



THE NORTHERN SHIELD: WHY CANADA SHOULD PARTICIPATE IN BALLISTIC MISSILE DEFENCE

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JCSP 49

Exercise Solo Flight

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Canada seems able to support missile defense for others, just not for itself.

– Paul Chapin, *former Canadian representative on NATO's Political Advisors Committee*

The history of Canada and ballistic missile defence (BMD) is a long one, going back to the 1980s.¹ But it is an ongoing topic of debate among military, policy, and political circles since that time, including two major decisions that kept Canada from joining the United States in the BMD mission, and several major developments in the geopolitical world environment. There has been much discussion on whether the current global state of competition, crises, and conflicts has fundamentally changed the factors that led to Canada's decisions to not participate in the BMD mission. In particular, Canada is currently undergoing a review of its defence policy, partially due to the Russian invasion of Ukraine,² so the time may be right to revisit the topic, since BMD has been identified by the United States National Defense Strategy of 2022 as “a core of deterrence by denial in an integrated deterrence strategy.”³ This paper argues that due to many of the changes in the global situation, the technology involved, the political and policy implications, the possible benefits to Canada, and other reasons, Canada should reconsider its stance and join the United States led BMD mission that currently just protects the United States from limited ballistic missile attack.

To make this argument, this paper will first discuss the threat that currently faces Canada and the United States. This will include how the threat has evolved into today's situation and look at the threat capabilities that potential adversary nations are developing. The paper will then look in detail at the historical factors that led to Canada saying no to joining the BMD mission in the past, to help analyze how many of those factors have now changed in today's environment. This paper then follows with a look at the technology and details of the BMD systems, and how they have evolved and improved over the last several years, including the current limitations of the system and a look at how the system could adapt in the future to the new threats that were discussed.

Next, the paper will go into detail on why Canada should join the BMD mission with the United States, why Canada's contribution would be valuable to its larger neighbor to the south, and what forms that contribution could take. It will also focus on why participation would be good for and within Canada politically, militarily, and economically. Lastly, the paper will discuss the reasons often held up by critics as why Canada should not join the BMD mission with the United States, along with an analysis on whether those reasons are still valid in today's environment or not, and then weigh

¹ John Noble, "Fortress America Or Fortress North America," *Law and Business Review of the Americas* 11, no. 3-4 (2005): 469.

² Andy Blatchford, "Canada taking 'comprehensive look' at joining U.S. ballistic missile defense," *Politico*, May 10, 2022, <https://www.politico.com/news/2022/05/10/canada-eyeing-bold-and-aggressive-military-options-to-defend-continent-00031349>.

³ Department of Defense, *2022 Missile Defense Review* (Washington, D.C.: October 27, 2022), 1.

these potential negatives against the possible benefits introduced above. The paper then finishes with the conclusion that all the current threat factors, defence requirements, and the wide array of benefits outweigh the negatives, and recommends that Canada join the BMD mission to defend its people, infrastructure, and territory.

THE THREAT

The genesis for the ballistic missile threat could be argued to be the V-2 rocket in World War II, but the technology has significantly advanced since the 1950s when true intercontinental ballistic missiles (ICBMs) became a prominent feature of the cold war.⁴ This paper will look at both the technological aspects of the ballistic missile threat, drawing on key characteristics that affect the BMD mission, and at the political and national aspects of the threat to see how these weapons are being developed and used by the potential adversaries of Canada and the United States. For Canada, this updated view of the threat is important because, as described by the Minister of National Defence Anita Anand, “the world we live in today differs from the threat assessments that underpin [the current Canadian defence policy,] ‘Strong, Secure, Engaged.’”⁵

Technical Threat Aspects

An ICBM works by launching the missile from a ground- or sea-based launcher, which then reaches suborbital space flight at altitudes of up to 1,000 kilometers, which is called the boost phase.⁶ After this, during the mid-course ballistic phase in space, the weapon follows a parabolic trajectory and releases the payload which then re-enters the atmosphere and falls or flies at rapid speed to the target, which is called the terminal phase.⁷ Modern ICBMs are highly accurate, able to hit their targets anywhere in the world.⁸ A brand new class of weapons, where warheads are loaded onto hypersonic glide vehicles (HGVs), change the mid-course and terminal phases, where the HGV separates from the booster rocket and then flies a much lower (non-ballistic) path to the target at

⁴ Christopher McFadden, “What Is an Intercontinental Ballistic Missile and How Does It Work?” Interesting Engineering, last modified January 04, 2022, <https://interestingengineering.com/innovation/what-is-an-intercontinental-ballistic-missile-and-how-does-it-work>.

⁵ Andy Blatchford, “Canada taking ‘comprehensive look’ at joining U.S. ballistic missile defense,” Politico, May 10, 2022, <https://www.politico.com/news/2022/05/10/canada-eyeing-bold-and-aggressive-military-options-to-defend-continent-00031349>.

⁶ Christopher McFadden, “What Is an Intercontinental Ballistic Missile and How Does It Work?” Interesting Engineering, last modified January 04, 2022, <https://interestingengineering.com/innovation/what-is-an-intercontinental-ballistic-missile-and-how-does-it-work>.

⁷ Christopher McFadden, “What Is an Intercontinental Ballistic Missile and How Does It Work?” Interesting Engineering, last modified January 04, 2022, <https://interestingengineering.com/innovation/what-is-an-intercontinental-ballistic-missile-and-how-does-it-work>.

⁸ Christopher McFadden, “What Is an Intercontinental Ballistic Missile and How Does It Work?” Interesting Engineering, last modified January 04, 2022, <https://interestingengineering.com/innovation/what-is-an-intercontinental-ballistic-missile-and-how-does-it-work>.

high speeds with the ability to manoeuvre throughout the mid-course phase, and then is able to dive to the target while still manoeuvring at speeds in excess of Mach 5.⁹

National Threat Aspects

When discussing the countries that pose a threat to North America, the main concern currently is Russia, which has 1400 nuclear warheads on ICBMs of various types that are all capable of reaching North America, and they are continuing to develop new systems despite sanctions, resource constraints, and arms control treaties.¹⁰ In addition to this development work, Russia has demonstrated their willingness to use such weapons (albeit without a nuclear payload) in the war in Ukraine, where they have fired thousands of missiles, including ballistic and hypersonic, at targets throughout the conflict area.¹¹ Russia believes that developing HGV weapons is the key to defeating BMD systems, and they have already done so.¹² The HGV SS-19 Avangard has been mounted on the RS-28 SARMAT ICBM, and is now operational at multiple locations in Russia, where it threatens North America today.¹³

The next potential threat is China, which has been developing large quantities of ballistic missiles,¹⁴ and will have over 200 nuclear capable ICBMs capable of hitting North America by 2025, including the road-mobile CSS-20 ICBM.¹⁵ Critically, China is not bound by any arms-control deals and has been unwilling to engage the United States in talks about its nuclear arsenal and policy.¹⁶ As with Russia, China is also making significant progress on HGV weapons, where they launched a nuclear-capable HGV in August 2021 that fully circled the globe before striking within miles of its intended evaluation target.¹⁷ This level of technological development both in HGVs and space technology was a significant surprise to western intelligence analysts.¹⁸

⁹ Katherin Hille and Demetri Sevastopulo, “China tests new space capability with hypersonic missile,” *Financial Times*, October 16, 2021.

