National Defence Défense nationale

Canadian Forces College

Collège des Forces Canadiennes

LEVERAGING THE CANADIAN SURFACE COMBATANT FOR BALLISTIC MISSILE DEFENCE

Lieutenant-Commander Damien Ciotti

JCSP 50

Service Paper

Disclaimer

Opinions expressed remain those of the author and do not represent Department of National Defence or Canadian Forces policy. This paper may not be used without written permission.

PCEMI n° 50

Étude militaire

Avertissement

Les opinons exprimées n'engagent que leurs auteurs et ne reflètent aucunement des politiques du Ministère de la Défense nationale ou des Forces canadiennes. Ce papier ne peut être reproduit sans autorisation écrite.

Canada

CANADIAN FORCES COLLEGE - COLLÈGE DES FORCES CANADIENNES

JCSP 50 - PCEMI n° 50
2023 - 2024

Service Paper – Étude militaire

LEVERAGING THE CANADIAN SURFACE COMBATANT FOR BALLISTIC MISSILE DEFENCE

Lieutenant-Commander Damien Ciotti

LEVERAGING THE CANADIAN SURFACE COMBATANT FOR BALLISTIC MISSILE DEFENCE

AIM

1. While Canada contributes personnel to the Ballistic Missile Early Warning mission as a part of the North American Aerospace Defence Command (NORAD), Canada lacks the ability to intercept ballistic missile threats. The Royal Canadian Navy (RCN) has selected systems for the Canadian Surface Combatant (CSC) which will enable Canada to conduct independent detection of ballistic missiles and conduct Ballistic Missile Defence (BMD) intercept missions.[1] Through CSC, the RCN can deliver on Canada's NORAD Modernization goals by significantly increasing the Integrated Air and Missile Defence (IAMD) capability of assets declared to NORAD. The combination of a command and control (C2) system with a ballistic missile detection sensor in the CSC project creates the possibility of a seaborne platform with an intercept capability. Paired with the appropriate interceptor, this suite would build Canadian IAMD coverage over a significant portion of Canada currently vulnerable to ballistic missile attack. This paper contends that leveraging the capabilities of the CSC is crucial for shaping a shift in Canadian policy towards conducting BMD operations. Focused development of BMD competencies in the CSC will strengthen Canada's security in North America through improved IAMD delivered via NORAD and contribute to global peace and security by delivering a deterrent to hostile actors who threaten ballistic missile attacks.

INTRODUCTION

2. The author's service at NORAD HQ in the Missile and Space Domain highlighted that Canada is inadvertently participating in the BMD process through the conduct of the Ballistic Missile Early Warning portion of the NORAD Aerospace Warning mission.[2] Discussions with senior Canadian Armed Forces (CAF) leadership during JCSP affirmed the institutional intention to capitalize on the enhanced capabilities of projects like the F-35, NORAD Modernization, and CSC in the coming decade to bolster Canadian participation in operations. These operations will require improved air defence capabilities across the CAF. NORAD Modernization prioritizes improving IAMD but focuses on air-centric aspects and delivery of the F-35.[3] However, there is an opportunity to incorporate a maritime element while adding BMD capability, crucially expanding

---

[1] David Dunlop, 'A Potential Political Brawl over BMD Capabilities on Canada's CSC Type 26 Frigates? – Canadian Naval Review', 27 November 2023, https://www.navalreview.ca/2023/11/a-potential-political-brawl-over-bmd-capabilities-on-canadas-csc-type-26-frigates/.

[2] The author served as a Missile and Space Domain Chief, as well as the Senior Evaluator, Missile and Space in the NORAD-USNORTHCOM Command Center, now referred to as the Joint Operations Center from 2018-21. There is significant overlap in the NORAD Missile Warning mission and the USNORTHCOM Missile Defence mission set, to include sharing of sensors, cooperative procedures, and shared exercises between the respective domains. Technically there is a solid line distinction between the two missions, but functionally the USNC Missile Defence Officer and the NORAD Missile and Space Domain work 'hand in glove' to a degree that this author suspects would surprise Canadian policymakers.

