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Is the Canadian Military Ready for a Great-Power Conflict?

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Is the Canadian Military Ready for a Great-Power Conflict?

Major Stephen Tremaine

Thucydides Trap Adjacent: Is The Canadian Military Ready For A Great Power Conflict?

Since the collapse of the Soviet Union, many western militaries have taken the opportunity to transform their militaries from a military that was optimized for major combat operations in Europe to a force more adept at handling other types of operations on the spectrum of conflict such as counterinsurgency, peace support operations or a variety of limited interventions. Whether due to a deemed lack of necessity or an opportunity to reduce costs, the force structure of many western militaries has drastically changed in the last three decades to the point that they are not prepared for a return to major combat operations. The Canadian military has suffered this fate as well. Unfortunately, the last three decades have created conditions where major combat operations in the context of great power struggle has become exceedingly plausible. Recently the Canadian government has declared war on Russia through its actions of arming a country, Ukraine, which Russia is currently at war with. While some may dispute this, deeming these actions falling short of an act of war, all that matters is that Russia sees it this way as their foreign minister recently affirmed publicly.[1] Thus far, this war has remained a proxy war, but the chances for miscalculation resulting in a retaliatory strike by Russia leading to further escalation and direct involvement of the Canadian Armed Forces (CAF) are high. Consequently, politicians have been looking to strengthen the CAF for such an eventuality with great earnestness. Although, it is always exceedingly difficult to predict what the next war will look like, inferences can be drawn from recent conflicts, weapons technology trends and the ways in which other militaries are modernizing. This paper will examine these factors, how these trends apply to the strategic, operational and tactical levels of war, and draw conclusions as to what are

[1] "Russia's Lavrov: Do not underestimate threat of nuclear war". Reuters. 25 April 2022.

the difference making weapons on the battlefield today that will likely remain the difference making weapons in the near future. Drawing on these conclusions, recommendations will be provided to field equipment and reorganize the CAF to quickly transform it from a force structured for low intensity conflict and close combat to a force designed to deliver long range fires and one that is prepared for the worst-case scenario of major combat operations with a near peer.

STRATEGIC LANDSCAPE

The calculus of nuclear deterrence and mutually assured destruction (MAD), widely viewed to have prevented direct conflict between nuclear powers has faced several challenges over the last two decades. This began with the United States (US) signaling its desire to achieve nuclear first strike capability when President Bush unilaterally withdrew the US from the Antiballistic Missile (ABM) Treaty on 13 December 2001.[2] The ABM Treaty barred the development and deployment of weapon systems that could shoot down ballistic missiles thereby preserving nuclear balance.[3] Put another way, "strategic stability has been threatened by the US efforts to deny other countries retaliatory strike capacity and achieve nuclear primacy".[4] This has contributed to challenges with other critical arms reduction agreements including the troubled Strategic Arms Reduction Talks (START) and the collapse of the Intermediate-Range Nuclear Forces (INF) Treaty. More importantly, it also encouraged Russia and China to focus on developing technology that could defeat potential US ABM capabilities. On 1 March 2018, President Vladimir Putin announced six new advanced weapons. These included a cruise missile

[2] Lynn F. Rusten. "U.S. Withdrawal from the Antiballistic Missile Treaty". Center for the Study of Weapons of Mass Destruction National Defense University. National Defense University Press. Washington, D.C. Jan 10. 10.
[3] Ibid. 1.
[4] Augusto C. Dall'Agnol and Marco Cepik. "The demise of the INF Treaty: a path dependence analysis". Revista Brasileira de Política Internacional. 11 May 21.

with a nuclear engine, a short-range directed-energy system, a nuclear-armed unmanned undersea vehicle, a possibly dual-purpose nuclear and conventional air-launched hypersonic cruise missile, a more advanced intercontinental ballistic missile (ICBM) called the RS-28 Sarmat, and a hypersonic boost-glide vehicle (HGV) called the Avangard.[5] When unveiling the weapons systems, President Putin outlined his position stating

> the US is permitting constant, uncontrolled growth of the number of anti-ballistic missiles, improving their quality, and creating new missile launching areas. If we do not do something, eventually this will result in the complete devaluation of Russia's nuclear potential. Meaning that all of our missiles could simply be intercepted".[6]

He went on to state "no one has listened to us, you listen to us now".[7]

Of the six new weapons, the Sarmat and Avangard are of particular concern. The Sarmat was successfully launched for the first time on 20 April 2022.[8] It can carry up to a 10 ton/8 megaton payload comprised of 10 to 15 separate conventional warheads (depending on configuration) or an unspecified number of HGVs, and an unspecified number of decoys. [9] The missile is particularly challenging to shoot down as its short boost phase drastically reduces the time that it can be tracked by infrared satellites while its range of 18,000 KM enables it to attack North America while taking a trajectory over the South Pole thereby bypassing the majority of ballistic missile defenses.[10] [11]

