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CANADIAN LAND COMPONENT: AIR AND MISSILE DEFENCE CAPABILITY GAP

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AIM

1. The aim of this paper is to argue the fundamental need for Canada to reinstate and develop an Air and Missile Defence (AMD) program. This reinstatement and development is recommended in order for Canadian Forces to remain relevant in its mandates, which are: protecting Canada, defending North America, and contributing to international peace and security. This paper also aims to recommend that the initial fielding for this AMD capability be given to the Canadian Army for application and manning.

INTRODUCTION

2. During the 2012 Canadian Defence Department budget cuts, Canada's already limited Air Defence capabilities were completely done away with. The Canadian Forces' official statement was that, "none of the ongoing moves will affect Canada's defence capability in any way."¹ Chief of Defence Staff General Walter Natynczyk said that, "the changes are designed to place priority on tactical and operational units."² However, with the technological advances of most state and non-state actors, the Canadian Forces' decision to dissolve their AMD programs and capabilities seems strategically flawed.

3. An explanation of why there is a fundamental need for Canada to reinstate and develop an Air and Missile Defence program will be addressed in the discussion section of this paper. In each subcomponent of the discussion portion of this paper, the threat platform will be identified in accordance to which Canadian mandate is affected. The conclusion section of this paper will then summarize the analyses. Lastly, the recommendation portion of this paper will provide

¹ Pugliese, David. "The Sun Sets on some Defense Systems: The 2012 Budget cut a swath through the Defence Department." *Esprit De Corps* Volume 19, Issue. 6 (2012)

² Ibid.

potential recommendations to mitigate Canada's AMD capability gap, and why the Canadian Army should be the first to assume this role.

DISCUSSION

Cruise and Ballistic Missile Threat

4. Due to the monetary implications, many militaries have prioritized creating larger cruise and ballistic missile inventories in lieu of an extensive Air Force Corps. While Canadian Forces do have Air to Air capabilities, these capabilities are inadequate in mitigating the threat platform of cruise and ballistic missiles that endanger all three Canadian Forces mandates.

5. Cruise missiles are divided into two subcomponents: subsonic and hypersonic. Historically, most cruise missiles were subsonic. With the increase in technology, however, cruise missile ranges have exponentially increased, and additional development has led to advanced terrain following systems. These improvements have allowed hypersonic cruise missile production. These munitions fly at hypersonic speeds NAP of the Earth (near as possible). With this formidable dexterity, hypersonic cruise missiles can travel through dangerous terrain, enabling them to stay hidden from many radar systems. In the past, access to cruise missile technology was limited. However, with present advancements and decreased costs, hypersonic cruise missile technology has become more available to multiple state powers throughout the globe.

6. Ballistic missile use dates back to WWII (World War II). The effective, but inaccurate ballistic missiles have since been developed into highly accurate and versatile weapon systems. With increased ranges, ballistic missiles are capable of carrying large, conventional warheads as well as full nuclear warheads. Even basic model ballistic missiles require flight into the lower to mid atmosphere, making their descent speeds towards intended targets extremely hypersonic. Most ballistic missiles also have interceptor countermeasures built into their terminal phases.

Unlike Intercontinental ballistic missiles, tactical ballistic missiles are actively used by nation states that have been in recent conflict with US (United States) and UN (United Nations) forces.

7. Since Canadian Forces have no Air Defence capabilities, intercepting cruise or ballistic missiles is no longer possible. While it is theoretically possible for an aircraft to engage a cruise missile, due to modernization, the detection of cruise missiles is minimalized by the cruise missiles' radar avoiding capabilities. Hence, the reaction time between the successful detection of a cruise missile and the scrambling of jets to initiate interception would create a large enough gap to deem the effort futile. Ballistic missiles, as aforementioned, re-enter from the atmosphere, and thusly, the complications derived by the hypersonic speed and angle of ballistic missiles does not allot for realistic mitigation by the Canadian Forces.

8. Without the capability to defeat cruise and ballistic missiles, Canada is left exposed to a growing, world threat. Monetarily, ballistic missiles are cheaper than cruise missiles. With ballistic missile deployment systems requiring the most investment, ballistic missiles themselves are more affordable, and hence, are capable of being purchased in larger quantities. To many countries, ballistic missile expenditure is preferable because it allows for greater quantities of munitions. Also, while many countries possess anti-aircraft capabilities, very few countries have the ability or technology to defeat a tactical ballistic missile. This being said, the countries that utilize ballistic missile weapons systems are nearly guaranteed to hit their intended targets with the added benefit of never needing to leave the protection of their own soil. Additional benefits for countries that utilize ballistic missile weapons system include the reduced risks of exposing pilots, and expensive aircraft to unnecessary danger. Aircraft prices vary, but as an example, the Canadian CF-18 costs approximately \$37 million dollars per plane to manufacture.³ Pilots must