¹⁰ Defense Intelligence Ballistic Missile Analysis Committee, *2020 Ballistic and Cruise Missile Threat* (Dayton: Wright-Patterson Air Force Base, January 11, 2021), 3.

¹¹ Department of Defense, *2022 Missile Defense Review* (Washington, D.C.: October 27, 2022), 2.

¹² Andrea Charron and James Fergusson, “NORAD: Beyond Modernization,” in *Shielding North America: Canada’s Role in NORAD Modernization*, edited by Nancy Teeple and Ryan Dean (Peterborough: North American and Arctic Defence and Security Network, 2021), 49.

¹³ Defense Intelligence Ballistic Missile Analysis Committee, *2020 Ballistic and Cruise Missile Threat* (Dayton: Wright-Patterson Air Force Base, January 11, 2021), 4.

¹⁴ General Terrence O’Shaughnessy and Brigadier General Peter Fesler, “Hardening the Shield: A Credible Deterrent & Capable Defense for North America,” in *Shielding North America: Canada’s Role in NORAD Modernization*, edited by Nancy Teeple and Ryan Dean (Peterborough: North American and Arctic Defence and Security Network, 2021), 71.

¹⁵ Defense Intelligence Ballistic Missile Analysis Committee, *2020 Ballistic and Cruise Missile Threat* (Dayton: Wright-Patterson Air Force Base, January 11, 2021), 3.

¹⁶ Katherin Hille and Demetri Sevastopulo, “China tests new space capability with hypersonic missile,” *Financial Times*, October 16, 2021.

¹⁷ Katherin Hille and Demetri Sevastopulo, “China tests new space capability with hypersonic missile,” *Financial Times*, October 16, 2021.

¹⁸ Katherin Hille and Demetri Sevastopulo, “China tests new space capability with hypersonic missile,” *Financial Times*, October 16, 2021.

The next level of threats come from North Korea and Iran, and the threat of a so-called ‘rogue nation’ ICBM attack. As far back as 2014, the Canadian Senate wrote a report about North Korea stating that it “is convinced that capability and intent are combining to form a threat to Canada and the United States that today cannot be as readily dismissed as in 2005 [in the previous Senate report].”¹⁹ North Korea continues to develop ICBM technology, and claims to be making progress on hypersonic missile technology as well.²⁰ In 2017, they launched the Hwasong-14, which was their first flight-tested ICBM with the range to strike North America, and they have since tested multiple solid propellant ballistic missiles of various ranges,²¹ with the longest having estimated ranges of up 13,000 kilometers.²² Conversely, while Iran does not currently have an ICBM threat, the current assessments are that they could use their nascent space program to shorten the path to an ICBM, and they have worked on several medium and short range ballistic missiles.²³

Implications of the Threat Analysis

It is clear from the above analysis that there is a definite threat to North America from these missile systems developed and operated by these nations that needs to be defended against. Both the technological advancements of the weapons themselves and the possible intentions of the nations wielding them have led to some realizations among western nations. Particularly, the North Atlantic Treaty Organization (NATO) has recognized the developing threats of ballistic missiles and in 2010, NATO shifted their BMD mission priority from deployed troops to defending NATO territory and cities, based on the threats and rhetoric from potential adversary nations.²⁴ The North American Aerospace Defense Command (NORAD) has also recognized a significant defensive shortfall against these new threats, saying that “our defence capabilities to deal with this new generation of threats, such as hypersonic vehicles, are obsolete. We have a major gap that needs to be filled for deterrent purposes.”²⁵ These recent BMD realizations provide a contrast to how Canada’s history with the BMD mission has unfolded over the years, which will be discussed next.

¹⁹ “Canada and Ballistic Missile Defence: Responding to the evolving threat,” Standing Senate Committee on National Security, Defence, and Veterans Affairs, 41st Parliament, 2nd Session (June 2014), accessed 09 April 2023, <https://sencanada.ca/en/content/sen/committee/412/secd/rms/01jun14/home-e>.

²⁰ Department of Defense, *2022 Missile Defense Review* (Washington, D.C.: October 27, 2022), 3.

²¹ Defense Intelligence Ballistic Missile Analysis Committee, *2020 Ballistic and Cruise Missile Threat* (Dayton: Wright-Patterson Air Force Base, January 11, 2021), 2.

²² Christopher McFadden, “What Is an Intercontinental Ballistic Missile and How Does It Work?” Interesting Engineering, last modified January 04, 2022, <https://interestingengineering.com/innovation/what-is-an-intercontinental-ballistic-missile-and-how-does-it-work>.

²³ Defense Intelligence Ballistic Missile Analysis Committee, *2020 Ballistic and Cruise Missile Threat* (Dayton: Wright-Patterson Air Force Base, January 11, 2021), 2.

²⁴ “Ballistic Missile Defence,” North Atlantic Treaty Organization, accessed April 10, 2023, https://www.nato.int/cps/en/natohq/topics_49635.htm.

²⁵ Ashley Burke, “NORAD commander warns Canadian officials about the threat posed by hypersonic missiles,” *Canadian Broadcasting Corporation*, November 30, 2021.

CANADA'S HISTORY WITH BALLISTIC MISSILE DEFENCE

Some analysts have observed that the topic of BMD has been treated in Canada like a partisan political issue, and not as a matter of national security.²⁶ As will be shown by this discussion, this has been very true over the past few decades, and that in the realm of BMD, “there's been a lack of... public clarity about what exactly we will and won't do when it comes to defending Canada.”²⁷

The Strategic Defense Initiative and Early Ballistic Missile Defence

In 1984, Prime Minister Brian Mulroney declined to take part in President Ronald Reagan's Strategic Defense Initiative (SDI) for multiple reasons such as fears of unravelling the Anti-Ballistic Missile (ABM) treaty between the United States and Russia,²⁸ and the idea that space-based interception technology would lead to the weaponization of space.²⁹ But when President George W. Bush started the modern BMD capability in 2005, Prime Minister Paul Martin opted out of BMD after initially signalling to many inside Ottawa that he would sign Canada onto the nascent BMD program.³⁰ The reasons for this reversal were many, but included being publicly pressured to join by the very unpopular President Bush, a divided liberal caucus in government, a substantial lack of support in the electorally-critical region of Quebec,³¹ resurgent concerns about prompting future arms races, and a perception of Canada abandoning the principles of arms control,³² all of which are political reasons rather than defence reasons. But there were also some defence reasons, since three key questions about the BMD systems of the day were not adequately answered: did the system work and how would it actually protect Canada; how much participation in decisions and management would Canada have in the United States-led mission; and how much would it cost for Canada.³³ Prime

²⁶ Nancy Teeple, “Canada and Missile Defence: A New Strategic Context Requires Revisiting Participation,” (North American and Arctic Defence and Security Network, August 07, 2020), 2.