[3] 'Domestic and Continental Defence', Government of Canada, 31 August 2023, https://www.canada.ca/en/department-national-defence/corporate/reports-publications/proactive-disclosure/nddn-main-estimates-2-may-2023/domestic-continental-defence.html.

Canada's IAMD capability and facilitating kinetic effects from varied and dispersed platforms.

3. This paper examines both past and present Canadian BMD policies, providing a comprehensive analysis through a comparative approach, evaluating the organization, equipment, and deployment strategies of the United States Navy's (USN) BMD capabilities. The paper advocates for the RCN to utilize BMD capabilities obtained through the CSC project. Specifically, the RCN should employ these capabilities to detect and counter ballistic missiles in support of NORAD and other strategic missions. The comparison is centered on the equipment involved from the USN and in the CSC project which would enable this mission set.

DISCUSSION

What is BMD?

4. BMD can be described as "a system, weapon, or technology, involved in the detection tracking, interception and destruction of attacking missiles."[4] BMD emerged during the Cold War, focused on countering intercontinental ballistic missiles (ICBM) armed with nuclear warheads. It marked a strategic shift from the deterrence by punishment doctrine, exemplified by Mutually Assured Destruction (MAD). Instead, BMD exercised deterrence by denial, emphasizing the ability to intercept and neutralize hostile missiles before they reach allied territories.

5. BMD systems have evolved beyond the Cold War paradigm, adapting to emerging threats. This maturation enables engagement not only of long-range nuclear missiles but also shorter-range, non-nuclear missiles.[5] This adaptability is crucial in addressing a diverse range of post-Cold War missile threats, including from regional conflicts and advanced technologies proliferated among state and non-state actors, such as the Houthi's in Yemen who have used ballistic missiles to attack civilian merchant shipping in the Red Sea.[6]

Historical Canadian Policy

6. Historically, Canada has had a complex relationship with missile defence initiatives, particularly those advanced by the U.S. In the late 1950s, Canada acquired two squadrons of the CIM-10 BOMARC surface-to-air missile for the newly integrated North American air defence system.[7] Designed to intercept and destroy incoming enemy aircraft, BOMARC became part of the joint defence arrangement symbolized by

---

[4] Katherine Ziesing, 'Ballistic Missile Defence 101: An Introduction', *Australian Defence Magazine*, 4 June 2015, https://www.australiandefence.com.au/news/ballistic-missile-defence-101-an-introduction.
[5] Ziesing, 2015.
[6] 'U.S., U.K. Warships Shoot Down Houthi Barrage in Red Sea - WSJ', accessed 7 February 2024, https://www.wsj.com/world/middle-east/houthis-launch-fresh-red-sea-barrage-as-blinken-tries-to-contain-gaza-war-91fed4fb.
[7] 'Bomarc Missile Crisis', accessed 7 February 2024, https://www.thecanadianencyclopedia.ca/en/article/bomarc-missile-crisis.

NORAD. Themselves meant to be equipped with nuclear warheads, BOMARC's presence on Canadian soil triggered a public debate on the implications and potential consequences for Canadian security and sovereignty, contributing to the eventual downfall of the Diefenbaker government.

7. The U.S. Strategic Defense [sic] Initiative (SDI), presented by President Ronald Reagan in 1983, proposed a missile defence system to safeguard the U.S. and its allies from potential Soviet nuclear missile attacks.[8] Referred to as 'Star Wars' in the media for its ambitious goals, SDI envisioned using ground and space-based technologies to intercept and destroy incoming ballistic missiles. Prime Minister Brian Mulroney declined Canadian participation, citing sovereignty concerns and complaining that Canada "would not be able to call the shots."[9]

8. While the SDI never materialized, its elements laid the groundwork for subsequent U.S. programs. In the early 2000s, the issue gained prominence in Canada as the U.S. proposed a much reduced missile defence program to counter rogue states with ICBM's. However, in 2005, Prime Minister Paul Martin decided against joining the U.S. BMD program.[10] The decision considered concerns about effectiveness, compatibility with Canada's defence priorities, and a desire to maintain diplomatic independence.