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[5] Joseph Trevithick. "Here's The Six Super Weapons Putin Unveiled During Fiery Address". The War Zone. 1 Mar 18.
[6] Vladimir Putin. "Presidential Address to the Federal Assembly". 1 Mar 18. Accessed 26 Apr 22. http://en.kremlin.ru/events/president/transcripts/56957
[7] Ibid.
[8] Roman Meitav. "Russia completes first launch of new nuclear-capable ICBM". The Jerusalem Post. 20 Apr 22.
[9] Samuel Cranny-Evans. "RS-28 Sarmat specifications revealed". Janes. 19 Jul 19.
[10] Amy F. Woolf. "Russia's Nuclear Weapons: Doctrine, Forces, and Modernization". Congressional Research Service. 21 Apr 22. 27.
[11] Ibid. 27.

The Avangard has been successfully tested and was reported to have entered into combat duty in December 2019.[12] The challenge posed by hypersonic missiles is that they maintain manoeuvrability at extreme speeds. This unpredictable flight path coupled with lower altitude flight relative to conventional ICBMs makes it impossible to shoot down with current air defense (AD) or ABM capabilities. China also reportedly tested an HGV on 27 July 2021.[13] The cumulative effect of the improvements to ICBMs and the introduction of HGVs by Russia and China is that we will continue to live in a MAD world for many years to come.

OPERATIONAL LANDSCAPE

China and Russia's Anti-Access/Aerial Denial (A2AD) capabilities are seen as a disruptive challenge to western forces' ability to conduct warfare in a manner that they are accustomed to. A broad template for this this style of war would be preliminary reliance on air and naval assets to employ substantial firepower and conduct shaping operations suppressing and then destroying the enemy's air defense (also known as SEAD and DEAD), disrupt their command, control, communication, intelligence, surveillance and reconnaissance capabilities and obtain air superiority. Following extensive shaping of the battlefield, ground forces would be inserted with ongoing support from naval and air assets. This template for warfare, sometimes referred to as "shock and awe" warfare, has been used successfully by western forces on numerous occasions, however it has not been tested against a true near-peer adversary with robust A2AD capability. Consequently, it is important to draw upon the best available information to assess the potential impact of leading A2AD capabilities on western forces. This

[12] Nicholas Fiorenza. "Russia declares first Avangard regiment operational". Defence Weekly. 30 Dec, 19.
[13] Mark Episkopos. "Take Note: China's Hypersonic Glide Vehicle Test was No 'Sputnik'". The National Interest. 20 Nov 21.

will be done by examining AD systems, their abilities to counter modern aircraft, including those enabled with stealth capabilities, as well as considering relevant missile capabilities.

Whereas western militaries focused heavily on developing stealth capabilities in the last half century, the Soviet Union and later Russia focused more heavily on integrated AD systems designed to defeat western air power. As a result, they have developed amongst the most advanced AD systems, missile defense systems and ground based radar systems in the world. What is arguably Russia's most important AD missile system, the S-400 Triumf, can detect targets up to 600 KM away and engage them up to 400 KM away.[14] The range of most air to ground munitions used by western bombers and attack aircraft is less than 400 KM. Perhaps most notably the AGM-88 High-speed Anti-Radiation Missile (HARM), the primary weapons system used to destroy enemy radars has a maximum range of 225 KM.[15] The S-400 also has the range to threaten higher value, yet more vulnerable airborne early warning and control (AEW&C) platforms. These platforms are critical for target/threat detection and command and control, but are limited to a maximum effective range of approximately 400 KM due to the curvature of the earth.

As a result of the strength and evolving capabilities of AD systems, western forces would likely be heavily reliant on stealth aircraft such as the F-35 and B-2 to conduct preliminary attacks. While the most advanced stealth capabilities have not been thoroughly tested against the most advanced AD capabilities in a near peer environment, it would be a mistake to think that western stealth capabilities would undoubtedly come out on top. On 27 March 1999, a stealth aircraft, the F-117 was shot down in Yugoslavia by an S-125 Neva/Pechora, a missile that was

[14] "S-400 Triumf Key Facts". Janes 19 Nov 21.
[15] "AGM-88E Advanced Anti-Radiation Guided Missile (AARGM): Key Facts". Janes. 10 Feb 22.

developed in 1961.[16] A second F-117 was also confirmed to have been damaged by a Yugoslavian AD system later that year.[17] According to a recent US Air Force (USAF) study, "F-35s [Lightening II] and F-22s [Raptor] will be unable to penetrate hostile airspace beyond 2030, not just in near-peer conflicts but anywhere advanced surface-to-air missiles (SAMs) are deployed".[18] Their major weakness is their vertical tails potentially leaving the B-2 as the only effective stealth plane currently in US inventory with its replacement, the B-21 Raider, expected to enter service not before 2026.[19] [20] Capability of the F-22 and F-35 is further limited by their inability to mount munitions on their external hard points without compromising their stealth capabilities, drastically limiting their payloads.

