. Excusing herself, she returned to her light armoured vehicle (LAV), where her gunner/operator was chatting with the company battle captain about the warning order. Graphic control measures and the enemy situation appeared instantly on vehicle, helmet visor, and forearm-mounted displays. As the platoon left the village, its light EW team detached and joined C Company en route to a new battle position.

At 0830 hours, B Company was ready in its initial delaying position along the Rio Serpiente. The company liaison officer deployed forward to join a local Lanceros company, who were providing surveillance toward the areas of dense jungle to the west.

At 0915 hours, as Montañan armoured forces crossed the border and the counter-air fight began, all of B Company's systems suddenly dropped off the network. Even high frequency (HF) voice radio struggled to cut through broad frequency jammers emplaced by UASs. Company headquarters and the platoons deployed their own UASs in an effort to maintain local situational awareness, while the signals non-commissioned officer tapped into the limited local landline system to try to re-establish some semblance of communications within the company. The company quartermaster sergeant, in the echelon, deployed a robotic rebroadcast node to see if he could extend non-line-of-sight communications. The OC and platoon commanders understood the commander's intent and were prepared to carry on the fight but, faced with an inability to coordinate their actions at a distance, were forced to concentrate more than usual. "We're making ourselves a nice, juicy arty target," grumbled Corporal Nickerson as he piloted his platoon's UAS to maximum altitude.

As the morning wore on, the BG's autonomous multifunction UASs methodically located and targeted the enemy's jammers for destruction by non-line-of-sight missiles. Basic connectivity was re-established, and none too soon, as the first of the enemy's small UAS started to swarm around the AO, looking for any platforms that were not covered by their multi-spectral camouflage screening.

In the shantytowns bordering the river, soldiers had unplugged from their LAVs and moved to develop dismounted delaying positions. There had been no time to set up a power grid, so they would have to rely on their own battery power for their exoskeletons and personal fire control systems. The platoon commander, in anticipation of a prolonged fight, directed her platoon warrant officer to sketch out a plan to cycle troops back to the LAV to recharge. At 1 Service Battalion, predictive analysis highlighted that potential problem, and the affiliated air detachment was tasked with preparing a self-guided parachute package for a push resupply of batteries.

By noon, the *Lanceros* began a staged withdrawal across the combat footbridges supplied by the engineers. As the company's active protection systems started to arc into the air to intercept the initial incoming artillery rounds, B Company prepared for its first taste of battle.

ARMY CHALLENGES

To remain operationally effective and relevant, and to realize the *Close Engagement* vision, the CA, in partnership with the Assistant Deputy Minister (Science and Technology) will need to develop innovative solutions that address the following key challenges:

- Enhance the capability to develop a shared understanding.
- Increase interoperability in the JIMP environment.
- Improve the CAF ability to generate, project and sustain expeditionary operations.
- Create balanced, agile and adaptive formations, units and sub-units.
- Build adaptability and robustness into equipment.

- Empower dispersed operations.
- Reap the advantages of networking, while ensuring the capability to operate in a degraded or austere information environment.
- Expand leader and soldier competencies to meet complex challenges.
- Optimize individual and team performance.
- Advance the capabilities needed to command deployed forces.

"GREATER DIVERSITY AMONG SOLDIERS AND LEADERS WILL ENHANCE OUR ABILITY TO ENGAGE WITH CIVILIAN POPULATIONS, AND THUS TO BETTER COMPREHEND THE DYNAMICS OF A SITUATION."

Enhance the Capability to Develop a Shared Understanding

The complex and unpredictable nature of operations in the FLOE will demand that the Canadian land forces enhance their abilities to develop a shared understanding of adversaries, political and economic conditions, and local populaces as well as the historical and cultural context of the situation. The following areas will need to be developed to achieve that outcome:

- There must be a continuous process of horizon-scanning and observation of political, environmental and technological change to provide better advance warning of disruptive change.
- There is an enduring need for better regional and country expertise, including better language skills. Innovative methods must be identified to incentivize personnel to develop those skills and interests.[11]
- Greater diversity among soldiers and leaders will enhance our ability to engage with civilian populations, and thus to better comprehend the dynamics of a situation (e.g. the power structures, economic realities and cultural norms, and how those things affect different groups within the population).
- A broader engagement with government departments, academia and other relevant stakeholders is needed to enhance sharing of differing perspectives and information sources.

11 The French and Australian armies, for example, have effective programs in place to address this requirement.

- Canadian land forces need to enhance their ability to adapt in contact through a more rapid and comprehensive process of identifying, sharing and institutionalizing lessons learned.

