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CANADA AND THE DEFENCE OF NORTH AMERICA: NORAD AND AERIAL READINESS

Report of the Standing Committee on National Defence

Stephen Fuhr
Chair

SEPTEMBER 2016

42nd PARLIAMENT, 1st SESSION

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has the honour to present its

SECOND REPORT

Pursuant to its mandate under Standing Order 108(2), the Committee has studied Canada and the Defence of North America and has agreed to report the following:

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GLOSSARY

ADIZ:	Air Defence Identification Zone
AESA:	Active Electronically Scanned Array
AEW:	Airborne Early Warning
ANR:	Alaskan NORAD Region
AOR:	Area of Responsibility
ASA:	Air Sovereignty Alert
AWACS:	Airborne Warning and Control Systems
BMD:	Ballistic Missile Defence
CADS:	Canadian Air Defence Sector
CAF:	Canadian Armed Forces
CANSOFCOM:	Canadian Special Operations Forces Command
CANR:	Canadian NORAD Region
CFB:	Canadian Forces Base
CIA:	Central Intelligence Agency (United States)
CJOC:	Canadian Joint Operations Command
CONR:	Continental U.S. NORAD Region
CSIS:	Canadian Security Intelligence Service
CTOL:	Conventional Take-Off and Landing
CV:	Carrier Variant
DND:	Department of National Defence
DOB:	Deployed Operating Base
FOL:	Forward Operating Location
GBI:	Ground-Based Interceptors
HIICR:	Heidelberg Institute of International Conflict Research

ICBM:	Intercontinental Ballistic Missile
IISS:	International Institute for Strategic Studies
IRBM:	Intermediate-Range Ballistic Missile
ISIL:	Islamic State of Iraq and the Levant
JSF:	Joint Strike Fighter
JUSTAS:	Joint Unmanned Surveillance and Target Acquisition System
MOB:	Main Operating Base
MOU:	Memorandum of Understanding
MRTT:	Multi-Role Transport Tanker
NATO:	North Atlantic Treaty Organization
NDDN:	House of Commons Standing Committee on National Defence
NORAD:	North American Aerospace Defense Command
ONE:	Operation NOBLE EAGLE
RCAF:	Royal Canadian Air Force
RCMP:	Royal Canadian Mounted Police
RFI:	Request for Information
SAR:	Search and Rescue
SIPRI:	Stockholm International Peace Research Institute
STOVL:	Short Take-Off and Vertical Landing
UA:	Unmanned Aircraft
UAS:	Unmanned Aircraft System
UAV:	Unmanned Aerial Vehicle
US:	United States
USAF:	United States Air Force
USNORTHCOM:	United States Northern Command
WMD:	Weapon of Mass Destruction

CANADA AND THE DEFENCE OF NORTH AMERICA: NORAD AND AERIAL READINESS

INTRODUCTION

The defence of Canada and of North America have long been the two primary missions of the Canadian Armed Forces (CAF), and as such have been of ongoing interest to the House of Commons Standing Committee on National Defence (the Committee) for some time. Over the last two years, the Committee held a number of hearings on this subject, and in June 2015, released a comprehensive report entitled *Canada and the Defence of North America*, which examined the various ways in which the CAF contribute to the defence of Canada and North America in collaboration with the United States (U.S.). That unanimous report covered a broad range of issues, including: Canada's cooperation with the U.S. in the North American Aerospace Defense Command (NORAD); the evolution of the Canada-U.S. defence relationship; defence policy; defence procurement; domain awareness; operational readiness in the aerospace, maritime and land domains; cyber security; Arctic sovereignty and security; search and rescue; and disaster relief and military aid to the civilian authorities, among other important issues.[1]

Since that time a new Parliament has been elected and the Government of Canada has launched a defence policy review, to be completed by the end of 2016 and publicly released in early 2017. As part of the defence policy review's public consultation process, the Committee has been invited to "study issues of relevance" to inform the development of a new defence policy.[2]

Every day, members of the CAF Regular Force and Reserve Force devote their lives to defend Canada and its population, and over the years many of them have paid the ultimate sacrifice in the line of duty. The Committee would like to take this opportunity to salute their courage and determination and to express its gratefulness for all of the hard and dangerous work that they do for Canadians both at home and abroad. The Committee would also like to extend its gratitude to military families and all of the sacrifices that they do in support of our women and men in uniform. That said, the Committee recognizes that there are a number of priorities for Canada's defence policy, and therefore a number of areas worthy of attention. At the same time, it is clear that an important portion of the defence policy review will inevitably deal with the defence of Canada and of North America in cooperation with the U.S. In order to make a focused and timely contribution to the defence policy review, the Committee decided to undertake a new study of the defence of North America, with emphasis on the Canadian NORAD Region and aerial readiness.

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1 House of Commons Standing Committee on National Defence (NDDN), *Canada and the Defence of North America*, 41st Parliament, 2nd Session, June 2015, 75 p.

2 Department of National Defence (DND), "Minister Sajjan Launches Public Consultations on Defence Policy Review," 6 April 2016. See also DND, *Defence Policy Review Public Consultation Document 2016*, April 2016, pp. 1-36.

It will subsequently complete reports on aspects related to the readiness of naval and land forces.

The Committee held seven hearings on the topic between March and May 2016. In the course of this study, it received testimony from a number of witnesses, including representatives of the CAF and the Department of National Defence (DND), Global Affairs Canada, and Public Services and Procurement Canada as well as various Canadian and American academics. In addition, on 1-4 May 2016, the Committee had the opportunity to travel to NORAD headquarters in Colorado Springs, Colorado, to hear from senior Canadian and U.S. government and military officials about NORAD and the Canada-U.S. defence relationship.

While the current study is not one of NORAD, that institution plays a central role in the aerial defence of North America. The reason is straightforward: successive Canadian governments for over half a century have concluded that protecting the vast territory of Canada and North America from aerospace threats can most effectively be accomplished through the mechanism of NORAD. As a binational command with an American commander, a Canadian deputy and a unified staff, NORAD allows the two countries to share an overview of global threats from a NORAD perspective, as well as assets for protecting North America from aerospace threats. While the details of NORAD are contained later in the report, the overview of threats that sets the broad context for the report also inevitably draws on the NORAD perspective, as it is partly based on testimony from military officials in Ottawa and at NORAD headquarters. As the Deputy Commander of NORAD, Lieutenant-General Pierre St-Amand, told the Committee:

> Our perspective is unique in the sense that we deliberately watch for and anticipate potential security issues for the homelands, and our area of interest is global in nature. As such, we see much that is of concern and deserves our attention.[3]

The report is primarily about the means by which Canada assures it remains ready to defend itself, and North America, against aerospace threats. It is subdivided into four sections, which move from the broad international and threat context, to the details of how Canada defends its aerospace through the mechanism of NORAD, and on to the assets it uses to do so. The first section therefore outlines the international security environment and aerospace threats to Canada and North America. The second looks at how Canada and the U.S. defend North America by working collaboratively through NORAD, and highlights possible areas of improvement that might strengthen that bi-national command as well as the Canada-U.S. defence relationship more generally. The third section focuses on the state of the Royal Canadian Air Force (RCAF) with consideration for ways to enhance its capabilities and contributions to both NORAD and the defence of Canada. The final section provides concluding remarks and recommendations for the Government of Canada.

Based on the testimony received over the course of the study along with publicly available information, the Committee offers the following report to the House of Commons.

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3 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand).

THE GLOBAL SECURITY ENVIRONMENT AND AEROSPACE THREATS TO NORTH AMERICA

During its meetings with both academics and military and government officials, the Committee was told that the international security environment is both unpredictable and in constant evolution. Since the beginning of the 21st century, there has been a significant increase in the number of armed conflicts fought around the world, such as those in Afghanistan, Iraq, Syria, and Ukraine.[4] In fact, the Stockholm International Peace Research Institute (SIPRI) reported in 2015 that "there were more wars in 2014 than any other year since the year 2000."[5] And the situation does not appear to be improving, according to the Heidelberg Institute of International Conflict Research, which reported 223 violent conflicts around the world in 2015, including no less than 43 wars.[6]

Aside from the global instability caused by the worldwide rise in armed conflicts over the past decade and a half, the emergence of new and complex threats has heightened insecurity globally and caused strain in international relationships. Some of these emerging threats include: transnational and domestic criminal and terrorist networks; violent extremism; rogue states; cyber-attacks; the proliferation of ballistic and cruise missile technology; the acquisition and potential use of weapons of mass destruction (chemical, biological, radiological, and nuclear) by state and non-state actors; international power shifts; and the aggressive rhetoric and actions of China, Iran, North Korea, Russia, and other regimes worldwide, among other things. Moreover, climate change and its impact on the Arctic and other regions, global competition for energy and resources, territorial disputes and sovereignty issues, population growth and mass migrations of people due to wars, poverty, environmental degradation and other factors could, among other things, cause instability, exacerbate tensions between states, and potentially result in unrest, violence or humanitarian crisis in several parts of the world, not to mention lead to a global rise in search and rescue incidents.[7] At the same time, military spending has been steadily increasing in many regions of the world, from a global total of US$839 billion in 2001[8] to US$1,675 billion by 2015.[9] In particular, the rapid militarization of Russia in recent years has been a source of concern to many countries, including Canada, the U.S., and their North Atlantic Treaty Organization (NATO) allies.[10]

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4 Heidelberg Institute of International Conflict Research (HIICR), *Conflict Barometer 2015*, Heidelberg, University of Heidelberg, 2016, pp. 12-19; Stockholm International Peace Research Institute (SIPRI), *SIPRI Yearbook 2015: Armaments, Disarmament and International Security (Summary)*, 2015, pp. 1-25.

5 SIPRI, *SIPRI Yearbook 2015*, p. 6.

6 The HIICR reported a total of 409 conflicts worldwide in 2015, of which 223 were violent and 186 were non-violent. HIICR, *Conflict Barometer 2015*, p. 13.

7 DND, *The Future Security Environment 2013-2040*, Ottawa, Chief of Force Development, 2014, pp. 1-138; International Institute for Strategic Studies (IISS), *Strategic Survey 2015*, 2016, pp. 5-420;

8 Elisabeth Sköns et al., "Military Expenditure," in *SIPRI Yearbook 2002: Armaments, Disarmament and International Security*, SIPRI, pp. 231-265.

9 Sam Perlo-Freeman, Aude Fleurant, Pieter Wezeman and Siemon Wezeman, "Trends in World Military Expenditure, 2015," Fact Sheet, SIPRI, April 2016.

10 IISS, *The Military Balance 2016*, pp. 163-177; Nick de Larrinaga, "Return of the Bear," *Jane's Defence Weekly*, Vol. 53, No. 11 (16 March 2016), pp. 22-32.

Canada is not immune to changes in this evolving international security environment. While Canada might appear to be well protected from foreign threats by the Arctic, Atlantic and Pacific Oceans and in sharing the longest international border in the world with the U.S., which happens to be its closest friend, military ally, and trading partner, our country nonetheless remains exposed to the volatility and unpredictability of the international security environment. We also share an Arctic border with Russia. "North America is no longer protected by distance and oceans," the Committee was told during its visit to NORAD headquarters. "Technology and interconnectedness have given state and non-state actors the ability to reach us militarily and asymmetrically."[11] Several witnesses, for example, told the Committee that conflicts and disputes overseas do have reverberations on the security of Canada and North America, either directly or indirectly, as rising tensions with Russia since 2014 over the Ukraine crisis can attest.

This is why NORAD, in particular, pays close attention to security concerns around the world. Keeping an eye on security developments worldwide is all the more crucial considering that many of the global threats that are emerging today know no boundaries, such as terrorism and cyber-attacks. Doing so will continue to be of critical importance "as we look at the future and are confronted with a threat environment that remains volatile, unpredictable, chaotic and ambiguous," explained Rear-Admiral Scott Bishop, DND's Director General, International Security Policy.[12]

Defining Threats

Stephen Burt, Assistant Chief of Defence Intelligence, Canadian Forces Intelligence Command, defined "threat" as "a combination of intent and capability."[13] As he explained:

> An entity with the desire to harm Canada but no capability to do so does not in our view represent a threat. Having discerned a foreign actor's intent to harm Canada, the intelligence apparatus must track any advancement in its capabilities in order to determine if that entity presents a threat. Tracking or predicting changes in capability is sometimes challenging, but is usually possible within a reasonable margin of error. Gauging current and evolving intent is more complicated but still possible. However, predicting future intent is highly risky. Where a state may not exhibit hostility while it is developing a capability, once acquired, that capability remains in its arsenal whatever changes happen in its political calculus and intent.[14]

Although Mr. Burt emphasized that at the present time the CAF "do not see a state actor that has both the capability and the intent to harm Canada militarily," he enumerated a number of possible threats to North American security, involving both state and non-state actors. The intelligence and military community, he said, is particularly preoccupied with and closely monitors the proliferation and potential use of weapons of mass destruction,

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11 North American Aerospace Defense Command (NORAD), "Threats to North America," brief presented to NDDN, NORAD Headquarters, Colorado Springs (Colorado, U.S.), 2 May 2016.

12 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Rear-Admiral Scott Bishop).

13 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Stephen Burt).

14 Ibid.

the development of ballistic and cruise missiles capable of reaching North America as well as terrorism, and cyber threats.[15]

That being said, the Canadian military has a responsibility to protect Canada's population, territory and national interests from any types of threats, whether imminent or not. "Our foremost defence priority is the defence of Canada and Canadians," emphasized Lieutenant-General Michael Hood, Commander of the RCAF.[16] This means preparing for the worst case scenario, including the low probability of a full-scale attack against Canada or North America by a foreign state. As Mr. Burt noted, intent "can change, obviously, and it can change quite quickly."[17] As a case in point, Lieutenant-General Hood reminded the Committee that Russia invaded Crimea just a few days after hosting the Olympic Games in Sochi in 2014.[18] Several additional witnesses, for example, expressed concerns with Russia's ongoing militarization efforts and aggressive behaviour on the world stage, especially following its annexation of Crimea in 2014.[19] "I can assure you that Russia is at the top of our list in terms of countries we watch carefully and monitor closely," Mr. Burt told the Committee.[20] Of particular concern to NORAD officials is Russia's ongoing modernization of its nuclear arsenal and delivery systems. Admiral William E. Gortney, Commander of NORAD and United States Northern Command (USNORTHCOM), warned the U.S. Senate's Armed Services Committee in March 2016, that "Russia's strategic nuclear forces remain the only foreign military threat that could imperil our nation's [U.S.] existence."[21]

While the CAF views "no direct military threat from another state to Canada in the next 10 years," Rear-Admiral Bishop noted that "it's very difficult to predict with certainty what the world is going to look like over a very long horizon of 20, 30, or 40 years" and that, as such, "there's always a worst-case scenario that we need to be ready to work through."[22]

Some witnesses also expressed concern over the unstable and unpredictable regime in North Korea, arguing that that country's ballistic missile and nuclear weapons programs specifically target North America. A few witnesses also spoke about how China

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15 Ibid.

16 NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood).

17 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Stephen Burt).

18 NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood).

19 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Rear-Admiral Scott Bishop and Stephen Burt); NDDN, *Evidence*, 1st Session, 42nd Parliament, 12 April 2016 (Margarita Assenova, Aurel Braun, and Elinor Sloan); NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand); NDDN, *Evidence*, 1st Session, 42nd Parliament, 21 April 2016 (Charles Doran and Christopher Sands); NDDN, *Evidence*, 1st Session, 42nd Parliament, 5 May 2016 (David Perry); NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (James Fergusson, Robert Huebert, and Adam Lajeunesse).

20 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Stephen Burt).

21 Senate Armed Services Committee (U.S.), "Statement of Admiral William E. Gortney (United States Navy) – Commander, United States Northern Command and North American Aerospace Defense Command," 10 March 2016.

22 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Rear-Admiral Scott Bishop).

and Iran pose a threat to North America.[23] In light of these threat assessments, NORAD closely monitors the activities of China, Iran, North Korea and Russia.[24]

Several witnesses emphasized to the Committee that Canada and the U.S. face similar threats by reason of geography, mutual interests, and friendship. Moreover, Canada and the U.S. are close military allies and strong NATO partners, often working together diplomatically and militarily around the world. "The defence of North America can't be separated from … [the] overall foreign and defence policy" of Canada and the United States and their "global engagement" overseas, explained Joel Sokolsky, Professor of Political Science at the Royal Military College of Canada. "It's that global engagement that makes both Canada and the United States potential targets.... It's our global engagement that makes us kind of vulnerable, and why we need to provide for the aerospace defence of North America."[25] In sum, as Lieutenant-General St-Amand told the Committee, "it's very difficult to isolate a threat to the United States from a threat to Canada, and vice versa."[26]

Reinforcing the need for close defence cooperation between Canada and the U.S. are the strong economic ties that exist between our two countries. David Drake, Director General of Global Affairs Canada's International Security and Intelligence Bureau, told the Committee that "the security of North America is the primary enabler for the close economic ties with the U.S. that underpin the prosperity of both Canada and the United States."[27] As he explained:

> Almost 25% of Canada's GDP [Gross Domestic Product] is generated through exports to the U.S. Comparatively, exports to all other countries generate only an additional 6% of Canada's GDP. In 2015, Canada-U.S. trade in goods and services reached almost $881 billion in annual trade for goods and services. Canadian exports to the U.S. were about $450 billion, representing more than 72% of all Canadian exports. Canada imported $431 billion in goods and services from the U.S., representing more than 64% of total imports. Goods and services worth over $2.4 billion cross the U.S.-Canada border every day.[28]

As such, Mr. Drake argued that it was important for Canada and the U.S. to maintain "a relationship of mutual confidence, including assurances that potential threats will not originate or pass through our respective countries." In his view, the "North American geographic reality" necessitates close "co-operation on domestic security measures" between Canada and the U.S., especially considering that the two countries possess "the

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23 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Rear-Admiral Scott Bishop and Stephen Burt); NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand); NDDN, *Evidence*, 1st Session, 42nd Parliament, 5 May 2016 (David Perry); NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (James Fergusson).

24 NORAD, "Threats to North America," brief presented to NDDN, NORAD Headquarters, Colorado Springs (Colorado, U.S.), 2 May 2016.

25 NDDN, *Evidence*, 1st Session, 42nd Parliament, 21 April 2016 (Joel Sokolsky).

26 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand).

27 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (David Drake).

28 Ibid.

world's longest shared border" and that "we are surrounded on almost all sides by rugged coastlines." North American security, he emphasized, is "fundamental to the continuation of the free and open relationship that Canada and the U.S. currently enjoy."[29]

Conventional and Asymmetric Threats

The aerospace domain continues to be a challenging security environment from a Canadian and North American defence standpoint. Canada and the U.S., in fact, face a number of aerospace threats, all of which are taken very seriously by NORAD. These threats are both "conventional" and "asymmetric."[30]

In the context of NORAD, conventional threats (sometimes known as symmetric threats) are threats from states and are usually associated with the military capabilities of foreign armed forces (for example, their military aviation or strategic missile forces). Although conventional threats are considered to be the most dangerous, NORAD does not view them as the most likely to occur. "A direct conventional attack against North America remains unlikely," Lieutenant-General St-Amand told the Committee.[31] This is consistent with statements heard from other witnesses in the course of this study, who repeatedly told the Committee that Canada, at the moment, faces no conventional military threat from any state,[32] even in the Arctic.[33] "When you look at military threats," explained Lieutenant-General Stephen Bowes, Commander of Canadian Joint Operations Command (CJOC), "you have to break it into capabilities and intent." While some states have the capabilities to attack North America, they have not expressed intent to do so.[34]

Once again, "intent can change quite rapidly," warned Lieutenant-General Bowes, "so we do have to be prepared."[35] This was reinforced by Lieutenant-General Hood. "There are potential adversaries that have the capability, and on any given day may or may not have intent," he said. After speaking of Russian long-range bomber aircraft flying near Canada's Air Defence Identification Zone (ADIZ), he said that "there is a real threat to Canadian sovereignty, without a doubt. The question is, is that likely to occur tomorrow or the week after? From my experience, I don't think we're very good at predicting things, whether that's the fall of the Berlin Wall … 9/11 … or [the Russian invasion of] Crimea, for that matter."[36] A conventional military attack against North America might appear far-fetched and highly unlikely at the moment, but it could still nonetheless occur in the future if the intent of certain state actors changed. This is why NORAD has "the responsibility …

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29 Ibid.

30 Andrea Charron and Jim Fergusson, *NORAD in Perpetuity? Challenges and Opportunities for Canada*, Centre for Defence and Security Studies, University of Manitoba, 31 March 2014, pp. 10-15.

31 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand).

32 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Stephen Burt and Rear-Admiral Scott Bishop).

33 NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016. (Lieutenant-General Stephen Bowes and Brigadier-General Mike Nixon).

34 NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016. (Lieutenant-General Stephen Bowes).

35 Ibid.

36 NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood).

to plan for the eventuality and contribute to the deterrence of such an attack," explained Lieutenant-General St-Amand, which includes "monitoring our maritime approaches" and the "deliberate control of air traffic approaching or entering our air defence identification zones on the outside perimeter of North America."[37]

Asymmetric threats (sometimes known as non-conventional threats) are generally associated with non-military and non-state actors (for example, terrorists or cyber criminals), but can also involve the covert support of state actors through funding, equipment and training. Whereas conventional threats usually come from outside North America, asymmetric threats can emanate from either outside or within our borders. Asymmetric threats can range from: terrorists bombing civilian aircraft or using them as missiles to attack specific ground targets, as was the case in the U.S. on 11 September 2001; cyber-attacks on critical infrastructure; or criminal organizations illegally trafficking narcotics, weapons, and other contraband goods into North America.

NORAD considers asymmetric threats as less dangerous, but far more likely than conventional ones.[38] Whereas no state actors with military capabilities to attack North America have thus far expressed any intent to do so, NORAD officials emphasized to the Committee that "terrorists have demonstrated capability and intent."[39] The Committee was, in fact, told that there have been several terrorist plots against Canada and the U.S. since 2001 and that some of them have involved aviation targets.[40] According to Major-General Christopher J. Coates, Director of NORAD Operations, NORAD responds on average to five asymmetric incidents per day in the U.S. and five per year in Canada.[41] This is why NORAD currently maintains a robust air presence over Canada and the U.S. and closely monitors aviation activities inside North America, something it did not do prior to the 11 September 2001 terrorist attacks in the U.S. Under Operation NOBLE EAGLE, Lieutenant-General St-Amand explained, NORAD today defends our continent against "9/11-type scenarios" and "any act attempting to use general or commercial aviation to threaten our security."[42]

In sum, NORAD must pay close attention to a spectrum of aerial threats to our security, which ranges from "traditional nation state military capabilities" to terrorist "individuals with access to increasingly destructive technologies."[43] The daily tracking of both conventional and asymmetric threats is arduous and has kept NORAD increasingly busy over the past fifteen years. In fact, the Committee was told in February 2015 by

37 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand).

38 Ibid.

39 NORAD, "NORAD Operations," brief to NDDN by Major-General Christopher J. Coates (Director of NORAD Operations), NORAD Headquarters, Colorado Springs (Colorado, U.S.), 2 May 2016.

40 NORAD, "Threats to North America," brief presented to NDDN, NORAD Headquarters, Colorado Springs (Colorado, U.S.), 2 May 2016.

41 Information provided by Major-General Christopher J. Coates (Director of NORAD Operations) during NDDN visit to NORAD Headquarters, Colorado Springs (Colorado, U.S.), 2-3 May 2016.

42 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand).

43 Ibid.

Major-General D.L.R. Wheeler, Commander of 1 Canadian Air Division and Canadian NORAD Region, that NORAD had, up until that time, responded to more than 3,500 possible airborne threats and intercepted more than 1,400 aircraft in the airspace of Canada and the U.S. since the 2001 terrorist attacks.[44]

However, it should be noted that various other security concerns are of interest to the American and Canadian militaries as well as to NORAD, including a number of non-military threats that fall within the purview of civilian authorities responsible for law enforcement and public safety and for which a whole-of-government response is necessary. In many of these cases, the military is only a participant in the whole-of-government responses and not the lead government department or agency. In the case of the CAF, this ranges from supporting law enforcement organizations in their ongoing efforts to counter criminal networks and their illicit smuggling of narcotics, weapons and humans to responding to search and rescue incidents, providing aid to the civil authorities in the event of natural or man-made disasters and other national emergencies, engaging in fisheries and pollution patrols, fighting cyber threats, contributing to counter-terrorism efforts, as well as conducting regular sovereignty, reconnaissance and surveillance patrols in the Arctic.[45]

The Arctic, in particular, constitutes a complex security environment. Lieutenant-General Bowes emphasized that while "there is a very low probability that another foreign nation is going to apply military force against Canadian territory" in the Arctic, "there are all kinds of threats and challenges everywhere to our ability to control our space."[46] Security challenges in the Arctic include, among other things: environmental concerns over air and maritime pollution; the effects of climate change and the melting of the polar ice on the Arctic region; increases in commercial aviation and shipping traffic; industrial exploitation of natural resources; infringements of Canadian sovereignty; search and rescue incidents; and various other security threats and concerns.[47]

In the course of this study on the Canadian NORAD region and aerial readiness, the following four security threats stood out to Committee members during the hearings and visit to NORAD headquarters: the resurgence of Russian long-range military aviation; the proliferation of ballistic missiles; the emergence of advanced cruise missiles; and aerial terrorism and violent extremism.