Short range conventionally armed ballistic missiles, cruise missiles and anti-ship missiles also pose a significant threat and are capable of attacking the bases and ships that would be required to project air power. The newest version of the Russian 3M-54 Kalibr cruise missile that is used by Russia and China is reported to have a range of over 4,500 KM.[21] Russia and China are also working to make missiles that are much harder to shoot down and have invested heavily in supersonic and hypersonic capabilities. The KH-47M2 Kinzhal, a hypersonic cruise missile was used in combat for the first time on 18 March 2022, striking a Ukrainian underground weapons depot.[22] The missile is capable of prosecuting both ground and naval targets, has a reported speed of Mach 10, a range of up to 1,200 miles and can be launched by either a MiG-

[16] Thomas Newdick. "Yes, Serbian Air Defenses Did Hit Another F-117 During Operation Allied Force In 1999". The War Zone. 1 Dec 20.
[17] Ibid.
[18] Peter Layton. "Contested Skies: Our Uncertain Air Superiority Future". Australian Strategic Policy Institute. 30 Jan 18. 8.
[19] Ibid. 8.
[20] Stefano D'Urso. "Second B-21 Raider Under Construction As The First One Approaches Roll-Out In Early 2022". The Aviationist. 17 January 2021. Retrieved 28 April 2022.
[21] Nicholas Fiorenza. "Russia reported to be developing longer-range Kalibr missile". Defence Weekly. 11 Jan 19.
[22] Gareth Jennings. "Ukraine conflict: Russia employs 'hypersonic' missile for first time". Defence Weekly. 21 Mar 22.

31K interceptor or TU-22M3 strategic bomber.[23] Anti-ship hypersonic missiles are also a reality with Russia's Tsirkon, assessed by US intelligence sources to be fielded in 2023. The missile is able to achieve Mach 6, with a range of up to 600 miles and can be launched from a variety of surface and sub-surface vessels.[24] It was reportedly successfully launched by a frigate in three tests throughout 2020 and from a Yasen-class submarine in October 2021.[25] China, meanwhile is not far behind having tested their own hypersonic anti-ship missile, the YJ-21 on 19 April 2022.[26]

Cumulatively, the advent of improved A2AD capabilities means that the viability of western forces relying on air power to gain and maintain air superiority or naval forces enabling a contested amphibious invasion are vastly reduced. Consequently, western land forces need to be able to operate far more independently than they have in the past.

TACTICAL LANDSCAPE

In contrast to the strategic or operational levels of warfare, there is significantly more information that can be gleaned from recent conflicts to make insights about the tactical level of warfare. The two primary conflicts that will be examined are the Russian and Ukrainian war in the Donbas from 2014-2015 and the conflict between Armenia and Azerbaijan in Nagorno-Karabakh in 2020.

2014-2015 Donbas Conflict

[23] Kelley M. Sayler. "Hypersonic Weapons: Background and Issues for Congress". Congressional Research Service. 17 Mar 22. 14-15.
[24] Ibid. 14.
[25] Samuel Cranny-Evans. "Russia conducts first submarine test launches of Tsirkon hypersonic missile". Janes. 4 Oct 21.
[26] Alex Gatopoulos. "Russia's Sarmat and China's YJ-21: What the missile tests means". 22 Apr 22.

Many have pointed to the 2014-2015 conflict in the Donbas as the return of the king (or perhaps more correctly the czar) of the battlefield, artillery. Artillery had seen its relative importance diminish in the latter half of the twentieth century and the early part of the twenty first century in part due to increased efficacy and availability of precision guided munitions delivered from a variety of aerial platforms and in part due to changing nature of conflict. Artillery was assessed to have caused 90% of Ukrainian conflict by Major General Andrii Koliennikov, the deputy director of the Central Scientific Research Institute's Armament and Military Equipment Directorate in Ukraine".[27] A Rand estimate was not far off concluding, "artillery produced approximately 85% of all casualties on both sides".[28]