Increase Interoperability in the Joint, Interagency, Multinational and Public Environment

"THE NEED TO DEVELOP SOLID PARTNERSHIPS WILL GROW IN THE FUTURE, GIVEN BOTH THE CONTINUED PROSPECT OF INSTABILITY AND CONFLICT PREVALENT IN A NUMBER OF REGIONS AND THE FISCAL CONSTRAINTS THAT CONTINUE TO CONFRONT DEFENCE."

Recognizing the value in partnerships—both domestic and international—is an essential component of future land operations. The need to develop solid partnerships will grow in the future, given both the continued prospect of instability and conflict prevalent in a number of regions and the fiscal constraints that continue to confront Defence. To achieve that outcome, the following elements of interoperability will need to be reviewed and prioritized:

- Partnering efforts should, to the extent possible, strive for integration and aim for collaboration with industry, other government agencies, allies and non-traditional partners.

- Building enduring relationships with non-traditional partners by, for example, bolstering the capacity of indigenous forces to address instability and conflict within their respective regions, should increase.

- Military power is joint power, set within an inter-organizational and multinational context, requiring an integrated or comprehensive approach.

- The CAF should also strive to foster a collaborative mindset among our leaders.

- Land forces must engage to influence mission outcomes within the broadest possible context of shared goals.

Improve the Canadian Armed Forces' Ability to Generate, Project and Sustain Expeditionary Operations

When a crisis is brewing or a situation is deteriorating, a land force that can deploy at speed into the area before armed opposition becomes organized and self-sustaining holds a significant advantage. For such operations, both overseas and domestic, the CAF needs to improve its

operational reach. That will include working with joint partners to further develop the capabilities needed to project land forces, but the following objectives must also be pursued:

- Land forces need to be as easily transportable as possible and, once in theatre, should be able to move long distances at speed.

- Specific force packages must be designed that can be rapidly transported by air and sealift.

- The Army should develop an expeditionary culture that anticipates the need to operate under austere conditions. There is a need to improve the skills required for living out of vehicles, utilizing extant structures, acquiring logistics supplies from local markets, and communicating when full network connectivity has not been established.

- The Army Reserve will remain a critical component of the Army's ability to successfully generate land forces for full-spectrum operations, both at home and abroad. Reserve units and brigade groups will generate formed elements as well as provide individual augmentation. Due to geographic realities, it is expected that Reserve elements will continue to be the most responsive forces in Canada's urban centres. In support of this, the Army Reserve needs to be strengthened to ensure effective, complete, and sustained integration on operations.

One of the greatest challenges to operations, from HODR to major combat, will be the provision of logistics support.

- *Land Operations 2021* outlined a number of capabilities that are needed to allow the CSS system to support future operations but, in most cases, those capabilities have not been achieved. In the FLOE, Canadian land forces must be able to support missions that could range from a brigade group in a major combat operation to a widely dispersed task force conducting stability operations in complex terrain.

- To meet that challenge, the CSS system will require significant investment. It must be able to access real-time consumption data and have the necessary planning tools and delivery methods to support operations across the spectrum of conflict.

Create Balanced, Agile and Adaptive Formations, Units and Sub-units

In the FLOE, Canadian land forces are likely to face crises and hostilities that arise with little or no warning and involve novel methods of warfare. Land forces will need to be adaptable, with the ability to quickly develop and employ new capabilities and organizational models. They will need balanced forces, with an appropriate mix of light, medium and heavy capabilities that can be rapidly deployed and employed. Land forces must be balanced, agile, adaptive and responsive (i.e. more capable of effectively meeting varied and unforeseen threats and challenges). To meet this challenge:

- The Army will consider developing an approach to force generation that better integrates the various combat disciplines and thus reduces the time required for pre-deployment training.

- Enabling capabilities should be, to the extent possible, decentralized to encourage the low-level interaction that can lead to innovative thinking.

- Commanders and institutions should be encouraged to experiment with their organizational structures in order to test the potential of new models.

- Further improvements will be found in pushing the boundaries of modularity. Identifying and solving obstacles to rapid reorganization, and reducing the amount of time needed for modular organizations to reach full combat effectiveness, will be critical to future success.

Build Adaptability and Robustness into Equipment

Adaptability is the ability to adjust a capability or organization to a new purpose. Uncertainty about the objective, location, duration and threat levels of future missions means that the Army needs to put a premium on equipment that can be rapidly adapted to purposes other than those for which it was designed.

- Acquiring equipment with growth potential—surplus power, unallocated space, reserve capacity in power generation and data management capability—will be a critical part of the ability to adapt in contact and must be robustly defended against processes that focus excessively on minimizing costs.

- The implementation of common architectures, open system standards and adaptive control systems will simplify and accelerate the implementation of new capabilities, thus enhancing adaptability.