³ CTV News, Bell Media "CF-18 upgrades will keep jets flying until 2025, Ottawa says." Accessed February 2016

complete one to two years of basic flight training, with costs at about one million dollars per pilot. The cost required to train a “fully” capable pilot with “requisite operational experience,” can exceed more than \$9 million dollars per pilot.⁴ These numbers do not account for the additional cost of pilot and maintenance crew salaries, annual aircraft maintenance costs, training fuel, or cost of the actual munition assigned to each aircraft. Although prices vary, a Scud B ballistic missile, in contrast to the aforementioned aircraft prices, is estimated to cost less than one million dollars per missile.⁵

9. Though larger countries with ballistic and cruise missile capabilities could potentially fire onto sovereign Canadian soil, this unlikely to happen because of the instigating nature of such an attack. Since Canada is part of the North Atlantic Treaty Organization (NATO), such an attack would draw retaliatory responses from other NATO nations. However unlikely, should a ballistic or cruise missile be fired at Canadian territory, Canadian Forces would be left without a means to deal with this threat platform, potentially failing at their mandate of protecting Canada and defending its sovereignty. Also, Canadian Forces could potentially fail at its second mandate of defending North America.

10. The Canadian Forces lack of Air Defence capabilities in relation to the ballistic and cruise missile threat platform also potentially threatens the Canadian Forces mandate of contributing to international peace and security operations throughout the world. When Canada had a full, conventional force, NATO and UN allies had the ability to employ the Canadian Forces in a more autonomous manner. This allowed the Canadian Forces to operate as an individual, organic unit while functioning as equal partners in a conventional fight. This

⁴ United States General Accounting Office. “Actions needed to Better define Pilot Requirements and Promote Retention.” National Security and International Affairs Division (August 1999)

⁵ Clark, R.S. *The Regional Emergence of Strategic Missiles: A Force of Rooks for a Black King*. APSC PAPER NUMBER 55, Air Power Studies Centre, Commonwealth of Australia 1997.

autonomous role allowed Canadian Forces to self-sustain and self-protect while tasked to complete a portion of the overall NATO or UN objective. However, since the technological advances and modifications of ballistic and cruise missiles, it is likely this will force the UN and NATO to consider Canadian Forces Air Defence capability gap if dealing with any larger, state actor. Should this happen, Canadian Forces would likely be divided within the umbrella of coalition forces that possess full range of self-defence capabilities.

Developing UAV Threat

11. The Unmanned Aerial Vehicle (UAVs) threat platform has never posed such a risk for militaries. This technology, which was once treated as elite and unaffordable, has been made readily available through the civilian market. The civilian market, with the current demand for drones, has taken cumbersome technology, and developed it. With streamlined designs, and mass production capabilities, drones are not only popular, but affordable. As an example, the RQ-11 Raven, a lightweight unmanned aircraft system of the United States Army and Canada, estimated cost is 35,000 dollars. The control system for the RQ-11 Raven is estimated to be 250,000 dollars. The RQ-11 Raven was developed with the intent to provide a lightweight, man-portable system used by light infantry for short range reconnaissance.⁶ In comparison, an off-the-shelf drone with video capabilities, depending on the quality, can cost 100 to 1,000 dollars. Professional surveying and mapping drones, such as the Sensefly, have features equal to and even greater than the RQ-11 Raven, and only cost 12,000 dollars for the full system.⁷ This comparison is essential in understanding why UAVs pose a threat to militaries, and especially, the Canadian Army.

⁶ Army-Technology.com, Kable Intelligence Limited “RQ-11 Raven Unmanned Aerial Vehicle, United States of America.” Accessed February 2016

⁷ The Coolist.com, Modern Design Lifestyle Magazine. “7 High Tech Drones for Sale Today.” Accessed February 2016,

12. The substantially decreased cost and ready availability of drones has allowed an opportunity for state actors to purchase civilian technology. With minimal development, state actors have been able to transform these civilian drones into military equivalent UAVs that could have the capability of surveillance, and lethal strikes. Civilian production has also opened the theatre of UAVs to non-state actors. Just like state actor acquisition, this poses a threat within the possibility of modification. With minimal cost, a lower model, civilian drone could potentially be transfigured into a guided, improvised explosive device (IED) against peace keeping forces. The non-state sponsor uses of UAVs grants new tools for terrorist groups against important, domestic federal headquarters and targets of opportunity. During foreign security and peacekeeping operations, Canadian Forces are vulnerable to both state and non-state actors that utilize this affordable form of airpower. Such capabilities pose a risk to all three Canadian Forces mandates.

13. While Canadian Forces do have Air to Air capabilities, mitigating the UAV threat with Air to Air capability is impractical. Canadian CF-18 airframes take a traditional role against piloted aircraft, and also fulfill the task of air to ground and close air support missions. In the future, with the potential number of UAVs seen by all actors in the theatre, tasking the CF-18 airframes to defeat the UAV threat is tactically and monetarily unsound.