The reason for the increased reliance on artillery are several fold. Firstly, there was a realization that the costs in losses of air power against AD were too high to be sustained. The majority of the fixed wing and rotary wing losses on the Ukrainian side occurred early in the conflict at the hands of the rebels operating both "shoulder-fired and self-propelled Strela-10M short-range systems".[29] Despite having very limited AD capabilities, the Donbas rebels were able to successfully shape the battlefield. By mid-August when Russia finally committed a substantive force into Donbas "Ukraine had lost so much tactical and transport aviation that its air force was unable to participate in the conflict because of the presence of strong AD" leaving them solely reliant on artillery for fire support.[30]

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[27] Samuel Cranny-Evans, Mark Cazalet, and Christopher F Foss. "The Czar of battle: Russian artillery use in Ukraine portends advances". Janes. 24 Apr 18.
[28] Phillip A. Karber. "Draft: Lessons Learned from the Russo-Ukrainian War". The Potomac Foundation. 8 Jul 15. 18.
[29] Michael Kofman et al. "Lessons from Russia's Operations in Crimea and Eastern Ukraine". Rand Corporation. 2017. 42.
[30] Ibid. 44.

Secondly, the accuracy and lethality of artillery has improved substantially. To underscore this, as reported by US intelligence, "a single-fire mission by Russian artillery destroyed two Ukrainian mechanized battalions in a few minutes in what became known as the Battle of Zelenopillya".[31] The attack was conducted by multiple launch rocket systems (MLRS), specifically the BM-21 Grad that fires 40 unguided 122mm high-explosive rockets with a maximum range of 40 KM.[32] Advances in aiming devices and fire control systems coupled with several developments to extend ranges has breathed new life into an already formidable category of weapons.

Thirdly, artillery has seen a reinvigoration due to the effective integration with remote piloted aircraft (RPAs). During the conflict, Russia, who is by no means a leader in RPAs, employed at least 14 different RPAs, integrating the variety of sensors launched by both separatist and Russian forces into an effective forward observation capability.[33] Although such a diverse fleet provides some challenges, the variety achieves mission tasking flexibility and increased difficulty for the defender to counter such a variety of platforms. Many Ukrainian forces indicated that they usually had between 10 and 15 minutes after sighting RPAs before their position would be hit with accurate artillery fire."[34]

Lastly, Russia has changed their artillery composition to make it more capable. To achieve this they have focused on self-propelled over towed artillery enabling quicker fire missions and manoeuvre to minimize the risk of counter-battery fires.[35] Additionally they have

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[31] Samuel Cranny-Evans, Mark Cazalet, and Christopher F Foss. "The Czar of battle: Russian artillery use in Ukraine portends advances". Janes. 24 Apr 18.
[32] "BM-21 Grad (122 mm) Key Facts". Janes. 28 Apr 22.
[33] Phillip A. Karber. "Draft: Lessons Learned from the Russo-Ukrainian War". The Potomac Foundation. 13-14.
[34] Samuel Cranny-Evans, Mark Cazalet, and Christopher F Foss. "The Czar of battle: Russian artillery use in Ukraine portends advances". Janes. 24 Apr 18.
[35] Ibid.

increased their ratio of rocket launchers to artillery to increase their effective range and volume of fire. During the Donbas conflict, they had approximately three MLRS to four traditional tubes, a ratio which is roughly inverted when contrasted to western forces.[36]

A further lesson from the Donbas conflict is the vulnerability of armoured vehicles, and in particularly lightly armoured infantry fighting vehicles (IFVs). These platforms were vulnerable to aerial threats, large caliber tank cannons, medium-caliber autocannons on other IFVs and the multitude of shoulder fired and vehicle mounted anti-tank guided missiles (ATGMs). What was shocking about the conflict was an increased threat posed against lightly armoured vehicles from artillery. The photographs of the aftermath of the Zelenopillya strike alone is compelling enough to generate increased questions regarding the survivability of mechanized infantry. The lessons learned on the disproportionate protection of tanks relative to IFVs has prompted Russia to follow suit with Israel and develop IFVs based off tank chassis with comparable protection.

A final observation was that Ukraine's ATGMs drastically underperformed due to their lacking tandem warheads with modern guidance systems. This resulted in their inability to penetrate reactive armour or effectively hit targets at long range. [37] With understanding that getting reliable information out of an active warzone is difficult, preliminary reporting of the current conflict between Ukraine and Russia seems to indicate that the Javelin Missile systems that the Ukrainian Forces have recently fielded have made a marked difference in their ability to counter Russian armour of all varieties.[38]

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[36] Phillip A. Karber. "Draft: Lessons Learned from the Russo-Ukrainian War". The Potomac Foundation. 19.
[37] Ibid. 43-44.
[38] Kris Osborn. "Pentagon Says Western Arms Have Made a Difference in Ukraine". The National Interest. 29 Apr 2022.