The Resurgence of Russian Long-Range Military Aviation

Since its creation in 1958, NORAD has closely monitored Russian long-range military aviation activities, especially bomber aircraft that come close to American and Canadian airspace. Although the number of Russian flights dramatically decreased with

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44 NDDN, *Evidence*, 2nd Session, 41st Parliament, 16 February 2015 (Major-General D.L.R. Wheeler).

45 NDDN, *Canada and the Defence of North America*, 41st Parliament, 2nd Session, June 2015, pp. 6-34.

46 NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (Lieutenant-General Stephen Bowes).

47 NDDN, *Canada and the Defence of North America*, pp. 11-13.

the end of the Cold War in the 1990s, it resurged in 2007.[48] NORAD officials informed the Committee that since 2007, NORAD jet fighters have conducted, on average, five intercepts per year of Russian military aircraft in the American or Canadian ADIZ. The peak year was 2014 when ten intercepts were made.[49] Most of these interceptions occur in the Arctic, "north of Inuvik."[50] According to Lieutenant-General Hood, the number of Russian long-range aviation flights approaching North America over "the last couple of years" has been "approximating the high point of the Cold War."[51]

However, Lieutenant-General St-Amand emphasized that none of these Russian aircraft have ever penetrated into American or Canadian airspace, nor demonstrated any hostile intentions. "What we are seeing [in recent years] is a peak in intrusions into our Air Defence Identification Zone [ADIZ]," he said, adding that "they have a right … to operate there" since "it is international airspace." But "at the same time," he explained, "we have declared those identification zones so that we know what's coming towards [North] America." Therefore, having Russian military aircraft approach North America is of concern to NORAD, especially in light of Russia's aggressive behaviour on the world stage over the past few years. In fact, what NORAD has witnessed in recent years is "a difference in the degree of sophistication in how [the Russians] approach us," explained Lieutenant-General St-Amand.[52] Such changes attract NORAD's attention and rightfully so. The problem with those military flights is that the Russians do not provide NORAD with flight plans in the way civilian aircraft do when they approach the ADIZ. "It would be a lot easier if they just filed flight plans and told us they were coming," explained Lieutenant-General Hood, "because then we wouldn't have to go up there and see them."[53]

The Proliferation of Ballistic Missiles

Another important conventional threat identified in the course of this study pertains to the worldwide proliferation of ballistic missiles. In April 2016, Lieutenant General David L. Mann, Commanding General, U.S. Army Space and Missile Defense Command/Army Forces Strategic Command and Joint Functional Component Command for Integrated Missile Defense, told the Strategic Force Subcommittee of the United States' Senate Armed Services Committee that "presently, nearly 30 countries possess ballistic missile capability" and that "together, these countries have approximately 50 different variants of ballistic missiles." In addition, he stated that "there are currently 13 new intermediate-range and eight intercontinental ballistic missiles (IRBM and ICBM) variants

48 NDDN, *Evidence*, 1st Session, 42nd Parliament, 12 April 2016 (Elinor Sloan); NDDN, *Evidence*, 1st Session, 42nd Parliament, 5 May 2016 (David Perry).

49 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand); NORAD, "NORAD Operations," brief to NDDN by Major-General Christopher J. Coates (Director of NORAD Operations), NORAD Headquarters, Colorado Springs (Colorado, U.S.), 2 May 2016.

50 NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood).

51 Ibid.

52 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand).

53 NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood).

under development" in those countries.[54] This is particularly concerning considering that ballistic missiles could carry not only conventional warheads, but also weapons of mass destruction. It should be noted that nine countries worldwide are known to have nuclear weapons (China, France, India, Israel, North Korea, Pakistan, Russia, United Kingdom, and United States). Altogether, these countries possess an estimated 15,900 nuclear warheads, the vast majority of which belong to Russia and the United Sates.[55] And several countries are known to possess chemical and biological weapons, including Libya, North Korea, Russia, and Syria.[56] Chemical weapons have been used in combat during the Syrian Civil War, which broke out in 2011 and continues to this day.[57]

This proliferation is of serious concern from a North American security perspective, according to Stephen Burt. "We view the proliferation and potential use of weapons of mass destruction, or WMD, including chemical, biological, radiological, and nuclear, as well as the development of ballistic missiles capable of reaching North America, as worrisome."[58] Mr. Burt emphasized that "only states can master the complexities of ballistic missile delivery systems" and raised concerns about the activities of Iran and North Korea in that field:

> States of concern, such as Iran and North Korea, will likely continue in their attempts to acquire, develop, and improve weapons of mass destruction, along with the ballistic missile capabilities to deliver them.… In the case of Iran, its current missile arsenal lacks the range to strike targets within North America.… North Korea, on the other hand, has expressly indicated that it wants to be able to target North America with nuclear armed missiles. While it is actively developing ballistic missiles that could potentially reach North America, whether North Korea has developed a practical weapon is unclear. North Korea's recent claim of successfully testing a thermonuclear weapon or H-bomb is unsubstantiated. Nevertheless, that country's history demonstrates continuing efforts to develop a viable nuclear weapon capability, which we will continue to watch closely.[59]

A similar view was expressed by Christopher Sands, Director of John Hopkins University's Center for Canadian Studies:

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54 Senate Armed Services Committee (U.S.), "Statement by Lieutenant General David L Mann, Commanding General, U.S. Army Space and Missile Defense Command/Army Forces Strategic Command and Joint Functional Component Command for Integrated Missile Defense," 13 April 2016. For more information on the countries with ballistic missile capabilities, see Arms Control Association, "Fact Sheet: Worldwide Ballistic Missile Inventories," July 2014; IISS, *The Military Balance 2016*, pp. 27-480; North Atlantic Treaty Organization (NATO), "Ballistic Missile Defence," 25 July 2016.

55 Claire Mills and Jon Lunn, Nuclear Weapons – Country Comparisons, House of Commons Library (United Kingdom), 20 April 2016, pp. 3-53. See also Hans M. Kristensen and Robert S. Norris, "Status of World Nuclear Forces," Federation of American Scientists, 2016; SIPRI, *SIPRI Yearbook 2015 – Summary*, pp. 18-19.

56 NATO, "Fighting Weapons of Terror," 4 September 2015; Nuclear Threat Initiative (NTI), "Libya," "North Korea," "Russia," "Syria," consulted 15 May 2016.

57 Syrian American Medical Society, *A New Normal: Ongoing Chemical Weapons Attacks in Syria*, February 2016, pp. 9-10.

58 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Stephen Burt).

59 Ibid.

> It seems unlikely short of a state of war, that Russia or China, being relatively responsible states, are going to launch a missile intending to hit a Canadian city. We don't know about the sort of more unreliable governments like North Korea's, and even to some extent Iran's, and because those governments aren't entirely trustworthy, we do have to worry about what the risk is of them taking a strike.[60]

"We're concerned about ballistic missiles and related capability developments," noted Lieutenant-General St-Amand, adding that ballistic missile technology is constantly improving and that "there are a lot of technical advances out there in the world" that make such systems a serious concern from a North American security perspective.[61] Indeed, other witnesses spoke about the continued improvement of ballistic missiles technology worldwide, which translates into weapon systems that are increasingly sophisticated and precise.[62] According to Lieutenant-General St-Amand, the menace from ballistic missiles is not about to disappear anytime soon. "Ballistic missiles have been around for a long time," he pointed out. "They are here to stay."[63]

Although a number of witnesses pointed out that the U.S., and not Canada, would likely be the prime target of a rogue state ballistic missile strike against North America, such an event would nonetheless have serious implications for Canada. "With respect to the ballistic missiles themselves," explained Lieutenant-General St-Amand, "it is very difficult for me to imagine that a single shot that hit a U.S. city … would not have any implications for Canadian sovereignty, the Canadian economy, and survivability. Even the threat itself, I find difficult to separate as far as being a U.S. threat only or a Canadian threat only."[64] James Fergusson, Professor of Political Studies at the University of Manitoba, noted that, since most of Canada's population is located close to the U.S. border, it is difficult to imagine that Canada would not be affected if hostile ballistic missiles struck neighbouring American cities such as Seattle or Detroit, especially if these weapons were armed with chemical, biological or nuclear warheads. Moreover, there is always the risk that a ballistic missile aimed at the U.S. might accidently fall on Canadian territory. In other words, Canada, because of its geographic proximity to the U.S., might inadvertently find itself in the way between the archer and the target.[65]

The Emergence of Advanced Cruise Missiles

The appearance of new and more advanced types of long-range precision cruise missiles capable of being launched from various platforms – particularly military aircraft, warships and submarines – is of grave concern to NORAD. Although cruise missiles have been around since the 1980s, the difference today is that these systems are much more advanced and sophisticated as well as hard to detect on radar due to their high speeds

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60 NDDN, *Evidence*, 1st Session, 42nd Parliament, 21 April 2016 (Christopher Sands).

61 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand).

62 NDDN, *Evidence*, 1st Session, 42nd Parliament, 21 April 2016 (Charles Doran).

63 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand);

64 Ibid.

65 NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (James Fergusson).

and low radar signature. They also have a greatly enhanced range and are capable of precision targeting.[66]

Several witnesses expressed concerns regarding the new Russian Kh-101 conventionally-armed cruise missile and its nuclear-armed counterpart, the Kh-102. It is believed that those two types of cruise missiles could easily reach North America from Russian airspace or territorial waters. Elinor Sloan, Professor of International Relations at Carleton University, emphasized that the Kh-101 "is believed to have an intercontinental range of between 3,000 and 5,000 kilometres."[67] The advanced capabilities of the Kh-101 were demonstrated in combat recently when Russia launched several of them from Tupolev Tu-160 Blackjack strategic bombers as well as from its warships and submarines against targets in Syria.[68] Many experts believe that this show of force was meant to demonstrate to the world the strength of Russia's "conventional global precision strike capability."[69] David Perry, Senior Analyst with the Canadian Global Affairs Institute, identified three aspects of these new Russian cruise missiles that he considers troubling from the standpoint of North American defence:

> First, these weapons come in both nuclear and conventional variants. Second, they can be carried by long-range Russian patrol aircraft and their newest and most capable submarines, and over the last decade Russia has resumed deploying both of these asset types in and around North America. Third, because of the increased distances at which these new missiles can successfully hit targets and their low observability characteristics, the current arrangements for defending North America against them must be upgraded to counter them effectively. In sum, Russia has developed … sophisticated new technology that could be deployed against North America, using the same aircraft and submarines that now routinely patrol the air and waters around Canada and the United States.[70]

Indeed, with the resurgence of Russian air and naval activities approaching North America in recent years, such cruise missiles are considered a significant security risk by NORAD. Lieutenant-General St-Amand expressed his concern as follows:

> What we see is a new generation of cruise missiles, with very long-range and low observability, which are really challenging our way to prosecute … any approaches to North America.… The advanced long-range cruise missiles that we have observed are not only still a threat in the aerospace domain but also in the maritime domain, because they are now being launched from submarines and surface vessels. So the maritime domain now is becoming a domain of interest that is really challenging us to think in terms of continental defence, as opposed to only from a perspective of U.S. or Canadian defence.[71]

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66 NDDN, *Evidence*, 1st Session, 42nd Parliament, 12 April 2016 (Elinor Sloan).

67 Ibid.

68 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand); NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (Adam Lajeunesse).

69 NORAD, "Threats to North America," brief presented to NDDN, NORAD Headquarters, Colorado Springs (Colorado, U.S.), 2 May 2016

70 NDDN, *Evidence*, 1st Session, 42nd Parliament, 5 May 2016 (David Perry).

71 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand).

He stated of this increased Russian capability that, "when combined with a high level of [Russian] long-range aviation activity in the vicinity of our Air Defence Identification Zones in the last few years, we take notice."[72] Like the new hypersonic missiles and other more sophisticated weapon systems under development that cannot be properly detected by current surveillance technology, the deployment of advanced cruise missiles poses a technological challenge from an aerospace defence perspective.

Aerial Terrorism and Violent Extremism

According to Stephen Burt, terrorism and the dangerous activities of violent extremist groups remains the top threat to the security of North America. "The most urgent [threat], the one that takes up most of the time and energy at the moment, is terrorism," he underlined. "It's a threat that we watch closely."[73] While counter-terrorism efforts in Canada and the U.S. are led by various civil government security departments and agencies, such as Public Safety Canada and the U.S. Department of Homeland Security, the American and Canadian militaries contribute to those efforts in various ways. As Mr. Burt explained, "while the primary Government of Canada agencies responsible for countering terrorism domestically are the RCMP and CSIS, the Canadian Armed Forces are ready to play a role in supporting their emergency management partners across Canada" and "also work closely with these and other partners to ensure the safety of our CAF personnel and infrastructure."[74]

That being said, NORAD is very concerned with violent extremism and the threat of terrorism in the aerospace domain. As already mentioned, since the terrorist attacks of 11 September 2001, when terrorists hijacked four civilian airliners and crashed two into the World Trade Center in New York City and another one into the Pentagon in Washington D.C., NORAD has been very preoccupied with the mounting threat of terrorism. These attacks made it clear to NORAD that threats to Canada and the U.S. emanated not only from outside of North America, but also from within. As a result, since 2001, NORAD monitors activities inside the airspace of North America primarily to defend Canada and the U.S. against "terrorist aggression originating either within or outside our … air borders" under Operation NOBLE EAGLE.[75] Over the years, NORAD has responded to thousands of potential airborne threats over Canada and the U.S. and has flown tens of thousands of aircraft sorties in support of Operation NOBLE EAGLE.[76]

During its visit to NORAD headquarters, the Committee heard that the most critical and likely threat to North America remains an "insider" threat. According to NORAD, since 2001, violent extremist groups have never ceased efforts to attack North America from the air. A number of terrorist aviation plots have been attempted and foiled over the years,

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72 Ibid.

73 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Stephen Burt).

74 Ibid.

75 NORAD, *A Brief History of NORAD as of 31 December 2013*, p. 8.

76 Ibid.

the Committee learned.[77] "We're … concerned about violent extremists and the enduring threat they represent to general and commercial aviation," indicated Lieutenant-General St-Amand.[78] According to NORAD, terrorist attempts to attack North America have been on the rise in recent years. The "pace of attack planning" by violent extremist groups inside North America, NORAD explained, has "increased since announcement of [the] Caliphate [the so-called Islamic State of Iraq and the Levant, or ISIL] in 2014." There have been an increasing number of aviation and military targets in recent years, the Committee heard.[79] NORAD officials asserted that aerial terrorists are today more focused on smuggling bombs in civilian aircraft or using model airplanes to fly explosives into ground targets than conducting major 9/11-type suicide operations. Notwithstanding that, North America is not immune from the possibility of another airborne terrorist attack of the magnitude of 9/11. But the Committee was told that such a threat is very low due to the many airport security measures introduced since 2001.[80]

The threat of terrorism and violent extremism is not expected to disappear soon. It is a threat that NORAD takes very seriously, considering that the time available to respond to an aerial terrorist incident is usually measured in minutes.[81] Of particular worry to NORAD is the constant evolution of the terrorist threat. Violent extremists continually improvise and seek new ways to attack North America, which means that NORAD must remain very vigilant. One threat of concern to NORAD is the rapid proliferation of non-traditional aviation technologies such as unmanned aircraft (UA), or drones, and their potential use by violent extremists to conduct future terrorist attacks. According to NORAD, "the abundance, size and speed of small UA create significant challenges for NORAD's existing air defence system" and pose "new stresses on NORAD's ability to defend North American airspace."[82]

Overall, as can be seen from the above, while there is no direct military threat to Canada or North America at this time, the range of capabilities and potential future threats means that Canada must continue working to understand them, and to provide the most cost-effective defence against them. One of the ways of doing this is by modernizing and expanding the capabilities of NORAD in cooperation with the U.S.

MODERNIZING NORAD AND EXPANDING ITS CAPABILITIES

Canada and NORAD

For almost 60 years, Canada and the U.S. have been working in close partnership through NORAD to protect North America from various aerospace threats. For many

77 Information obtained during NDDN visit to NORAD Headquarters, 2 May 2016.

78 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand).

79 NORAD, "Threats to North America," brief presented to NDDN, NORAD Headquarters, Colorado Springs (Colorado, U.S.), 2 May 2016.

80 Information obtained during NDDN visit to NORAD Headquarters, 2 May 2016.

81 Ibid.

82 NORAD, "NORAD Operations," Brief to NDDN by Major-General Christopher J. Coates (Director of NORAD Operations), NORAD Headquarters, Colorado Springs (Colorado, U.S.), 2 May 2016.

Americans and Canadians, NORAD symbolizes the close bilateral defence relationship that Canada and the U.S. have maintained for decades and the extent to which their respective countries are determined to jointly protect the North American continent and their homelands from a range of threats. NORAD is by far the most high-profile of the "more than 800 defence agreements and arrangements" that currently exist between Canada and the U.S. "NORAD itself is a cornerstone of the Canada-U.S. defence relationship," Rear-Admiral Bishop told the Committee. "It remains today the key means by which our two nations jointly defend North American airspace."[83] Lieutenant-General Pierre St-Amand echoed this view, pointing out that the NORAD "story has been characterized by success and great service to both the United States and Canada."[84] NORAD officials, in fact, told the Committee that NORAD is the "only bi-national command in the world."[85] No other countries have a similar defence arrangement. And the NORAD success story is expected to continue for years to come.

The origins of NORAD can be traced to the height of the Cold War. In 1957, Canada and the U.S. decided to establish a bi-national air defence organization known as the "North American Air Defense Command" or NORAD (renamed North American Aerospace Defense Command in 1981) to monitor and defend North America and its airspace against the threat of nuclear-armed Soviet long-range bombers. The NORAD agreement was officially signed by the two countries on 12 May 1958. It has since been "reviewed, revised, renewed or extended" several times. The last renewal occurred a decade ago, in 2006, when NORAD was renewed in perpetuity and was given a maritime warning function.[86]

Today, NORAD's mission consists of conducting aerospace warning, aerospace control and maritime warning.[87] The NORAD agreement defines those missions as follows:

- *Aerospace Warning*: "consists of processing, assessing, and disseminating intelligence and information related to man-made objects in the aerospace domain and the detection, validation, and warning of attack against North America whether by aircraft, missiles or space vehicles … An integral part of

83 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Rear-Admiral Scott Bishop).

84 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand).

85 Information obtained during NDDN visit to NORAD Headquarters, 2 May 2016.

86 The NORAD agreement was "reviewed, revised, renewed or extended" in 1968, 1973, 1975, 1980, 1981, 1986, 1991, 1996, 2000 and 2006. However, the basic text of the agreement has been substantially revised only a few times in that period. For example, in 1975, the NORAD mission was expanded to include aerospace warning and assessment of aircraft, missile or space threats to North America. This expansion was done in response to the proliferation of intercontinental, submarine-launched, and other types of ballistic missiles, and the emergence of anti-satellite and other space-based weapon technologies in the 1960s and 1970s. As a result, in 1981, NORAD was officially renamed the "North American Aerospace Defense Command" instead of "North American Air Defense Command." In 1996, NORAD's mission was re-defined as aerospace warning and aerospace control of North America. In 2006, a maritime warning function was added to the NORAD mission. NORAD, "NORAD Agreement." See also NORAD, *A Brief History of NORAD as of 31 December 2013*, pp. 4-41.

87 NORAD, "About NORAD."

aerospace warning … [entails the] monitoring of global aerospace activities and related developments."

- *Aerospace Control*: "consists of providing surveillance and exercising operational control of the airspace of Canada and the United States. Operational control is the authority to direct, coordinate, and control the operational activities of forces assigned, attached, or otherwise made available to NORAD."

- *Maritime Warning*: "consists of processing, assessing, and disseminating intelligence and information related to the respective maritime areas and internal waterways of, and the maritime approaches to, Canada and the United States, and warning of maritime threats to, or attacks against North America … to enable identification, validation, and response by national commands and agencies responsible for maritime defense and security. Through these tasks NORAD shall develop a comprehensive shared understanding of maritime activities to better identify potential maritime threats to North American security. Maritime surveillance and control shall continue to be exercised by national commands and, as appropriate, coordinated bilaterally."[88]

NORAD headquarters is located at Peterson Air Force Base near Colorado Springs, Colorado. There are also three NORAD regions: the Continental U.S. NORAD Region (CONR), headquartered at Tyndall Air Force Base in Florida; the Alaskan NORAD Region (ANR), headquartered at Elmendorf Air Force Base in Alaska; and the Canadian NORAD Region (CANR), headquartered in Winnipeg, Manitoba.[89]

NORAD uses a network of satellites, ground-based radars, Airborne Warning and Control Systems (AWACS) aircraft, jet fighters and other air assets to detect, intercept, and, if necessary, engage aerial threats to Canada and the U.S. The Committee was repeatedly told that NORAD functions as a system of systems. Communication between systems is key to the success of NORAD, Lieutenant-General St-Amand explained:

> NORAD maintains very high readiness forces throughout the continent. To deliver effective operations, we have come to rely on a sophisticated system of systems, which allows us to fully exploit a spectrum of engagement, which includes indicators and warnings, detection, identification, and if necessary, the deployment of fighter aircraft to intercept and engage airborne tracks.… To be able to deploy and sustain any number of fighter aircraft vast distances away from their main operating bases requires the choreography and coordination of many parts of a system. Whether it is training, command and control nodes, our infrastructure, air-to-air refuellers, airborne early warning platforms, ground-based radars or fighter aircraft, we need to be able to communicate and have command and control over the

88 *Agreement between the Government of Canada and the Government of the United States of America on the North American Aerospace Defense Command*, 28 April 2006.

89 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand); NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood); NORAD, "Alaskan NORAD Region"; "Canadian NORAD Region"; and "Continental U.S. NORAD Region."

> entirety of the defended area. Each of these components must be as capable as possible and must be able to network with each other.[90]

For this reason, the interoperability of the systems used by Canada and the U.S. for NORAD missions is critical to all operations, which means that future systems acquired by the American and Canadian militaries will also need to be interoperable.

Canada's contribution to NORAD consists of financial resources, personnel, aircraft (for example, jet fighters and air tankers) and aerospace assets such as satellites, as well as infrastructure and ground-based radar stations.[91] CAF members assigned directly to NORAD operations work not only in Canada, but also in the U.S.; of the more than 700 CAF personnel serving in the U.S. at any given time, approximately 300 are committed to the NORAD mission, including 147 working at NORAD headquarters in Colorado Springs. The remainder are assigned to various units and locations in the U.S. as well as to the NORAD Airborne Warning and Control Systems (AWACS) program.[92] Under that program, Canadian and American military personnel work together on board U.S.-based E-3 Sentry AWACS aircraft in support of continental defence operations.[93] It should be noted that, in turn, the "United States sends a lot of exchange officers to work with the Canadian military," some of whom are assigned to CANR headquarters in Winnipeg, Manitoba, as well as to various RCAF Wings.[94]

CANR is responsible for the defence of Canada's airspace, which is a vast geographical area of responsibility that spreads from the Atlantic Ocean in the east to the Pacific Ocean in the west, and from the U.S. border in the south to the northern tip of the Canadian Arctic archipelago in the north.[95]

The Canadian Air Defence Sector (CADS) in North Bay, Ontario, is responsible for providing aerospace surveillance, identification, control and warning to CANR. This mandate is achieved through the use of information received from satellites, radar stations and AWACS aircraft. All aircraft detected by those systems in or near CANR are tracked by CADS personnel. The integrated air picture gathered is then shared with CANR headquarters and the other NORAD regions, which help to provide an overall picture of activities taking place in North American skies.[96]

If a potential threat emerges within the CANR area of responsibility, CANR headquarters, which is co-located with 1 Canadian Air Division, can deploy CF-18 jet

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90 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand).

91 NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood); NORAD, "Canadian NORAD Region."

92 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Rear-Admiral Scott Bishop).

93 DND, "35 Years of Canadian Participation in NORAD AWACS Program," 24 November 2014.

94 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Rear-Admiral Scott Bishop).

95 NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood); NORAD, "Canadian NORAD Region."

96 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand); DND, "22 Wing North Bay."

fighters from 3 Wing Bagotville, Quebec, and 4 Wing Cold Lake, Alberta, to intercept.[97] These two main operating bases (MOB) maintain CF-18s on alert for short-notice NORAD missions 24 hours a day, 365 days a year. In addition, CF-18s can also rely on deployed operating bases (DOB) and forward operating locations (FOL) scattered across Canada, including in the Arctic. According to Major General D.L.R. Wheeler, Commander of 1 Canadian Air Division and Canadian NORAD Region, "these auxiliary locations extend the reach of our fighters by providing forward areas for basing, refuelling, and maintenance."[98] Other RCAF air assets can also be deployed if needed on NORAD missions. For example, CC-150 Polaris and CC-130 Hercules air-to-air refuelling tanker aircraft respectively stationed at 8 Wing in Trenton, Ontario, and 17 Wing, Winnipeg, Manitoba, are often mobilized to refuel CF-18s engaged on long-range missions.[99]

NORAD allows Canada to share resources with the U.S. thereby avoiding duplication of efforts and establishing greater defence capabilities. Rear-Admiral Bishop indicated that "one of the benefits of being in this NORAD agreement is that we're essentially pooling our resources given the difficulty of defending such a large continent."[100] The Committee was told on several occasions that this pooling of resources is what makes NORAD so successful. For example, witnesses underlined how U.S-owned AWACS aircraft help extend the reach of ground-based radar systems and how valuable information gathered by those aircraft is shared with Canada. The Committee also heard how U.S. air refuelling aircraft often support Canadian CF-18 jet fighters when deployed on extended missions in the Arctic, thereby putting less pressure on Canada's small fleet of two CC-150 Polaris and three CC-130 Hercules air tankers, especially when some of those Canadian aircraft are deployed on military operations overseas.[101] Witnesses referred to occasions when American jet fighters have been deployed across the border to counter threats to Canada as well as cases where Canadian jet fighters did the same for the U.S. Lieutenant-General Hood, however, pointed out that such cross-border actions do not happen very often. He explained that over the past fifteen years, "the Americans crossed our border with armed fighters four times, and Canada crossed their borders six times."[102] This nonetheless shows the high level of cooperation that currently exists between Canada and the U.S. through NORAD.