Modern Canadian Policy

9. Canada's current policy regarding missile defence is nuanced, but has failed to evolve and is ill-suited for the present security environment. Canada's policy toward the U.S. BMD System has remained unchanged despite the escalating threats from hostile states and non-state actors, and a global security environment that has drastically deteriorated since the 2005 decision. However, Canada has quietly acknowledged the necessity of BMD, particularly within the NATO context. The 2010 signing of NATO's updated Strategic Concept emphasized the need for BMD as a core element of collective defence.[11] The 2012 NATO Deterrence and Defence Posture Review, also signed by Canada, highlighted the growing concern and threat posed by the proliferation of ballistic missiles. In 2022 testimony before the Standing Committee on National Defence, Director General Continental Defence Policy, Mr. Jonathan Quinn, affirmed Canada's significant role in North American aerospace threat detection, including detection of ballistic missiles, and acknowledged the diverse missile threats facing the homelands.[12] The policy contradiction between participating fully in missile detection, but only selectively in engagement - depending on missile type, suggests a lack of understanding among Canadians regarding the nuances of these threats.

---

[8] Bureau of Public Affairs Department Of State. The Office of Electronic Information, 'Strategic Defense Initiative (SDI), 1983' 1 May 2008), https://2001-2009.state.gov/r/pa/ho/time/rd/104253.htm.
[9] 'Canada and Ballistic Missile Defence', Canadian Global Affairs Institute, accessed 6 February 2024, https://www.cgai.ca/canada_ballistic_missile_defence.
[10] 'Canada and Ballistic Missile Defence'.
[11] 'Canada and Ballistic Missile Defence'.
[12] 'Evidence - NDDN (44-1) - No. 34 - House of Commons of Canada', accessed 7 February 2024, https://www.ourcommons.ca/documentviewer/en/44-1/NDDN/meeting-34/evidence.

10. The Canadian government acknowledges the importance of defending against ballistic missiles within a NATO context. However, when concerning North American defence, Canada adopts a bifurcated strategy, employing manned aircraft to engage cruise missile threats while refusing to conduct BMD with the U.S.[13] This approach is outdated and leaves Canada susceptible to various missile threats. General Wayne Eyre, Chief of Defence Staff, highlighted in his 2022 Parliamentary appearance alongside Mr. Quinn that the distinctions between missile types are diminishing rapidly, and advocated for a Canadian IAMD system. He emphasized the challenge of targeting specific threats amid the range of potential dangers, i.e. separating cruise missiles from ballistic missiles, and asserted that IAMD is the future operating concept. Nearly two years on from that testimony, IAMD is not just a future concept but a present necessity, requiring a mix of capabilities, including BMD, to effectively counter current and future threats to Canadians.

11. While Canada's defence policy *Strong, Secure, Engaged* makes no mention of BMD or IAMD, it repeatedly highlights the escalating risk to regional stability and international peace and security caused by the proliferation of ballistic missiles.[14] The policy firmly commits to funding the modernization of NORAD as a key pillar of Canadian defence policy. Canada's plan for funding NORAD Modernization does discuss the increased need to collaborate with the U.S. in an IAMD system.[15] This is especially critical today, given the danger of evolving missile threats such as hypersonic weapons and improved cruise missile technology. In 2023, then-Defence Minister Anita Anand supported adopting an IAMD concept for Canada via NORAD Modernization due to the complexity of contemporary missile threats.[16] While Canada's NATO allies have embraced IAMD, Canada's aged policy involves air platforms intercepting cruise missiles under NORAD, and U.S. national assets engaging ballistic missiles after they are detected by NORAD, creating an artificial seam that an IAMD system with a BMD capability would effectively address.

Comparative Analysis of USN BMD

12. The USN conducts BMD through a multi-layered and integrated approach, utilizing a combination of sensors, C2 systems, and interceptor missiles. The primary goal of the system is to detect, track, and if necessary, intercept and destroy ballistic missiles that pose a threat. This is accomplished through the use of the *Aegis* C2 system deployed on *Arleigh Burke*-class destroyers and *Ticonderoga*-class cruisers.[17] *Aegis*-BMD is made up of three basic components: sensors, interceptors, and command and control.