²⁷ Lee Berthiaume, “Canada won't join U.S. missile defence, send troops to Afghanistan, Trudeau says,” *Toronto Star* (Toronto), August 23, 2017.

²⁸ John Noble, “Fortress America Or Fortress North America,” *Law and Business Review of the Americas* 11, no. 3-4 (2005): 469.

²⁹ James Fergusson, *Canada and Ballistic Missile Defence, 1954-2009: Déjà Vu All Over Again* (Vancouver: UBC Press, 2010), 10.

³⁰ Colin Robertson, “North Korea's threats show that Canada needs to be part of U.S. missile defence pact,” *Globe and Mail* (Toronto), April 03, 2013.

³¹ Justin Massie, Jean-Cristophe Boucher, and Stephane Roussel, “Back to the Future? Missile Defence as a Political Landmine,” in *Shielding North America: Canada's Role in NORAD Modernization*, edited by Nancy Teeple and Ryan Dean (Peterborough: North American and Arctic Defence and Security Network, 2021), 92.

³² “2014 Policy Update: Canada and Ballistic Missile Defence,” Canadian Global Affairs Institute, accessed April 08, 2023. https://www.cgai.ca/canada_ballistic_missile_defence.

³³ Colin Robertson, “Why Canada needs to revisit its stance on ballistic missile defence,” *Globe and Mail* (Toronto), November 29, 2017.

Minister Martin also went so far as to refuse to host a United States missile defence warning radar facility in Labrador.³⁴

The Middle Years of Ballistic Missile Defence

Into the 2010s, Canada began to have a policy disconnect in that it supported NATO in their pursuit of BMD capability in Europe and deployed operating areas, but not at home, partially because of a lack of a perception of any threat to Canada at the time.³⁵ NATO declared BMD as “a core element of our collective defence” and pledged to “develop the capability to defend our populations and territories against ballistic missile attack,”³⁶ and it is now one of the alliance’s permanent missions as part of the NATO integrated air and missile defence framework.³⁷ Through this time, multiple House and Senate committees in Canada made reports recommending that Canada join the BMD mission, but Prime Minister Steven Harper stayed out of the program through 2015, and this policy continued under Prime Minister Justin Trudeau, who said “our long-standing positions on [BMD] are not going to be changed any time soon.”³⁸ This attitude continued even when multiple ballistic missile tests by North Korea in 2017 brought the issue to the national forefront for a short time.³⁹ When Canada’s defence policy was written in 2017, it dodged the topic of BMD with a single line: “Canada’s policy with respect to participation in ballistic missile defence has not changed.”⁴⁰

Recent Ballistic Missile Defence History

However, as the global and threat environments have continued to change, there has been some development in the last few years. The United States has publicly stated that they want to work with allies and partners in the BMD mission and have done so quite robustly with NATO in Europe.⁴¹ And with the recent Russian invasion of Ukraine, a review of Canada’s defence policy has begun,⁴² where Minister Anand has said that

³⁴ Michael Byers, “Canada’s about-face on ballistic missile defence,” *Globe and Mail* (Toronto), June 28, 2021.

³⁵ Nancy Teeple, “Canada and Missile Defence: A New Strategic Context Requires Revisiting Participation,” (North American and Arctic Defence and Security Network, August 07, 2020), 4.

³⁶ Alan Dowd, “Time for Canada to Join the Missile Defense Team,” Fraser Institute, accessed April 10, 2023, <https://www.fraserinstitute.org/article/time-canada-join-missile-defense-team>.

³⁷ “Ballistic Missile Defence,” North Atlantic Treaty Organization, accessed April 10, 2023. https://www.nato.int/cps/en/natohq/topics_49635.htm.

³⁸ Lee Berthiaume, “Canada won’t join U.S. missile defence, send troops to Afghanistan, Trudeau says,” *Toronto Star* (Toronto), August 23, 2017.

³⁹ Justin Massie, Jean-Cristophe Boucher, and Stephane Roussel, “Back to the Future? Missile Defence as a Political Landmine,” in *Shielding North America: Canada’s Role in NORAD Modernization*, edited by Nancy Teeple and Ryan Dean (Peterborough: North American and Arctic Defence and Security Network, 2021), 95.

⁴⁰ Colin Robertson, “Why Canada needs to revisit its stance on ballistic missile defence,” *Globe and Mail* (Toronto), November 29, 2017.

⁴¹ Department of Defense, *2022 Missile Defense Review* (Washington, D.C.: October 27, 2022), 1.

⁴² Andy Blatchford, “Canada taking ‘comprehensive look’ at joining U.S. ballistic missile defense,” Politico, May 10, 2022, <https://www.politico.com/news/2022/05/10/canada-eyeing-bold-and-aggressive-military-options-to-defend-continent-00031349>.

Canada is examining the possibility of joining the BMD mission with the United States: “we are leaving no stone unturned in this major review of continental defence.”⁴³ It remains to be seen what the results will be of the defence policy review and update, but this paper argues that Canada should indeed join the BMD mission. The last important topic area to introduce, before analyzing the reasons both for and against joining the BMD mission, is to look at just what the BMD system involves, including technology, system management, and infrastructure.

BALLISTIC MISSILE DEFENCE SYSTEMS AND FUTURE CAPABILITIES

There are several different options to accomplish the task of BMD, so when considering what role Canada might play in the BMD mission, it is important to discuss the types of BMD systems that would be involved to make a relevant analysis and recommendation. There are three main ways to intercept a ballistic missile; during each phase of flight. The boost phase is when an ICBM is most vulnerable and easiest to identify and track, but since this occurs far away from the defences of North America, it requires forward deployed forces which are usually not available in the very short vulnerability window, and this is not part of current the BMD system protecting the United States.⁴⁴ Current BMD systems can engage the ICBM during the mid-course ballistic phase, using ground-based mid-course defence (GMD) interceptor missiles which usually rely on hit-to-kill collisions to destroy their targets.⁴⁵ In the terminal phase, systems such as PATRIOT, Terminal High-Altitude Area Defense (THAAD), or Surface-to-Air Missile Platform/Terrain (SAMP/T) batteries can all engage the incoming warheads prior to the intended targets being struck.⁴⁶

Ballistic Missile Defence System Designs and Features

The GMD focus of the current BMD system has faced some challenges during the development process, but several scientists have agreed that GMD capability is worth pursuing: “the technology is feasible, certainly for dealing with threats from North Korea and countries like Iran... [it] should be adequate for defending against a small number of ballistic missile warheads...”⁴⁷ In tests through the 2010s, BMD systems successfully

⁴³ Konrad Yakabuski “Canada needs to put up or shut up on missile defence,” *Globe and Mail* (Toronto), May 12, 2022.

⁴⁴ The United States attempted to solve this problem with the YAL-1, a Boeing 747 with a chemical oxide iodine laser, whose mission would have been to destroy ICBMs during the boost phase as they launched from hostile territory. Despite a successful test in February 2010 where it destroyed an actual ICBM target in the boost phase, the program was cancelled due to lack of affordability and technical expertise on the systems. - Mehta, Devansh, “Boeing YAL-1: The Laser-Equipped 747-400F,” Simple Flying, July 19, 2022, <https://simpleflying.com/boeing-747-yal-1-guide/>.