However, when asked if Canada was currently in a position to guarantee its air sovereignty on its own, without NORAD support, Lieutenant-General St-Amand responded

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97 NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood); DND, "3 Wing Bagotville" and "4 Wing Cold Lake."

98 NDDN, *Evidence*, 2nd Session, 41st Parliament, 16 February 2015 (Major-General D.L.R. Wheeler).

99 NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood); NORAD, "Canadian NORAD Region."

100 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Rear-Admiral Scott Bishop).

101 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand); NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood).

102 NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood).

that "in peacetime, we could, but not in the context of an international emergency."[103] It would depend on the nature and type of threat involved. As he explained:

> In the case of NORAD, we have complete control of what we do in our own airspace in peacetime. The commanders are Canadians, the military controllers are Canadians, the aircraft are piloted by Canadians.… Having an agreement with NORAD enables us to respond very quickly, but that does not mean that we do not have sovereignty, since Canadians are involved in the decisions. In terms of the most probable scenarios, we are capable of completely defending ourselves.[104]

However, in the event of a Third World War, for example, Canada would have a hard time defending itself with its current air fleet and "would have to join forces with [its] allies to deal with the threat."[105] It should be noted that the RCAF currently operates a fleet of more than 370 fixed-wing and rotary-wing aircraft, but only a little over 20% of those air assets are purpose-built combat aircraft (77 CF-18 jet fighters). The rest of the air fleet largely consist of multi-mission patrol aircraft as well as air tankers, transports, trainers, search and rescue aircraft, and various types of helicopters.[106] In comparison, the United States Air Force (USAF) has an air fleet of almost 4,900 aircraft, which includes more than 1,600 jet fighters.[107]

Evolving and Modernizing NORAD

Evolution and modernization is not new to NORAD. Over the years, the Canadian and U.S. governments have, on several occasions, acted to adapt NORAD's mission and structure to meet the various threats emanating from a changing international security environment. When NORAD was created in the 1950s, the main threat to North America came from long-range military aviation. This threat landscape changed, however, in the 1960s and 1970s with the advent of ballistic missiles. And it changed again in the 1980s with the emergence of the first-generation of cruise missiles. Since then, the emergence of new threats has forced NORAD to adapt further. Before the 11 September 2001 terrorist attacks, for example, NORAD only focused on threats from outside of North America.

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103 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand).

104 Ibid.

105 Ibid.

106 The RCAF fleet consists of 376 aircraft (214 fixed-wing and 162 rotary wing), which includes 77 CF-188 Hornet fighters; 14 CP-140 Aurora multi-mission patrol aircraft; 85 CH-146 Griffon and 15 CH-147 Chinook tactical helicopters; 27 CH-124 Sea King and 8 CH-148 Cyclone maritime helicopters, 14 CH-149 Cormorant search and rescue helicopters, 5 CC-177 Globemaster III strategic transports, 17 CC-130J Super Hercules and 13 CC-130 Hercules tactical transports, 5 CC-150 Polaris air tankers and transports, 4 CC-144 Challenger executive jets, 6 CC-115 Buffalo search and rescue aircraft, 4 CC-138 Twin Otter utility transports, 4 CT-142 Dash-8, 16 CT-155 Hawk, and 25 CT-156 Harvard II training aircraft, 13 CH-139 Jet Ranger training helicopters, and the 24 CT-114 Tutor air demonstration jets of the Snowbirds. DND, "Royal Canadian Air Force: Aircraft," consulted 15 May 2016. On the Cyclone, see DND, "Canada Accepts Six CH-148 Cyclone Helicopters," 19 June 2015; NDDN, "DND Response to Questions Asked at NDDN Meeting of 14 April 2016," QTON N° 42.1-07, 13 June 2016.

107 According to the International Institute for Strategic Studies, the USAF operates a fleet of 4,894 fixed-wing and rotary-wing aircraft, which includes 1,603 fighters, 157 bombers and 312 other types of combat aircraft. These figures do not include the air fleets of the U.S. Army, the U.S. Navy, and the U.S. Marine Corps, which altogether account for another 8,628 fixed-wing and rotary-wing aircraft, including 1,401 fighters and 236 other types of combat aircraft. IISS, *The Military Balance 2016*, pp. 39-49.

But after those attacks, it started looking at threats from within the continent. As mentioned previously, this internal air defence mission is known as Operation NOBLE EAGLE and has been ongoing since September 2001. Another example of how NORAD continues to adapt to a changing international security environment is the 2006 extension of its mission into the area of maritime warning.[108] The Committee will study issues related to the maritime environment in the fall of 2016.

Today, NORAD is once again faced with new military technologies and threats, forcing it to review its capabilities and processes in order to ensure that it remains relevant and ready to efficiently respond to an increasingly complex and ambiguous international security environment. As a case in point, the advent of advanced, long-range, high-speed cruise missiles – capable of precision strike capabilities and that can be launched from military aircraft as well as from warships and submarines – constitutes an important new challenge for NORAD.[109] In addition, new technological challenges are expected to emerge in the near future with the proliferation of unmanned aircraft systems (UAS) and the development of hypersonic and other more advanced weapon systems.[110] This, combined with existing conventional and asymmetric threats, means that NORAD must continuously adapt to a multi-domain threat environment.

This is why a few years ago, under the NORAD Next initiative, the U.S. and Canadian governments began conducting analysis of emerging challenges and threats Canada and the U.S. would likely face in the 2025–2030 timeframe, as well as an investigation of the capabilities required from NORAD in order to confront such threats.[111] That process continues to this day, although it is now referred to as NORAD evolution and modernization.[112]

NORAD is currently looking at modernizing its plans, policies, as well as command and control structures to ensure that its "system of systems" can handle the highest levels of operational tempo and efficiently operate in a multi-domain security environment against multiple threats.[113]

Most defence experts would probably agree that NORAD remains vital to the defence of North America and that it must evolve and modernize in order to remain relevant into the future. Some believe, including officials the Committee met on its trip to NORAD headquarters, that NORAD's mission should be expanded beyond aerospace warning, aerospace control and maritime warning. They maintain that Canada and the U.S. should consider expanding NORAD in order to address all environments – air, space,

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108 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand). See also NORAD, *A Brief History of NORAD as of 31 December 2013*, pp. 4-12.

109 Ibid.

110 NORAD, "Evolution of North American Defense and the Modernization of NORAD," brief presented to NDDN, NORAD Headquarters, Colorado Springs (Colorado, U.S.), 2 May 2016.

111 NORAD, *A Brief History of NORAD as of 31 December 2013*, pp. 11-12.

112 Information obtained during NDDN visit to NORAD Headquarters, 2 May 2016.

113 NDDN, *Evidence*, 1st Session, 42nd Parliament, 21 April 2016 (Andrea Charron).

maritime, land and cyber – for all of North America. In other words, those analysts and commentators would like to see NORAD providing what is known as "all-domain" awareness capabilities. However, others believe that NORAD's scope should remain limited to the aerospace domain.[114]

At the same time, some defence experts maintain that improvements could be made to enhance the existing Canada–U.S. Tri-Command structure, which was established in 2009 to coordinate relations between NORAD, Canadian Joint Operations Command (CJOC) and United States Northern Command (USNORTHCOM). They believe that such efforts could strengthen cooperation, efficiency and interoperability between those three commands, especially in times of emergency.[115] Andrea Charron, Deputy Director of the University of Manitoba's Centre for Defence and Security Studies, highlighted the current complexity of the Tri-Command structure. "The Tri-Command structure," she explained, "means that there are three military commands involved in the defence of North America – NORAD, USNORTHCOM, and CJOC – each with different mandates and focuses."[116] She further explained that:

> NORAD is air-dominant in personnel and focus.… It is most concerned with defending North America against air-breathing threats. This means its maritime warning mission can be overlooked. The very large USNORTHCOM, with its 60-plus civilian agencies as well as air force, navy and army sub-commands, is charged with defending the U.S. homeland.… [CJOC] is tasked with operations at home and abroad, except for air operations at home and in support of NORAD. These fall to the 1 Canadian Air Division, Canadian NORAD regional headquarters in Winnipeg....[117]

In other words, as NORAD officials explained to the Committee, NORAD is a bi-national command with its own command and control structure whereas CJOC and USNORTHCOM are national commands that are focused on multiple domains and also have their own command and control structures.[118] As Ms. Charron noted, some experts believe that this Tri-Command structure is too complex and should be refined and perhaps even merged into a single bi-national North American defence command and control structure that would be responsible for all domains and that NORAD should serve as the model.[119]

This question is also being considered by military authorities in both Canada and the U.S., beginning with those at NORAD. As Lieutenant-General St-Amand told the Committee, "as we look at the future under Tri-Command, we are now starting to challenge ourselves with questions such as whether the aerospace domain is sufficient to defend North America or whether we should think about going into a binational as opposed to

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114 Information obtained during NDDN visit to NORAD Headquarters, 2-3 May 2016. See also NDDN, *Canada and the Defence of North America*, pp. 52-56.

115 NDDN, *Canada and the Defence of North America*, pp. 50-52, 56-57.

116 NDDN, *Evidence*, 1st Session, 42nd Parliament, 21 April 2016 (Andrea Charron).

117 Ibid.

118 NORAD, "Evolution of North American Defense and the Modernization of NORAD," brief presented to NDDN, NORAD Headquarters, Colorado Springs (Colorado, U.S.), 2 May 2016.

119 NDDN, *Evidence*, 1st Session, 42nd Parliament, 21 April 2016 (Andrea Charron).

bilateral approach" in the maritime, land and other domains, which currently fall under the responsibility of CJOC and USNORTHCOM.[120] While staff work is undertaken in order to develop options and recommendations for civilian authorities, it is those authorities in both countries that must make the decision to proceed with any such evolution.

As the Committee learned during its visit to NORAD headquarters, many officials within NORAD believe that the time is right for NORAD to expand into other domains. Admiral William E. Gortney, who was at the time Commander of NORAD and USNORTHCOM (General Lori Robinson assumed command of NORAD and USNORTHCOM from Admiral Gortney on 13 May 2016),[121] and other senior NORAD officials suggested to the Committee that the current Tri-Command structure may not be the best way to defend North America from a command and control perspective. In their view, having multiple commands defending North America against multiple threats and multiple approaches in multiple domains creates a "unity of action challenge." The best way to defend the American and Canadian homelands and "yield unity of effort," NORAD authorities explained, would be through "unity of command." What Admiral Gortney envisions is an integration of the Tri-Command structure and an alignment of plans into a single "bi-national command with multi-domain authorities." In other words, a single bi-national commander with a single bi-national command and control structure would be responsible for the defence of North America.[122] In his opinion, doing this would not be particularly costly and would considerably improve the North American defence command and control situation.[123]

Admiral Gortney enumerated three options moving forward. The first would be to retain the status quo. The second would be to create a bi-national Joint Task Force – North American Defense that both Canada and the U.S. could temporarily stand up when needed in times of emergency. The third and preferable option, according to Admiral Gortney, would be to create a permanent North American Defense Command. Political approval for the project would, however, need to be obtained from both the American and Canadian governments. Admiral Gortney told the Committee that these options would be presented to the joint Canada-U.S. Permanent Joint Board on Defence shortly for discussion up through each country's political chain of command. However, he stated that a decision should not be rushed and should wait until after Canada finalized its defence policy review and the 2016 U.S. presidential election was over.[124]

Admiral Gortney held the view that the new North American Defense Command construct should only include the air, space, maritime and land domains. The cyber domain, he stated, should be excluded on the grounds that the policy framework is not mature enough at this stage in terms of international cooperation between Canada and the

120 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand).

121 NORAD, "NORAD News: Gen. Robinson Assumes Command of NORAD, USNORTHCOM," 13 May 2016.

122 NORAD, "Evolution of North American Defense and the Modernization of NORAD," brief presented to NDDN, NORAD Headquarters, Colorado Springs (Colorado, U.S.), 2 May 2016.

123 Ibid.

124 Information provided during NDDN visit to NORAD Headquarters, 2 May 2016.

U.S.[125] At the moment, the two countries conduct cyber defence very differently. Moreover, responsibility for cyber security in each country is largely coordinated by other federal government organizations, namely Public Safety Canada in Canada and the Department of Homeland Security in the U.S. NORAD, in turn, is only responsible for the protection of its own systems from cyber threats, including the threat from electromagnetic pulses. Lieutenant-General St-Amand echoed Admiral Gortney's view that the cyber domain should not be included in any future evolution of NORAD. "Cyber is very complicated," he indicated. "I am not sure that we could reach a binational [agreement] on cyber, other than just co-operation and the exchange of information. We're still probably not mature enough to envisage a continental defence against cyber. It is very national in nature, and there are a lot of sensitivities."[126] Asked if NORAD should eventually expand into the cyber domain, he responded that "it should be in our mandate only if we think there are benefits to the continental approach. I assume that it could be developed, eventually, but for the moment, it is a bridge that is yet to be crossed and that will take a lot of work. For the moment, I would say no."[127]

Lieutenant-General Bowes emphasized to the Committee that the CAF is a learning organization that strives to always question its procedures in the search for a better solution. At the same time, he underlined that there is a lot of work that would need to be done before NORAD could actually expand into other domains or even merge with CJOC and USNORTHCOM to form a new multi-domain North American Defense Command. He explained that "there are a lot of questions that need to be answered" and "a lot of things that need to be teased out," as the maritime and land domains currently do not have "well-defined terms of reference" in the way the aerospace domain does under the NORAD construct. Work still needs to be done to ensure that the maritime and land components can function in the same bi-national way as the aerospace component, Lieutenant-General Bowes said. The whole process is still in its early stages, he explained, and "whether we do this" or not remains to be determined. That being said, he believed that "there is great value in continuing to explore it if … the outcome is that it makes us better at doing what we do today."[128]

Whatever course of action is adopted in the future with regards to NORAD expansion and modernization, Rear-Admiral Bishop reassured the Committee that the CAF will "keep a very close eye on any effort by NORAD that looks at modernizing or changing the way they do business to make sure that Canada's sovereignty concerns are kept first and foremost in those discussions."[129] But protecting Canada's sovereignty is not the only issue that will need to be resolved. According to Andrea Charron, expanding NORAD into multiple domains and adding more missions to it will come "at an incredible cost." In her view, Canada would "have to make some tough decisions" in the future if "we're obligated to defend Canada and to defend North America" under a multi-domain

125 Ibid.

126 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand).

127 Ibid.

128 NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (Lieutenant-General Stephen Bowes).

129 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Rear-Admiral Scott Bishop).

NORAD, which means that "anything else," such as participation to NATO operations or military deployments overseas, will have to come "after those two missions have been achieved."[130] Moreover, as Christopher Sands emphasized, there will also be a need to enhance the coordination and interoperability of North American defence resources and assets with any expansion of NORAD into the maritime, land or other domains. In his view, great efforts will have to be made to ensure that the armies, navies and coast guards of Canada and the U.S. can work together in a more coordinated way for the defence of North America.[131]

Investing in Cruise Missile Defence

During the course of this study, the Committee heard that Canada and the U.S. possess limited defence capabilities against advanced cruise missiles and that this constitutes, according to certain witnesses, a serious gap in the aerospace defence of North America.[132] It should be noted that cruise missile defence is separate from ballistic missile defence. Unlike ballistic missiles, whose flight trajectories usually takes them outside of the atmosphere, cruise missiles are air-breathing weapon systems and always remain within the atmosphere. As such, measures to detect and engage cruise missiles are very different from those designed for ballistic missiles.[133] Moreover, responsibility for ballistic and cruise missile defence falls to different organizations. NORAD is responsible for cruise missile defence, whereas ballistic missile defence of the U.S. is achieved through USNORTHCOM. In other words, cruise missile defence in North America is done bi-nationally whereas ballistic missile defence is not. The U.S. BMD system, which has been set up to defend the U.S. from limited ballistic missile attack, has no capability to engage cruise missiles.[134]

The Committee did receive some information confirming that Canada and the U.S. are in possession of cruise missile defence capabilities.[135] The Committee learned that Canada does possess some capability against cruise missiles, but that details are classified. "There is a capacity for the Canadian [Armed] Forces to conduct some form of defence against cruise missiles," emphasized Rear-Admiral Bishop.[136] However, Ms. Charron pointed out that "based on unclassified information," her understanding is that "there is very little" cruise missile defence capability in Canada.[137]

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130 NDDN, *Evidence*, 1st Session, 42nd Parliament, 21 April 2016 (Andrea Charron).

131 NDDN, *Evidence*, 1st Session, 42nd Parliament, 21 April 2016 (Christopher Sands).

132 NDDN, *Evidence*, 1st Session, 42nd Parliament, 12 April 2016 (Elinor Sloan).

133 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Rear-Admiral Scott Bishop); NDDN, *Evidence*, 1st Session, 42nd Parliament, 21 April 2016 (Andrea Charron).

134 NORAD, "USNORTHCOM Ballistic Missile Defense Operations by Mr. Steve Allen," brief presented to NDDN, NORAD Headquarters, Colorado Springs (Colorado, U.S.), 3 May 2016.

135 NDDN, *Evidence*, 1st Session, 42nd Parliament, 21 April 2016 (Andrea Charron).

136 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Rear-Admiral Scott Bishop).

137 NDDN, *Evidence*, 1st Session, 42nd Parliament, 21 April 2016 (Andrea Charron).

Several witnesses stated that the North Warning System, a network of 11 long-range and 36 short range radar stations located in the Arctic, which is reaching the end of its operational life,[138] has some limited capabilities for cruise missile detection.[139] Elinor Sloan also believes that U.S.-owned AWACS aircraft operated by American and Canadian crews around North America have a cruise missile detection capability.[140] As noted earlier, however, the problem is that new generation cruise missiles, such as the Russian Kh-101 and Kh-102, are much more advanced and sophisticated than their predecessors and can be launched from both air and naval platforms. They are long-ranged, can achieve very high speeds, are difficult to detect by radar because they fly low to the ground, and are extremely precise. This constitutes a problem from a North American defence perspective.[141] As NORAD officials pointed out, the very long range of the Kh-101 and Kh-102 means that Russia could launch any of them against North America from its own territory across the Arctic.[142]

Asked how Canada can best contribute to the defence of North America with respect to cruise missiles, David Perry responded:

> I think the best way to respond against them is by participating fully and upgrading the North Warning System to enhance our ability to project further north into our Arctic with our intelligence, surveillance, and reconnaissance assets, and to acquire some new ones to give us a better picture. We must make sure that we move forward quickly with acquiring a new fighter aircraft that has the capabilities to respond to Russian aircraft that can fire cruise missiles towards Canada from greater distances than the current set of arrangements were designed to defend against.[143]

Ms. Sloan took the argument further:

> To defend against that, you would need to have a detection capability, which could involve AWACS, could involve the F-35, which I believe has a detection capability against cruise missiles, and could involve land-based sensors.… Potentially the RADARSAT Constellation [satellites] could look down and detect cruise missiles. RADARSAT Constellation is designed to detect ships and so is much more powerful than a satellite higher up; thus it could potentially detect cruise missiles. Also, unmanned aerial vehicles [such as the] Global Hawk ... can detect cruise missiles. If you are looking for persistent surveillance, then you're looking at satellites, high-altitude unmanned aerial vehicles, or a land-based system.[144]

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138 "North Warning System Replacement" project in DND, "Aerospace Systems," *Defence Acquisition Guide 2016*; DND, "All Domain Situational Awareness S&T program," 5 May 2016.

139 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Rear-Admiral Scott Bishop); NDDN, *Evidence*, 1st Session, 42nd Parliament, 12 April 2016 (Elinor Sloan).

140 NDDN, *Evidence*, 1st Session, 42nd Parliament, 12 April 2016 (Elinor Sloan).

141 Ibid.

142 NORAD, "NORAD Operations," brief to NDDN by Major-General Christopher J. Coates (Director of NORAD Operations), NORAD Headquarters, Colorado Springs (Colorado, U.S.), 2 May 2016.

143 NDDN, *Evidence*, 1st Session, 42nd Parliament, 5 May 2016 (David Perry).

144 NDDN, *Evidence*, 1st Session, 42nd Parliament, 12 April 2016 (Elinor Sloan).

Asked if ground-based cruise missile detectors and interceptors on Canadian soil might augment Canada's protection against cruise missiles, Ms. Sloan responded the following: "Yes, a ground-based detection system would help. It's a matter of where you locate them. We have in the past had air defence systems located on the east and west coasts. I believe they have been de-commissioned. Ground-based systems based in northern parts of Canada in specific locations would help."[145] In her view, the Arctic would be a good location to establish cruise missile detection and interception sites, in light of the fact that Russian long-range military aircraft and submarines capable of launching cruise missiles regularly operate in that region.[146]

NORAD is currently looking at ways to enhance its cruise missile defence capabilities and is working closely with other American and Canadian partners to examine new technologies that would allow it to provide persistent surveillance and detection of cruise missiles around North America, including in the Arctic.[147] NORAD also informed the Committee that it would like to extend the ADIZ higher north in order to better respond to the threat posed by modern long-range cruise missiles. At the moment, the position of the ADIZ is tied to the range of the aging North Warning System, which is expected to be replaced in the coming years.[148]

Revisiting Canada's Non-Participation in Ballistic Missile Defence

During the course of this study, several witnesses raised the issue of Canada's non-participation in ballistic missile defence (BMD) in cooperation with the U.S. It need be noted that because NORAD is already actively engaged in ballistic missile detection, the issue of participation in ballistic missile defence had been, and continues to be, raised in the NORAD context.

In 2004, the American and Canadian governments agreed to allow ballistic missile warning information from NORAD to be provided to USNORTHCOM for use with the U.S. limited BMD system. While Canada also entered into discussions with the U.S. about potential participation in the U.S. BMD system, it decided not to do so in 2005. This decision was based on several factors, including the impact of the system on the global security environment, questions about its effectiveness, and its cost relative to other needs. Although Canada opted out of the U.S BMD program, there has been renewed debate in recent years on whether or not Canada should revisit this decision. Several defence experts, in fact, believe that Canada should re-examine its 2005 decision and

145 Ibid.

146 Ibid.

147 Senate Armed Services Committee (U.S.), "Statement of Brian P. McKeon, Principal Deputy Under Secretary of Defense for Policy," 13 April 2016.

148 Information provided during NDDN's visit to NORAD Headquarters, 2 May 2016.

re-consider participation in BMD with the U.S. They maintain that Canada's current non-participation in BMD is detrimental to the defence of North America.[149]

It is clear that the defence policy review will revisit Canada's 2005 decision not to participate with the U.S. in BMD. In its *Defence Policy Review Public Consultation Document* released in April 2016, DND raised a number of questions related to BMD: "Should this decision [of 2005] be revisited given changing technologies and threats? Would a shift in policy in this area enhance Canadian national security and offer an avenue for greater continental cooperation? Or are there more effective areas in which to invest to better protect the North American continent?"[150] Several witnesses offered their views on the subject during the Committee study, and did so in spite of the fact that it did not convene formal panels specifically on BMD. While several witnesses believed Canada should join the U.S. BMD system, others did not share that position.

It is, however, important to note that although Canada does not participate in the U.S. BMD system itself, it is nonetheless involved in the detection of ballistic missiles through NORAD, which then feeds into that system. As Rear-Admiral Bishop explained:

> For surveillance of North American approaches from ballistic missiles and from cruise missiles, again, we operate in NORAD headquarters. We have Canadians on the watch floor, and despite the fact that we don't participate in North American ballistic missile defence, our officers on the floor are not excluded from conducting surveillance and warning of airspace. NORAD has the capacity to detect ballistic missile launches from other countries.… [NORAD] does have the capacity for ballistic missile surveillance.[151]

USNORTHCOM is responsible for the BMD system and the Commander of USNORTHCOM, who is also Commander of NORAD, would take the decision to engage any hostile inbound ballistic missile. This would be a unilateral U.S. decision. In the current system, Canadians would not take part in that process and would only act as silent observers.

The U.S. BMD system was specifically developed to counter a limited ballistic missile threat from rogue states, particularly North Korea, which explains why its ground-based interceptors, or GBIs, are strategically located at Fort Greely Air Force Base in Alaska and Vandenberg Air Force Base in California. The system was not developed to counter the extended ballistic missile capabilities of global powers, such as China or Russia. The BMD system comprises the two above-mentioned GBI sites as well as fire control sites, satellites, radar stations, and other assets.[152] The system currently consists of about 30 interceptors controlled by the U.S. and located on its territory, with the goal

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149 For example, see NDDN, *Canada and the Defence of North America*, pp. 61-64; Standing Senate Committee on National Security and Defence, *Canada and Ballistic Missile Defence: Responding to the Evolving Threat*, June 2014, pp. 1-21.