2020 Nagorno-Karabakh War

Whereas artillery enabled by RPAs was the decisive weapon in the 2014-2015 Donbas conflict, RPAs on their own were the decisive weapon system in the 2020 conflict between Azerbaijan and Armenia. The most important RPA in the conflict, the Bayraktar TB2, a Turkish made medium-altitude long-endurance (MALE) drone alone destroyed 567 ground targets (including 90 T-72 tanks) while an additional 74 were destroyed by loitering munitions.[39] [40] So overwhelming was the impact of RPAs in the conflict that visually confirmed destruction or abandonment of Armenian military equipment later captured by ground forces as a result of RPA attacks was assessed as 40% of Armenia's prewar military equipment.[41] The President of Azerbaijan stated on public television that their Turkish made drones alone had destroyed Armenian military equipment worth $1 billion dollars.[42] This is made even more astonishing when considering that the TB2 costs less than $2 million per aircraft.[43] Several key lessons can be drawn from Azerbaijan's tactical successes with RPAs.

Firstly, AD systems are not optimized for small drones, largely made of composite materials with small signatures. This allowed RPAs to be used in SEAD and DEAD roles in the conflict, thereby avoiding risk to pilots. To this end, antiquated Antinov-2 aircraft were retrofitted as decoy RPAs and used to get Armenian AD systems to fire on them thereby unmasking their positions and enabling follow up attacks launched from or coordinated by the use of other RPAs. Although Armenia had a distinct advantage in AD capabilities, their "modern

[39] Stijn Mitzer, Joost Oliemans et al. "The Conqueror of Karabakh: The Bayraktar TB2". Oryx (blog), 27 Sep 21. https://www.oryxspioenkop.com/2021/09/the-conqueror-of-karabakh-bayraktar-tb2.html
[40] Stijn Mitzer and Joost Oliemans. "Death From Above - Azerbaijan's Killer Drone Arsenal". Oryx (blog), 29 Dec 21. https://www.oryxspioenkop.com/2021/12/death-from-above-azerbaijans-killer.html
[41] Ibid
[42] France 24 English Interview of Ilham Aliyev by Catherine Norris-Trent, 14 Oct 20, https://www.youtube.com/watch?v=vUhXEJ0RLu4
[43] Burak Ege Bekdil. "Turkey and Ukraine to coproduce TB2 drones". Defense News. 4 Feb 22.

Russian SAM Tor-M2KM system and Repellent-1 and Avtobaza-M electronic warfare systems proved entirely incapable of hindering the operations of RPAs".[44] Even if AD systems do become more capable against RPAs there will still be a potential financial imbalance as many RPAs are drastically cheaper than the missiles in AD systems. This has been starkly illustrated in the Middle East where $3 million patriot missiles have been used to destroy $1000 drones.[45] Although not a tactic employed in Nagorno-Karabakh, cheap RPAs also pose the potential of using what is known as "swarm" tactics to overwhelm and defeat AD systems.

Secondly, the use of a variety of relatively cheap RPAs and loiter munitions operating in conjunction with tactical ballistic missiles, rocket artillery and conventional artillery can replicate standoff fire support capabilities at a price point drastically lower than what western militaries achieve with modern piloted aircraft and expensive RPAs. This became apparent to Armenia who had recently spent over $100 million on six modern Russian jets that made no difference in the conflict. [46] A comparable expenditure on drones and loiter munitions by Armenia may have made the outcome of the conflict much different. Not only would the lower price point mean that they would have many more sensors and shooters in absolute numbers, but there would have been greater willingness to commit those assets due to their low costs and no risk to pilots. The Turkish made TB2 is theoretically less capable than similar US or Israeli competitors as it lacked the ability for satellite control and uses many commercial of the shelf parts that should make it more susceptible to countermeasures. In reality, it has performed just as well as its competitors at a fraction of the cost.

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[44] Stijn Mitzer and Joost Oliemans. "Death From Above - Azerbaijan's Killer Drone Arsenal". Oryx (blog), 29 Dec 21. https://www.oryxspioenkop.com/2021/12/death-from-above-azerbaijans-killer.html
[45] Ibid.
[46] David Hambling. "The Magic Bullet Drones Behind Azerbaijan's Victory Over Armenia". Forbes. 10 Nov 20.