- Trainability—the ease with which soldiers can learn to operate new equipment—is an important aspect of adaptability. Simplicity of operation and common user interfaces would increase the speed with which soldiers can learn to operate new systems, shortening the time needed to become operationally effective. Ideally, a soldier possessing a skill, such as driving wheeled vehicles, should be able to operate similar equipment with minimal or no additional training.

- Existing processes for the procurement of equipment are becoming increasingly cumbersome and time-consuming. The Army must improve its own internal processes and invest the necessary resources to speed up the aspects of the procurement system that it controls, and it must tirelessly advocate for greater efficiency in the CAF, Department of National Defence, and Public Services and Procurement Canada parts of the process.

"FOR LAND FORCES, THE SUSTAINABLE AND PRACTICAL LEVEL AT WHICH AN ORGANIZATION CAN BE EXPECTED TO OPERATE INDEPENDENTLY FOR EXTENDED PERIODS IS THE SUB-UNIT COMBINED ARMS TEAM."

Empower Dispersed Operations

The future land force will need to be able to operate in a dispersed—low density—posture while retaining the ability to aggregate force quickly for mass effect. In order for combat organizations to operate in dispersed mode and yet take advantage of all of the enablers and fire support capabilities that networks provide, the Army will need to create the conditions for smaller force packages to operate independently and at a distance from their parent formations. For land forces, the sustainable and practical level at which an organization can be expected to operate independently for extended periods is the sub-unit combined arms team.

Sub-units will need to be equipped and configured with the capabilities required for independent operations. Those include integral abilities that will allow the headquarters, with appropriate subordinate elements, to conduct and operate in the following tasks and situations:

- Plan and command tactical operations, and control subordinate elements in the execution of those combat and non-combat operations.

- Access higher-level assets and enablers to gain situational understanding and apply lethal and non-lethal force.
- Be resilient—able to operate after losses.
- Provide sustainment for all assigned elements.

Canadian land forces will also need longer-range indirect fire assets that can support more widely dispersed elements.

Operations in a dispersed posture inherently entail an increased element of risk. Even with a fully capable sensor grid, an adversary can achieve surprise and engage dispersed forces with superior numbers. Smaller force elements therefore need an enhanced ability to defend themselves and neutralize adversaries while awaiting reinforcement. Solutions to this challenge include increases to the following capabilities and characteristics:

- protection;
- lethality;
- soldier mobility; and
- soldier–machine teaming.

Reap the Advantages of Networking, while Ensuring the Capability to Operate in a Degraded or Austere Information Environment

High-capacity networks able to operate over long distances offer a significant advantage. The current generation of equipment provides real advances in capability, at the cost of significant complexity of operation. To realize the full benefits of networking, the Army will need to build on this experience to develop enhanced capabilities. That includes the following improvements:

- more intuitive user interfaces;
- improved ability to regroup adaptively;

- the provision, to all soldiers, platforms and headquarters, of baseline functionality—especially position, navigation and time applications, friendly situational awareness, an all-informed voice network and, where possible, effective command and control applications;

- better predictive planning and asset visibility for the sustainment function;

- improved integration of joint fires and targeting in support of land operations;

- increased interoperability with allies;

- robust defences of the network against cyberspace and EW threats; and

- reduced electromagnetic signatures.

The Army must also carefully plan for and practise the ability to operate in reversionary modes when its use of the network is degraded.

Expand Leader and Soldier Competencies to Meet Complex Challenges

Developing the breadth and depth of competencies that leaders and soldiers can employ is the key to achieving a more versatile and adaptable force that can survive and win on the battlefields of the future. For Canadian land forces, this means the ability of personnel to adapt quickly to a wide variety of situations and responsibilities. To empower the leaders and soldiers of the future, the Army needs to provide them with the tools to do the following tasks:

- Interact successfully with people from all societies, cultures and values and work collaboratively to solve problems while retaining the courage, tenacity and willpower needed to win in combat.

- Be psychologically agile enough to shift rapidly between those activities, as the situation dictates.

Advanced methods of training and education will need to be fielded that provide more and better opportunities for leaders to make decisions in a stressful and uncertain environment and offer better consolidation and exploitation of those experiences. Careful selection and development of leaders and soldiers throughout their careers will be facilitated through the adoption of a competencies-based career management system that will track individual knowledge, skills and interests.[12]

Optimize Individual and Team Performance

Soldiers work in adverse, ambiguous and changing situations, whether within the physiological, psychological and/or socio-cultural dimensions, during training and operations. Soldiers work within teams; when preparing for and confronting these situations, individual and team readiness and resilience are important to the operational effectiveness and sustainability of the force. A performance culture that fosters the development of total fitness[13]—emotional, familial, intellectual, physical, social and spiritual—reinforced by strong leadership which enables access to training, resources and services, will improve a land force's ability to resist and/or cope with the effects of potentially traumatic events and possibly thrive in a climate of uncertainty and surprise.