150 DND, *Defence Policy Review Public Consultation Document 2016*, p. 13.

151 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Rear-Admiral Scott Bishop).

152 NORAD, "USNORTHCOM Ballistic Missile Defense Operations by Mr. Steve Allen," brief presented to NDDN, NORAD Headquarters, Colorado Springs (Colorado, U.S.), 3 May 2016.

being to increase this number to 44 by 2017.[153] The Committee was told during its visit to NORAD headquarters that it cost approximately US$45 billion to develop the BMD system. The system is an expensive one, and ballistic missiles themselves are less expensive than the system developed to destroy them. As Admiral Gortney told the U.S. Senate's Armed Services Committee:

> We need to invest in the lethality of our kill vehicles, and in ways to get us to the right side of the cost curve. Our adversaries are developing relatively inexpensive technologies, which we assess can reach the homeland. By contrast, our interceptors are vastly more expensive. Today, our [Ballistic Missile Defense System] is in an unsustainable cost model, which has us postured to shoot down inexpensive rockets with very expensive ones.[154]

USNORTHCOM officials explained that the cost of a single GBI missile is approximately US$75 million. Moreover, replacing a GBI with a new one after it has been launched can take time, as the launch silos require refurbishment and a new GBI must be ordered, produced and delivered from a factory. This means that for a short period of time following a GBI launch, there is diminished capacity within the BMD system. This situation explains why the U.S. is currently working to refine its system and produce less complicated and less expensive GBIs.[155] USNORTHCOM officials emphasized the fact that over the past decade, the BMD system has "significantly improved" its capability to shoot down a ballistic missile. However, while the mission of the BMD system is to "engage and destroy limited intermediate and long-range ballistic missile threats in the mid-course battle space to protect the U.S. homeland,"[156] USNORTHCOM officials told the Committee that the system currently has no capability to hit a hostile ballistic missile in its so-called "boost phase" (i.e. when it is launched). However, the Americans are working to find a solution and ensure that the system is capable of doing so in the future.[157]

During its visit to NORAD headquarters, the Committee heard that currently, there is no plan for an official U.S. government invitation for Canada to join the BMD system in the future. However, should Canada wish to join, it was suggested that the U.S. would be open to the discussion.[158]

Although senior NORAD officials did not comment on whether Canada should or should not participate in the U.S. BMD system, they indicated that if Canada joined, this

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153 NDDN, *Evidence*, 1st Session, 42nd Parliament, 12 April 2016 (Elinor Sloan).

154 Senate Armed Services Committee (U.S.), "Statement of Admiral William E. Gortney (United States Navy) – Commander, United States Northern Command and North American Aerospace Defense Command," 10 March 2016.

155 Information obtained during NDDN visit to NORAD Headquarters, 2 and 3 May 2016.

156 NORAD, "USNORTHCOM Ballistic Missile Defense Operations by Mr. Steve Allen," brief presented to NDDN, NORAD Headquarters, Colorado Springs (Colorado, U.S.), 3 May 2016.

157 Information obtained during NDDN visit to NORAD Headquarters, 2 and 3 May 2016.

158 Ibid.

would facilitate operations and processes from a command and control perspective. Lieutenant-General St-Amand, for example, provided the following three observations:[159]

> First, there are the ballistic missiles.… Some countries, notably North Korea, are working very hard to develop the capacity to attack North America. So ballistic missiles are here to stay. I think this is a threat that will continue to exist.
>
> The second thing I have observed is this. In terms of the approaches in North America, command and control are a little complicated in Colorado Springs [NORAD and USNORTHCOM headquarters]. NORAD is responsible for assessing an attack or identifying a missile that might approach North America. The Canadians can tell NORAD that it is an attack on North America, but as soon as a decision is made, or a missile is identified, the defence is entirely up to the Americans [through USNORTHCOM].… If the missile came back into the atmosphere, NORAD would again be responsible for determining whether there is a nuclear explosion. For NORAD and NORTHCOM, the command and control are complicated.… If we were part of the missile defence shield, that would enable the binational commands to simplify command and control for that threat.
>
> The third thing I have observed is this. Given that Canada is not part of the system, it does not have access to the technology or to the strategy and planning, and it certainly has no influence on the decisions made.… The United States doesn't have a need to share, and we don't have a right to know. Anything we have, we have out of good will. Certainly they cooperate with us. We have been very close allies for a long time, but we simply are not part of that mission.[160]

Based on those three observations, Lieutenant-General St-Amand is of the opinion that Canada's decision not to participate in BMD with the U.S. is "an important matter to revisit," especially in light of the ongoing defence policy review.[161] Rear-Admiral Bishop expressed a similar point of view, stating that the question of Canadian participation in the U.S. BMD system is one that the Canadian government should "consider or talk about in the defence policy review."[162]

Several witnesses believe that Canada should revisit its 2005 decision not to participate in the U.S. BMD system. According to Elinor Sloan, Canada's current position entails certain risks from a national and continental security standpoint. She said:

> The risk in not being part of ballistic missile defence is that we don't have a say in a decision whether to strike down a ballistic missile.… There's that risk, but there is another risk that I think is even more likely, and that is when we're cut out of information.[163]

In her view, the international security situation has changed to such an extent over the past decade that Canada should revisit its decision not to participate in BMD. North Korea, she emphasized, emerged as a nuclear power in 2006 and is now aggressively pursuing a ballistic missile capability aimed at North America. Asked if Canada has the level of

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159 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand).

160 Ibid.

161 Ibid.

162 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Rear-Admiral Scott Bishop).

163 NDDN, *Evidence*, 1st Session, 42nd Parliament, 12 April 2016 (Elinor Sloan).

protection it needs from ballistic missiles right now, Ms. Sloan responded: “No, I don’t think so. I think we should be part of the response component of ballistic missile defence. We're already part of the detection component, but I think we should be part of the response part.”[164]

Christopher Sands shared a similar view, challenging the popular assumption that the U.S. would shoot down a ballistic missile if it were coming towards Canada, even if Canada was not a participant in BMD. In his words:

> I think sometimes we imagine the missile defence system as infinite ammunition, and if a missile is coming in we can just keep firing and knocking those missiles down. Even in the United States the reality is we have a limited number of bullets in the gun, if you will. We have a limited number of shots ... we don't want a situation where the United States is investing to put in missile defences to protect Americans and Canadians, and they have to make a choice. If Canada doesn't participate in the system, and because Canada isn't adding bullets to the gun, the U.S. has to make a choice between protecting Los Angeles or Vancouver from a North Korean missile.[165]

James Fergusson agreed:

> Canada cannot and should not expect the United States to defend Canada, for a variety of strategic and political reasons. Legally, U.S. Northern Command, responsible for the ground-based system, is only mandated to defend the United States and cannot be expected to expend one or more interceptors to save a Canadian city, unless its potential target may directly impact, via the blast or radiation effect, an American location.… In failing to defend ourselves, Canada places American decision-makers in a horrible moral dilemma of expending an interceptor to save Canadian lives, but in so doing potentially undermining the ability of the United States to defend itself.[166]

In Mr. Fergusson’s view, Canada should reconsider its non-participation in the U.S. BMD system. And he believes that “any decision regarding whether Canada should or should not acquire its own missile defence capability requires the government to obtain as much information as possible about the U.S. system.” In his view, Canada will need to “contribute a meaningful capability of value in order to truly participate with the United States in the missile defence of North America,” which could include financial resources, personnel and possibly setting up “a tracking radar or a full-fledged interceptor site” on Canadian soil.[167]

Joel Sokolsky expressed his opinion that it “would be preferable to be integrated” in the U.S. BMD system from a sovereignty and security standpoint:

> I think it's a piece of North America that we are not fully participant in … It's a question of attitude and altitude. For some reason we're willing to participate in the air-breathing protection, but not in protection from a weapon which, because of its trajectory, exits the

164 Ibid.

165 NDDN, *Evidence*, 1st Session, 42nd Parliament, 21 April 2016 (Christopher Sands).

166 NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (James Fergusson).

167 Ibid.

> atmosphere. We're willing to support a ballistic missile defence for allies in Europe, but not participate fully in our own defence.[168]

Mr. Sokolsky believed that if Canada chose to participate with the U.S. in BMD, its contribution would mainly consist of financial and human resources. As he explained:

> As for Canada's participation – certainly it would not build interceptors of its own and deploy them – it could mean a financial contribution to the American program, or it could mean having Canadians directly involved at some of the sites in Alaska. If new sites are put up, on the U.S. east coast in particular, you could have Canadian presence there, just as you have Canadian exchange officers at various commands in the United States. You have Canadians operating at some of the U.S. air defence bases.[169]

Few witnesses believed, however, that there would be significant economic, industrial and technological benefits for Canada in joining BMD at this stage, as the system is already up and running. "I think at this stage some of the benefits that had been talked about [in 2005], potential industrial benefits from getting involved and helping to build the systems, those have largely passed," explained Christopher Sands.[170] That being said, some witnesses noted that there might be benefits for Canada in the future should the U.S. decide to modernize and/or expand the system to include the east coast of North America, to have a capability against ballistic missiles launched from the Middle East or elsewhere. Canada, as a joint partner, could then secure important research and development as well as industrial, economic and technological benefits, if radars or interceptor sites were to be located on Canadian soil. Mr. Sokolsky suggested that:

> If the U.S. does go forward with some sort of east coast system, this provides the opportunity for Canada to jump in and say, "Well, we're willing to participate in this system, either by putting sensors in Canada, or by helping financially and with staffing on those systems." It's a non-technological opening, but if the U.S. were to move forward with an east coast system … this would then provide the opportunity for Canada to step in and contribute. It really depends on what they're going to do.[171]

Mr. Sands concurred. "On the security side getting involved now still allows you to be part of the [BMD] system and part of the development of the next generation of that system," he said, adding that "there are always new technologies coming forward … that may give you [Canada] a second opportunity at some of those [economic and industrial] benefits."[172] This underscores Committee discussions in Colorado Springs with USNORTHCOM officials about the ongoing search for new technologies.[173]

Several other witnesses expressed opinions in favour of Canadian participation in BMD with the U.S., including David Perry as well as Charles Doran, Professor of

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168 NDDN, *Evidence*, 1st Session, 42nd Parliament, 21 April 2016 (Joel Sokolsky).

169 Ibid.

170 NDDN, *Evidence*, 1st Session, 42nd Parliament, 21 April 2016 (Christopher Sands).

171 NDDN, *Evidence*, 1st Session, 42nd Parliament, 21 April 2016 (Joel Sokolsky).

172 NDDN, *Evidence*, 1st Session, 42nd Parliament, 21 April 2016 (Christopher Sands).

173 Information obtained during NDDN visit to NORAD Headquarters, 2 and 3 May 2016.

International Relations at John Hopkins University, and Rob Huebert, Professor of Political Science at the University of Calgary.[174] For instance, when asked in what capacity Canada should be considering participation in BMD and cruise missile defence, Mr. Huebert responded that "it's almost to the point of being a no-brainer." He added:

> When we look at missile proliferation, when we look at the technologies that are now being developed [for example, hypersonic cruise missiles in China and Russia].… To pretend that these type of technologies are not being developed with countries that have very different interests from Canada is just simply sticking our head in the snow, to be honest. Therefore, any type of participation, first and foremost with the Americans, is a complete essential to Canadian security.[175]

A number of witnesses were of the opinion that if, after consideration, Canada decided to maintain the status quo, its decision to do so would not significantly affect Canada-U.S. defence relations. "My judgment is that things will go on about as they have here," said Mr. Doran.[176] Canada is a "good ally," noted Mr. Sands, and the U.S. is going to react well to whatever decision the Canadian government takes. The Canadian decision would certainly cause some frustrations in the U.S, Mr. Sands explained, but "it doesn't mean that the fundamental relationship between United States and Canada breaks down."[177] Mr. Sokolsky agreed, noting that "the future of NORAD really doesn't depend on whether we participate in ballistic missile defence or not.… The United States would prefer, would welcome, Canadian participation, but it isn't a deal breaker as far as NORAD is concerned."[178] However, James Fergusson warned that while, "under current circumstances, whether Canada participates or not will have no significant impact upon the NORAD relationship, Canada-U.S. defence relations in general, and the Canada-U.S. relationship as a whole," this could change if the U.S. eventually "comes to the conclusion that Canadian participation, or, more accurately, Canadian territory becomes vital to the missile defence of the United States." In his view, "a failure by Canada to participate will have a major impact on the relationship and the future of NORAD."[179]

However, some witnesses were of the opinion that Canada should not reconsider its position on BMD. Peggy Mason, a former Canadian Ambassador for Disarmament who is President of the Rideau Institute on International Affairs, firmly urged Canada not to participate in the U.S. BMD system. In her view, it is "not in Canada's defence and security interests to pursue participation in the American ballistic missile defence program for North America at this time." She enumerated "six reasons why Canadian participation in U.S. BMD for North America should not be a Canadian priority."[180]

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174 NDDN, *Evidence*, 1st Session, 42nd Parliament, 21 April 2016 (Charles Doran); NDDN, *Evidence*, 1st Session, 42nd Parliament, 5 May 2016 (David Perry); NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (Robert Huebert).

175 NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (Robert Huebert).

176 NDDN, *Evidence*, 1st Session, 42nd Parliament, 21 April 2016 (Charles Doran).

177 NDDN, *Evidence*, 1st Session, 42nd Parliament, 21 April 2016 (Christopher Sands).

178 NDDN, *Evidence*, 1st Session, 42nd Parliament, 21 April 2016 (Joel Sokolsky).

179 NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (James Fergusson).

180 NDDN, *Evidence*, 1st Session, 42nd Parliament, 5 May 2016 (Peggy Mason).

> One, the American BMD system … is not reliable, despite … billions of dollars spent. Two, strategic BMD is a spur for Russia and China to build ever more and better offensive systems in order to overwhelm these defences in case they should ever work and be directed at them. It is infinitely cheaper to build more offensive systems. In other words, BMD has very negative security implications. Three … there is no military threat to Canada from either North Korea or Iran.... Four, there is very little likelihood that Canadian participation in missile defence would give Canada the much sought-after seat at the BMD table.... Five, the fact that European members of NATO are participating in … theatre missile defence and regional missile defence is an issue that is entirely separate from whether Canada should participate in a strategic system that does not work for North America.… Six, there will be significant financial costs to Canadian BMD participation at a time … when the Department of National Defence is facing a veritable abyss of delayed procurement, not to mention a major modernization of the North Warning System in about 10 years.[181]

Michael Byers, Professor of Political Science at the University of British Columbia, was also against Canadian participation in BMD, saying that: "We don't need to join U.S. missile defence because the threat, relatively speaking, does not top out on that [Canada's defence] priority list, and the cost of joining is likely to be prohibitively high."[182]

In Mr. Byers' opinion, participating in BMD should be "way down the list" in terms of priorities considering Canada's limited defence budget and the need to recapitalize the CAF with new jet fighters, warships, military trucks and other systems in coming years.[183] Adam Lajeunesse, Postdoctoral Fellow at St-Jerome's University, expressed a similar view, arguing along Mr. Byers that in terms of priorities, emphasis should be placed on the recapitalization of Canada's navy and air force. "Missile defence," he stated, "will be toward the bottom end of that priority list."[184] Andrea Charron also believed that participation in BMD should be "fairly low" in "terms of prioritizing threats and investments."[185]

It is clear from the above-mentioned testimony and comments that some Canadian experts differed on the question of whether or not Canada should participate in BMD with the U.S. However, the Committee recognizes that much has changed on the world stage since the Canadian government last made its decision not to join the U.S. BMD system in 2005. The emergence of a nuclear-armed North Korea aggressively engaged in the development of ballistic missiles capable of reaching North America is a new reality that did not exist a decade ago. It was suggested to the Committee during its visit to NORAD headquarters that the ongoing defence policy review provides a timely opportunity to engage with the U.S. in order to gain a better understanding of the BMD system and how Canada could possibly participate if it decided to do so.[186]

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181 Ibid.

182 NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (Michael Byers).

183 Ibid.

184 NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (Adam Lajeunesse).

185 NDDN, *Evidence*, 1st Session, 42nd Parliament, 21 April 2016 (Andrea Charron).

186 Information obtained during NDDN visit to NORAD Headquarters, 2 and 3 May 2016.

Overall, NORAD has proven its central role in the defence of Canada and the U.S. over the decades. Although the potential threats to North America have changed over the years, NORAD has proven adaptable when faced with them.

STRENGTHENING THE ROYAL CANADIAN AIR FORCE

The RCAF and Aerial Readiness

The RCAF is the air component of the CAF. Like the Canadian Army and the Royal Canadian Navy, the RCAF is often referred to as a "force generator" within the CAF. As such, it is responsible for organizing, training, and equipping forces that are generally employed operationally by other organizations, such as the operational commands of the CAF (CJOC and Canadian Special Operations Forces Command, or CANSOFCOM) and NORAD. As "force employers," CJOC, CANSOFCOM, and NORAD essentially "employ" the forces organized, trained and equipped by the "force generators" (army, navy and air force) and direct them on operations at home and abroad.[187]

The RCAF consists of approximately 18,000 men and women, which includes both Regular and Reserve Force members of the CAF as well as civilians.[188] It is made up of 14 Wings located across Canada,[189] all of which report operationally to 1 Canadian Air Division / Canadian NORAD Region headquarters in Winnipeg, Manitoba. RCAF Wings conduct air operations under the direction of 1 Canadian Air Division, which is responsible for the operational command and control of all air force assets. It acts as the "source of air power" provided by the RCAF to the operational commands of the CAF and NORAD.[190] According to Lieutenant-General Hood, the "air power capabilities" of the RCAF "must be available to the government whenever needed, on a daily basis, 24 hours a day, 365 days a year," adding that this is achieved through the "education, training and commitment" of its personnel.[191]

Defending Canada and Canadians is the number one priority of the RCAF. Lieutenant-General Hood told the Committee that "this requires that the RCAF is aware of any potential hostile activity occurring within Canadian territory, ready to protect all of the approaches to it, able to effectively deter threats, and able to respond to contingencies anywhere in the country, from hurricanes in the Maritimes, to floods on the prairies or

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187 NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood); NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand); DND, "Royal Canadian Air Force (RCAF): Overview" and "RCAF: Operations."

188 NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood).

189 1 Wing in Kingston, Ontario; 2 Wing (RCAF Air Expeditionary Wing) and 3 Wing in Bagotville, Quebec; 4 Wing in Cold Lake, Alberta; 5 Wing in Goose Bay, Newfoundland and Labrador; 8 Wing in Trenton, Ontario; 9 Wing in Gander, Newfoundland and Labrador; 12 Wing in Shearwater, Nova Scotia; 14 Wing in Greenwood, Nova Scotia; 15 Wing in Moose Jaw, Saskatchewan; 16 Wing in Borden, Ontario; 17 Wing in Winnipeg, Manitoba; 19 Wing in Comox, British Columbia; and 22 Wing (Canadian Air Defence Sector) in North Bay, Ontario. DND, "RCAF: Wings and Squadrons."

190 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand); DND, "RCAF: 1 Canadian Air Division" and "RCAF: Organizational Overview."

191 NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood).

environmental issues in the Arctic."[192] He also emphasized that the RCAF is "tasked by government to provide five principal capabilities." He described these as follows:

> The RCAF is tasked to conduct surveillance and reconnaissance. The situational awareness of Canada's vast land mass, maritime approaches, and airspace is a critical task essential to guaranteeing Canadian sovereignty.
>
> We control our airspace and are ready with the power necessary to act in control of that airspace in the defence of Canada and North America, or when deployed on NATO or coalition operations.
>
> That power to act leads to our capability to attack as required, based on the assigned mission. This controlled use of force, when our government chooses to use it, is a key aspect of military air power, distinct from civil resources.
>
> We also provide air mobility for personnel, equipment, and systems to be deployed anywhere in Canada or around the world as part of Canadian Armed Forces missions and in support of other government departments. We enable the government to reach far and fast, thereby contributing to Canada's reputation as a valuable international player.
>
> Last, we provide critical support capabilities, whether to joint operations with our sister services, or to civil authority in the form of humanitarian aid or essential search and rescue missions.[193]

One of the principal ways in which the RCAF contributes to the defence of Canada and North America is through its contribution to NORAD. "Canada contributes financial resources, physical assets, and personnel to NORAD, and commands one of three NORAD regions, the Canadian NORAD Region, out of our RCAF operational headquarters in Winnipeg," reported Lieutenant-General Hood. The witness added that "Canadian NORAD Region maintains [CF-18] fighter and [CC-150 Polaris and CC-130 Hercules] tanker aircraft on alert, operates and maintains the Canadian portion of the North Warning System … radar chain in the north, and operates four Forward Operating Locations to support fighter operations in the Arctic."[194]

However, NORAD is not the only important mission through which the RCAF contributes to the security of Canada and Canadians. The RCAF, for example, also has "primary responsibility for aeronautical search and rescue" in Canada. It should be noted that search and rescue in Canada is a whole-of-government affair and responsibilities are shared among federal, provincial, and territorial governments. For instance, ground search and rescue is conducted under the legal authority of the provincial and territorial governments. The Royal Canadian Mounted Police (RCMP) is the "operational authority" for ground search and rescue in most of Canada. The Canadian Coast Guard, in turn, has the primary responsibility for maritime search and rescue services and the RCAF for aeronautical search and rescue services.[195]

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192 Ibid.

193 Ibid.

194 Ibid.

195 DND, "Search and Rescue Canada" and "RCAF: Operations."

Search and rescue entails a considerable amount of effort and resources for the RCAF and its search and rescue technicians. The Arctic, in particular, poses a complex challenge in that regard because of its enormous size and austere climate and conditions. "Canada's Arctic region is immense," described Lieutenant-General Bowes. "It comprises some 40% of Canada's overall landmass, and 75% of its coastline." Although only 4% of search and rescue incidents occur "north of the 55th parallel," he said, "every one of them is complex just by virtue of the environment." Because search and rescue air assets are located south, where most of Canada's population lives and most search and rescue incidents occur, every search and rescue operation in the Arctic becomes "expeditionary in nature" because of the long distances to cover. "To fly from Winnipeg to the high north is like flying from St. John's, Newfoundland, across the Atlantic," he noted, adding that it can take search and rescue technicians up to eight hours to reach destinations in the Arctic from Winnipeg, Manitoba, in a CC-130 Hercules and about 12 to 16 hours to do the same in a CH-149 Cormorant helicopter.[196] Lieutenant-General Hood informed the Committee that "last year the rescue coordination centres received 9,534 calls for help" and that, "of these, 962 were tasked to the Canadian Armed Forces, resulting in 661 aircraft launches by the RCAF."[197] Providing aeronautical search and rescue is a "no-fail task" that the RCAF "delivers daily to Canadians," he added. The RCAF search and rescue fleets of CH-149 Cormorant and CH-146 Griffon helicopters and CC-115 Buffalo, CC-130 Hercules, and CC-138 Twin Otter fixed-wing aircraft regularly partake in search and rescue operations across Canada.[198]

While "readiness for NORAD and search and rescue operations take precedence," according to Lieutenant-General Hood, the RCAF also conducts a wide range of other missions domestically.[199] For example, its CC-177 Globemaster III, CC-150 Polaris, and CC-130J Super Hercules transport aircraft regularly carry CAF personnel and supplies, providing essential airlift support to Canadian military operations at home and abroad. Its modernized CP-140 Aurora patrol aircraft are routinely engaged in sovereignty and maritime air patrols, which includes surveillance for illegal fishing, drug smuggling, polluters and illegal immigration. Its CH-124 Sea King maritime helicopters regularly deploy from the decks of Royal Canadian Navy warships on naval operations while its fleet of CH-146 Griffon and CH-147 Chinook tactical helicopters provide daily support to Canadian Army units.[200]

The RCAF, however, needs new aircraft and infrastructure to replace some of its aging assets and to ensure its capabilities remain relevant. A few procurement and infrastructure renewal projects are currently underway, but many more are expected to be launched in years to come. It is clear that billions of dollars will need to be invested in the RCAF in the near future, not only to maintain its level of readiness and to ensure that its contributions to NORAD as well as search and rescue operations, in particular, remain as

196 NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (Lieutenant-General Stephen Bowes).

197 NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood).

198 DND, "RCAF: Aircraft."

199 NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood).

200 DND, "RCAF: Overview" and "RCAF: Aircraft."

efficient and successful as can be, but also to enhance its capabilities to respond to any new challenge or threat the international security environment may throw its way. The security of Canada and Canadians depends on it.