⁴⁵ “Canada and Ballistic Missile Defence: Responding to the evolving threat,” Standing Senate Committee on National Security, Defence, and Veterans Affairs, 41st Parliament, 2nd Session (June 2014), accessed 09 April 2023, <https://sencanada.ca/en/content/sen/committee/412/secd/rms/01jun14/home-e>.

⁴⁶ James Fergusson, *Canada and Ballistic Missile Defence, 1954-2009: Déjà Vu All Over Again* (Vancouver: UBC Press, 2010), 9-10.

⁴⁷ “Canada and Ballistic Missile Defence: Responding to the evolving threat,” Standing Senate Committee on National Security, Defence, and Veterans Affairs, 41st Parliament, 2nd Session (June 2014), accessed 09 April 2023, <https://sencanada.ca/en/content/sen/committee/412/secd/rms/01jun14/home-e>.

engaged 59 out of 74 targets for a success rate of 79.7 percent, and during one exercise in 2012 the system deflected four out of five nearly-simultaneous representative threats.⁴⁸ For NATO in Europe, their BMD system obtained initial operating capability in 2016, and consists of command and control sites, BMD radar sites including AEGIS Ashore, AEGIS missile cruisers, and multiple missile battery types, and NATO remains committed to achieving full implementation, having reiterated that stance as recently as the Madrid summit in 2022.⁴⁹ As a general concept, a functioning BMD system can actually raise the threshold for nuclear conflict, by denying a potential aggressor the ability to execute a small-scale coercive or demonstrative nuclear strike.⁵⁰

The BMD system currently protecting the United States uses GMD interceptor missiles based in Alaska and California, since the system is oriented and designed to counter ballistic missiles fired from North Korea, but since Canada is not a participant in the program, northern radars that feed into NORAD early warning are not tied into the BMD system.⁵¹ The arctic essentially gives some extra time and space for a BMD engagement to take place, and helps the effectiveness of the system since BMD missile locations can only defend areas that are behind them relative to the incoming ICBM threat.⁵² Because of this factor, the United States Department of Defense's Arctic strategy has identified Canada as a key partner in defending the northern approaches to North America.⁵³ It is also very important to the later analysis in this paper to clarify that the BMD system defending the United States is not designed in any way to defend against a large nuclear attack from Russia or China, in the orientation of the sensors, the location of the interceptor sites, and in the limited capacity of the system to only defend against a small number of incoming missiles.⁵⁴

Future Ballistic Missile Defense Capabilities

One intersection of Canada and BMD capabilities that has already come to fruition is that of Canada's future Canadian Surface Combatant (CSC) warship. The CSC will have the AN/SPY-7 AEGIS radar installed, which is capable of conducting the BMD

⁴⁸ Alan Dowd, "Time for Canada to Join the Missile Defense Team," Fraser Institute, accessed April 10, 2023, <https://www.fraserinstitute.org/article/time-canada-join-missile-defense-team>.

⁴⁹ "Ballistic Missile Defence," North Atlantic Treaty Organization, accessed April 10, 2023. https://www.nato.int/cps/en/natohq/topics_49635.htm.

⁵⁰ Department of Defense, *2022 Missile Defense Review* (Washington, D.C.: October 27, 2022), 6.

⁵¹ General Terrence O'Shaughnessy and Brigadier General Peter Fesler, "Hardening the Shield: A Credible Deterrent & Capable Defense for North America," in *Shielding North America: Canada's Role in NORAD Modernization*, edited by Nancy Teeple and Ryan Dean (Peterborough: North American and Arctic Defence and Security Network, 2021), 75.

⁵² Ryan Dean and P. Whitney Lackenbauer, "Geostrategy and Canadian Defence: From C.P. Stacey to a Twenty-First Century Arctic Threat Assessment," *Journal of Military and Strategic Studies* vol 20, no. 1 (2019): 86.

⁵³ Ryan Dean and P. Whitney Lackenbauer, "Geostrategy and Canadian Defence: From C.P. Stacey to a Twenty-First Century Arctic Threat Assessment," *Journal of Military and Strategic Studies* vol 20, no. 1 (2019): 90.

⁵⁴ Department of Defense, *2022 Missile Defense Review* (Washington, D.C.: October 27, 2022), 1.

mission when paired with SM-3 missiles.⁵⁵ At this time Canada has only purchased SM-2 missiles which are only capable of theater missile defence, and not BMD, but this presents an intriguing possible first step towards Canadian involvement in BMD. The role of sensors is also vitally important in the future, and NORAD and the United States have identified that BMD warning and engagement sensors will have to be integrated across all domains from space and airborne to terrestrial and over-the-horizon, with input from the cyber domain as well, to provide effective command and control of the system.⁵⁶

The BMD mission can also involve non-kinetic capabilities in the future, as the possibilities of electronic warfare, jamming, and cyber actions could all play a role.⁵⁷ However, the problems posed by HGVs are significant for the future of the BMD mission. NORAD, for example, has no task or policy guidance for defending against HGVs, and no capability to do so in any case.⁵⁸ The United States has identified this area as a strategic imperative to continue investment and development efforts, and is explicitly trying to work with allies and partners to develop hypersonic defence options with their next generation of interceptor missiles, along with a focus on integrating sensors across all domains.⁵⁹

Taken together, all these factors combine to show a system that is currently capable of defending North America against limited ballistic missile threats. There are several good reasons why Canada would want to join such a system, and there are also several capabilities or qualities that Canada can bring to the system to make it more effective, which will all be discussed next in the main analytical section of the paper.

REASONS CANADA SHOULD JOIN BALLISTIC MISSILE DEFENCE

When considering the reasons for Canada to join the BMD mission, they generally can be expressed in four groups: improved security for Canada, better relations with the United States and NATO, discussing what Canada can contribute, and finally the economic benefits to Canada. Each of these will be discussed in turn to present the overall argument for Canada joining the BMD mission.

Improving the Security of Canada

Multiple government reports have now recommended that Canada should join the BMD mission, with the Department of Foreign Affairs saying in 2004 that “it is in Canada's strategic and national interest to be involved in decisions concerning the

⁵⁵ Michael Byers, “Canada's about-face on ballistic missile defence,” *Globe and Mail* (Toronto), June 28, 2021.

⁵⁶ Nancy Teeple, “Canada and Missile Defence: A New Strategic Context Requires Revisiting Participation,” (North American and Arctic Defence and Security Network, August 07, 2020), 23.

⁵⁷ Nancy Teeple, “Canada and Missile Defence: A New Strategic Context Requires Revisiting Participation,” (North American and Arctic Defence and Security Network, August 07, 2020), 3.

⁵⁸ Ashley Burke, “NORAD commander warns Canadian officials about the threat posed by hypersonic missiles,” *Canadian Broadcasting Corporation*, November 30, 2021.