Thirdly, the quantity, endurance and precision fire capabilities of RPAs in Nagorno-Karabakh changed the dynamics of survivability on the battlefield for ground forces. The endurance of RPAs in particular can be contrasted against modern fighters that would likely be operating further from the front and only be able to provide at best a few hours of reconnaissance or close air support. The TB2 offered 27 hours of endurance and usually stayed on station after expending all ammunition leveraging its sensors to identify targets and coordinate strikes from other platforms.[47] The sheer volume of sensors in the air, some that could detect targets from up to 75 KM away, meant the utility of camouflage, concealment and dispersion was greatly diminished.[48] Azerbaijan was able to control the tempo of the conflict by their effective use of RPAs to repeatedly fix their opponents, strip them of their armoured vehicles and artillery and follow-up with friendly armour and infantry to clear a decimated opponent and seize terrain.

CAF EQUIPMENT AND STRUCTURE

Having discussed modern trends and recent conflicts in warfare, we will now turn to an examination of the CAF and how it is equipped and structured, identifying capability gaps at the various levels of warfare in the eventuality of high intensity combat with a near peer.

STRATEGIC CAPABILITIES

When it comes to military strategic capability, nuclear capability has been the most important weapon system since 1949 and will continue to remain so for the foreseeable future. With strong relations with the US, Canada is defacto under their nuclear umbrella and with membership of NORAD and NATO, it is de jure under the umbrella. Accordingly, there is no

[47] Stijn Mitzer and Joost Oliemans. Death From Above - Azerbaijan's Killer Drone Arsenal. Oryx, 29 Dec 21. https://www.oryxspioenkop.com/2021/12/death-from-above-azerbaijans-killer.html
[48] Stijn Mitzer, Joost Oliemans et al. "The Conqueror of Karabakh: The Bayraktar TB2". Oryx (blog), 27 Sep 21. https://www.oryxspioenkop.com/2021/09/the-conqueror-of-karabakh-bayraktar-tb2.html

added deterrence for the CAF to seek nuclear capability and doing so would make Canadian soil a viable target for nuclear attack thereby making Canadians less safe. Where Canada has been a historically valuable contributor in the nuclear defense umbrella is with early detection radar stations. The current early warning infrastructure dubbed the North Warning System is comprised of dozens of radar stations in Canada's North completed in the 1980s and has been criticized as obsolete and not prepared to identify modern nuclear threats.[49] Modernization of these systems is required to improve their detection capabilities against modern ballistic missiles, HGVs and strategic bombers. At sea, Canada has already indicated intentions to improve its detection capabilities by equipping the upcoming Type 26 acquisition with the AN/SPY-7 Radar, which is amongst the most advanced in the world and optimized for detecting ballistic missiles.[50] The system will also reportedly be equipped with the Cooperative Engagement Capability, which integrates its radars with allied nation ships armed with ABMs.[51] Collectively these efforts will serve to help maintain nuclear balance thereby ensuring MAD continues to deter a potential nuclear first strike attempt.

The second major way that Canada can play a non-escalatory role in the nuclear umbrella is to deter the last part of the nuclear triad, the submarine. To achieve this it must upgrade its anti-submarine warfare (ASW) capabilities. Although the planned Canadian Surface Combatant project will undoubtedly help modernize this capability when the Type 26 frigates enter service in the 2030s, there is a conceptual shift that is required. Existing ASW capabilities are based on a small number of large, expensive, and crewed submarines, surface vessels and aircrafts. This

[49] Jacques Gallant. "Could Canada's Arctic defence line detect a rocket from Russia? Not anymore, critics say". The Toronto Star. 31 Mar 22.
[50] Michael Byer. "Canada has done a complete about-face on ballistic missile defence". The Globe and Mail. 28 Jun 21.
[51] Ibid.

results in extremely limited ASW coverage and significant gaps that can be exploited. In order to close these gaps, a shift will need to occur in the future to a large number of cheap autonomous or remotely piloted systems. Being able to saturate Canada's massive coastline with sensors, integrate them into a cohesive system and link them to effective response capabilities would not only create greater ASW capability on a more cost effective basis, but it would provide a more effective deterrent and likely encourage greater standoff of enemy submarines. This in turn would increase the flight time of submarine launched missiles and increase reaction time for decision makers and ABM systems.

OPERATIONAL CAPABILITIES

The key to operational success in modern high intensity near peer warfare is shaping fires. The CAF currently has very few capabilities to conduct or defend against such attacks. The Halifax Class Frigate's recent refit in addition to enhancing its AD, anti-ship, ASW and radar capabilities also saw it crucially gain a ship to shore missile capability out to approximately 240 KM.[52] [53] While this is a valuable capability, its limited range puts it within the envelope of shore based anti-ship missiles and means that it will be at elevated risk when supporting ground forces or conducting littoral operations. Consequently, the Royal Canadian Navy (RCN) should ensure that the Type-26 is equipped with modern cruise missiles that drastically improve standoff capabilities, easily quadrupling current capabilities.