The Procurement of New Air Assets

In the course of this study, the Committee heard that there is an urgent need to move ahead with the recapitalization of the RCAF. A number of defence procurement projects are currently underway that are intended to provide the RCAF with new air assets in the future, including 15 fixed-wing search and rescue aircraft to replace the CC-115 Buffalo and CC-130 Hercules as well as 28 maritime helicopters (CH-148 Cyclone) to replace the CH-124 Sea King. Moreover, the RCAF is currently upgrading and modernizing 14 of its 18 CP-140 Aurora patrol aircraft to extend their life until 2030.[201] In 2014, the federal government also announced plans to modernize and upgrade the RCAF's existing fleet of 77 CF-18 jet fighters over the next few years to extend their life expectancy to 2025.[202]

Several witnesses underlined that a number of existing RCAF air assets will need to be replaced in coming years. The RCAF is, in fact, planning to launch numerous military aircraft projects in the near future. It has identified requirements for:

- jet fighter aircraft to replace the CF-18 Hornet;
- multi-mission aircraft to replace the CP-140 Aurora;
- strategic tanker-transport aircraft to replace the CC-150 Polaris;
- utility transport aircraft to replace the CC-138 Twin Otter;
- executive transport aircraft to replace the CC-144 Challenger;
- tactical reconnaissance utility helicopters to replace the CH-146 Griffon; and
- air demonstration aircraft to replace the CT-114 Tutor for the Snowbirds aerobatic team.[203]

In addition, pending delivery of the above-mentioned aircraft, the RCAF expressed a desire to upgrade, modernize and extend the life of several of its existing fixed-wing and

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201 NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood); NDDN, *Evidence*, 1st Session, 42nd Parliament, 5 May 2016 (Patrick Finn); DND, "Status Report on Transformational and Major Crown Projects," *Report on Plans and Priorities 2016-2017*.

202 NDDN, *Evidence*, 1st Session, 42nd Parliament, 5 May 2016 (Patrick Finn); "CF-188 Life Extension 2025" project in DND, "Aerospace Systems," *Defence Acquisition Guide 2016.*

203 For information on these RCAF projects, see the entries "Canadian Multi-Mission Aircraft," "CC-144 Consolidation Project," "Snowbird Aircraft Replacement Project," "Strategic Tanker Transport Capability," "Tactical Reconnaissance Utility Helicopter," and "Utility Transport Aircraft." DND, "Aerospace Systems," *Defence Acquisition Guide 2016*.

rotary-wing aircraft, particularly the Challenger, Griffon, Polaris, Tutor and Twin Otter, as well as the CH-149 Cormorant search and rescue helicopters.[204]

The Replacement of the CF-18 Jet Fighters

Replacing Canada's fleet of CF-18s with a new jet fighter should be the priority, according to many witnesses. Canada purchased its CF-18s in the 1980s, and has been planning to replace them since at least 2008. That year, the federal government announced in the *Canada First Defence Strategy* its intention to acquire "65 next-generation fighter aircraft," to be delivered starting in 2017.[205] In 2010, the government of the day announced that Canada would be acquiring 65 Lockheed-Martin F-35 Lightning II fifth-generation stealth jet fighters, also known as the Joint Strike Fighter (JSF), to replace the CF-18s.[206] Canada has been one of nine international partners actively engaged in the JSF program and the development of the F-35 since 1997.[207]

The government's decision to acquire the F-35 attracted considerable political, media, and public attention. In particular, commentators questioned the necessity of acquiring a fifth-generation stealth fighter for Canada and criticized the government's selection of the F-35, the lack of competitive tendering, the procurement process, and the costs associated with this project as well as the capabilities of the aircraft. Proponents of the program, on the other hand, argued that Canada needed a sophisticated fifth-generation fighter to protect its sovereignty and interests and to respond to an unpredictable future threat environment. They also argued that certain foreign countries – that may challenge Canada militarily in the future – are developing fifth-generation jet fighter aircraft and that the F-35 is the only aircraft that meets RCAF mandatory requirements. They also suggest that this aircraft will facilitate interoperability with allies on international operations, and that Canada is gaining important industrial and technological benefits from its participation in the F-35 program.

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204 NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood); NDDN, *Evidence*, 1st Session, 42nd Parliament, 5 May 2016 (Patrick Finn); NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (Brigadier-General Mike Nixon). For information on those RCAF projects, see the entries "CC-138 Twin Otter Life Extension Project," "CC-144 Consolidation Project," "CC-150 Life Extension," "CH-149 Cormorant Mid-Life Upgrade," "CT-114 Life Extension Beyond 2020," and "Griffon Limited Life Extension." DND, "Aerospace Systems," *Defence Acquisition Guide 2016*.

205 DND, *Canada First Defence Strategy*, 2008, p. 17.

206 DND, "Canada's Next Generation Fighter Capability – The Joint Strike Fighter F-35 Lightning II," 16 July 2010; DND, "Next Generation Fighter Announcement," 16 July 2010.

207 The F-35 program is led by the U.S. and involves eight international partners: Australia, Canada, Denmark, Italy, the Netherlands, Norway, Turkey, and the United Kingdom. Innovation, Science and Economic Development Canada, "F-35 Joint Strike Fighter (JSF) Program;" *Jane's All the World's Aircraft 2015–2016*, IHS Global, 2015, pp. 856-862; Lockheed-Martin, "F-35 Partnership with Canada." In October 2015, it was reported that the Canadian government had spent US$309.3 million on its participation in the program since 1997. David Pugliese, "How Much Has Canada Spent on the F-35 So Far?" *Ottawa Citizen*, 30 October 2015. To date, Canada's participation in the F-35 program has resulted in some $750 million in contracts for Canadian industry, involving more than 110 companies. "Industrial Participation: Canada," and "Canadian Industry Partners," 2016.

When reports released by the Parliamentary Budget Officer and the Auditor General of Canada in 2011 and 2012[208] respectively identified problems with the procurement process and projected life-cycle costs of the 65 F-35s, the federal government put the project on hold and launched a Seven Point Plan to address the procurement issues identified as well as to examine other jet fighter options. Canada, the government emphasized, would not sign a contract to purchase new jet fighters until the Seven Point Plan was completed.[209] The necessary requirements of the plan were largely met by the end of 2014.[210] However, no official decision pertaining to the replacement of the CF-18 had been made by the time the last federal election occurred in 2015.

During her testimony, Elinor Sloan stressed the need to move forward rapidly with the jet fighter replacement, arguing that replacing the CF-18 is "absolutely critical." "I do think that the [replacement] needs to proceed expeditiously," she said. "If the statement of requirements is already done up, then it is possible that we could have an aircraft in place within four years, and certainly by 2025, which is now the end date given on our CF-18s based on their airframe." But "in order to have an aircraft in place by 2025," she emphasized, the replacement process would "need to start very, very soon."[211] A similar perspective was expressed by David Perry.[212]

Although most witnesses agreed that the replacement of the CF-18 needs to be expedited, a number of witnesses commented on the type of capabilities that Canada's future jet fighter must have.

Most witnesses agreed that Canada should prioritize the defence of Canada and North America when looking at capabilities, as these are the two primary missions of the CAF and the new aircraft would have to operate under NORAD. One of the overarching requirements, according to Lieutenant-General Hood, is the need for the new jet fighter to be "seamlessly interoperable with … U.S. Air Force" aircraft and other aerospace systems used by Canada and the U.S. for the NORAD mission. For Canada, he said," being interoperable with the U.S. Air Force is number one," adding that this has been the case since the beginning of NORAD.[213] As he explained:

> I think with the complexity of the signals environment, the way aerial warfare is evolving, interoperability today and into the future will be a very important factor. Your ability to receive information from space-based assets, from AWACS aircraft, from ground-based sensors, from other aircraft, requires a level of interoperability that not every aircraft has

208 Office of the Parliamentary Budget Officer, *An Estimate of the Fiscal Impact of Canada's Proposed Acquisition of the F-35 Lighting II Joint Strike Fighter,* Ottawa, 10 March 2011; Office of the Auditor General of Canada, "Chapter 2: Replacing Canada's Fighter Jets," *Report of the Auditor General of Canada to the House of Commons,* Spring 2012.

209 DND, "Government of Canada announces comprehensive response to Chapter 2 of the 2012 Spring Report of the Auditor General of Canada," 3 April 2012.

210 Government of Canada, *Summary Report – Evaluation of Options for the Replacement of the CF-18 Fighter Fleet*, December 2014; DND, *Next Generation Fighter Capability Annual Update*, December 2014.

211 NDDN, *Evidence*, 1st Session, 42nd Parliament, 12 April 2016 (Elinor Sloan).

212 NDDN, *Evidence*, 1st Session, 42nd Parliament, 5 May 2016 (David Perry).

213 NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood).

> the capability to meet. For example the U.S. Air Force … in the future will be flying the F-22 and the F-35, very complementary [platforms]…. I think in making the choice of aircraft for Canada, that has to be one of the factors … our interoperability today but also 20 and 30 years into the future.[214]

Most witnesses concurred with Lieutenant-General Hood that interoperability with U.S. air assets needs to be a central capability of the new jet fighter that Canada will acquire in the future. Lieutenant-General St-Amand, for example, pointed out that interoperability will be critical if the new aircraft is to be capable of undertaking NORAD missions and operating with other NORAD aircraft and aerospace systems, particularly those owned by the Americans. He said that:

> Interoperability is absolutely critical. When you think of what NORAD does, just image a triangle with fighter aircraft at the tip. That fighter aircraft, of course, is critical to control. This is how we control the airspace. It relies on a system which has platforms, long base radars, airborne early warning which can communicate data link, people that are qualified, the training system, the standards, and so on and so forth. It is better to take a look at the tip as the result of the whole triangle and in the triangle, of course, you have the infrastructure. There's no doubt in my mind that changes may be required no matter what replaces the CF-18. It may or may not be required because it's not only a matter of runway, operation, or base location, it's the whole system here. It involves the sensor to sensor ability to communicate, man-machine interface, the weapons that would be used, and so on and so forth.[215]

He told the Committee that U.S. military authorities, particularly those engaged in NORAD, are very interested in what Canada plans to acquire to replace the CF-18s and are "watching the situation closely."[216] Asked if NORAD had a preference in terms of jet fighter types, Lieutenant-General St-Amand responded that NORAD, as a force employer, is "married to mission requirements" and, as such, is "platform-agnostic." However, he added that NORAD "will be satisfied as long as the plane that replaces the CF-18 has the capacities we need for NORAD missions."[217] And one of those key capabilities, of course, is interoperability. NORAD's Commander, Admiral Gortney, reiterated this point during the Committee's visit to NORAD headquarters.[218]

But as Rear-Admiral Bishop emphasized, the need to be interoperable with U.S. air assets does not only apply to Canada's future jet fighter, but also to other aircraft and aerospace systems that Canada might acquire in years to come. "As we look for … a replacement of some of our current capability for the military," he suggested, "we will be very interested in making sure that we remain able to operate with the United States, both to protect our continent and to work with them and other partners internationally to pursue military operations when the Canadian government decides it needs to do so."[219]

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214 Ibid.

215 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand).

216 Ibid.

217 Ibid.

218 Information provided during NDDN visit to NORAD Headquarters, 2 May 2016.

219 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Rear-Admiral Scott Bishop).

Interoperability offers important operational advantages to the RCAF. According to Rear-Admiral Bishop:

> Being interoperable with the United States to pursue military operations is not surrendering Canadian sovereignty. In fact, it's exactly the opposite. Being interoperable with the United States lets us remain an equal partner because we have capabilities to work shoulder to shoulder with our most important ally. The other benefit of remaining interoperable with the United States is that the United States sets the bar for any military operation of significance around the world. By ensuring that we are very interoperable with the United States, Canada can operate in pretty much any foreign military operation and not only operate but also assume a leadership role, which we have done several times.[220]

Interoperability aside, several witnesses debated whether or not Canada's new jet fighter needed stealth capabilities. While some firmly believed that Canada should acquire a fifth-generation stealth jet fighter, others maintained that a fourth-generation non-stealth aircraft would be more than satisfactory. Aurel Braun, Professor of International Relations and Political Science at the University of Toronto, argued that a fifth-generation platform was essential for Canada, especially in light of the resurgence of Russian long-range military aviation around North America. He said that:

> Deterrence is crucial.… We have to think very hard about what we can do, even with the limited dollars we have. We can't match Russia … in terms of quantity. We need to try, therefore, to use quality.… What would quality be? Quality would be using the latest technology. The latest technology is not about an airplane; it is about a system. Do you go for fourth generation, or four and a half? We really need to go for fifth generation and spend the money. There are no really inexpensive ways of getting around it.… This is why I think … it makes no sense to look at anything other than the F-35, because it is a system; it is something that is integrated. It is what the United States is getting.[221]

Professor Braun also alluded to the fact that many of the allies Canada operates with in the Arctic – NATO partners such as Denmark, Norway and the United States – are all planning on replacing their jet fighter fleets with F-35s.[222]

That said, other witnesses did not believe that fifth-generation stealth capabilities were required, especially if the main purpose of the new jet fighter is to assure Canadian sovereignty and contribute to the NORAD mission. According to Elinor Sloan:

> I would agree with the Trudeau government's approach of focusing on Canadian sovereignty and the aircraft that's necessary for Canadian sovereignty. Therefore, I don't necessarily think that fifth-generation stealth is critical in terms of our having an ability to take out air defence batteries in a foreign operation. I think we will probably always engage in such missions with the United States.[223]

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220 Ibid.

221 NDDN, *Evidence*, 1st Session, 42nd Parliament, 12 April 2016 (Aurel Braun).

222 Ibid.

223 NDDN, *Evidence*, 1st Session, 42nd Parliament, 12 April 2016 (Elinor Sloan).

Regardless of whether the new jet fighter selected will have stealth capabilities or not, Rear-Admiral Bishop pointed out that it will be important for air force officials to consider future threats and the evolution of the international security environment in determining the aircraft's requirements. As he explained:

> One of the key things is that we need to take a look over a really long horizon at the kinds of situations Canada could potentially face. Those situations are very difficult to predict with any accuracy. I think that almost always drives a worst-case type of scenario, where we have to be able to be prepared to operate across the full spectrum of conflict. That's what essentially drives a lot of the requirements, and I'm sure those same requirements will drive decisions about the future fighter aircraft.[224]

Analyzing the evolution of air forces worldwide and the type of aircraft that potential future adversaries may operate in decades to come will be an important consideration when selecting a new jet fighter for Canada, underlined Rear-Admiral Bishop:

> When we look to the future, we have to look at what possible aircraft we'd be required to fly against. It's not just aircraft. It's also ground-based, surface-to-air missile systems. It's a whole package of military capabilities that are emergent or could be in the future that we would have to contend with. The other part of that threat formula of capability plus intent is often the most difficult to forecast with any kind of accuracy, so we look at countries like China and Russia, which have very high-end military capabilities, and the potential for some of those capabilities to proliferate to different areas of the world. If we're going to operate in the future and in the time frame that we're talking about for something like a fighter aircraft that's going to operate for many decades, then we need to make sure we're getting something that's going to be able to operate against those kinds of adversaries.[225]

Another key capability required in the new jet fighter is range and reliability. It will need to be capable of operating in all-weather conditions and far from its operating base over vast uninhabited distances, such as in the Arctic, where next to no assistance will be available if engine problems occur. "I think that's a critical requirement," noted Rear-Admiral Bishop. "Any aircraft … we acquire needs to be able to operate all across Canada.… We do need a fighter aircraft that can operate in the far north."[226] However, witnesses disagreed as to whether the new jet fighter should have one or two engines. Lieutenant-General Hood, for example, expressed the opinion that selecting a single-engine aircraft instead of a twin-engine one would be satisfactory. "The reliability of engine technology has increased to the point where there is really no requirement to concede to have two" engines, he said, adding that "there are some advantages to having a single engine," such as reduced engine costs.[227]

However, not all witnesses agreed. Michael Byers, for instance, believes Canada needs a long-range twin-engine jet fighter. In his opinion, Canada should not purchase the F-35, which is a single-engine machine, and should instead acquire the twin-engine

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224 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Rear-Admiral Scott Bishop).

225 Ibid.

226 Ibid.

227 NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood).

Boeing F-18 Super Hornet. Although he acknowledged that aircraft engines are becoming increasingly more reliable, he noted that "twin engine jets are still more reliable than single engine jets." He explained that "single engine planes … are getting more reliable, but they are still not approaching the reliability of comparable twin engine planes."[228] In his view, engine reliability is crucial for operations in the high Arctic:

> [The] Canadian Arctic is extraordinarily large. It's 40% of the second-largest country on Earth. We have very extensive maritime zones. We have, at the moment, twin-engine fighter jets that we chose because of the safety provided by a second engine, just like the U.S. Navy chose the F-18, and has bought a lot of replacement Super Hornets, again for the second engine, because of the safety over hostile ocean – or Arctic, in our case. If we were to choose a single-engine jet for the Arctic, we would have to substantially improve our Arctic search and rescue, so that we could get to pilots quickly if they had to parachute to safety.[229]

Further emphasizing his point, Mr. Byers questioned whether anybody "would want to fly from Ottawa to London, England, on a single engine civilian aircraft."[230]

Aside from capabilities and technical requirements, witnesses also spoke about the number of jet fighters that should be procured. According to Elinor Sloan, before any number is set, there needs to be a solid review of the RCAF fighter strength and the evolution of the international security environment as well as the emergence of new threats. Although Ms. Sloan emphasized that "we're not in a new Cold War," she pointed out that Canada is "in a situation like a Cold War in terms of the threat" and that, as such, "what we need today and over the next few years would be similar … in terms of fighter aircraft to what we needed during the Cold War."[231] She then alluded to the fact that Canada originally purchased 138 CF-18 fighters in the last years of the Cold War (1982-1988). However, that number has since been significantly reduced. In fact, the federal government agreed to modernize and upgrade only 80 of those aircraft between 2001 and 2010.[232] Today, the CF-18 fleet consists of 77 modernized aircraft.[233]

Taking these numbers into consideration, Ms. Sloan expressed worry at the federal government plans of recent years to purchase only 65 new jet fighters to replace the CF-18s. "I think there absolutely needs to be an assessment of just how many fighter aircraft you need to effectively defend Canada, considering that the threat today is starting to look an awful lot like the threat of the mid- to late 1980s."[234] It should be noted that Canada's existing jet fighter force of 77 CF-18s is relatively small compared to those of other NATO or G-20 countries, especially in light of the size of its territory (9,984,670 km^2

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228 NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (Michael Byers).

229 Ibid.

230 Ibid.

231 NDDN, *Evidence*, 1st Session, 42nd Parliament, 12 April 2016 (Elinor Sloan).

232 Martin Auger, *The Royal Canadian Air Force and the Replacement of the CF-18 Jet Fighters*, Library of Parliament backgrounder prepared for NDDN, 28 April 2016, pp. 1-17.

233 DND, "CF-188 Hornet."

234 NDDN, *Evidence*, 1st Session, 42nd Parliament, 12 April 2016 (Elinor Sloan).

of land and water), as Annexes A and B illustrate. As a case in point, Australia possesses 97 jet fighters (7,741,220 km^2); China 1,746 (9,596,960 km^2); France 277 (643,801 km^2); Germany 235 (357,022 km^2); India 834 (3,287,263 km^2); Italy 226 (301,340 km^2); Japan 361 (377,915 km^2); Russia 793 (17,098,242 km^2); Spain 159 (505,370 km^2); and the U.S. 3,004 (9,833,517 km^2).[235]

The number of new jet fighters to be purchased by Canada under the Future Fighter Capability project remains to be determined. However, the Commander of the RCAF told the Committee that it should not be lower than 65, regardless of the type of aircraft selected. "With a fleet of 65 aircraft," he said, "our capabilities are not compromised" and "we can fulfill our mission with NORAD." Procuring a smaller number of jet fighters would mean that Canada would possibly have to decrease or "change [its] present commitments" to NORAD.[236] In other words, 65 is the minimum number of aircraft that should be acquired. NORAD's Deputy Commander shared with the Committee that "with respect to the NORAD requirements 65 is adequate."[237] Whatever number of jet fighters Canada agrees to purchase in the future, plans will need to take into consideration attrition rates, including losses to accidents, technical problems and other unexpected difficulties that may be encountered over time. For example, the Committee was told that a total of 18 CF-18s have been lost to accidents since the acquisition of that aircraft in the 1980s.[238]

Cost will be another key factor to consider in the acquisition of a future jet fighter. The financial cost of airpower has increased considerably over past decades, mostly due to the advanced technologies incorporated in modern combat aircraft.[239] For example, the unit cost of a CF-18 Hornet jet fighter was approximately CDN$24 million in the 1980s. It was, at the time, the most expensive jet fighter ever purchased by the RCAF.[240] Today, the unit cost of a fourth-generation jet fighter such as the F-18 Super Hornet is approximately US$57 million[241] while that of a fifth-generation stealth jet fighter such as the Lockheed Martin F-35 Lightning II ranges between US$94.8 million and

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235 United States Central Intelligence Agency (CIA), *The World Factbook*, April 2016 (for country areas) and IISS, *The Military Balance 2016*, pp. 27-480 (for jet fighter forces).

236 NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood).

237 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand).

238 NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood).

239 Mark V. Arena et. al., *Why Has the Cost of Fixed-Wing Aircraft Risen? A Macroscopic Examination of the Trends in U.S. Military Aircraft Costs over the Past Decades*, RAND Corporation, 2008.

240 In comparison, subsonic jet fighters of the 1950s, such as the North American (Canadair) F-86 Sabre and the A.V. Roe Canada CF-100 Canuck, each cost $360,000 and $660,000, respectively. The supersonic fighters of the 1960s were even more expensive. For example, the unit cost of a McDonnell-Douglas CF-101 Voodoo was $1,590,000, a Lockheed (Canadair) CF-104 Starfighter $1,200,000 (single-seat) and $1,400,000 (two-seat), and a Northrop (Canadair) CF-5 Freedom Fighter $1,100,000 (single-seat) and $1,200,000 (two-seat). T.F.J. Leversedge, *Canadian Combat and Support Aircraft*, St. Catharines, Vanwell, 2007, pp. 63, 96, 99-100, 102, 124, 202, 207, 209.

241 *Jane's All the World's Aircraft 2015-2016*, IHS Global, 2015, p. 717-718; United States Navy, "United States Navy Fact File: F/A-18 Hornet Strike Fighter."

US$115.7 million (excluding engine).[242] Faced with such high costs, Canada, with a limited defence budget, will have to make difficult choices, explained Michael Byers. The CF-18s, he emphasized, "need to be replaced within a reasonable budget." As he warned, consideration will have to be given to monetary exchange rates, especially if Canada were to select a jet fighter of U.S. origin. Mr. Byers used the Canadian government's original decision of 2010 to purchase 65 F-35s to prove his point:

> The acquisition budget for the F-35s of $9 billion for 65 planes was set at an exchange rate of 92¢ on the U.S. dollar. At today's exchange rate, at 77¢ to the dollar, you can only buy 56 F-35s, so consider whether or not your government, within a set budget and a minimum number of planes, is going to be able to acquire some of the aircraft under consideration.[243]

Regardless of the specific aircraft that will be selected, Admiral Gortney underscored to the Committee that it should not be so costly that it can only be purchased at the expense of Royal Canadian Navy or Canadian Army procurement projects. In other words, the Government of Canada should not purchase fewer warships for the navy in order to acquire jet fighters for the air force. He stated that a balanced approach should be taken in connection to the acquisition of the new jet fighter. Admiral Gortney also said that whatever new aircraft Canada acquires should be fitted with an active electronically scanned array (AESA) radar and be interoperable with U.S. air assets. He went on to say that his biggest challenge from a NORAD capability standpoint at the moment was the availability of airborne early warning (AEW) and tanker aircraft.[244]

In addition to cost, Elinor Sloan enumerated a few additional factors to consider when acquiring a new jet fighter. One of those factors related to the supply chain. "We want an aircraft that will fly for at least 40 years," she stated, adding that the "CF-18 will have flown for [almost] 45 years by the time" it is expected to retire (1982-2025). Therefore, whichever type of jet fighter Canada acquires, it must anticipate whether or not "there will be supply chain problems in the long term, in the third and fourth decades," if Canada were to need spare parts and components or even manufacturer technical assistance to maintain the aircraft. In other words, if Canada were to acquire an existing and well-established jet fighter, for example, but that aircraft design was only expected to fly until the 2040s, this could constitute a problem from a logistical and supply chain standpoint. Another potential problem could emerge from a interoperability perspective if all of Canada's closest allies – Australia, the United Kingdom and the U.S., for example – were to acquire a certain type of jet fighter, but Canada chose a different one. "It is important to be

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242 As of 1 February 2016, the unit cost (excluding engine) of an F-35A (Conventional Take-Off and Landing, or CTOL) is US $94.8 million, an F-35B (Short Take-Off and Vertical Landing, or STOVL) is US $102.0 million, and an F-35C (Carrier Variant, or CV) is US $115.7 million. Lockheed Martin, "F-35 Lightning II Program Status and Fast Facts," 1 February 2016. Lockheed Martin is trying to reduce the unit cost of an F-35 to about $80 million by 2019. "Lockheed Continues to Drive Down JSF Price, Far from $10M Savings Goal," *Inside the Pentagon*, Vol. 32, No. 12 (24 March 2016).