14. Air to Air platforms are limited in the manner of engagement. Two of the main Air to Air missiles used by the Canadian Forces are the AIM-120D AMRAAM missile and the AIM 9-Sidewinder.⁸ The AIM-120D AMRAAM missile is estimated to cost 1.098 million dollars per All-Up Round as of 2015.⁹ The AIM-9 Sidewinder ranges from 56,000 to 84,000 dollars per

⁸ CBC News, CBC/Radio-Canada “In Depth, Canada’s CF-18 Hornets.” Accessed February 2016

⁹ AeroWeb A Forecast International Inc. “Raytheon AIM-120D AMRAAM.” Accessed February 2016

round as of 2015.¹⁰ Essentially, the only means by which the Canadian Forces can address the UAV threat is with Air to Air platforms. Even without the missile costs, fuel, ballistic ammunition, and additional operational demands makes the utilization of aircraft against the UAV threat superfluous.

CONCLUSION

15. The aim of this paper is to argue the fundamental need for Canada to reinstate and develop an Air and Missile Defence program. The technological advances in cruise and ballistic missile technology have resulted in efficient and accurate munitions that threaten the Canadian Forces mandates of protecting Canada, defending North America, and contributing to international peace and security. With ready accessibility, and cheaper manufacturing costs, ballistic missiles have taken precedence over other traditional airframes for conventional war fighting at the tactical and operational levels. With such relevance in today's operating environment, this capability gap in Canadian Forces could potentially degrade its ability to uphold its mandates. Also, without Air Defence capabilities, Canadian Forces would potentially not be able to conduct their autonomous portion of a coalition operation, which would then potentially require Canadian Forces to be fully integrated into the ranks of other coalition forces that possess the full spectrum of self-defence capabilities. Thusly, the Canadian Forces lack of Air Defence capabilities also threatens their mandate of contributing to international peace and security.

16. With civilian technological advances streamlining drone capabilities, the manufacturing and production costs have dropped significantly. This decrease in cost has allowed for a wider market, and the drones being sold vary in degree of specification. Equivalents of existing military drones are sold on the civilian market for a significantly lower price, and through this

¹⁰ F-16.net. "F-16 Armament." Accessed February 2016

ready access, the potential to capitalize on such availability could pose a potential risk to Canadian Forces. Through modification, military equivalent drones could be utilized for not only surveillance, but lethal strikes. Canadian Forces have no practical way to mitigate the potential, growing UAV threat.

17. The Canadian Forces Air Defence capability gap potentially threatens Canadian Forces mandates in the face of the ballistic and cruise missile threat platform, as well as the developing UAV threat platform. In conclusion, there is a fundamental need for Canada to reinstate and develop an Air and Missile Defence program.

RECOMMENDATION

Cruise and Ballistic Missile Threat

18. With the arguments provided within this paper, it is recommended that the Canadian Army pursues tested and proven Army based ballistic and cruise missile defence systems, such as Patriot missile batteries with PAC-3 GEM-T and GEM-C capability. With the Canadian Army's close ties with the United States, and with shared interests of North American defence concerns, systems such as THAAD could be an advantageous platform to invest in.

Developing UAV Threat

19. Concerning the above stated discussions it is recommended that the Canadian Army purchase a short to medium range Air Defence system to mitigate the developing UAV threat. This system would need to include both gun and missile capability, such as the Avenger Air Defence System. Due to the cost and vast differences in UAV platforms, a cost effective gun system would be needed for low flying, less capable drones. The missile system to address the UAV threat would need to counter faster, more advanced drones that would be similar in nature to the current Predator and Reaper drones flown by the US military.

Canadian Army Implementation

20. Based on the aforementioned arguments of the threats to Canadian land forces and its interests, it is recommended that the Canadian Army assume the primary implementation of Air and Missile Defence capabilities. As previously discussed in this paper, the Canadian Air Force has current air to air capabilities. However, the developing risks of UAV systems could potentially pose the most threat for ground forces. Thusly, this would leave the Canadian Army as the most vulnerable and exposed. Self-defensive capabilities would therefore benefit the Canadian Army most. While the Canadian Navy could also invest in air and missile defence platforms such as AEGIS destroyers, the primary function of the Canadian Navy is to support naval operations. These operations, depending upon the encountered threat, are often limited to shore areas.

21. With cruise and ballistic missiles primarily targeting command centres and troops, Air and Missile Defence capabilities would be of greatest benefit and interest for the Canadian land forces. Air and Missile Defence capabilities would grant land force commanders the ability to plan and task these defence systems within the protection of Canadian interests, both domestically and abroad. This protection would not only extend to military assets and troop concentrations, but also to federal buildings and parliamentary interests.

22. Lastly, the recommendation for the Canadian Army to assume the primary implementation of Air and Missile Defence capabilities exists within maneuverability. Being that most proven and tested Air and Missile Defence systems operate on ground base maneuverable platforms, common sense in the command and control of such capabilities is most appropriate for ground force commanders who are experienced in fires and maneuver for effect.

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