The Royal Canadian Air Force's (RCAF) is in a similar place to the RCN where they are awaiting their next generation of multi-role fighter while conducting upgrades to the CF-18 to try to ensure ongoing relevance. With the F-35 having been recently announced as the preferred

[52] "Halifax-Class Canadian Patrol Frigate Fact Sheet". National Defense. Mar 15.
[53] "RGM-84/UGM-84 Harpoon (GWS 60) Key Facts". Janes. 28 Apr 22.

successor to the CF-18, and deliveries not expected to begin before 2025, the program will likely be hitting initial operating capability and integrating stealth right around the time that the USAF assesses those capabilities to be obsolete.[54] [55] Additionally, much of the infrastructure and complementary assets that the F-35 will rely on (airfields, fuel depots, AEW&C aircraft, air to air refuelers and combat search and rescue) would be within enemy missile range or at risk from enemy AD. Resultantly, if the CAF is going to maintain a capability to project airpower into enemy territory it will likely need another way. The best ways to pursue this are conventionally armed land based cruise and theatre ballistic missiles as well as medium altitude long endurance (MALE) RPAs. While there is an extant MALE RPA acquisition program it is focused on the Heron TP costing roughly $40 million and the MQ-9 Reaper at approximately $32 million.[56] [57] While these are undoubtedly capable systems, it is questionable whether or not their cost premium can be justified. Consequently, similar but cheaper battle proven Turkish drones should be considered, either as well as or in addition to the current contenders.

TACTICAL CAPABILITIES

While the RCN's Canadian Surface Combatant program and the RCAF's Future Fighter Capability and RPA Systems Project will drastically increase their element's respective capabilities, A2AD capabilities of potential adversaries means that sustained air superiority and fire support from air and naval forces may not be achievable or only achievable for short periods of time. As a result, land forces must be able to conduct the tactical fight independently.

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[54] David Pugliese. "Government communications strategy designed two years ago to justify F-35 purchase. Ottawa Citizen". 28 Mar 22.
[55] Peter Layton. "Contested Skies: Our Uncertain Air Superiority Future". Australian Strategic Policy Institute. 30 Jan 18. 8.
[56] Manu Pubby. "Government Approves $400-Million Plan to Procure Armed Heron TP Drones from Israel". The Economic Times. 14 Jul 18.
[57] Elisabetta Confalonieri. "The Turkish Bayraktar TB2: Ankara's Renewed Prominence in the Drone Market". FINABEL European Army Interoperability Centre. 3 Aug 21.

Achieving this will take a drastic rethink of the CA. Currently the CA force is a manoeuvre centric force with limited integral fire support. As we have seen, success on the modern battlefield relies on sensing and striking the enemy before they can do the same to you and preferably from beyond the effective range of their weapons systems. To outline how this could be achieved the infantry, armoured and artillery corps will be examined to address how each should be amended to increase their lethality and survivability.

While the Infantry will remain essential due to its versatility in a variety of terrain and ability to hold ground, the Royal Canadian Infantry Corps (RCIC) is currently not organized and equipped for high intensity combat. It is primarily a medium force with two thirds of its regular force units considered operating from lightly armoured wheeled vehicles that lack anti-armour capability. This leaves it insufficient in protection, mobility and firepower. The remaining one third of its regular force is a light force that maintains many exquisite capabilities, but also lacks the firepower, mobility and protection to be relevant against a near-peer excluding scenarios involving complex terrain or urban combat. The reservist portion of the infantry is a dismounted force, which lacks most of the niche capabilities of the light forces, but would still be highly valuable in an urban environment. In the long term, in order to make its regular forces more relevant the RCIC should move towards a combination of heavy forces equipped with a tank based IFV and light forces equipped with a track based vehicle favouring mobility over protection. In the short term, all existing fighting vehicles should be retrofitted with ATGM capability to improve the forces firepower. Lastly in what are the easiest ways to quickly enhance the lethality of the RCIC, the battlefield should be littered with both longer range man-portable AA weapons equipped with tandem warheads and AD capability via man portable air defense systems known as MANPADS.