243 NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (Michael Byers).

244 Information provided during NDDN visit to NORAD Headquarters, 2 May 2016.

able to operate with our allies," Ms. Sloan reiterated. "If all of our major allies are buying the F-35," she gave as an example, "then I would go in the F-35 direction."[245]

In the meantime, pending the selection of a new jet fighter, the federal government is moving forward with plans announced in 2014 to modernize and extend the life of Canada's entire fleet of 77 CF-18s from 2020 to 2025. The estimated cost of that modernization program is about $400 million, according to Rear-Admiral Patrick Finn, DND's Assistant Deputy Minister (Materiel).[246] However, it should be noted that no CF-18s have yet been upgraded under this modernization program. DND is currently investigating options on how to upgrade the CF-18s to extend their operational life to 2025.[247] According to the latest version of DND's *Defence Acquisition Guide* (2016), a Request for Proposal is expected to be released in 2017 and a contract awarded in 2018.[248]

Other Projects Related to the Future Jet Fighter

It should be noted that in connection to the Future Fighter Capability project, DND is planning to launch a number of related defence procurement projects in coming years. For example, DND notes in the latest version of its *Defence Acquisition Guide* that the project to acquire a new strategic tanker transport aircraft to replace the RCAF's CC-150 Polaris "is pending the result of the evaluation to replace the CF-188, due to different fuel receiving systems in use by various fighter aircraft." DND expects a contract to be signed for the new strategic tanker transports in 2022 and the aircraft to be delivered between 2026 and 2036.[249] Lieutenant-General Hood told the Committee that "once a decision is made on the next fighter aircraft, the next decision will be the tanker replacement … the plan all along was to choose a fighter and then make sure that the tanker capacity was there."[250]

Taking this point into consideration, a number of witnesses stressed the need to move forward with the replacement of Canada's air tanker fleet as soon as possible. Tanker support for Canada's jet fighters is "vitally important," stated Rear-Admiral Bishop. "We all understand that Canada is a huge country, and the aerospace dimension of Canada is even larger as it extends to seaward. We would be hard pressed with our fighter aircraft to be able to achieve the NORAD mission without refuelling support from tankers. That is a critical element of the NORAD mission, just to be able to cover the geography."[251]

At the moment, Canada's air-to-air refuelling fleet consists of five aircraft. Two of Canada's five CC-150 Polaris transport aircraft operate as strategic air-to-air refuelling

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245 NDDN, *Evidence*, 1st Session, 42nd Parliament, 12 April 2016 (Elinor Sloan).

246 NDDN, *Evidence*, 1st Session, 42nd Parliament, 5 May 2016 (Rear-Admiral Patrick Finn).

247 David Pugliese, "Time Running Out to Upgrade Canada's Aging CF-18 Jets," *National Post*, 14 April 2016.

248 "CF-188 Life Extension 2025" project in DND, "Aerospace Systems," *Defence Acquisition Guide 2016*.

249 "Strategic Tanker Transport Capability" project in DND, "Aerospace Systems," *Defence Acquisition Guide 2016.*

250 NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood).

251 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Rear-Admiral Scott Bishop).

aircraft (Multi-Role Transport Tanker, or MRTT). These are each capable of transporting 79,380 pounds of fuel.[252] In addition, three CC-130 Hercules transports have been configured for air-to-air refuelling. The Hercules is capable of carrying 38,000 pounds of fuel.[253] However, some witnesses questioned whether the time was right to increase the size of Canada's tanker aircraft fleet. Elinor Sloan believes five tanker aircraft are "sufficient, but just barely sufficient, because oftentimes our tankers are required overseas." She alluded to the fact that since 2014, Canada has had one of its Polaris air tankers deployed overseas on Operation IMPACT in support of coalition efforts engaged in the fight against Daesh (also known as the Islamic State of Iraq and the Levant, or ISIL) in Iraq and Syria. She also noted that because Canada is "a big country" and its five air tankers are not always available, it often has to rely on U.S. air tankers to help refuel its jet fighters engaged on long-range NORAD missions.[254] This was confirmed by Lieutenant-General Hood, who stated that "there are American tankers on standby" in Maine and Oregon and that they "quite often" provide tanker support to our CF-18s. At the time of his appearance, he told the Committee that none of Canada's CC-150 Polaris air tankers were available for NORAD missions. "One is deployed right now," he said, "and the other one is in heavy maintenance; it's not available to support."[255]

Other defence procurement projects expected to be initiated in the near future in connection to the Future Fighter Capability project include various types of advanced missile systems, bombs, and other types of armaments.[256] These advanced systems will ensure the relevance of the future platform.

Enhancing Surveillance and Domain Awareness Capabilities

Domain awareness and the conduct of surveillance in Canada is achieved through a system of systems that involves a range of technologies, which include aircraft, ships, radars, sensors, satellites, and other assets.[257] However, during this study, several witnesses identified gaps in Canada's existing surveillance and domain awareness capabilities. In their view, there is a need to improve the system in Canada in order to better respond to new threats and changes in the international security environment.[258] David Perry emphasized increased Russian aviation and maritime activity near North America, stating that this required an enhancement of domain awareness in Canada's airspace and maritime approaches. As a result:

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252 DND, "CC-150 Polaris," consulted 14 May 2016.

253 DND, "CC-130 Hercules," consulted 14 May 2016.

254 NDDN, *Evidence*, 1st Session, 42nd Parliament, 12 April 2016 (Elinor Sloan).

255 NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood).

256 "Long Range Air-to-Air Missile," "Advanced Short Range Missile," "Medium Range Air-to-Air Missile Sustainment," "Low Collateral Damage Weapon," and "Complex Weapon" projects in DND, "Aerospace Systems," *Defence Acquisition Guide 2016.*

257 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Rear-Admiral Scott Bishop); NDDN, *Evidence*, 1st Session, 42nd Parliament, 12 April 2016 (Elinor Sloan).

258 NDDN, *Evidence*, 1st Session, 42nd Parliament, 21 April 2016 (Andrea Charron, Christopher Sands, and Joel Sokolsky).

> Progress should be made to further upgrade and life-extend the existing platforms we currently operate to conduct intelligence, surveillance, and reconnaissance missions, so that we maintain an awareness of this activity. In the medium and long term, we need to acquire new platforms that would enhance our ability to do so in the future.[259]

Moreover, according to Elinor Sloan, there is an important gap with regards to the detection and interception of cruise missiles:

> Where there is a notable gap in the aerial surveillance and control of North America is in the ability to detect and respond to cruise missile threats. Cruise missiles fly low to the earth. They are hard to detect and harder to intercept. NORAD has only a limited detection capability against cruise missiles, likely involving airborne warning and control aircraft.[260]

A number of suggestions were made by witnesses about how to enhance the country's surveillance and domain awareness capabilities. These ranged from replacing radar stations to the acquisition of new patrol aircraft, satellites and unmanned aerial vehicles (UAVs).

Several witnesses spoke of the need to renew or replace the aging North Warning System network of ground-based radar stations in the Arctic, which is reaching the end of its operational life. "One of the immediate material concerns for NORAD," according to Andrea Charron, "is the modernization of the North Warning System, which is vital to NORAD's ability to detect, assess, and track airborne activity emanating from the north."[261] Michael Byers, Elinor Sloan and David Perry were of a similar opinion.[262]

The North Warning System was built between 1986 and 1992, and according to Lieutenant-General St-Amand, needs to be either upgraded or replaced. "As of now, the newest parts of the system are already 24 years old," he said. "We expect the system to last until around 2025, at which point we will be looking for modern solutions to replace its capabilities." He emphasized that the system in place was originally developed to respond to threats "as perceived in the late 1970s." Technology has since changed considerably, as did the threat environment, which is why, "from a capability point of view, we have to look at something else," he argued.[263]

DND is currently planning the replacement of the North Warning System.[264] However, the configuration of the future system remains to be determined. Most witnesses, however, believed that the North Warning System should not rely

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259 NDDN, *Evidence*, 1st Session, 42nd Parliament, 5 May 2016 (David Perry).

260 NDDN, *Evidence*, 1st Session, 42nd Parliament, 12 April 2016 (Elinor Sloan).

261 NDDN, *Evidence*, 1st Session, 42nd Parliament, 21 April 2016 (Andrea Charron).

262 NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (Michael Byers); NDDN, *Evidence*, 1st Session, 42nd Parliament, 5 May 2016 (David Perry); NDDN, *Evidence*, 1st Session, 42nd Parliament, 12 April 2016 (Elinor Sloan).

263 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand).

264 See the "North Warning System Replacement" project in DND, "Aerospace Systems," *Defence Acquisition Guide 2016*; DND, "All Domain Situational Awareness S&T program," 5 May 2016.

uniquely on radar stations and that it should incorporate the most advanced surveillance and sensor technologies available. “I think it would be a mistake to assume that radars are going to be replaced one by one at exactly the same locations,” Lieutenant-General St-Amand told the Committee. “I talk about a system of systems.… It's not necessarily a one-for-one replacement. It's not necessarily about using the same location. Really, it's about exploiting the latest technology in order to improve our way to sense, detect, and track whatever is coming.” He added: “Whether this is going to materialize in the form of radar sites further north or other technology” remains to be determined.[265] The future system might not only use different and more advanced types of radars, but also various kinds of sensors, satellites, UAVs and a range of other modern technologies.

The Committee was also told that the new system’s range should reach further north in order to cover the high Arctic. At the moment, the North Warning System cannot cover that region.[266] The system that will replace the North Warning System will need to properly cover the Arctic Archipelago, Ms. Charron agreed. Because “it's so expensive to operate and to put things in the Arctic”, she added, “We may need a combination of space, land, and other assets. Hopefully it doesn't do just one thing. We need it to be multi-purposed.”[267]

However, replacing the North Warning System is not enough, according to certain witnesses. Some of them believe that Canada should also enhance its patrol aircraft capabilities. At the moment, only 14 of Canada’s original fleet of 18 CP-140 Aurora are being upgraded and modernized. As of March 2016, nine of those fourteen had been modernized. DND expects that number to increase to eleven by the end of 2016.[268] Despite this, some witnesses believe that Canada should consider increasing to 18 the total number of CP-140 Aurora patrol aircraft currently being upgraded and modernized.[269] A number of witnesses also emphasized the need to replace the CP-140 Aurora with a new and more modern patrol aircraft. Many of Canada’s closest allies, explained Elinor Sloan, are “now investing in their maritime patrol aircraft fleets.” This includes Australia, Norway and the United Kingdom. “Canada will want to prioritize the Multi-Mission Aircraft that has been on the books for some time to replace Canada’s upgraded but aging and relevantly limited in number long-range patrol aircraft.”[270]

Several witnesses, however, stated that Canada should invest in satellites and UAVs to enhance its domain awareness. Elinor Sloan held that the North Warning System could potentially be replaced with such technologies. “One option is a space-based surveillance or detection system, and the RADARSAT Constellation of three

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265 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand).

266 Ibid.

267 NDDN, *Evidence*, 1st Session, 42nd Parliament, 21 April 2016 (Andrea Charron).

268 DND, “Status Report on Transformational and Major Crown Projects,” *Report on Plans and Priorities 2016-2017*.

269 NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (Michael Byers); NDDN, *Evidence*, 1st Session, 42nd Parliament, 5 May 2016 (David Perry).

270 NDDN, *Evidence*, 1st Session, 42nd Parliament, 12 April 2016 (Elinor Sloan).

satellites scheduled to be launched starting in 2018 could well be suited to this mission," she told the Committee. "Another option might be unmanned aerial vehicles, the high altitude ones like the Global Hawk UAV. The RADARSAT Constellation of satellites and high-altitude unmanned aerial vehicles … could best provide a persistent surveillance of the air and maritime space region." However, she said that more satellites might be required in the future. "It's possible that three satellites would not be enough in terms of the RADARSAT Constellation, that you would need perhaps five."[271] Michael Byers agreed, arguing that Canada might even consider increasing the total number of RADARSAT Constellation satellites to six. [272]

A number of witnesses highlighted the advantages of using UAVs, or drones, particularly in the Arctic and maritime domains. According to Rear-Admiral Bishop:

> Drones have proven to be invaluable for military operations.... They're particularly good at intelligence, reconnaissance, and surveillance missions, where you need an airborne platform, with sensors, that can loiter in a specific area for a long period of time. These unmanned aircraft have proven their worth in countless operations over the last decade, including in support of Canada's operations in Afghanistan. Really, drones are a military capability that most countries are pursuing, and Canada is no different.[273]

Rear-Admiral Bishop also stated that DND is moving forward with the Joint Unmanned Surveillance and Target Acquisition System (JUSTAS) project, which seeks to provide the CAF with a UAV capability for surveillance and reconnaissance. In January 2016, DND released a Request for Information (RFI) to industry related to JUSTAS. The plan, according to the document, is to "acquire one (1) UAS [Unmanned Aircraft System], comprising of up to four (4) Unmanned Aircraft (UA)" that will be "expected to transit to distant regions of Canada's maritime and Arctic AOR [Area of Responsibility] for surveillance and search and rescue (SAR) and remain on stations for extended periods of time prior to returning to base." The document also reports that those UA must be capable of carrying "a suite of sensors" as well as "precision-guided munitions."[274] Rear-Admiral Bishop explained that "the issue of whether or not those drones should be armed" is a question that will need to be "tackled in the defence policy review."[275]

However, not all witnesses believed acquiring UAVs was the way forward, even for Arctic surveillance. According to Michael Byers, Canada is "good on surveillance in the Arctic right now, and [will] be so for the next 20 years," so there is "no need for drones."[276] In his view, the CAF have enough surveillance assets currently to cover the Arctic with satellites, radars and patrol aircraft.

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271 Ibid.

272 NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (Michael Byers).

273 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Rear-Admiral Scott Bishop).

274 PSPC, "Joint Unmanned Surveillance and Target Acquisition System (JUSTAS) Project – Request for Information (RFI)," 15 January 2016.

275 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Rear-Admiral Scott Bishop).

276 NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (Michael Byers).

Improving RCAF Infrastructure

Key to the future of RCAF capabilities is the need to modernize and improve infrastructure. Every year, the CAF spends about $1.9 billion on infrastructure, which includes approximately $150 million for new construction, $250 million for recapitalization of existing infrastructure, and several hundreds of millions of dollars for the repair and maintenance of existing infrastructure, among other things.[277] The infrastructure funds are distributed throughout the CAF, including the RCAF.

The RCAF is in a period of recapitalization in terms of infrastructure. In recent years, significant efforts have been made to modernize, upgrade and replace many of the air force's aging infrastructures and adapt them to modern needs. This includes buildings, hangars, airfields, runways, and other facilities at RCAF Wings across Canada. At the same time, it has been necessary to build new infrastructure to accommodate the new aircraft fleets that have been purchased in recent years, such as the CC-177 Globemaster III strategic transports, the CC-130J Super Hercules tactical transports, the CH-147 Chinook tactical helicopters, and the CH-148 Cyclone maritime helicopters, which are still being delivered to the air force.[278] Many of these infrastructure projects are ongoing. For example, Jaime Pitfield, DND's Assistant Deputy Minister (Infrastructure and Environment), told the Committee that work was progressing on more than $700 million worth of infrastructure projects at five of the RCAF's 14 Wings: those in Bagotville, Quebec; Cold Lake, Alberta; Comox, British Columbia; Trenton, Ontario; and Winnipeg, Manitoba. Additional infrastructure projects are underway at the other Wings.[279] Furthermore, many more RCAF infrastructure projects are expected to be launched in the near future, not only to modernize, upgrade and replace Wings infrastructure, but also to accommodate the new aircraft fleets that are expected to be acquired in years to come, including the new jet fighter. Moreover, as already noted, there will also be a need to replace or renew the North Warning System in the near future. The required infrastructure budget to meet all of these RCAF needs will be significant.

When asked if projects were already underway to modernize and upgrade infrastructure at RCAF air bases in preparation for the acquisition of a new jet fighter, Mr. Pitfield responded that no such project was in progress. As he explained:

> Our regular maintenance and regular upgrades are scheduled to keep the asset in the condition that it needs to be to support operations right now. As new aircraft or new capability come on anywhere within National Defence, we'll change the infrastructure to support that. At this point we're not preparing for anything for the next generation, because we don't know what it is.[280]

That said, Rear-Admiral Patrick Finn noted that some infrastructure funding had been allocated for improvement work at air bases when, in 2010, the federal government

277 NDDN, *Evidence*, 1st Session, 42nd Parliament, 5 May 2016 (Jaime Pitfield).

278 DND, "Infrastructure Projects (2009-2015)," modified 30 July 2015.

279 NDDN, *Evidence*, 1st Session, 42nd Parliament, 5 May 2016 (Jaime Pitfield).

280 Ibid.

announced plans to acquire 65 F-35s. “Work was done on what would be the rough order of magnitude approach for infrastructure” improvements, he confirmed. It “looked at hangars and what kind of runways. Again, I would just say that it was early work. The aircraft itself was still evolving.”[281] The following clarifications were provided by DND at a later date:

> A rough order of magnitude infrastructure estimate for the F-35 was prepared for the 2014 Next Generation Fighter Capability Annual Update, publically released on December 10th, 2014 as part of the Government's Seven-Point Plan. The infrastructure estimate included new construction as well as upgrades to existing infrastructure for two Main Operating Bases, in Bagotville, Quebec and Cold Lake, Alberta, as well as for five Forward Operating Locations in Inuvik and Yellowknife in the North West Territories; Iqaluit and Rankin Inlet in Nunavut; and Goose Bay in Newfoundland and Labrador. This estimate was based on a number of planning assumptions related to operational concepts in Canada and the understanding at that time of facility requirements published by the F-35 Joint Program Office in the United States. The rough order of magnitude infrastructure estimate in 2014 was $254 million, excluding contingency. As the Seven-Point Plan has since been completed, no updates to the infrastructure or other elements of the F-35 cost estimate have been made.[282]

It is clear to the Committee that whichever jet fighter or other military aircraft Canada procures in the future, there will be a need to adapt existing infrastructure to accommodate these new air assets. Regardless of the aircraft types purchased, RCAF infrastructure will have to be adapted in order to effectively and efficiently operate them. Depending on the type of aircraft selected, there might be a need to build new hangars, depots and maintenance facilities, flight simulator and training centres, runways and other facilities at various RCAF Wings. All of this will come at a cost that will need to be properly accounted for in aircraft procurement projects. As infrastructure costs can be significant, a balance must be struck when considering options. While a specific aircraft type may seem attractive from a cost and capabilities standpoint, if all existing infrastructure are inadequate to support it and must be replaced, this would significantly alter the overall price tag associated with that particular aircraft procurement project. Although it is recognized the procurement of any new aircraft will require some infrastructure changes, it should not entail an entire overhaul of existing infrastructure. This reality will need to be taken into consideration not only in the selection process for Canada’s future jet fighter, but also the selection of other types of aircraft.

The Committee heard of the need to continually adapt air force infrastructure to changes in the threat environment. Lieutenant-General St-Amand, for example, explained that “NORAD's current structure of main operating bases, forward operating locations, and the North Warning System was designed to counter a threat perceived in the late 1970s.” At the time, he said, “ballistic missiles and Soviet long range aviation armed with first-generation cruise missiles were essentially the only systems capable of reaching North America and, given hostile intent, become a threat.”[283] As discussed earlier in this report,

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281 NDDN, *Evidence*, 1st Session, 42nd Parliament, 5 May 2016 (Rear-Admiral Patrick Finn).

282 NDDN, “DND Response to Questions Asked at NDDN Meeting of 5 May 2016,” QTON No 42.1-18, 13 June 2016.

283 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand).

much has changed in the international security environment and while some threats have disappeared over the years, new ones have also emerged. “North America is facing new threats, including increased nation state competition and the proliferation of advanced military capabilities,” suggested Lieutenant-General St-Amand. These threats “are challenging our ability to successfully defend Canada and the United States.” In his view, much good could be gained by reviewing the current infrastructure posture of the RCAF to ensure that this responds as well as possible to new and emerging threats. ”Perhaps the best indication that our current infrastructure might not be a good base of reference is to look at the structure,” he said. As a case in point, he pointed to the fact that the four Forward Operating Locations in Canada’s Arctic were originally set up in response to “a threat that was perceived in the 1970s.” That structure, he argued, might not be “totally adequate for what's to come [in terms of threats], especially if we're thinking about next 30 to 40 years.”[284]

This also raises the question of whether or not the location of Canada’s CF-18 assets, which are currently based at two main operating bases (MOB) – 3 Wing Bagotville in Quebec and 4 Wing Cold Lake in Alberta – are optimally positioned to address new and emerging threats. In the course of this study, questions were raised as to whether or not CF-18 assets should be stationed at other locations to better respond to threats. At the moment, CF-18s have access to four Deployed Operating Bases (DOB) located in southern Canada and four Forward Operating Locations (FOLs) in the Arctic, where they can deploy whenever needed, such as in times of emergency.[285] However, no CF-18s are permanently stationed at those sites. These sites are only temporarily used by CF-18 pilots to get closer to areas of interests. For example, CF-18s were deployed to the DOB in Comox, British Columbia, at the time of the Vancouver Olympic Games in 2010.[286] Likewise, CF-18s were deployed to the DOB in Trenton, Ontario, at the time of the terrorist shootings on Parliament Hill in Ottawa in 2014.[287]

Several witnesses pointed to NORAD’s increased focus on asymmetric threats since 2001 and questioned whether having CF-18s based in Bagotville and Cold Lake, far from major urban centres such as Montreal, Toronto or Vancouver, was sufficient from an operational standpoint. The Committee was told more than once that if an aerial terrorist attack or major asymmetric incident occurred in Vancouver, for example, NORAD would, in all likelihood, deploy U.S. Air Force jet fighters stationed in nearby Portland, Oregon, rather than RCAF CF-18s from Cold Lake, Alberta, located further away. Lieutenant-General St-Amand told the Committee that if a short notice threat scenario transpired on Canada’s west coast, it was “more than likely that those would be Portland fighter aircraft” that would deploy to engage that threat. That said, he emphasized that once those U.S.-

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284 Ibid.

285 Deployed Operating Bases (DOB) for CF-18s are located in Comox (British Columbia), Winnipeg (Manitoba), Trenton (Ontario), and Greenwood (Nova Scotia). The Forward Operating Locations (FOLs) in the Arctic are located in Inuvik (Yukon), Yellowknife (Northwest Territories) and Iqaluit and Rankin Inlet (Nunavut). DND, *North American Aerospace Defence (NORAD)*, presentation to NDDN by Colonel Paul Prévost (Strategic Joint Staff), 21 April 2016.

286 NDDN, *Evidence*, 1st Session, 42nd Parliament, 12 April 2016 (Elinor Sloan).

287 NDDN, *Canada and the Defence of North America*, p. 48.

based fighters crossed the Canadian border, they would come under the command of the Commander of the Canadian NORAD Region in Winnipeg.[288] According to military officials, this is a demonstration of the extent to which Canada and the U.S. are interoperable and pool their resources through NORAD. Rear-Admiral Bishop expanded on this point:

> Obviously, the United States has more fighter resources than we do. The commander of NORAD uses all the fighters that he has at his disposal, both Canadian and U.S., to make the best decisions. I think when there is a threat stream or we have indications and warnings of an event, then the commander of NORAD repositions the aircraft to be ready to respond to those events. For air incidents that occur in Canadian and American airspace in civil aircraft, as you can imagine, there's very little notice involved with those kinds of incidents, so we don't have the opportunity to forward or position aircraft. Given the size of our country and the resources that we have for defence, I don't think we'd ever be in a position where we would always be able to scramble an aircraft to intercept another aircraft anywhere in Canada. I don't think that's realistic. That's why the NORAD agreement works so well for us because we are able to help the Americans out and they're able to help us out, but in a way that respects each other's sovereignty.[289]

Nevertheless, such a scenario raises interesting questions from the perspective of Canadian sovereignty. For example, are Canadian jet fighters based in the right locations to best respond to the most urgent existing and emerging threats? Should a new arrangement be contemplated? Should the RCAF revisit where it positions its CF-18s?

In light of new and emerging threats, Canada might want to revisit where it positions its NORAD resources in order to be as effective as possible. “Our fighter bases are located based on the Cold War threat” of Soviet long-range bomber aircraft attacking Canada and the U.S. by way of the Arctic, Elinor Sloan noted in her attempt to explain where Canada’s jet fighter bases are located. These bases were not originally set up to respond to asymmetric threats against Canadian urban centres. The asymmetric menace only emerged with 9/11, more than a decade after the end of the Cold War. In her view, it “would make sense to relocate” CF-18s “closer to the urban centre,” though Ms. Sloan did note that jet fighters “don’t stay at the base at all times.” They are regularly up in the air, patrolling Canadian skies.[290] Aurel Braun expressed a similar view: “We obviously have to try to deploy them [jet fighters] as wisely as possible and where the most likely threats are going to be.”[291] It should be noted that the U.S. has responded to the asymmetric threat by establishing fighter alert locations in several places across the U.S. These locations operate as remote detachments of their parent Wings. According to NORAD, there are three such detachments in the U.S., although their location is classified.[292]

Canada may wish to consider doing the same as its moves forward with both the defence policy review and the acquisition of new jet fighters. The concept of detachments

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288 NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand).

289 NDDN, *Evidence*, 1st Session, 42nd Parliament, 22 March 2016 (Rear-Admiral Scott Bishop).

290 NDDN, *Evidence*, 1st Session, 42nd Parliament, 12 April 2016 (Elinor Sloan).

291 NDDN, *Evidence*, 1st Session, 42nd Parliament, 12 April 2016 (Aurel Braun)

292 “Email from Major-General Christopher Coates (NORAD Director of Operations) to NDDN,” 10 May 2016.

is not new to this country. At the end of the Cold War, for example, the RCAF maintained CF-18 jet fighter detachments of 441 Fighter Squadron (CFB Cold Lake, Alberta) in Comox, British Columbia, and of 425 Fighter Squadron (CFB Bagotville, Quebec) in Goose Bay, Newfoundland and Labrador. Through this arrangement, CF-18s from the above-mentioned squadrons were permanently stationed on alert at Comox and Goose Bay in the late 1980s and early 1990s.[293] The RCAF may wish to reconsider such an approach.