- The baseline of total fitness, which includes both readiness and resilience, will be set by an organizational culture that treats every member of the organization with respect and develops highly skilled and trusted leaders. It is only possible to optimize performance and foster total fitness within a leadership culture which ensures that all members are treated with respect and that selects, trains, educates and empowers successors who are also skilled and trusted leaders.

- The Army must further its understanding of soldiers' physiological, psychological and socio-cultural readiness and resilience in combat and ensure that training activities, both individual and collective, are designed to develop and test total fitness.

12 See *The Defence Learning, Education and Training Handbook: Educating the Leader and Leading the Educated* (2013).

13 Commander Canadian Army, 4500 1 (CA PD) Mission Ready: The Canadian Army Integrated Performance Strategy (CAIPS), 24 Nov 15, Annex E.

- Land forces must be designed for resilience by ensuring that elements at all levels have sufficient personnel with the right skills to continue operations after casualties have been incurred.

- Continued research is needed into the methods of developing total fitness, reduce the incidence and severity of injury and promote full recovery.

Advance the Capabilities Needed to Command Deployed Forces

Canadian land forces will need effective and agile command and command support systems that can rapidly adapt to diverse situations within a comprehensive approach. Sensors and information feeds will continue to multiply exponentially in numbers and purpose.

- Formation headquarters will be the focus for land force interoperability. They will need to be built with the integral capability to access and coordinate combined, joint and land enablers. The Army will pursue an increased ability to synchronize and integrate joint effects, including seamless integration with strategic targeting processes.

- Field headquarters will be built around a mobile, protected core element suitable for combined arms manoeuvre but will be expandable for stability operations, including conflict prevention or post-conflict peace building.

- In order to develop headquarters that are small enough to survive, yet large enough to plan and coordinate in a JIMP context, the concept of reachback or split-basing could be explored.

- Autonomous, persistent surveillance capabilities will be required, along with the processing and analysis capabilities needed to exploit them.

- Canadian land forces will need automated analysis capability and new data visualization tools to accelerate processing times and exploit large volumes of information to better understand the operating environment.

FUNCTIONAL CONCEPTS

Capability is defined as "the ability to carry out a military operation to create an effect."[14] The *Close Engagement* concept represents the first step in a new capability development cycle, to advance a capability from its conceptual beginnings through detailed process and delivery options to its tangible realization. The Army staff oversees capability development and force management through the Army Capability Development Continuum. The continuum consists of four pillars—Conceive, Design, Build and Manage—and the force development process is encapsulated in the first three pillars.

"THE 'CLOSE ENGAGEMENT' CONCEPT REPRESENTS THE FIRST STEP IN A NEW CAPABILITY DEVELOPMENT CYCLE, TO ADVANCE A CAPABILITY FROM ITS CONCEPTUAL BEGINNINGS THROUGH DETAILED PROCESS AND DELIVERY OPTIONS TO ITS TANGIBLE REALIZATION."

The details regarding how the *Close Engagement* concept is realized will be found in the functional concepts. Those concepts will describe land forces in terms of their operational functions (Command, Sense, Act, Shield, and Sustain), with emphasis on how land forces will be differentiated from the present. The functional concepts will provide the detail needed for the Build (capability integration) function, where selected capability requirements are translated into validated designs for force employment—equipment, doctrine and structures.

The development of functional concepts will involve collaborative work between the Canadian Army Land Warfare Centre and stakeholders both internal and external to the Army. It would be inappropriate to usurp this process by providing detailed guidance in this document, but the analysis of the FLOE that led to the *Close Engagement* concept, and an understanding of how the concept is intended to work, have highlighted a number of key issues that will need to be resolved in the functional concepts and a number of areas where further research and development efforts are required.

Command

Command is the operational function that integrates all the operational functions into a single, comprehensive strategic-, operational- or tactical-level concept.

14 Defence Terminology Standardization Board, record 36730, 29 Jan 2015.

- Field headquarters need to be mobile, yet fully networked. How can those conflicting requirements be reconciled? Is split-basing[15] a feasible option?

- For stability operations, field headquarters are likely to be static and will need expanded staff capabilities and infrastructure to accommodate additional enabling capabilities and a wide range of JIMP partners. A headquarters that has to increase significantly in size and integrate unfamiliar actors normally undergoes a period of stress and inefficiency before trust is established and efficient processes are in place. Research is needed into practical measures that can be taken to accelerate this process.

- The electromagnetic signatures of headquarters will need to be masked or reduced to avoid being targeted during combat operations.