⁵⁹ Department of Defense, *2022 Missile Defense Review* (Washington, D.C.: October 27, 2022), 7-12.

security and defence of North America,”⁶⁰ and the Senate in 2014 making a unanimous recommendation to join.⁶¹ These recommendations were made for several reasons, not least of which was to provide better security for Canada. According to NATO, an effective BMD program complicates any hostile planning of adversary nations and can provide leaders with more time during a crisis to determine an appropriate response to a threat.⁶² But one of the more important points is that Canada cannot assume any of its territory will be protected under the current BMD program of the United States.⁶³ Because Canada is not a participant, decisions are made solely by the United States Northern Command, and it has been made very clear that any decisions to engage a missile that would impact in Canada – whether by design or guidance failure – would not be based on any legal justification, but just by the ethics and morals of those in command at the time.⁶⁴ And if there are multiple incoming missiles, especially under the standard shoot – look – shoot doctrine, an American officer might not defend Canada even if they wanted to, in order to properly defend the United States with limited interceptors.⁶⁵ With the current geopolitical climate and Russia’s invasion of Ukraine, Canada can no longer get by just paying lip service to national security, the defense of North America, and commitments to NATO. It is these international relationships and obligations that are also very important reasons to discuss next.

Better Relations with the United States and NATO

Aligning Canada’s policy for its own defence with its commitments to NATO would likely help improve defence relations with the 30 other members of NATO.⁶⁶ And many defence and security scholars believe that participation in BMD, and thus alignment with NATO, would not harm Canada’s diplomatic relations as a whole.⁶⁷ Additionally, taking part in the BMD mission would held Canada meet the NATO target of spending two percent of its gross domestic product (GDP) on defence spending, which

⁶⁰ John Noble, "Fortress America Or Fortress North America," *Law and Business Review of the Americas* 11, no. 3-4 (2005): 469.

⁶¹ “Canada and Ballistic Missile Defence: Responding to the evolving threat,” Standing Senate Committee on National Security, Defence, and Veterans Affairs, 41st Parliament, 2nd Session (June 2014), accessed 09 April 2023, <https://sencanada.ca/en/content/sen/committee/412/secd/rms/01jun14/home-e>.

⁶² “Ballistic Missile Defence,” North Atlantic Treaty Organization, accessed April 10, 2023. https://www.nato.int/cps/en/natohq/topics_49635.htm.

⁶³ “Canada and Ballistic Missile Defence: Responding to the evolving threat,” Standing Senate Committee on National Security, Defence, and Veterans Affairs, 41st Parliament, 2nd Session (June 2014), accessed 09 April 2023, <https://sencanada.ca/en/content/sen/committee/412/secd/rms/01jun14/home-e>.

⁶⁴ Murray Brewster, “U.S. not obliged to defend Canada in event of North Korean missile attack, MPs told,” *Canadian Broadcasting Corporation*, September 14, 2017.

⁶⁵ “2014 Policy Update: Canada and Ballistic Missile Defence,” Canadian Global Affairs Institute, accessed April 08, 2023. https://www.cgai.ca/canada_ballistic_missile_defence.

⁶⁶ “Canada and Ballistic Missile Defence: Responding to the evolving threat,” Standing Senate Committee on National Security, Defence, and Veterans Affairs, 41st Parliament, 2nd Session (June 2014), accessed 09 April 2023, <https://sencanada.ca/en/content/sen/committee/412/secd/rms/01jun14/home-e>.

⁶⁷ Nancy Teeple, “The Future of Canadian Participation in Missile Defence,” *Canadian Army Journal* 19.2 (2021): 20.

would be another improvement in diplomatic relations.⁶⁸ This policy change would help meet Canada's priorities, where the national defence policy states that the overall second priority is being "secure in North America, active in a renewed partnership... with the United States,"⁶⁹ along with the joint government statement on NORAD modernization which states that:

No two sovereign, neighboring nations enjoy as strong, supportive, and enduring a partnership as Canada and the United States. We understand that, to meet our security and defense objectives, both countries must be secure within our shared North American continent.⁷⁰

This special relationship between Canada and the United States, along with concrete examples about how both countries can work together on engagement decisions is evident with the continued success of the NORAD mission, where in February 2023, President Joe Biden and Prime Minister Trudeau worked together to authorize a NORAD engagement of an airborne target in Canadian airspace by American fighter aircraft.⁷¹ Participating in the BMD mission would enable similar cooperation in the defence of ballistic threats, and remove the current requirement for Canadian NORAD staff to 'leave the room' that occurs during BMD events today.⁷² Conversely, if Canada remains out of the BMD mission, and if Canadian territory or capabilities are viewed as vital by the United States to their own defence, then it could do significant damage to the bi-national relationship, and Canada would be ceding its defence to unilateral American decisions.⁷³ Overall, there is much to be said about how Canada manages its relationship with the United States, and the BMD portfolio provides an opportunity for Canada to take advantage of the nuances of that relationship while still maintaining sovereignty:

The political radar of the United States tends to be preoccupied with problems; so, showing up on that radar tends to be a liability. At the same time, with political bandwidth in Washington highly constrained, Canada has made a virtue of necessity, proving adept at capitalizing on rare yet short attention spans in Washington to move the goalposts of the bilateral relationship as far as it possibly can as windows of opportunity arise.

⁶⁸ Nancy Teeple, "Canada and Missile Defence: A New Strategic Context Requires Revisiting Participation," (North American and Arctic Defence and Security Network, August 07, 2020), 3.

⁶⁹ Government of Canada, *Strong, Secure, Engaged: Canada's Defence Policy* (Ottawa: Ministry of National Defence, 2017), 14.

⁷⁰ "Joint Statement on NORAD Modernization," Government of Canada and Government of the United States of America, August 14, 2021, <https://www.canada.ca/en/department-national-defence/news/2021/08/joint-statement-on-norad-modernization.html>.

⁷¹ "Readout of President Biden's Call with Prime Minister Trudeau of Canada," Government of the United States of America, February 11, 2023, <https://www.whitehouse.gov/briefing-room/statements-releases/2023/02/11/readout-of-president-bidens-call-with-prime-minister-trudeau-of-canada-2/>.

⁷² "Canada and Ballistic Missile Defence: Responding to the evolving threat," Standing Senate Committee on National Security, Defence, and Veterans Affairs, 41st Parliament, 2nd Session (June 2014), accessed 09 April 2023, <https://sencanada.ca/en/content/sen/committee/412/secd/rms/01jun14/home-e>.

⁷³ Andrea Charron and James Fergusson, "NORAD: Beyond Modernization," in *Shielding North America: Canada's Role in NORAD Modernization*, edited by Nancy Teeple and Ryan Dean (Peterborough: North American and Arctic Defence and Security Network, 2021), 50.

Canada's approach to its superpower neighbor(hood) is a delicate balancing act: maintaining its sovereignty and independence of thought and action by being the U.S.'s most reliable and valuable security partner.⁷⁴

In the end, with the high national importance of the unique bi-national relationship, this is a very strong reason for Canada to join the BMD mission, particularly in today's geopolitical climate. Some of the potential ways to do so are discussed next.