CONCLUDING REMARKS AND RECOMMENDATIONS

Before proceeding to its concluding remarks and recommendations, the Committee wishes to set these within the broader context of principles that will inform its work going forward. First, the men and women of the Canadian Armed Forces' Regular Force and Reserve Force are its greatest asset, and must be provided with the best training, equipment and support possible as they carry out their missions. Second, the defence procurement process by which equipment is purchased must be as efficient and streamlined as possible, and use Canadian expertise and technology whenever appropriate while providing the best value for public funds. Third, while prioritization will be necessary at times, the army, navy and air force each have important needs, and these must be met in a balanced way that does not come at the expense of the others. Finally, all defence policy, equipment and other decisions must be made with due regard for Canadian sovereignty.

While the current report focuses primarily on NORAD and aerial readiness, the Committee recognizes the importance of the maritime and land domains to the defence of Canada and North America, which is why it intends to study issues related to the readiness of naval and land forces in the future.

Throughout the course of this study, the Committee has learned a great deal about NORAD, Canada's participation in that bi-national command in cooperation with the U.S., and the current state of the RCAF and aerial readiness in Canada. It is clear to this Committee that NORAD remains relevant and indeed crucial to the defence of Canada and North America, especially in light of the volatility and unpredictability of the international security environment and the constant evolution of global threats. The Committee was impressed with the high state of readiness of NORAD and the RCAF, and with their capacity to defend Canada and North America from various external and internal menaces.

However, the Committee also believes that there may be means to enhance and strengthen the aerospace defence of Canada and North America in a number of ways. NORAD must evolve and modernize to remain relevant and capable of effectively and efficiently responding to new threats and changes in the international security environment. At the same time, the RCAF, as a "force generator," needs to be properly recapitalized with new air assets and infrastructure in order to remain a strong partner in

293 Jocelyn Coulon, *En première ligne: Grandeurs et misères du système militaire canadien*, Montreal, Le Jour Éditeur, 1991, p. 72; Larry Milberry, *Canada's Air Force Today*, Toronto, CANAV Books, 1987, p. 13.

the defence of Canada and North America with the U.S. by providing “force employers” like NORAD with the right capabilities to protect our country and continent.

As such, the Committee makes the following recommendations to the Government of Canada to improve the aerospace defence of Canada and enhance our NORAD partnership with the U.S. in the defence of North America.

The Committee recommends:

Recommendation 1

That the Government of Canada conduct a thorough review of Canada's international and domestic capability requirements for the replacement of the CF-18 fighter jets; that the Government select a replacement which satisfies both Canada's international and domestic needs by being capable of effectively exercising Canada's sovereignty in the high Arctic and remote regions of the country while remaining interoperable with our allies; and that the CF-18 replacement:

a) **Possess an active electronically scanned array (AESA) radar and beyond line of sight communication equipment;**

b) **Work to a high degree with Canada's existing infrastructure;**

c) **Be interoperable with the United States of America's NORAD assets;**

d) **Provide sufficient fighter capability to ensure NORAD and NATO commitments can be fulfilled as currently defined; and**

e) **Have well defined capital and sustainment costs as to not jeopardize the recapitalization of other much-needed military equipment.**

Recommendation 2

That, for procurement contracts pertaining to aircraft utilized in the context of the far North region, pilot safety be a key consideration.

Recommendation 3

That the Government of Canada decide on the replacement of the current fleet of CF-18 fighter jets within the next 12 months.

Recommendation 4

That the Government of Canada recognize the importance of air-to-air refueling as it relates to the Royal Canadian Air Force's number one priority, which is sovereignty.

Recommendation 5

That the defence policy review evaluate the primary locations of Canada's Air Sovereignty Alert (ASA) assets to ensure they are optimally positioned to respond to asymmetric threats under the auspices of Operation NOBLE EAGLE (ONE).

Recommendation 6

That the Government of Canada recognize the proliferation of cruise missiles, and related emerging technologies, as a threat to Canada and take the necessary action to protect Canada from this threat.

Recommendation 7

That the Government of Canada recognize emerging ballistic missile threats.

Recommendation 8

That the defence policy review reconsider Canada's position with regard to ballistic missile defence (BMD) in the context of Canada's defence priorities and limited financial resources.

Recommendation 9

That, in terms of Canada's potential role in ballistic missile defence, Canadian research and development be a consideration.

Recommendation 10

That the defence policy review take into account that witnesses have questioned the efficacy of the ballistic missile defence program.

Recommendation 11

That the Government of Canada recognize the detrimental effects of climate change in our North; and that the Government quickly adapt our northern surveillance and defences to a potential Russian threat.

Recommendation 12

That, with the end of the North Warning System's operational life approaching, the Government of Canada recognize the need to maintain and improve all aspects of Arctic domain awareness.

Recommendation 13

That the Government of Canada ensure that adequate safeguards are in place to protect Canada and Canadians from, and respond to, cyber-attacks by foreign governments and non-state actors.

APPENDIX A

Air Forces and Fighter Aircraft Fleets of Select NATO and G-20 States[1]

Country	Fixed-Wing Combat Aircraft				Aircraft Fleet (Combat and Non-Combat)[a]			Fighters as % of Aircraft Fleet
	Fighters[b]	Bombers	Others[c]	Total	Fixed-Wing	Rotary-Wing	Total	
Australia	**97**	**0**	**51**	**148**	**264**	**169**	**433**	**22.4**
Army	0	0	0	0	0	129	129	0
Air Force	97	0	51	148	264	0	264	36.7
Navy	0	0	0	0	0	40	40	0
Belgium	**59**	**0**	**29**	**88**	**139**	**31**	**170**	**34.7**
Air Force	59	0	29	88	139	31	170	34.7
Brazil	**106**	**0**	**127**	**233**	**636**	**253**	**889**	**11.9**
Army	0	0	0	0	0	81	81	0
Air Force	106	0	115	221	624	99	723	14.7
Navy	0	0	12	12	12	73	85	0
Canada	**77**	**0**	**14**	**91**	**214**	**162**	**376**	**20.5**
Air Force	77	0	14	91	214	162	376	20.5
China	**1,746**	**150**	**756**	**2,652**	**3,599**	**1,069**	**4,668**	**37.4**
Army	0	0	0	0	8	913	921	0
Air Force	1,468	120	718	2,306	3,077	53	3,130	46.9
Navy	278	30	38	346	514	103	617	45.1
Denmark	**44**	**0**	**0**	**44**	**78**	**30**	**108**	**40.7**
Air Force	44	0	0	44	78	30	108	40.7
France	**277**	**0**	**83**	**360**	**614**	**504**	**1,118**	**24.8**
Army	0	0	0	0	13	338	351	0
Air Force	217	0	64	281	483	80	563	38.5
Navy	60	0	19	79	118	86	204	29.4
Germany	**235**	**0**	**8**	**243**	**421**	**365**	**786**	**29.9**
Army	0	0	0	0	0	220	220	0
Air Force	235	0	0	235	411	102	513	45.8
Navy	0	0	8	8	10	43	53	0
Greece	**232**	**0**	**12**	**244**	**429**	**213**	**642**	**36.1**
Army	0	0	0	0	20	163	183	0
Air Force	232	0	7	239	404	31	435	53.3
Navy	0	0	5	5	5	19	24	0
India	**834**	**0**	**118**	**952**	**1,516**	**841**	**2,357**	**35.4**
Army	0	0	0	0	0	275	275	0
Air Force	791	0	90	881	1,390	441	1,831	43.2

1 NATO member countries are: Albania, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Iceland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Turkey, United Kingdom, and United States. North Atlantic Treaty Organization (NATO), "NATO Members Countries." G-20 member states are: Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Turkey, United Kingdom, United States and European Union. Global Affairs Canada, "History and Membership of the G-20."

Country	Fixed-Wing Combat Aircraft				Aircraft Fleet (Combat and Non-Combat)[a]			Fighters as % of Aircraft Fleet
	Fighters[b]	Bombers	Others[c]	Total	Fixed-Wing	Rotary-Wing	Total	
Navy	43	0	28	71	126	125	251	17.1
Italy	**226**	**0**	**34**	**260**	**417**	**348**	**765**	**29.5**
Army	0	0	0	0	6	189	195	0
Air Force	210	0	34	244	392	102	494	42.5
Navy	16	0	0	16	19	57	76	21.1
Japan	**361**	**0**	**276**	**637**	**879**	**589**	**1,468**	**24.6**
Army	0	0	0	0	8	412	420	0
Air Force	361	0	196	557	722	46	768	47.0
Navy	0	0	80	80	149	131	280	0
Netherlands	**63**	**0**	**0**	**63**	**83**	**75**	**158**	**39.9**
Air Force	63	0	0	63	83	75	158	39.9
Norway	**57**	**0**	**6**	**63**	**86**	**33**	**119**	**47.9**
Air Force	57	0	6	63	86	33	119	47.9
Poland	**98**	**0**	**0**	**98**	**214**	**225**	**439**	**22.3**
Army	0	0	0	0	0	122	122	0
Air Force	98	0	0	98	202	78	280	35.0
Navy	0	0	0	0	12	25	37	0
Russia	**793**	**139**	**344**	**1,276**	**2,052**	**854**	**2,906**	**27.3**
Air Force	677	139	274	1,090	1,805	669	2,474	27.4
Navy	116	0	70	186	247	185	432	26.9
Saudi Arabia	**285**	**0**	**40**	**325**	**495**	**205**	**700**	**40.7**
Army	0	0	0	0	0	114	114	0
Air Force	285	0	40	325	495	45	540	52.8
Navy	0	0	0	0	0	46	46	0
South Korea	**488**	**0**	**84**	**572**	**765**	**602**	**1,367**	**35.7**
Army	0	0	0	0	0	511	511	0
Air Force	488	0	68	556	744	49	793	61.5
Navy	0	0	16	16	21	42	63	0
Spain	**159**	**0**	**5**	**164**	**383**	**190**	**573**	**27.8**
Army	0	0	0	0	0	108	108	0
Air Force	146	0	5	151	366	44	410	35.6
Navy	13	0	0	13	17	38	55	23.6
Turkey	**364**	**0**	**0**	**364**	**764**	**370**	**1,134**	**32.1**
Army	0	0	0	0	112	301	413	0
Air Force	364	0	0	364	640	40	680	53.5
Navy	0	0	0	0	12	29	41	0
United Kingdom	**194**	**0**	**72**	**266**	**513**	**366**	**879**	**22.1**
Army	0	0	0	0	13	262	275	0
Air Force	194	0	60	254	479	8	487	39.8
Navy	0	0	12	12	21	96	117	0
United States	**3,004**	**157**	**548**	**3,709**	**7,769**	**5,753**	**13,522**	**22.2**
Army	0	0	0	0	222	4,380	4,602	0
Air Force	1,603	157	312	2,072	4,696	198	4,894	32.8
Navy	956	0	236	1,192	2,018	720	2,738	34.9
Marine Corps	445	0	0	445	833	455	1,288	34.6

Country	Fixed-Wing Combat Aircraft				Aircraft Fleet (Combat and Non-Combat)[a]			Fighters as % of Aircraft Fleet
	Fighters[b]	Bombers	Others[c]	Total	Fixed-Wing	Rotary-Wing	Total	
Noteworthy Air Forces of Non-NATO and Non-G-20 States								
Egypt	**393**	**0**	**191**	**584**	**799**	**256**	**1,055**	**37.3**
Air Force	393	0	191	584	795	241	1,036	37.9
Navy	0	0	0	0	4	15	19	0
Iran	**300**	**0**	**37**	**337**	**626**	**289**	**915**	**32.8**
Army	0	0	0	0	17	223	240	0
Air Force	300	0	34	334	590	36	626	47.9
Navy	0	0	3	3	19	30	49	0
Israel	**394**	**0**	**46**	**440**	**586**	**177**	**763**	**51.6**
Air Force	394[d]	0	46	440	586	177	763	51.6
North Korea	**431**	**80**	**34**	**545**	**977**	**286**	**1,263**	**34.1**
Air Force	431	80	34	545	977	286	1,263	34.1
Taiwan	**423**	**0**	**78**	**501**	**584**	**294**	**878**	**48.2**
Army	0	0	0	0	0	255	255	0
Air Force	423	0	78	501	584	19	603	70.1
Navy	0	0	0	0	0	20	20	0

Notes: The table does not include aircraft operated by coast guards or paramilitary forces.

a. The fixed-wing combat aircraft category includes anti-submarine warfare aircraft (ASW), bomber aircraft (BBR), fighter aircraft (FTR), fighter/ground attack aircraft (FGA), and attack aircraft (ATK). The fixed-wing non-combat aircraft category includes, among other things, airborne warning and control system aircraft (AWACS), combat search and rescue aircraft (CSAR), electronic warfare aircraft (EW), electronic, communication and signals intelligence aircraft (ELINT, COMINT and SIGINT), fire-fighting aircraft (FF), intelligence, surveillance and reconnaissance aircraft (ISR), maritime patrol aircraft (MP), multi-role aircraft (MR), search and rescue aircraft (SAR), tanker (i.e., air refuelling) aircraft (TK), training aircraft (TRG), and transport aircraft (TPT). Please note that tilt-rotor aircraft have been included in the fixed-wing aircraft category. The rotary-wing aircraft category includes both combat types (ASW and ATK helicopters) as well as non-combat types (CSAR, ISR, MR, SAR, and TPT helicopters).

b. The "Fighters" category includes both FTR and FGA fixed-wing combat aircraft.

c. The "Others" category mainly consists of ATK and ASW fixed-wing combat aircraft (it excludes BBR, FTR and FGA fixed-wing combat aircraft).

d. This only includes FTR and FGA that are currently in-service in Israeli Air Force squadrons. It does not include the more than 200 additional FTR and FGA that Israel keeps in storage, in case of a national emergency.

Source: Table prepared using data from International Institute for Strategic Studies (IISS), *The Military Balance 2016*, pp. 27–480.

APPENDIX B

Territorial Areas of Select Countries and their Jet Fighter Forces

Country	Territorial Area (Land and Water) (Square Kilometers)	Number of Jet Fighters	Type of Jet Fighters	Ratio (Square Kilometers Per Jet Fighter)
Russia	17,098,242	793	MiG-29 Fulcrum (158) MiG-31 Foxhound (112) Su-24 Fencer (181) Su-27 Flanker (199) Su-30 Flanker (32) Su-33 Flanker (18) Su-34 Fullback (57) Su-35 Flanker (36)	21,561
Canada*	9,984,670	77	CF-18 Hornet (77)	129,671
United States*	9,833,517	3,004	AV-8 Harrier II (131) F-5 Tiger II (44) F-15 Strike Eagle (438) F-16 Fighting Falcon (911) F-18 Hornet (610) F-18 Super Hornet (560) F-22 Raptor (179) F-35 Lighting II (131)	3,273
China	9,596,960	1,746	J-7 Fishbed (528) JH-7 Flounder (240) J-8 Finback (168) J-10 Firebird (347) J-11 Flanker (277) J-15 Flying Shark (14) Su-27 Flanker (75) Su-30 Flanker (97)	5,497
Brazil	8,515,770	106	F-5 Tiger II (57) AMX (49)	80,337
Australia	7,741,220	97	F-18 Hornet (71) F-18 Super Hornet (24) F-35 Lightning II (2) (In Test)	79,806
India	3,287,263	834	Jaguar (103) MiG-21 Fishbed (226) MiG-27 Flogger (124) MiG-29 Fulcrum (95) Mirage 2000 (50) Sea Harrier (10) Su-30 Flanker (225) Tejas (1)	3,941
Denmark*	2,910,573[a]	44	F-16 Fighting Falcon (44)	66,149
Saudi Arabia	2,149,690	285	F-15 Eagle (151) Tornado (81) Typhoon (53)	7,542

Country	Territorial Area (Land and Water) (Square Kilometers)	Number of Jet Fighters	Type of Jet Fighters	Ratio (Square Kilometers Per Jet Fighter)
Iran	1,648,195	300	Azarakhsh (6) F-4 Phantom II (70) F-5 Freedom Fighter (20) F-5 Tiger II (55) F-7 Airguard (24) F-14 Tomcat (43) MiG-29 Fulcrum (36) Mirage F-1 (10) Saegheh (6) Su-24 Fencer (30)	5,493
Egypt	1,001,450	393	F-4 Phantom II (29) F-16 Fighting Falcon (209) J-7 Fishbed (30) MiG-21 Fishbed (50) Mirage 5 (54) Mirage 2000 (18) Rafale (3)	2,548
Turkey*	783,562	364	F-4 Phantom (51) F-5 Freedom Fighter (53) F-16 Fighting Falcon (260)	2,153
France*	643,801[b]	277	Mirage 2000 (121) Rafale (135) Super Etendard (21)	2,324
Spain*	505,370	159	AV-8 Harrier II (13) F-5 Freedom Fighter (19) F-18 Hornet (86) Typhoon (41)	3,178
Japan	377,915	361	F-2 (92) F-4 Phantom II (68) F-15 Eagle (201)	1,047
Germany*	357,022	235	Tornado (106) Typhoon (129)	1,519
Norway*	323,602	57	F-16 Fighting Falcon (57)	5,677
Poland*	312,685	98	F-16 Fighting Falcon (48) MiG-29 Fulcrum (32) Su-22 Fitter (18)	3,191
Italy*	301,340	226	AV-8 Harrier II (16) Tornado (68) Typhoon (71) AMX (71)	1,333
United Kingdom*	243,610	194	Tornado (76) Typhoon (115) F-35 Lighting II (3) (In Test)	1,255
Greece*	131,957	232	F-4 Phantom II (34) F-16 Fighting Falcon (154) Mirage 2000 (44)	569

Country	Territorial Area (Land and Water) (Square Kilometers)	Number of Jet Fighters	Type of Jet Fighters	Ratio (Square Kilometers Per Jet Fighter)
North Korea	120,538	431	MiG-17 and J-5 Fresco (107) MiG-19 and J-6 Farmer (100) MiG-21 and J-7 Fishbed (150) MiG-23 Flogger (56) MiG-29 Fulcrum (18)	280
South Korea	99,720	488	F-4 Phantom II (70) F-5 Tiger II (174) F-15 Eagle (60) F-16 Fighting Falcon (164) FA-50 Golden Eagle (20)	204
Netherlands*	41,543	63	F-16 Fighting Falcon (61) F-35 Lightning II (2) (In Test)	659
Taiwan	35,980	423	F-5 Tiger II (94) F-16 Fighting Falcon (145) Mirage 2000 (56) F-CK-1 Ching Kuo (128)	85
Belgium*	30,528	59	F-16 Fighting Falcon (59)	517
Israel	20,770	394[c]	F-15 Eagle (50) F-15 Super Eagle (25) F-16 Fighting Falcon (319)	53

Notes: * NATO member states

a. Includes Denmark (43,094 sq. km), the Faroe Islands (1,393 sq. km) and Greenland (2,166,086 sq. km).

b. Includes France (551,500 sq. km) and its overseas territorial possessions of French Guiana, Guadeloupe, Martinique, Mayotte and Reunion (92,301 sq. km).

c. The Israeli Air Force also keeps more than 200 jet fighters in store, in case of an emergency. This includes older versions of the C-7 Kfir, F-4 Phantom II, F-15 Eagle, and F-16 Fighting Falcon.

Source: Table prepared using data from the United States Central Intelligence Agency (CIA), *The World Factbook*, April 2016 (for country areas) and IISS, *The Military Balance 2016*, pp. 27–480 (for jet fighter forces).

APPENDIX C
LIST OF WITNESSES

Organizations and Individuals	Date	Meeting
Department of Foreign Affairs, Trade and Development	2016/03/22	5
David Drake, Director General, International Security and Intelligence Bureau		
Department of National Defence		
RAdm Scott Bishop, Director General, International Security Policy		
Stephen Burt, Assistant Chief of Defence Intelligence, Canadian Forces Intelligence Command		
As an individual	2016/04/12	6
Margarita Assenova, Director of Programs for Balkans, Caucasus and Central Asia, The Jamestown Foundation		
Aurel Braun, Professor, University of Toronto		
Elinor Sloan, Professor, Carleton University		
Department of National Defence	2016/04/14	7
BGen Todd Balfe, Director General, Air Readiness, Royal Canadian Air Force		
LGen Michael Hood, Commander, Royal Canadian Air Force		
Department of National Defence	2016/04/19	8
LGen Pierre St-Amand, Deputy Commander, North American Aerospace Defense Command (NORAD)		
As an individual	2016/04/21	9
Andrea Charron, Deputy Director, Centre for Defence and Security Studies, University of Manitoba		
Charles F. Doran, Professor of International Relations (Andrew W. Mellon), Johns Hopkins University		
Christopher Sands, Director, Center for Canadian Studies, Johns Hopkins University		
Joel Sokolsky, Professor, Department of Political Science, Royal Military College of Canada		
As an individual	2016/05/05	10
David Perry, Senior Analyst, Canadian Global Affairs Institute		
Department of National Defence		
Patrick Finn, Assistant Deputy Minister, Materiel		
Col Kevin Horgan, Commander, Real Property Operations Group - Director General Fire And Nuclear Safety		
Jaime W. Pitfield, Assistant Deputy Minister, Infrastructure and Environment		

Organizations and Individuals	Date	Meeting
Public Services and Procurement Canada	2016/05/05	10
Lisa Campbell, Assistant Deputy Minister, Acquisitions Branch		
Rideau Institute on International Affairs		
Peggy Mason, President		
As an individual	2016/05/10	11
Michael Byers, Professor and Canada Research Chair, Department of Political Science, University of British Columbia		
James Fergusson, Professor, Department of Political Studies, University of Manitoba		
Robert Huebert, Associate Professor, Department of Political Science, University of Calgary		
Adam Lajeunesse, Postdoctoral Fellow, Department of History, St. Jerome's University		
Department of National Defence		
LGen Stephen J. Bowes, Commander, Canadian Joint Operations Command		
BGen Mike A. Nixon, Commander, Joint Task Force North		

REQUEST FOR GOVERNMENT RESPONSE

Pursuant to Standing Order 109, the Committee requests that the government table a comprehensive response to this Report.

A copy of the relevant *Minutes of Proceedings* (Meetings Nos. 5, 6, 7, 8, 9, 10, 11, 15, 16 and 18) is tabled.

Respectfully submitted,

Stephen Fuhr
Chair

Dissenting Opinion of the Official Opposition to the House of Commons Standing Committee on National Defence Report on Canada and the Defence of North America: NORAD and Aerial Readiness

Introduction:

The Official Opposition (Conservative) committee members do not recognize the report on *Canada and the Defence of North America: NORAD and Aerial Readiness* as legitimate for several reasons.

Firstly, in the opinion of the Official Opposition, the committee's majority report is not legitimate because of the procedures and practices implemented by the members of the Liberal party throughout the course of this study. No opposition members were present for the final stages of drafting. Some members of the committee, with the tyranny of the majority, rushed through the final stages of the draft report, which included making recommendations and established the short deadline for the dissenting opinions for opposition members.

Furthermore, the committee, passed a motion forcing members of the opposition parties to submit a dissenting report less than three days after the last meeting. Members of the Official Opposition were not afforded an opportunity to see the final version of the report before the deadline for submission of dissenting reports. Therefore, the Conservative Party's dissenting report was written in the dark, without seeing the final version of the committee's majority report.

Additionally, the motion that was passed by the committee forces opposition members to submit their dissenting reports in both official languages in less than 72 hours. This is an unreasonable demand, seeing as translation services typically allows for three days to complete a translation, especially on longer documents such as dissenting reports.

It is the opinion of the Official Opposition that the members of the governing party took advantage of their majority status throughout the study to draft a report that suits their political needs, rather than the shared opinion of all committee members. Members of the Official Opposition, were not consulted on the motion and timing to submit a dissenting report and their consent was not given.

Furthermore, the Minister of National Defence said that he would use the committee's findings in shaping the government's defence policy, which is currently under review. The Official Opposition is of the opinion that the committee's majority report is not reflective of all members of the committee, but only of those of the governing party. The behaviour of the Liberal members of the committee, throughout the course of the study, is evidence that the government is using its majority status to predetermine the outcome of not only the committee's report, but the government's defence policy review as well.

Additionally, this report only addresses one aspect of the Canadian Armed Forces, - the Royal Canadian Air Force - and does not fully reflect all aspects of the military and Canada's defence policy. For the above reasons, the Official Opposition committee members do not accept the committee's majority report and respectfully request that the

Minister of National Defence consider all dissenting opinions in the government's review of Canada's National Defence policy.

Question on breach of Parliamentary privilege:

The Official Opposition members believe that the Parliamentary Secretary to the Minister of National Defence, the Honourable John McKay, breached the committee's Parliamentary privilege.