- The fire support command and control system needs to be capable of operating and synchronizing at all levels of command in a timely manner.

Sense

Sense is the operational function that provides the commander with the knowledge needed to understand the environment. This function incorporates all capabilities that collect and process data.

- Long-range surveillance and target acquisition capabilities will be required to support both lethal and non-lethal engagements throughout the AO as well as to provide inherent warning and protection from land- and air-based threats to the deployed force. What mix of capabilities can most effectively meet that demand?

- Autonomous or remotely guided surveillance systems able to cover large areas will be required by forces deployed in a dispersed mode or tasked with a wide area security mission.

15 Location of some elements of a headquarters outside of the area of operations. Frequently referred to as "reachback."

- The ability to dismount and engage effectively with the local population will be extremely important, but equally important may be the ability to understand a city as an adaptive system and thus potentially understand how to adjust the city's sub-systems to increase stability or influence selected populations.

- Enhanced capabilities for dismounted soldiers will be needed. Those capabilities should take into consideration the need for effective interaction with civilian populations and should include, *inter alia*, applications for translation, cultural understanding, facial recognition, human intelligence collection, etc. Future soldier systems must be designed so that they do not detract from the ability to interact with people.

Act

Act is the operational function that integrates manoeuvre, firepower and information operations to achieve the desired effects.

- A widely dispersed force in an adaptive dispersed operations construct will require dispersed and long-range supporting fires that include all-weather and day/night capabilities in order to effectively support manoeuvre.

- Automated planning tools at all levels of command are needed to enhance the responsiveness and effectiveness of forces.

- Fires capabilities must be broad, from lethal to non-lethal, and effective against multiple and diverse threats while minimizing collateral damage.

- While the probability of Canada being engaged in major combat operations is low, there is an enduring need for a robust capability to conduct major combat operations, and they cannot be created on short notice. Moreover, the extent to which Canada and its North Atlantic Treaty Organization (NATO) allies are prepared for major combat operations will influence that probability, as effective capability has a strong deterrent effect. Canadian land forces will need to improve their ability to conduct the following tasks:

- » Avoid being detected and targeted by integrated reconnaissance-strike capabilities.
- » Operate in a dispersed manner for force protection.
- » Deliver suppressive fires and deep attack on armoured targets.
- » Protect themselves against the effects of chemical, biological or nuclear weapons.

Shield

Shield is the operational function that protects a force, its capabilities and its freedom of action.

- An air defence capability or set of capabilities will be needed to protect deployed forces against the following threats:
  - » fast attack aircraft;
  - » armed helicopters;
  - » ballistic missiles; and
  - » small, low-altitude, and potentially swarming UASs.
- Land platforms will require active protection against explosive and kinetic energy projectiles.
- The increasing likelihood of being targeted by integrated reconnaissance-strike systems will drive a requirement for smaller or managed signatures in all spectra. Considerable research is needed into methods for reducing all signatures. Land forces should seek not only to be invisible or masked in electro-magnetic environments, but also to be harder to see in all light spectra and quieter in operation.
- In order to retain freedom of movement and agility, land forces will need better route security capabilities. For force protection reasons, we will need to enhance our ability to move many small elements simultaneously on separate routes in a coordinated way.

- Continued research is needed into advanced capabilities to counter explosive hazards.

- Canadian land forces need to significantly improve their ability to function in environments contaminated by chemical weapons, toxic products and radioactive materials. Research is needed into methods of rapidly identifying novel biological agents.

Sustain

Sustain is the operational function that regenerates and maintains capabilities in support of operations.

- The logistics system should operate in a dispersed and networked manner, but control of overall logistics capability must be centralized at formation level.

- Continued research and development into life-saving technologies will be needed. The nature of the threat, the size of the theatre of operations and the extent of dispersion may create situations where the evacuation of casualties from dispersed locations to a Role 3 hospital may not be achievable within the "golden hour." In such situations, dispersed elements will need an integral treatment capability. Current research by some of our allies into forward surgical teams should be closely tracked.

- The CSS system must be able to conduct logistics missions in hazardous areas. Experimentation is needed to determine whether enhanced combat capabilities within the service battalion will suffice or whether additional defence and security troops will be needed for the logistics mission.

- Research and experimentation is needed to determine the extent to which additive manufacturing can reduce the need for stocks to be held in the supply system.

LAND POWER DEPENDENCIES

The CA is the proponent for, and a major contributor to, land power, but other CAF capabilities will play a pivotal role in generating effective land power. The capability development goals of the Army must therefore remain aligned with those of the RCAF, the RCN and other CAF components.