While there is evidence that the vulnerability of the main battle tank has increased with the ubiquity of sensors, precision guided munitions, increased accuracy and lethality of artillery, the tank still affords the most protection of anything on the battlefield. Coupled with its firepower and mobility characteristics it will likely remain highly valuable for many years to come despite the increased threats. Where the Royal Canadian Armoured Corps (RCAC) requires further introspection is in their reconnaissance capabilities. Armoured reconnaissance that falls substantially short of matching the mobility characteristics of the platforms for which it is reconnoitering for is wrong at a conceptual level and of limited utility. This lack of mobility coupled with limited protection is also questionable. In its current design, the CA's ratio of armoured reconnaissance to tanks being approximately 3:1 is also inverted. Reserves in the RCAC are universally focused on reconnaissance and suffer from unsuitable platforms. Despite these extant structural flaws there is a further problem with armoured reconnaissance, which is the simple reality that the future of land based reconnaissance is in the air with RPAs. To maximize integration of sensor to shooter functions, the majority of the CA's RPA capability should reside with the artillery. Accordingly, the RCAC regular force should be right sized to support the number of tanks we have, while the reserve units should be converted to infantry or artillery units.

There is no portion of the CAF that requires more attention and restructuring than the Royal Canadian Artillery (RCA) Corps. While the RCA's primary weapon system, the 155mm M777 howitzer towed artillery piece is amongst the best towed artillery pieces in the world, it suffers from the limitations of all towed artillery. It fires slower, takes longer to get off a first shot, takes longer to move after its last shot, requires more personnel to operate and offers less protection than self-propelled alternatives. The reserves equipped with 105mm towed artillery

howitzers are even less viable for the modern battlefield. The RCA needs to be able to shoot further, faster and with more firepower. To achieve this, the RCA should transition to self-propelled guns to enable protection through mobility against counter battery fire and other threats. The reduced crews will free up personnel for other tasks. More importantly, the RCA requires MLRS and tactical ballistic missiles to enable extended range massed and precision fires. This could extend the RCA's range from 40 KM to 400 KM.

Revolutionizing the range and firepower of the RCA would require a complementary revolution in existing forward observation capabilities. While existing acoustic and counter mortar radar defensive sensors are due for upgrades, obtaining offensively oriented sensors to acquire targets is even more pressing. To achieve this the RCA needs to saturate the skies with RPAs and create an air force for the Army, aggressively expanding the number and variety of platforms as well as operators. These systems should not be tied to infrastructure and launched either by rail, tube or hand thereby preventing reliance on runways and the associated vulnerabilities which that creates. A variety of platforms will provide different characteristics making detection harder and enemy counter measures less effective. Amongst at least some platforms, low cost solutions should be sought, understanding that quantity can be a force multiplier, not only in ensuring an abundance of sensors, but also in overwhelming enemy AD. As the former Chief of Defense Staff highlighted, "there is little point to having an [RPA] that can see a danger but can't strike it if it needs to".[58] Accordingly, whenever possible based on RPA payload capability, they should be armed. In that vein, loiter munitions are a sub-set of RPAs that should be aggressively pursued by the CAF to quickly increase the CA's standoff

[58] Tom Parry. "Canada should buy drones that can strike as well as see, says Jonathan Vance". CBC News. 7 Mar 16.

firepower. With a variety of different ranges and sizes, down to man portable, some RPAs and loiter munitions would also be suitable for Infantry, as not only do they require their own sensors, but they have historically maintained integral short range indirect capability in the form of mortars.

The final significant investment in the RCA that is required is a re-establishment of AD capabilities. Although the recent purchase of 10 medium range radar systems is a first step in the right direction, sensors not linked to shooters are of limited value. The RCA needs to operate a layered and integrated AD system with numerous sensors and shooters that are highly mobile. Interoperability and the ability to integrate and communicate with allied AD systems should be at the forefront of consideration when this is pursued. Further, a variety of threats including missiles, aircraft and small RPAs must all be considered.

NEAR FUTURE OF WARFARE

While the reports of the death of the tank have been greatly exaggerated, the future of warfare is not the combat team attack. Neither is it shock and awe campaigns reliant on air power from piloted aircraft. Nor does it involve opposed amphibious assaults or moving carrier strike groups within the range of shore based anti-ship missiles. The future of warfare, or at least the near future is being able to sense and strike your enemy quicker or from further away than they can do the same to you. In order for the CAF to be ready for this future, there is an immediate need for investment in a variety of RPAs to be our long-range sensors, a variety of missiles, self-propelled rocket and conventional artillery and ATGMs to strike, and a variety of AD systems to prevent the enemy from doing the same. From 2005 to 2010 the CAF had 21 unforecasted operational requirements (UOR) programs that procured $1.13 billion worth of equipment

required to address capability gaps for forces in Afghanistan.[59] Many of the deficiencies outlined above could be addressed with the UOR process to quickly shore up capability gaps in the CAF. Both the deficiencies and stakes are much higher than they were when conducting counter insurgency operation in Afghanistan. It is time to act decisively to ensure the CAF is ready if a great power conflict becomes a reality.

[59] "Audit of Unforecasted Operational Requirement (UOR) Process". National Defence Chief Review Services. Sep 12. 1.

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