---

[13] 'Domestic and Continental Defence'.
[14] National Defence, 'Strong, Secure, Engaged: Canada's Defence Policy', navigation page - audience page, 31 May 2019, https://www.canada.ca/en/department-national-defence/corporate/reports-publications/canada-defence-policy.html.
[15] 'Domestic and Continental Defence'.
[16] 'Domestic and Continental Defence'.
[17] Ronald O'Rourke, 'Navy Aegis Ballistic Missile Defense (BMD) Program: Background and Issues for Congress', *Congressional Research Service*, 20 December 2023, https://crsreports.congress.gov RL33745.

13. The primary sensors for *Aegis*-BMD are Active Electronically Scanned Array (AESA) radars, such as the AN/SPY-1D, or the newer SPY-6 or SPY-7 radars.[18] AESA radars are preferred for BMD systems due to several key advantages that enhance their effectiveness in tracking and engaging ballistic missile threats.[19] AESA radars contribute to a comprehensive situational awareness by providing a continuous and adaptable view of the airspace. This is particularly crucial for detecting and tracking ballistic missiles in their various phases of flight.

14. The interceptors in use by *Aegis*-BMD are the Standard Missile-3 (SM-3) and the Standard Missile-6 (SM-6), both fired from the Mark 41 Vertical Launch System (Mk 41 VLS).[20] The SM-3 uses kinetic kill technology, essentially hitting the threat missile in flight with another missile while in mid-flight phase outside of the atmosphere. The SM-6 engages in terminal BMD, after the threat missile has re-entered the atmosphere; however, both missiles are effective in the BMD role.

15. BMD of the Continental U.S. is currently provided by the Ground-based Midcourse Defense [sic] (GMD) system operated by U.S. Northern Command, although *Aegis*-equipped BMD ships have been considered for this task. Primarily due to the number of hulls available, these ships are instead employed in theatres worldwide to safeguard against potential ballistic missile threats from rogue nations like Iran and North Korea.[21] These BMD ships have been operating in the Red Sea since late 2023, defending merchant shipping – and themselves - against Houthi missile attacks.[22] The proliferation of ballistic missiles to non-state actors like the Houthis, who are willing to use them against civilian targets is extremely worrisome, and poses a significant challenge to global security that should gravely concern Canada.

Analysis of Potential CSC BMD Capability

16. Canada's strategic decision to adopt the *Aegis* C2 system for the CSC project marks a significant step.[23] This choice empowers Canadian vessels to execute BMD operations in a similar manner to the USN. The CSC will also be equipped with the SPY-7 radar and the Mk 41 VLS, providing the required technical components that the USN considers fundamental to conducting BMD.[24] With these systems in the CSC framework, the CAF has a path toward a robust IAMD system comprised of more than a single component, amplifying Canadian contribution to NORAD missions dedicated to safeguarding Canadians. These systems, integral to the CSC project, constitute the primary investment required to establish a fully equipped BMD-capable element. From a

[18] 'Aegis Ballistic Missile Defense', Missile Threat, accessed 6 February 2024, https://missilethreat.csis.org/system/aegis/.
[19] 'Aegis Ballistic Missile Defense'.
[20] 'Aegis Ballistic Missile Defense'.
[21] O'Rourke, 'Navy Aegis Ballistic Missile Defense (BMD) Program: Background and Issues for Congress'.
[22] 'U.S., U.K. Warships Shoot Down Houthi Barrage in Red Sea - WSJ'.
[23] 'Canada – AEGIS Combat System | Defense Security Cooperation Agency', accessed 7 February 2024, https://www.dsca.mil/press-media/major-arms-sales/canada-aegis-combat-system.
[24] Dunlop, 'A Potential Political Brawl over BMD Capabilities on Canada's CSC Type 26 Frigates?'