"THE CAPABILITY DEVELOPMENT GOALS OF THE ARMY MUST THEREFORE REMAIN ALIGNED WITH THOSE OF THE RCAF, THE RCN AND OTHER CAF COMPONENTS."

This section outlines land power capabilities resident in other CAF organizations that will be needed to meet the challenges of the FLOE. It is not intended to be an exhaustive list, but it highlights capabilities that will need to be configured to support widely dispersed land forces in austere environments across the spectrum of conflict. Detailed discussions will be needed with our CAF partners to ensure that concepts are aligned and that possible gaps are identified.

The Royal Canadian Navy

Canadian land forces will continue to rely on the Navy for some strategic movement and for control and defence of the sea lines of communication. With a new generation of ships being constructed, there is an opportunity to enhance or generate a range of capabilities that could support land operations. They are grouped below under the combat functions.

- **Command**
  - » afloat command and control
  - » airspace control
- **Sense**
  - » ship-borne and ship-launched sensor platforms, with information configured so that it can be integrated into the common land operating picture
  - » early warning of air and missile threats

- **Act**
  - » small boat operations and ship-borne helicopter support during littoral operations
  - » naval fires (gunfire and/or land attack missiles)
- **Shield**
  - » sea-based air defence
  - » ballistic missile defence
- **Sustain**
  - » sea-basing of medical and logistics elements supporting land operations
  - » port operations

The Army will need to work with the Navy to ensure that the above capabilities are optimized. Concepts should also be explored for the utilization of land force capabilities such as ground-based air and missile defence to support naval operations in Canada and overseas.

The Royal Canadian Air Force

Canadian land forces will continue to depend on aerospace platforms—inhabited and uninhabited—for strategic movement, casualty evacuation, resupply, command support, surveillance, reconnaissance, fire support, protection from air threats and the tactical movement of soldiers.

The Army will seek to work with the RCAF to ensure that the following land power–related capabilities are part of the future aerospace force.

- **Command**
  - » satellite communications, including secure voice
  - » radio rebroadcast capability (networking over long distance)

- liaison detachments
- a tactical planning function less rigid and more timely than the 72-hour air tasking order cycle
- air elements at formation (brigade) level able to interoperate with allied or coalition two-star headquarters
- command and liaison capability

- **Sense**
  - jamming-resistant position, navigation and timing
  - aerospace surveillance with automated threat warning
  - airborne sensors with integral downlink capability
  - long-duration, high-fidelity sensor platforms (multi-spectral, all-weather, with integrated ground downlink stations)
  - space imagery from classified and commercial systems

- **Act**
  - precision strike in low- and high-threat scenarios
  - close air support and battlefield air interdiction
  - armed tactical aviation
  - airmobile capability (with evolution toward an air assault capability)
  - a wide variety of air-delivered munitions, including unguided, guided, tuneable yield, and mass effect munitions
  - airborne capability: the ability to deliver an all-arms sub-unit (around 160 persons) with supporting arms, wedges and toboggans, etc.

- **Shield**
  - » tactical air control parties mounted in vehicles with the land command and control system, appropriate levels of durability, mobility and protection
  - » anti-UAS capability
  - » air-to-ground EW: jamming, direction-finding, intercept, and computer network attack
  - » land forces and tactical aviation able to operate in a contaminated environment
- **Sustain**
  - » aerial resupply operational and tactical level by
    - – fixed and rotary wing
    - – precision aerial delivery
    - – low-altitude air drop
  - » ability to support operations in austere environments (i.e. without infrastructure)
  - » battlefield casualty evacuation
  - » strategic airlift that can carry the largest/heaviest Army platforms

Space

Canadian land forces will depend heavily on space-based assets for communication, location and sensing. The Army will not attempt to generate or acquire space assets, but it will need dedicated space expertise in order to maximize access to space capabilities. This should include deployable space support elements, institutional education, training and professional development, and development of supporting concepts and doctrine.

Canadian Special Operations Forces Command

The CA and CANSOFCOM are key contributors to the generation of land power. To prepare for the FLOE, they will need to continue to increase their interoperability. Most CANSOFCOM operations require conventional forces support and, in complex human-centric operations where counterinsurgency or unconventional warfare strategies and tactics are adopted, the achievement of strategic objectives will demand closer coordination and cooperation between the two components. Discussion and collaboration need to continue to determine how land forces and special operations forces can best support each other and contribute to success across the spectrum of conflict and in all missions, including the global counter-violent-extremist-organization and counter-terrorism effort.

Canadian Forces Health Services Group

Canadian Forces Health Services Group is well advanced in its efforts to develop concepts for battlefield medical services in the mid-term future. The Army has been an observer and contributor to that process, and at the moment there do not appear to be any significant gaps between those concepts and this one. In general, Canadian land forces will depend on Canadian Forces Health Services Group to provide the following services to widely dispersed forces in austere conditions:

- medical and dental treatment;
- ground casualty evacuation, in conjunction with the land force;
- medical evacuation;
- medical supply; and
- preventive medicine.