How Canada Can Contribute to Ballistic Missile Defence

When considering participation in the BMD mission, the default assumption is the hosting of GMD interceptor missiles on Canadian territory. While this is definitely an option to consider and will be discussed below, there are several other options Canada could take if they did not want to commit to hosting missile sites, keeping participation on the passive side due to political considerations or weaponization concerns.⁷⁵ As mentioned above, there is a substantial role for research and development in the realm of BMD future capabilities that Canada could take part in, including for Canadian companies. Additionally, Canada could contribute significantly on the command and control and sensor sides of BMD, with radar feeds from existing facilities, future over-the-horizon facilities, plus surveillance of space awareness and RADARSAT constellation information as well.⁷⁶ Canada could also contribute to the use of non-kinetic Cyber domain actions for BMD, as they become available in the future.⁷⁷

Into the kinetic side of BMD, the use of the future CSC vessels for the BMD mission, with or without SM-3 missiles, would also be a solid contribution without any missile facilities on Canadian soil. But one of the most effective contributions would be the time and space afforded by vast size of Canada, where several GMD interceptor sites could be positioned to significantly increase the effective defence of North America. A GMD site in Northern Ontario, possibly near North Bay, could defend the critical southern Ontario corridor along with the very dense northeast American coast, which cannot be defended by American-based assets due to the attack geometry.⁷⁸ Finally, when looking at all the contributions Canada could make to the BMD mission, the last factor to consider is the economic benefits.

⁷⁴ Christian Leuprecht, Joel Sokolsky, and Thomas Hughes, editors. *North American Strategic Defense in the 21st Century: Security and Sovereignty in an Uncertain World* (Switzerland: Springer, 2018), 253.

⁷⁵ Nancy Teeple, "The Future of Canadian Participation in Missile Defence," *Canadian Army Journal* 19.2 (2021): 26.

⁷⁶ Nancy Teeple, "The Future of Canadian Participation in Missile Defence," *Canadian Army Journal* 19.2 (2021): 26.

⁷⁷ Nancy Teeple, "The Future of Canadian Participation in Missile Defence," *Canadian Army Journal* 19.2 (2021): 25.

⁷⁸ Andrea Charron and James Fergusson, "NORAD: Beyond Modernization," in *Shielding North America: Canada's Role in NORAD Modernization*, edited by Nancy Teeple and Ryan Dean (Peterborough: North American and Arctic Defence and Security Network, 2021), 48.

Economic Benefits of Participating in Ballistic Missile Defence

There are obviously several economic benefits that Canada could take advantage of by participating in BMD. The main issue is that since the exact nature of the participation is only a potential list and is not actually known at this time, this discussion remains just an estimate. However, there have been detailed economical analyses made for the modernization of the NORAD Northern Warning System (NWS) that do provide some illuminating data that can provide a valid comparison. Like possible participation in BMD, the NWS modernization effort involves command and control upgrades, both in infrastructure and technology, plus a large amount of facility construction throughout Canada, including in the Arctic. This would be a similar situation with Canada contributing the BMD capabilities discussed above. Taking part in the BMD mission would open many government contracts to Canadian companies to build and support the system. The NWS modernization overall is estimated to be an \$11 billion project, of which roughly \$4.4 billion would be directly spent in the Arctic, and that \$4.4 billion alone would result in a regional output revenue of \$6.8 billion and \$3.6 billion added to Canada's GDP, along with 51,000 jobs.⁷⁹ Given the uncertain amounts of money that could be spent, additional calculations were made that show for every additional \$1 billion spent, there would be a resulting increase of \$1.6 billion of output revenue, an \$826 million increase in GDP, and an extra 7,500 jobs.⁸⁰ Participation in BMD would likely be on a similar scale to the NWS modernization and would help meet a Canadian Government priority of indigenous investment and reconciliation, especially in the Arctic, and help reinforce Arctic sovereignty. Money invested in the BMD mission is not wasted by any means, resulting not only in better security for Canada, but also in significant, defined economic benefits for multiple regions and the country as a whole.

With the completed analysis of all the reasons why Canada should join the BMD mission to defend North America, it follows that the reasons that critics have raised why Canada should not join the BMD mission must also be discussed to complete a full assessment and see if those reasons are still valid or not.

REASONS CANADA SHOULD NOT JOIN BALLISTIC MISSILE DEFENCE

The arguments made by critics over the years against Canada's participation in the BMD mission have tended to fall into one of several areas. Each of these will be discussed in turn to see whether they are still valid today or not. These arguments include: the costs and effectiveness of the technology, debate about the actual threat to Canada from ballistic missiles, various policy reasons along with a desire to maintain strategic independence, and finally concerns about global arms control and weaponization trends.

⁷⁹ J. Craig Stone, "The Economic Benefits of North Warning System Modernization," (Defence Research and Development Canada, April 2022), 15.

⁸⁰ J. Craig Stone, "The Economic Benefits of North Warning System Modernization," (Defence Research and Development Canada, April 2022), 15.

Cost and Effectiveness

This issue of cost is one of the reasons against participation in the BMD mission that is still a fairly strong argument, due to the fact that the costs for Canada to join the United States are still mostly unknown at this time.⁸¹ This is mainly because the exact nature of Canada's possible participation has not been decided, and the range of possible costs is very wide, from infrastructure development, to research efforts, to possible weapons purchases. Critics contend that this money could be better used to address other pressing societal risks,⁸² and while that may always be true, at some point, Canada must fulfil the responsibility to protect its citizens. However, there would be several economic and political benefits to Canada and Canadians that would result from these costs. Lastly, some critics view money spent on BMD as being wasted on a losing technological proposition,⁸³ which leads to the discussion of effectiveness, or the lack thereof.

Unlike the unknowns of costs, the issue of effectiveness that was used in past discussions about BMD has changed in recent years, as shown by some of the earlier discussions in this paper. But critics believe that BMD does not meet an acceptable cost exchange ratio, which is the cost for an aggressor to get one additional warhead through the defense, divided by the cost to the defender to interdict that additional missile.⁸⁴ While it is true that it is harder to defend than to attack, accepting this argument would mean having no defense at all would be logical, which again would be an abrogation of Canada's responsibility to defend its people.

Debate About the Threat to Canada

Critics have said that there is no direct threat to Canada from ballistic missiles and have contended that even nations like North Korea have viewed Canada as "a peaceful and indeed friendly country" as recently as 2017.⁸⁵ While this is a dubious claim to make, since Canada fought in the Korean War, it highlights the threat perception issue. Along these lines, some people believe Canada is already effectively defended since a vast majority of the population lives within 150 kilometers of the border with the United States,⁸⁶ but this would be scant comfort to Edmonton, Calgary, Winnipeg, and large

⁸¹ Nancy Teeple, "The Future of Canadian Participation in Missile Defence," *Canadian Army Journal* 19.2 (2021): 20.

⁸² "Canada and Ballistic Missile Defence: Responding to the evolving threat," Standing Senate Committee on National Security, Defence, and Veterans Affairs, 41st Parliament, 2nd Session (June 2014), accessed 09 April 2023, <https://sencanada.ca/en/content/sen/committee/412/secd/rms/01jun14/home-e>.