technical perspective, the only remaining gap is the acquisition of a suitable interceptor, which should not be a technical issue given that the CSC will have the same VLS, sensors, and C2 suite that is used by the USN for BMD. The more challenging shift required is the change in policy to allow the CAF to conduct BMD. The urgency for this policy adjustment and the critical need for BMD capabilities at sea was underscored by Vice-Admiral Angus Topshee, Commander of the RCN, who stated that "BMD is self-defence for ships now" during recent discussions with JCSP.[25] The RCN needs CSC to have BMD capabilities to be able to operate effectively at sea, and Canada needs BMD capabilities for a robust IAMD system under NORAD. CSC delivering BMD capabilities in a period of increased threat from ballistic missiles is the vehicle the CAF should use to advocate for a policy change to permit the conduct of BMD. To navigate the proposed policy change effectively, CAF leadership must actively engage both the government and the public to explain the threat in modern terms. Recognizing potential government hesitancy rooted in historical sovereignty concerns is crucial, but necessary to overcome, especially in light of the ever-evolving complexities of the international security environment.

17. The comparative analysis of the USN's BMD capabilities yields crucial insights which support advocating for harnessing the capabilities of the CSC. The *Aegis*-equipped ships in the USN's arsenal, showcase the maneuverability, practicality, and effectiveness of an integrated approach to BMD. The use of advanced AESA radars and versatile interceptors like the SM-3 and SM-6 highlights the centrality of having a comprehensive and adaptable system to counter diverse ballistic missile threats.

18. This insight reinforces the argument for the CSC project's BMD capabilities, which includes the *Aegis* system and associated technologies. The CSC's integration of *Aegis* C2 systems, SPY-7 radar, and the Mk 41 VLS aligns with the proven capabilities of the USN's BMD approach. By adopting a similar framework, Canada can establish a robust BMD capability, enhancing its contribution to NORAD missions and addressing evolving missile threats effectively. This comparative analysis supports the feasibility and strategic advantage in leveraging the CSC for bolstering Canada's air and missile defense capabilities.

CONCLUSION

19. This essay has traced the nuances of past and present Canadian BMD policies, and proposed a strategic shift in defence posture through the CSC project. The primary objective of this shift is to strengthen Canada's security by significantly bolstering its role in North American defense, specifically addressing evolving missile threats. Additionally, possessing a credible BMD capability will serve as a valuable deterrent against hostile international actors posing a threat to global security. The analysis underscores the potential of the CSC project to facilitate this evolution; equipped with *Aegis* C2 systems, SPY-7 radar, and the Mk 41 VLS, to provide a credible BMD capability for Canada.

[25] Topshee, Angus, VAdm, Email 'Ballistic Missile Defence', 4 February 2024.

20. Recent shifts in Canadian policy towards BMD, evident in commitments to NATO's Strategic Concept and NORAD Modernization, acknowledge the growing risk posed globally by ballistic missiles. However, a policy disconnect remains in Canada's differentiated approach to missile defence against cruise and ballistic missiles in North America.

21. Comparatively analyzing the USN's BMD capabilities provides a model for Canada to consider, emphasizing the effectiveness of *Aegis*-equipped ships in countering ballistic missile threats. The CSC project's selection of C2 architecture, sensors, and BMD-compatible vertical launch systems presents the CAF with the opportunity to generate BMD capabilities and advocate for a policy shift towards the integration of BMD into the broader defence strategy.

22. In the current geopolitical landscape and with the stated need for an improved approach to IAMD, this essay contends that Canada has a pivotal opportunity to strengthen its national defence and significantly contribute to collective security. As Canada invests in NORAD Modernization, incorporating BMD capabilities such as through CSC should be a critical component, aligning with our commitment to safeguard Canadian interests and those of our allies.

RECOMMENDATION

23. This author strongly recommends two key elements: a policy shift allowing the CAF to conduct BMD and the procurement of missiles capable of BMD for the CSC project. Firstly, Canada should adopt a more proactive approach to conducting BMD, leveraging the capabilities of the CSC project for detection and defence against ballistic missiles. Secondly, the acquisition of suitable interceptors is imperative. The *Aegis* system, coupled with the SPY-7 radar and Mk 41 VLS, forms the foundation for a BMD-capable element, but requires the kinetic portion - the missile itself - to complete the system. These recommendations underscore the urgency for policy realignment and the timely procurement of assets, positioning Canada to actively counter the threat of proliferated ballistic missiles and aligning with its commitment to collective security outlined in national defence policies. By embracing these recommendations, Canada can enhance its national defence and play a vital role in contributing to international peace and security.