Canadian Forces Military Police Group

Land forces will need to include military police, both to police the force and to provide police support to the force through five core functions:

- **Mobility Support**
- **Security.** Military police support to security operations comprises the following categories:
  - » area security;
  - » personnel security;
  - » physical security;
  - » information security;
  - » information technology security;
  - » operations security; and
  - » specialized security and protection.
- **Custody**
- **Policing.** This includes the enforcement of discipline and the conduct of investigations.
- **Stability Policing.** Stability policing activities are conducted in support of establishing a safe and secure environment, restoring public order and security, and establishing the conditions for meeting longer-term needs with respect to governance and development. Military police, as soldier police, have the important role of supporting police capacity-building, under the umbrella of security force capacity-building.

Canadian Forces Intelligence Command

Canadian Forces Intelligence Command supports the land force intelligence function through the Canadian Forces Intelligence Group and Director General Military Signals Intelligence, while land operations intelligence elements will continue to be force generated by the CA. The Canadian Forces Intelligence Group will force-generate intelligence capabilities including the following functions:

- imagery intelligence;
- meteorological intelligence;
- open source intelligence;
- human intelligence; and
- geospatial intelligence.

Canadian Joint Operations Command

Any sustained CAF deployment will rely on CJOC to generate the following capabilities:

- national command and strategic direction;
- movement and movement control;
- design, construction and support of infrastructure;
- contracting support; and
- theatre communications and sustainment architecture.

Assistant Deputy Minister (Information Management)

Any Canadian force deployment will rely on Director General Information Management Operations to generate or provide the following:

- signals intelligence;
- infrastructure line;
- satellite communications management; and
- cyberspace support.

Assistant Deputy Minister (Materiel)

CAF members, whether in training or on deployment, will require materiel acquisition and support and will rely mainly on Director General Land Equipment Program Management and Director General Materiel Systems and Supply Chain to sustain land, common and ammunition equipment and platforms.

Consequently, Assistant Deputy Minister (Materiel) will continue to provide support in the following ways:

- Support the acquisition and sustainment of equipment and platforms.
- Support the logistics system to operate in a dispersed and networked manner from the strategic environment down to the tactical reality.
- Provide a Level 3 land engineering capability when necessary.

Director General Cyber

As communications and information systems continue to merge, it is likely that, in the near future, the conceptual boundary between cyberspace activities and EW will disappear. The Army will need to clarify how cyberspace capabilities fit into the architecture of EW tools and what specific cyberspace capabilities are needed to complement those tools. It is certain that the force of the future will need to be able to understand and manage the electromagnetic operating environment to assess and neutralize threats. Robust, layered defences at the tactical and operational level will be needed to mitigate against attacks on networks, whether those are by brute force methods (jamming, electromagnetic pulse) or by an adversary's offensive cyber operations (OCO), such as hacking, insertion of malicious code, etc. The ability to exploit adversary and open-source networks will be a crucial requirement in humanitarian, peace support

and counterinsurgency operations. The specific requirements for OCO tools at the tactical level are unclear and warrant further consideration. With the right tools, it might be possible to achieve a significant effect on an adversary that relies on an electronic network. Potential adversaries that are less technologically advanced may well have less robust defences and could also have their operations degraded by OCO. Given that the tools and skill sets needed for network defence are in general the same as those needed for OCO, the potential exists to create an associated OCO capability. The type of cyberspace defence Canadian land forces need and the nature of the target effects it might wish to generate by offensive action need to be decided as a matter of high priority.

"ACHIEVING ALL OF THESE ADVANCES OVER THE NEXT TWENTY YEARS WOULD REQUIRE MAJOR NEW INVESTMENT, AND THE EXTENT TO WHICH THAT WILL OCCUR IS DEPENDENT ON THE STRATEGIC SITUATION AND THE DOMESTIC ECONOMY."

CONCLUSION

Land operations in the next two decades will be characterized by complex operations involving a diverse range of conditions and a wide array of multi-faceted, adaptable adversaries. The Army and other elements of the CAF need to be able to generate land forces that can survive and win in combat and, through shared understanding and the ability to engage effectively with all actors, help set the conditions for enduring mission success.

Canadian land forces that are agile, connected and modular, and thus able both to work in a widely dispersed stance and to concentrate for effect, will continue to be able to succeed in full-spectrum operations. Land forces that are highly interoperable and credible with allies, and able to work effectively with JIMP partners, will be an essential and valued contributor to alliance and coalition missions abroad and a core component of the defence and security of Canada.