⁸³ "Canada and Ballistic Missile Defence: Responding to the evolving threat," Standing Senate Committee on National Security, Defence, and Veterans Affairs, 41st Parliament, 2nd Session (June 2014), accessed 09 April 2023, <https://sencanada.ca/en/content/sen/committee/412/secd/rms/01jun14/home-e>.

⁸⁴ "Even more reasons for Canada to stay out of American ballistic missile defence," Ceasefire.ca, October 21, 2021, <https://www.ceasefire.ca/even-more-reasons-for-canada-to-stay-out-of-american-ballistic-missile-defence/>.

⁸⁵ Murray Brewster, "U.S. not obliged to defend Canada in event of North Korean missile attack, MPs told," *Canadian Broadcasting Corporation*, September 14, 2017.

⁸⁶ John Noble, "Fortress America Or Fortress North America," *Law and Business Review of the Americas* 11, no. 3-4 (2005): 469.

parts of Atlantic Canada. The other aspect of the threat discussion is where critics say participating in the BMD mission would make Canada a target or more likely to be attacked pre-emptively, however both Russia and China are explicitly aware that BMD is not arrayed against their nuclear forces and that it does not impact their second-strike capability against North America.⁸⁷

Policy Reasons and Strategic Independence

One of the more significant policy implications of Canada joining the BMD mission would depend on how the process was integrated with NORAD; if it was made part of NORAD then the NORAD Agreement would likely have to be opened and significantly updated, which would be a large political task that Canada has been adverse to doing in the past, and would take a concerted effort to get through.⁸⁸ While there has been some concern among Canadian Liberals fearing that the progressive reputation of their party would take a hit if they signed up to conduct BMD, this is not a national level problem.⁸⁹ The major criticism in this area is the fear of becoming too reliant on, or strategically subservient to, the United States due to joining the BMD mission.⁹⁰

These arguments fall flat when considering the level of interdependence the two countries have in many other areas such as trade, and other aspects of defence where a collective effort with the United States has been very effective and beneficial without political cost to Canada.⁹¹ The best example of this is NORAD, where mutual security for Canadians is achieved at a much higher level of effectiveness than Canada could provide on its own. The final policy argument is that it is unknown just how much Canada would be involved in the management and decision making of the BMD mission if it joined. However, based on the highest levels of strategy and policy of the United States, it is clear they wish to work with allies to enable BMD,⁹² and the track record of running NORAD is another helpful example that Canada would likely not have any issues, particularly if it contributes a meaningful capability to the system.

⁸⁷ “2014 Policy Update: Canada and Ballistic Missile Defence,” Canadian Global Affairs Institute, accessed April 08, 2023. https://www.cgai.ca/canada_ballistic_missile_defence.

⁸⁸ Andrea Charron, “Responding to Hardening the SHIELD: A Credible Deterrent and Capable Defense for North America,” in *Shielding North America: Canada’s Role in NORAD Modernization*, edited by Nancy Teeple and Ryan Dean (Peterborough: North American and Arctic Defence and Security Network, 2021), 87.

⁸⁹ Konrad Yakabuski “Canada needs to put up or shut up on missile defence,” *Globe and Mail* (Toronto), May 12, 2022.

⁹⁰ “Canada and Ballistic Missile Defence: Responding to the evolving threat,” Standing Senate Committee on National Security, Defence, and Veterans Affairs, 41st Parliament, 2nd Session (June 2014), accessed 09 April 2023, <https://sencanada.ca/en/content/sen/committee/412/secd/rms/01jun14/home-e>.

⁹¹ “2014 Policy Update: Canada and Ballistic Missile Defence,” Canadian Global Affairs Institute, accessed April 08, 2023. https://www.cgai.ca/canada_ballistic_missile_defence.

⁹² Department of Defense, *2022 Missile Defense Review* (Washington, D.C.: October 27, 2022), 1.

Concerns About Arms Control and Weaponization

Several critics of Canada joining the BMD mission believe that doing so would undermine Canada's standing on the topics of arms control and non-proliferation,⁹³ as well as increase the risk of the weaponization of space.⁹⁴ On the first two topics, this has long been a concern about the BMD capability in general, but the truth is that from 2000 through the early 2010s, there were several bilateral disarmament agreements between the United States and Russia, including the reduction of strategic nuclear warheads from 2,200 to 1,550, which is 71% lower than 1991 and 30% lower than 2002.⁹⁵ There is the related argument that a successful BMD program prompts potential adversaries to develop ways to counter that system, leading to proliferation.⁹⁶ But Russia is aware that BMD does not actually impact their ability to strike, and Moscow's opposition to BMD in Europe has more to do with being unable to hold sway over the countries of Eastern Europe anymore, than it does from any real threat to Russian security.⁹⁷ On the last topic of the weaponization of space, while it is true that the 2019 Ballistic Missile Defence Review did introduce possible space-based interceptor technology as a future option,⁹⁸ such a capability is still far off, and if Canada becomes part of the BMD mission, it may be able to influence such decisions. With all these negative factors covered, it is now possible to make a conclusion.

ANALYSIS AND CONCLUSION

As has been shown through this paper, the threat to Canada and North America warrants defence, and for Canada to choose to not defend itself would be an abandonment of the responsibility of government. It is also important to recognize that Canada's history does not define its future, and it is time for a change in this policy area. Most importantly, the BMD system is capable of effectively defending North America against the threat for which it was designed.

There are several very good reasons for Canada to join the BMD mission, including better security for Canada, better international relations, the effectiveness of Canadian contributions, and the significant economic benefits that would result. And

⁹³ Nancy Teeple, "Canada and Missile Defence: A New Strategic Context Requires Revisiting Participation," (North American and Arctic Defence and Security Network, August 07, 2020), 3.

⁹⁴ "Even more reasons for Canada to stay out of American ballistic missile defence," Ceasefire.ca, October 21, 2021, <https://www.ceasefire.ca/even-more-reasons-for-canada-to-stay-out-of-american-ballistic-missile-defence/>.

⁹⁵ "2014 Policy Update: Canada and Ballistic Missile Defence," Canadian Global Affairs Institute, accessed April 08, 2023. https://www.cgai.ca/canada_ballistic_missile_defence.

⁹⁶ Ryan Dean and P. Whitney Lackenbauer, "Geostrategy and Canadian Defence: From C.P. Stacey to a Twenty-First Century Arctic Threat Assessment," *Journal of Military and Strategic Studies* vol 20, no. 1 (2019): 78.

⁹⁷ Alan Dowd, "Time for Canada to Join the Missile Defense Team," Fraser Institute, accessed April 10, 2023, <https://www.fraserinstitute.org/article/time-canada-join-missile-defense-team>.

⁹⁸ Andrea Charron and James Fergusson, "NORAD: Beyond Modernization," in *Shielding North America: Canada's Role in NORAD Modernization*, edited by Nancy Teeple and Ryan Dean (Peterborough: North American and Arctic Defence and Security Network, 2021), 46.

while some of the reasons presented above for Canada not to join BMD are still valid to some extent today, several of them have been mitigated or have changed over the last 20 years. When the negatives are weighed against the positive factors for why Canada should join, it is a straight-forward conclusion: it is time for Canada to join the Ballistic Missile Defence mission.