Bibliography

'AN/SPY-7(V)3 – Canadian Naval Review', 18 June 2022. https://www.navalreview.ca/2022/06/an-spy-7v3/.

'Bomarc Missile Crisis'. Accessed 7 February 2024. https://www.thecanadianencyclopedia.ca/en/article/bomarc-missile-crisis.

'Canada – AEGIS Combat System | Defense Security Cooperation Agency'. Accessed 7 February 2024. https://www.dsca.mil/press-media/major-arms-sales/canada-aegis-combat-system.

Canadian Global Affairs Institute. 'Canada and Ballistic Missile Defence'. Accessed 6 February 2024. https://www.cgai.ca/canada_ballistic_missile_defence.

Defence, National. 'Strong, Secure, Engaged: Canada's Defence Policy'. Navigation page - audience page, 31 May 2019. https://www.canada.ca/en/department-national-defence/corporate/reports-publications/canada-defence-policy.html.

Department Of State. The Office of Electronic Information, Bureau of Public Affairs. 'Strategic Defense Initiative (SDI), 1983'. Department Of State. The Office of Electronic Information, Bureau of Public Affairs., 1 May 2008. https://2001-2009.state.gov/r/pa/ho/time/rd/104253.htm.

'Domestic and Continental Defence'. Government of Canada, 31 August 2023. https://www.canada.ca/en/department-national-defence/corporate/reports-publications/proactive-disclosure/nddn-main-estimates-2-may-2023/domestic-continental-defence.html.

Dunlop, David. 'A Potential Political Brawl over BMD Capabilities on Canada's CSC Type 26 Frigates? – Canadian Naval Review', 27 November 2023. https://www.navalreview.ca/2023/11/a-potential-political-brawl-over-bmd-capabilities-on-canadas-csc-type-26-frigates/.

'Evidence - NDDN (44-1) - No. 34 - House of Commons of Canada'. Accessed 7 February 2024. https://www.ourcommons.ca/documentviewer/en/44-1/NDDN/meeting-34/evidence.

Lockheed Martin. 'Aegis Combat System'. Accessed 6 February 2024. https://www.lockheedmartin.com/en-us/products/aegis-combat-system.html.

Missile Threat. 'Aegis Ballistic Missile Defense'. Accessed 6 February 2024. https://missilethreat.csis.org/system/aegis/.

O'Rourke, Ronald. 'Navy Aegis Ballistic Missile Defense (BMD) Program: Background and Issues for Congress'. *Congressional Research Service*, 20 December 2023. https://crsreports.congress.gov RL33745.

Staff, U. S. Naval Institute. 'Report to Congress on Navy Aegis Ballistic Missile Defense'. *USNI News* (blog), 2 May 2023. https://news.usni.org/2023/05/02/report-to-congress-on-navy-aegis-ballistic-missile-defense-9.

Topshee, Angus, VAdm. Email 'Ballistic Missile Defence', 4 February 2024.

‘US Strategic Ballistic Missile Defence: Why Canada Won’t Join It | The Simons Foundation’. Accessed 6 February 2024. https://www.thesimonsfoundation.ca/highlights/us-strategic-ballistic-missile-defence-why-canada-wont-join-it.

‘U.S., U.K. Warships Shoot Down Houthi Barrage in Red Sea - WSJ’. Accessed 7 February 2024. https://www.wsj.com/world/middle-east/houthis-launch-fresh-red-sea-barrage-as-blinken-tries-to-contain-gaza-war-91fed4fb.

Ziesing, Katherine. ‘Ballistic Missile Defence 101: An Introduction’. *Australian Defence Magazine*, 4 June 2015. https://www.australiandefence.com.au/news/ballistic-missile-defence-101-an-introduction.