The capability changes highlighted in the *Close Engagement* concept are comprehensive. Achieving all of these advances over the next twenty years would require major new investment, and the extent to which that will occur is dependent on the strategic situation and the domestic economy. The intent of this capstone operating concept is to identify the capability goals that the Army needs to pursue and set the direction of travel, so that we can continue to provide combat-effective land forces to defend Canadians and serve Canadian interests across the spectrum of conflict, now and in the future.

ANNEX A – GLOSSARY AND LIST OF ACRONYMS AND ABBREVIATIONS

Glossary

	DEFINITION	SOURCE
Adaptability	The ablity to adjust to new conditions.	Oxford Dictionary
Agility	The ability to redirect swiftly.	Defence Terminology Standardization Board; approved 09/10/2008
Comprehensive Approach	A philosophy according to which military and non-military actors collaborate to enhance the likelihood of favourable and enduring outcomes within a particular situation. Note: The actors may include joint or multinational military forces, Canadian government departments and agencies (whole of government), other governments (foreign, provincial and municipal), international organizations (NATO, UN), non-governmental organizations (CARE, OXFAM), private-sector entities or individuals.	Defence Terminology Standardization Board; approved 21/07/2011
Connectivity	The product of networked communications and an integrated and pervasive data environment.	
Cyberspace	The element of the operational environment that consists of interdependent networks of information technology structures—including the Internet, telecommunications networks, computer systems, embedded processors and controllers—as well as the software and data that reside within them.	Defence Terminology Standardization Board; approved 31/08/2016
Electromagnetic Operations	All operations that shape or exploit the electromagnetic environment or use it for attack or defence, including the use of the electromagnetic environment to support operations in all other operational environments.	AAP-6; approved 14/12/2016
Force Protection	All measures and means to minimize the vulnerability of personnel, facilities, equipment and operations to any threat and in all situations, to preserve freedom of action and the operational effectiveness of the force.	AAP-6; Army Terminology Panel; approved 22/06/2004

	DEFINITION	SOURCE
Hybrid Threat	A threat consisting of a combination of regular and irregular forces, or a single regular or irregular force using a combination of regular or irregular tactics, combined in pursuit of a common objective.	Army Terminology Panel; approved 12/07/2016
Integration	The combination of military and non-military elements to achieve a common goal through coordinated and complementary efforts.	Defence Terminology Standardization Board; approved 12/07/2010
Land Power	The element of military power that is applied in the land operating environment to achieve effects on or below the surface of the earth.	Draft definition for consideration by the Army Terminology Panel.
Littoral	In military operations, a coastal region consisting of the coastal sea areas and that portion of the land that is susceptible to influence or support from the sea.	Defence Terminology Standardization Board; approved 21/08/2009
Robust	Effective across a range of conditions.	Defence Terminology Standardization Board; approved 09/10/2008
Situational Awareness	The knowledge of the elements of the operational environment necessary to make well-informed decisions.	Defence Terminology Standardization Board; approved 13/08/2014
Unmanned Aircraft System	A system that includes the necessary equipment, network, and personnel to operate an unmanned aerial vehicle. (Caveat: the term *unmanned aerial vehicle* is obsolete; Defence Terminology Standardization Board, record 44144, 30/09/2013. The term has been replaced by *unmanned aircraft*.)	Defence Terminology Standardization Board; approved 24/01/2012

Acronyms and Abbreviations

ABCANZ
American, British, Canadian, Australian and New Zealand Armies Program

ADO
Adaptive dispersed operations

AO
Area of operations

ASIC
All source intelligence centre

BG
Battle group

CAF
Canadian Armed Forces

CANSOFCOM
Canadian Special Operations Forces Command

CFINTCOM
Canadian Forces Intelligence Command

CIMIC
Civil–military cooperation

CJOC
Canadian Joint Operations Command

CMBG HQ
Canadian Mechanized Brigade Group Headquarters

CO
Commanding officer

CORA
Centre for Operations Research and Analysis

CSS
Combat service support

DRDC
Defence Research and Development Canada

ECAT
Empowered combined arms team

EW
Electronic warfare

FLOE
Future land operating environment

HODR
Humanitarian operations and disaster relief

JIMP
Joint, interagency, multinational and public

LAV
Light armoured vehicle

LEMS
Land equipment management system

MILPERSCOM
Military Personnel Command

MRT
Mobile repair team

NATO
North Atlantic Treaty Organization

OC
Officer commanding

OCO
Offensive cyber operations

RCAF
Royal Canadian Air Force

RCN
Royal Canadian Navy

UAS
Unmanned aircraft system

ANNEX B – BIBLIOGRAPHY

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