BIBLIOGRAPHY

- Berthiaume, Lee. "Canada won't join U.S. missile defence, send troops to Afghanistan, Trudeau says." *Toronto Star* (Toronto), August 23, 2017.
- Blatchford, Andy. "Canada taking 'comprehensive look' at joining U.S. ballistic missile defense." Politico, May 10, 2022.
<https://www.politico.com/news/2022/05/10/canada-eyeing-bold-and-aggressive-military-options-to-defend-continent-00031349>.
- Brewster, Murray. "U.S. not obliged to defend Canada in event of North Korean missile attack, MPs told." *Canadian Broadcasting Corporation*, September 14, 2017.
- Burke, Ashley. "NORAD commander warns Canadian officials about the threat posed by hypersonic missiles." *Canadian Broadcasting Corporation*, November 30, 2021.
- Byers, Michael. "Canada's about-face on ballistic missile defence." *Globe and Mail* (Toronto), June 28, 2021.
- Canadian Global Affairs Institute. "2014 Policy Update: Canada and Ballistic Missile Defence." Accessed April 08, 2023.
https://www.cgai.ca/canada_ballistic_missile_defence.
- Ceasefire.ca. "Even more reasons for Canada to stay out of American ballistic missile defence." October 21, 2021. <https://www.ceasefire.ca/even-more-reasons-for-canada-to-stay-out-of-american-ballistic-missile-defence/>.
- Charron, Andrea, and James Fergusson. "NORAD: Beyond Modernization." In *Shielding North America: Canada's Role in NORAD Modernization*, edited by Nancy Teeple and Ryan Dean, 27-66. Peterborough: North American and Arctic Defence and Security Network, 2021.
- Charron, Andrea. "Responding to Hardening the SHIELD: A Credible Deterrent and Capable Defense for North America." In *Shielding North America: Canada's Role in NORAD Modernization*, edited by Nancy Teeple and Ryan Dean, 84-89. Peterborough: North American and Arctic Defence and Security Network, 2021.
- Dean, Ryan, and P. Whitney Lackenbauer. "Geostrategy and Canadian Defence: From C.P. Stacey to a Twenty-First Century Arctic Threat Assessment." *Journal of Military and Strategic Studies* vol 20, no. 1 (2019): 33-96.
- Defense Intelligence Ballistic Missile Analysis Committee. *2020 Ballistic and Cruise Missile Threat*. Dayton: Wright-Patterson Air Force Base, January 11, 2021.
- Department of Defense. *2022 Missile Defense Review*. Washington, D.C.: October 27, 2022.

- Dowd, Alan. "Time for Canada to Join the Missile Defense Team." Fraser Institute. Accessed April 10, 2023. <https://www.fraserinstitute.org/article/time-canada-join-missile-defense-team>.
- Fergusson, James. *Canada and Ballistic Missile Defence, 1954-2009: Déjà Vu All Over Again*. Vancouver: UBC Press, 2010.
- Government of Canada. *Strong, Secure, Engaged: Canada's Defence Policy*. Ottawa: Ministry of National Defence, 2017.
- Government of Canada and Government of the United States of America. "Joint Statement on NORAD Modernization." Department of National Defence, August 14, 2021. <https://www.canada.ca/en/department-national-defence/news/2021/08/joint-statement-on-norad-modernization.html>.
- Government of the United States of America. "Readout of President Biden's Call with Prime Minister Trudeau of Canada." White House, February 11, 2023. <https://www.whitehouse.gov/briefing-room/statements-releases/2023/02/11/readout-of-president-bidens-call-with-prime-minister-trudeau-of-canada-2/>.
- Heyman, Bruce. "It's time for Canada and the US to consider a bigger, bolder partnership." *Chicago Tribune* (Chicago), June 07, 2022.
- Hille, Katherin, and Demetri Sevastopulo. "China tests new space capability with hypersonic missile." *Financial Times*, October 16, 2021.
- Lee, Michael. "NORAD shoots down 'unidentified object' over Yukon under PM Trudeau's orders." *CTV News*, February 11, 2023.
- Leuprecht, Christian, Joel Sokolsky, and Thomas Hughes, editors. *North American Strategic Defense in the 21st Century: Security and Sovereignty in an Uncertain World*. Switzerland: Springer, 2018.
- MacDonald, Lieutenant General George. "NORAD and National Missile Defence: A Perspective of the Deputy Commander-In-Chief." *Canadian Military Journal* (Summer 2000): 5-12.
- Massie, Justin, Jean-Cristophe Boucher, and Stephane Roussel. "Back to the Future? Missile Defence as a Political Landmine." In *Shielding North America: Canada's Role in NORAD Modernization*, edited by Nancy Teeple and Ryan Dean, 90-107. Peterborough: North American and Arctic Defence and Security Network, 2021.
- McFadden, Christopher. "What Is an Intercontinental Ballistic Missile and How Does It Work?" Interesting Engineering. Last modified January 04, 2022. <https://interestingengineering.com/innovation/what-is-an-intercontinental-ballistic-missile-and-how-does-it-work>.

- Mehta, Devansh. "Boeing YAL-1: The Laser-Equipped 747-400F." *Simple Flying*, July 19, 2022. <https://simpleflying.com/boeing-747-yal-1-guide/>.
- Noble, John. "Fortress America Or Fortress North America." *Law and Business Review of the Americas* 11, no. 3-4 (2005): 461-526.
- North Atlantic Treaty Organization. "Ballistic Missile Defence." Accessed April 10, 2023. https://www.nato.int/cps/en/natohq/topics_49635.htm.
- O'Shaughnessy, General Terrence, and Brigadier General Peter Fesler. "Hardening the Shield: A Credible Deterrent & Capable Defense for North America." In *Shielding North America: Canada's Role in NORAD Modernization*, edited by Nancy Teeple and Ryan Dean, 67-83. Peterborough: North American and Arctic Defence and Security Network, 2021.
- Robertson, Colin. "North Korea's threats show that Canada needs to be part of U.S. missile defence pact." *Globe and Mail* (Toronto), April 03, 2013.
- Robertson, Colin. "Why Canada needs to revisit its stance on ballistic missile defence." *Globe and Mail* (Toronto), November 29, 2017.
- Standing Senate Committee on National Security, Defence, and Veterans Affairs. "Canada and Ballistic Missile Defence: Responding to the evolving threat." Senate of Canada, 41st Parliament, 2nd Session (June 2014). Accessed 09 April 2023. <https://sencanada.ca/en/content/sen/committee/412/secd/rms/01jun14/home-e>.
- Stone, J. Craig. "The Economic Benefits of North Warning System Modernization." Defence Research and Development Canada, April 2022.
- Teeple, Nancy. "Canada and Missile Defence: A New Strategic Context Requires Revisiting Participation." North American and Arctic Defence and Security Network, August 07, 2020.
- Teeple, Nancy. "The Future of Canadian Participation in Missile Defence." *Canadian Army Journal* 19.2 (2021): 18-31.
- Yakabuski, Konrad. "Canada needs to put up or shut up on missile defence." *Globe and Mail* (Toronto), May 12, 2022.