On Tuesday, June 7, 2016, the Parliamentary Secretary appeared on a televised broadcast on CPAC on a program titled *Prime Time Politics*. During an on-air discussion with host Peter Van Duesen, James Bezan (Member of Parliament for Selkirk—Interlake—Eastman) and Randall Garrison (Member of Parliament for Esquimalt—Saanich—Sooke), the Parliamentary Secretary made reference to recommendation #3 of the report that was submitted to the clerk of the committee for consideration in drafting the committee's report. In a discussion concerning the replacement of Canada's CF-18 fighter jets Mr.McKay said "You need a plane… Even James, **in his representations to committee** has said the government needs to make a decision within 12 months, and I agree". At no point during the course of the study did Mr. Bezan or any other member of the committee make reference to a suggestion that the government make a decision regarding the replacement of Canada's CF-18s within a 12 month period. However, in providing suggested recommendations to the clerk of the committee, Mr. Bezan, on behalf of the Official Opposition Members of the committee, wrote "That the Government of Canada decide on the replacement of the current fleet of CF-18's within the next 12 months". The Official Opposition's recommendations were submitted confidentially directly to the clerk of the committee, through Mr. Bezan's office. In accordance with committee procedures, the clerk then shared all submitted recommendations with the committee members, clearly indicating that the information was strictly confidential and not to be shared with anyone who is not a member of the committee. The e-mail distributed by the clerk on May 30th, 2016 says:

> Any disclosure of information contained in this draft report and document could be considered a potential breach of parliamentary privilege (House of Commons Procedure and Practice, Second Edition, 2009, p. 1077-1078). This list is **CONFIDENTIAL AND REMAINS SO** even after the final version of the report is presented in the House of Commons.

It is important to note here that Mr. McKay, the Parliamentary Secretary to the Minister of National Defence, is **NOT** a member of the Standing Committee on National Defence, and therefore should not have had access to this confidential information. Therefore, this incident indicates at least two breaches of the committee's Parliamentary privilege. Firstly, Mr. McKay should not have had access to this confidential information, a member of the committee must have shared it with him, despite clear instructions from the clerk. Secondly, as an experienced Parliamentarian, Mr. McKay should be well aware that any

confidential information that is provided to the committee cannot be shared outside of committee, nonetheless on national television.

Furthermore, the involvement of the Parliamentary Secretary in the business of committee is in violation of a campaign promise made by the Prime Minister. During the last federal election campaign, the Prime Minster promised “We will change the rules so that Ministers and Parliamentary Secretaries may not be, or stand in for, voting members on committees”. Clearly, their effort to distance members of the Government from the work of committees has failed.

The working relationship among members of the committee began to deteriorate when Mr. Bezan attempted to address this potential breach of privilege.

Threats to Canada and North America:

Ensuring the defence of Canada has always been the top priority of the Canadian Armed Forces. In an ever-changing world, new threats to Canada and its citizens are bound to emerge. Canada prides itself on being the True North Strong and Free. The CAF is the means by which our freedom and sovereignty are protected.

A basic understanding of history shows that the global security environment is fluid, always changing and evolving. This idea was reaffirmed by military and government officials on a number of occasions throughout the course of the study. On multiple occasions, the Official Opposition members heard about the continuous challenge of staying ahead of the development and modernization of new threats. As Lieutenant-General Pierre St-Amand, Deputy Commander, NORAD noted “we're observing threat streams that force us to adjust our aperture and pay attention to other domains”.[1]

The safety and security of Canadians is at risk from threats that can stem from either beyond or within our borders. Extremist groups from around the world have proven more than capable of launching attacks on the West. Ensuring that our domestic agencies have the tools they need to stop an attack on Canadian soil is paramount. In addition, responding to a terrorist attack with the proper force and effectiveness is necessary for ensuring a safe and secure Canada. Setting the framework so that the CAF, RCMP, and local assets have the ability to work in tandem during a crisis must be a priority for any Canadian government.

The threats from non-state actors have been on the rise. Examples of these threats range from drug traffickers, to radicalized individuals, often referred to as ‘lone wolves’, to organized terrorist groups that have declared war upon Canadian values. In an uncertain world, filled with newly emerging threats, it is paramount that the government remains vigilant in protecting Canada and Canadians.

The rapid modernization of the threats facing Canada is perhaps best illustrated through the examples of non-state actors. They are often difficult to predict and can be carried out with weapons ranging from commercial aircrafts, to hand held knives, to cyber

[1] NDDN, *Evidence*, 1st Session, 42nd Parliament, 19 April 2016 (Lieutenant-General Pierre St-Amand).

technologies and everything in between. Despite these difficulties, Dave Perry believes that Canada has developed an expertise in defending against and preventing these types of attacks, “For more than two decades, the focus of North American defence and security has been largely on non-state threats, on things like narcotics trafficking and terrorism. I'd argue that Canada is currently quite well positioned to defend itself against those types of threats[2]” he said.

An emerging threat, stemming more and more from non-state actors, has been cyberattacks. Cyber technologies can be used for variety of purposes including but not limited to disabling a power grid, distributing government services, or conducting theft of information or resources. Cyberattacks are now a reality that government must face on a daily basis, and from a wide array of actors. As the Chief of the Communications Security Establishment, noted our reliance on new technologies has made us more susceptible to cyberattacks, “More and more of the world's and Canada's government operations, our business, our military systems, and citizens' lives are conducted online. This increased prevalence of digital information and electronic systems represents tremendous opportunity for Canada, but it also presents risks and threats to our government systems, to Canadian industry, and ultimately to Canadians”[3].

Recommendation: 1. *That the Government of Canada ensure that adequate safeguards are in place to detect, deter, and prevent conventional and asymmetric attacks on Canada and Canadians, including but not limited to cyber-attacks, missile threats and terrorism, by foreign governments and non-state actors.*

Surveying the North and Protecting our Sovereignty:

One of the key areas of concern when addressing potential threats to Canada’s sovereignty is the Artic. From population to geographical makeup, the barren landscape that is Canada’s northern border poses a number of security concerns. It can best be described by Lieutenant General Stephen Bowes who said “Canada's Arctic region is immense. It comprises some 40% of Canada's overall land mass, and 75% of its coastline. Its size, combined with its austere climate and conditions, present a complex environment in which the Canadian Armed Forces must be prepared to operate at any time.”[4]

Surveying Canada’s North is imperative to the sovereignty of Canada. The vast expansion that is Canada’s Northern border is shared with a number of countries, and not all are allies. This is done through a network of surveillance equipment such as the North Warning System and UAVs that safeguards Canada’s domain awareness. To ensure our borders are secure and sovereignty protected, Canada must ensure its surveillance equipment is effective, modern, and interoperable.

[2] NDDN, *Evidence,* 1st Session, 42nd Parliament, 5 May 2016 (Dave Perry, Senior Analyst, Canadian Global Affairs Institute)

[3] NDDN, *Evidence,* 1st Session, Greta Bossenmaier Chief, Communications Security Establishment – NDDN Appearance May 19, 2016

[4] NDDN, Evidence, 1st Session, 42nd Parliament, 10 May 2016 (LGen Stephen Bowes)

At this current time Canada's northern surveillance does not meet the requirements for a full grasp of domain awareness[5]. As threats in the north become more prevalent in terms of intent and technology, Canada must be able to ensure that sovereignty is protected. Before a nation can respond, it must first be aware. An overwhelming number of experts and military personnel stated that there are gaps in our surveillance systems that must be filled.

Canada is not alone in this task, and our partnership in NORAD has a large role to play in ensuring North American surveillance and sovereignty. This is echoed by Rear Admiral Scott Bishop who stated "NORAD also plays an important role in ensuring Canadian sovereignty and security, serving as a deterrent against potential attacks, and providing crucial surveillance capability for North America's approaches."[6] Through NORAD's tri-structure command the Arctic is a shared responsibility between Canada and the United States. This allows for the sharing of resources and intelligence in order to maximize the defence of North America.

With this said, a number of witnesses told Conservative members that Canada must be vigilant that the North Warring System as well as other surveillance equipment are becoming outdated. According to Andrea Charron of the Norman Patterson School of International Affairs, "One of the immediate material concerns for NORAD is the modernization of the North Warning System, which is vital to NORAD's ability to detect, assess, and track airborne activity emanating from the north."[7] This sentiment was echoed by a three other witnesses at the committee. The lone exception was academic Michael Byers who said Canada is "good on surveillance in the Artic right now and [will] be for the next 20 years."[8] An overwhelming majority of witnesses support an upgrade of our northern surveillance system that was built between 1986 and 1992. Since that time technology and threats have evolved, and our surveillance systems must adapt as well.

In terms of monitoring the north, Canada must not be reactive, but forward thinking. With the advancement of Russia's stealth fighter jet program and other advanced weapons Canada must remain ahead of the technological curve. This point was also made by Lieutenant-General Pierre St-Amand who said that's NORAD's system was in place to survey threats "perceived in the late 1970's" and that is why, "from a capability point of view, we have to look at something else."[9]

The lifecycle of the North Warning System has started near its end. According to Lieutenant-General St-Amand "We expect the system to last until around 2025, at which point we will be looking for modern solutions to replace its capabilities."[10] At this time DND is in the planning process of replacing the North Warning System, but what the future makeup of the system will be is uncertain. Canada has the option to invest in a

[5]NDDN, Evidence, 1st Session, 42nd Parliament, 21 April 2016 (Dr. Christopher Sands)
[6] NDDN, Evidence, 1st Session, 42nd Parliament, 22 March 2016 (RAdm Scott Bishop)
[7] NDDN, Evidence, 1st Session, 42nd Parliament, 21 April 2016 (Andrea Charron).
[8] NDDN, Evidence, 1st Session, 42nd Parliament, 10 May 2016 (Michael Byers).
[9] NDDN, Evidence, 1st Session, 42nd Parliament, 19 April 2016 (LGen Pierre St-Amand)
[10] iBid

number of surveillance equipment such as satellites, UAV's, radar systems, and patrol aircraft. How Canada chooses to invest its money in surveillance equipment will show how serious it considers its northern sovereignty.

Conservative members also heard multiple testimonies that northern surveillance should not only be upgraded, but expanded as well. Conservative members were told that whatever system were to replace the North Warning system must cover more of the Arctic territory. This was echoed by Lieutenant General Pierre St-Amand who said that the system that replaces the North Warning System must cover the far north, as the system currently in place cannot[11]. Ensuring that Canada is aware of activities in the North is intertwined with the concept of sovereignty.

In terms of surveillance, interoperability is a must. With our commitments to NORAD, Canada must ensure that the equipment purchased for surveillance and response must work alongside our American partners. Rear Admiral Scott Bishop agreed with this point when he said, "the other benefit of remaining interoperable with the United States is that the United States sets the bar for any military operation of significance around the world. By ensuring that we are very interoperable with the United States, Canada can operate in pretty much any foreign military operation and not only operate but also assume a leadership role, which we have done several times."[12] The equipment must also work in conjunction with allies outside the scope of NORAD and be relevant for decades to come. This point was solidified when Lieutenant General Michael Hood said, "I think in making the choice of aircraft for Canada, that has to be one of the factors that keeps in mind our interoperability today but also 20 and 30 years into the future."[13] Canada shares the vast Arctic expansion with a number of NATO allies, which must work together to ensure a shared security.

Recommendations: 2. *That the Government of Canada ensures that proper surveillance safeguards, operational capabilities and deterrent measures are in place to protect Canada against any potential threats.*

3. *That the Government of Canada maintain its current support and involvement in both NORAD and NATO.*

4. *That the Government of Canada consider a plan to replace and upgrade the North Warning System by extending the infrastructure's operational life cycle, adapting new technology, and expanding the system to cover Canada's Arctic Archipelago.*

5. *That the Government of Canada acquire and employ unmanned aerial vehicles (UAVs) for the surveillance and defence of Canadian Arctic territory.*

6. *That the Government of Canada, both independently and through its NORAD partnership, continue to strengthen its domain awareness and surveillance operations of any threats to Canada and North America, specializing in the Arctic and maritime domains.*

[11] iBid
[12] NDDN, Evidence, 1st Session, 42nd Parliament, 22 March 2016 (RAdm Scott Bishop)
[13] NDDN, Evidence, 1st Session, 42nd Parliament, 14 April 2016 (LGen Michael Hood)

7. *That the Government of Canada commit to deploying the remaining RadarSat Constellation and expanding the number of satellites to guarantee the surveillance of Canada's Arctic on a continuous basis.*

8. *That the Government of Canada ensure the RCAF has sufficient assets and resources to protect Canadian sovereignty both at home and abroad, and defend our values internationally when deemed appropriate and necessary.*

Submarine Defence:

Having a dominant stance in the marine domain defence of Canada is paramount. This covers both above and below water vessels. It was stated by Adam Lajeunesse that "the Russians have also been rebuilding their submarine capability. Now, these boats are intended largely for use in the Arctic. The Russians have historically had a very strong under-ice presence through most of the last decades of the Cold War."[14] Submarines are important in the context of North American security due to their ability to launch cruise missiles. It was expressed by Dr. Robert Huebert that "submarine factors are already coming into context. To pretend that these types of technologies are not being developed with countries that have very different interests from Canada is just simply sticking our head in the snow, to be honest."[15] Tracking and defending against below water vessels will become critically important due to the potential cargo traffic that will exist within the Artic sphere of influence.

Recommendation: 9. *That the Government of Canada recognize the proliferation of submarines as a threat to Canadian sovereignty and ensure we enhance the RCAF and RCN surveillance and deterrent capabilities against such threats.*

The right equipment to get the job done

Following the 2015 federal election, the government announced its plan to hold an "open and transparent competition to replace the CF-18 fighter aircraft, focusing on options that match Canada's needs."[16] While the Liberals have indicated that they do not plan on launching the competition process until the defence policy review is complete, we have concluded that such a decision will jeopardize the possibility of securing a functional fleet by 2025. After hearing statements from several witness who have indicated that "the competition needs to proceed expeditiously," it is the opinion of the Conservative Party that the Liberals must propose a statement of requirements as soon as possible, so that the competition process can begin.

In Question Period on June 15th, 2016 the Minister of National Defence informed the House that "26 aircraft have been extended," and that the Liberals "are trying to extend all the aircraft up to 2025."[17] Based on this update, it can be concluded that the condition of Canada's current CF-18s will not pose a capability gap to the RCAF, assuming the Liberal Party selects a replacement aircraft within the next 12 months.

[14] NDDN, Evidence, 1st Session, 42nd Parliament, 10 May 2016 (Adam Lajeunesse)
[15] NDDN, Evidence, 1st Session, 42nd Parliament, 10 May 2016 (Dr. Robert Huebert)
[16] Office of the Prime Minister of Canada, "Minister of National Defence Mandate Letter," 13 November 2015.
[17] Question Period, 1st Session, 42nd Parliament, 16 June 2016 (Minister of National Defence Harjit S. Sajjan).

According to the testimony given by Dr. Michael Byers' on May 10th, 2016, purchasing 65 of Lockheed Martin's F-35 aircraft is unaffordable. He references the limited nature of the government's budget for securing a replacement for the current fleet of CF-18s, and indicates that the cost of the F-35 would be too great for the government to be able to afford the minimum number of jets required to service the RCAF.[18] However, Denmark's recent report detailing the competitive procurement process that they held to select a new fighter aircraft, directly contradicts Dr. Byers' suggestion that the F-35 is unaffordable in comparison to other aircraft being considered.[19] In an article discussing Denmark's competition process, *Defense News* states that "the Danish government pegged the overall procurement cost to buy 28 F-35s at $2.33 billion, or $83 million a piece," while the overall cost to buy the same number of Super Hornets amounts to $4.65 billion ($122 million per unit).[20]

Given the changing nature of both conventional and asymmetric threats in the current global security environment, and the consequential security demands that must be met by the CAF, Canada must be equipped with the appropriate resources. This in mind, the Conservative Party considers it an obligation of the Liberal Party to secure a replacement for the CF-18s, using a process that guarantees the aircraft best suited for the RCAF. This in mind, the only way to ensure that the RCAF is properly resourced, is to have the Liberal Party conduct an open and transparent procurement process to replace the CF-18 Hornet. By pursuing a competitive tendering process, we will be able to determine which aircraft best meets the needs of the RCAF, as well as secure a contract that offers competitive pricing and a suitable timeline.

Recommendation: 10. *That the Government of Canada conduct an open and fair competition to replace Canada's outgoing fleet of CF-18 fighter jets.*

Following the replacement of Canada's CF-18 fighter jets, there should be an evaluation of: the existing military infrastructure in place, the compatibility of the infrastructure with the replacement aircraft, and the projected lifespan of the existing infrastructure. Due to the age and limited capabilities of the CC-150 Polaris currently in use by the RCAF, DND has indicated its intention to purchase new multi-role tankers between 2021 and 2025, with completion expected to take place between 2026 and 2030. However, this timeline will prove problematic should the aircraft chosen to replace Canada's CF-18s not be compatible with the CC-150 Polaris. According to Lieutenant-General Hood, "once a decision is made on the next fighter aircraft, the next decision is the tanker replacement."[21] He also said that "we will replace the tanker aircraft with whatever our front-line fighter is at the time. That's been our plan for quite some time."[22] Lieutenant-General Hood, along with several other witnesses, were insistent on reminding the

[18] NDDN, Evidence, 1st Session, 42nd Parliament, 10 May 2016 (Michael Byers).
[19] Executive Summary: *Type Selection of Denmark`s New Fighter Aircraft*. Rep. Danish Ministry of Defence, 2016.
[20] Seligman, Lara. "Boeing Disputes Denmark's F-35 Evaluation." *Defense News*. 19 May 2016. Web.
[21] NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood).
[22] Ibid.

committee of the need to secure a replacement air tanker fleet as soon as possible, and of the critical nature of the air tanker to Canada's participation in the NORAD mission.[23]

Recommendation: 11. *That the Government of Canada begin the process of replacing the Polaris refuelling tankers immediately following the selection of the next RCAF fighter jet.*

As Canada initiates the process of replacing its current fleet of CF-18s, it is crucial that we consider the interoperability capacities of all potential aircraft options presented. As a member of NORAD, in partnership with the United States, Canada is responsible for protecting one of the largest airspaces in the world. Our obligations as a NATO member to fulfill various international defence commitments, as well as our efforts to protect our sovereign territory in the Arctic, are ones that necessitate constant communication and cooperation with our allies. The interoperability made possible through the coordination of aircraft acquisition has the potential to greatly benefit all cooperative missions in the future, through shared investments in personnel, equipment, readiness, and infrastructure. In his testimony, Lieutenant-General Hood stated the following:

> With the complexity of the signals environment, the way aerial warfare is evolving, interoperability today and into the future will be a very important factor. Your ability to receive information from space-based assets, from AWACS aircraft, from ground-based sensors, from other aircraft, requires a level of interoperability that not every aircraft has the capability to meet... I think in making the choice of aircraft for Canada, that has to be one of the factors that keeps in mind our interoperability today but also 20 and 30 years into the future.[24]

Recommendation: 12. *That the Government of Canada consider interoperability with our allies, and in particular the United States, as a key component for the replacement of Canada's CF-18s.*

It is the Conservative Party's firm belief that where the safety of Canadian soldiers is concerned, operational effectiveness and efficiency of the CAF should be a paramount priority. The Liberal Party's decision to postpone $3.7 billion worth of military spending deprives the CAF of the resources necessary to defend Canada in today's global security environment, and maintain aerial readiness. This decision will result in the suspension of 62 projects commissioned by Department of National Defence that were initiated to improve the capabilities of the CAF, as they work to protect Canada's security, sovereignty, and freedoms. The delays imposed on military procurement and infrastructure investment by the Liberals threaten to limit Canada's ability to respond to threats in the future – not improve it.

Recommendation: 13. *That the Government of Canada reverse its decision to delay major capital projects for the CAF.*

[23] NDDN, Evidence, 1st Session, 42nd Parliament, 22 March 2016 (Rear-Admiral Scott Bishop).
[24] NDDN, *Evidence*, 1st Session, 42nd Parliament, 14 April 2016 (Lieutenant-General Michael Hood).

The Official Opposition's Recommendations:

1. *That the Government of Canada ensure that adequate safeguards are in place to detect, deter, and prevent conventional and asymmetric attacks on Canada and Canadians, including but not limited to cyber-attacks, missile threats and terrorism, by foreign governments and non-state actors.*

2. *That the Government of Canada ensures that proper surveillance safeguards, operational capabilities and deterrent measures are in place to protect Canada against any potential threats.*

3. *That the Government of Canada maintain its current support and involvement in both NORAD and NATO.*

4. *That the Government of Canada consider a plan to replace and upgrade the North Warning System by extending the infrastructure's operational life cycle, adapting new technology, and expanding the system to cover Canada's Arctic Archipelago.*

5. *That the Government of Canada acquire and employ unmanned aerial vehicles (UAVs) for the surveillance and defence of Canadian Arctic territory.*

6. *That the Government of Canada, both independently and through its NORAD partnership, continue to strengthen its domain awareness and surveillance operations of any threats to Canada and North America, specializing in the Arctic and maritime domains.*

7. *That the Government of Canada commit to deploying the remaining RadarSat Constellation and expanding the number of satellites to guarantee the surveillance of Canada's Arctic on a continuous basis.*

8. *That the Government of Canada ensure the RCAF has sufficient assets and resources to protect Canadian sovereignty both at home and abroad, and defend our values internationally when deemed appropriate and necessary.*

9. *That the Government of Canada recognize the proliferation of submarines as a threat to Canadian sovereignty and ensure we enhance the RCAF and RCN surveillance and deterrent capabilities against such threats.*

10. *That the Government of Canada conduct an open and fair competition to replace Canada's outgoing fleet of CF-18 fighter jets.*

11. *That the Government of Canada begin the process of replacing the Polaris refuelling tankers immediately following the selection of the next RCAF fighter jet.*

12. *That the Government of Canada consider interoperability with our allies, and in particular the United States, as a key component for the replacement of Canada's CF-18s.*

13. *That the Government of Canada reverse its decision to delay major capital projects for the CAF.*

Study on Canada, NORAD, and Aerial Readiness in the Canadian NORAD Region: NDP Recommendations for the Report

It is with regret that New Democrats submit this dissenting opinion on Canada's Aerial Readiness. We had hoped that the Defence Committee could arrive at consensus recommendations which would constitute a substantive contribution to the ongoing Defence Review on the basis of all party support. The Committee heard valuable evidence from a wide variety of witnesses and we thank them for their contribution.

Unfortunately this report does not represent a consensus of members from all parties on the Defence Committee. Instead at the 11th hour, the Committee adopted the report without discussing proposed recommendations with all parties. In fact, some members chose to press their partisan advantage and proceeded to adopt the final report at a time when there were no opposition members present. This was possible only because of a dispute over the handling of an apparently deliberate violation of the confidentiality of the drafting process for partisan advantage by a Liberal MP. Worse still, in their haste to exploit the absence of Opposition members, the Committee adopted the report without even having a final text before it. And it now seems the Committee did all this under the direction of the Parliamentary Secretary to the Minister of National Defence in direct contradiction of the Prime Minister's promise to let committees operate independently.

In the end, New Democrats believe the majority report tabled does not do justice to the evidence heard by the Defence Committee. Instead, this report is primarily an attempt by the Liberals to reinforce the Government's defence agenda. In particular, the Committee report marshals evidence to bolster the Liberal decision to sole-source the purchase of Super Hornets, their desire to reposition Canada's current fighter jets, and their attempt to justify participation in the US missile defence program. New Democrats believe that a fair examination of the evidence would lead to three different conclusions, that Canada is in need of an open and transparent procurement process to acquire future aerial assets, that capital expenditures need to take into account the need to replace additional air assets in the medium term including refueling and search and rescue aircraft, and that participation in the ineffective US missile defence scheme would not only be financially costly but would also risk further promoting another round of an arms race focused on offensive ballistic missiles.

What was heard consistently from witnesses during the study was the need for new equipment so that the RCAF can maintain interoperability with our allies as well as meet Canada's domestic and sovereignty requirements. Domestic requirements would include the ability to operate in the Arctic as climate change brings increased activity in the area. LGen Stephen Bowes indicated that "the Canadian Arctic is expected to experience an increase in overall activity in the coming years due to developments in areas such as natural resource exploitation, adventure actives, and maritime traffic."[1]

[1] NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (Lieutenant-General Stephen Bowes.

The increased activity in the Canadian Arctic from tourists and corporations alike will add an increased role for the Royal Canadian Air Force both in terms of defending Canadian sovereignty, environmental monitoring, and search and rescue operations.

With the vast geographic size of Canada and the Canadian Arctic in mind, the Committee heard testimony regarding both a single-engine and twin-engine aircraft to replace the CF-18. While Rear-Admiral Scott Bishop testified that engine technology has become increasingly more reliable and single-engine aircraft are less-expensive, other witnesses testified that the risk of potential engine failure outweighs the potential cost-benefits to single-engine aircraft. Dr. Michael Byers from the University of British Columbia's Political Science department stated in his presentation that "twin engine jets are still more reliable than single engine jets."[2]

Any decision on which aircraft that will replace the CF-18s must be taken in an open and transparent manner. The sole-sourcing process adopted by the Conservatives to purchase the F-35 has proven so far to be costly and inefficient, and exactly how expensive the F-35s would be remains an open question. The plane also remains unproven in terms of performance and mechanical issues. The F-35 is a single-engine aircraft and given the testimony heard from several witnesses about the needs of Canada's vast geography, the F-35 simply does not appear to meet our domestic requirements. However, an open, transparent process can meet the need to balance costs with finding the right aircraft for Canada. We still lack a clear statement of the capabilities required to meet the needs of Canada's complex geography combined with interoperability with our allies. The procurement process must also allow for timely delivery of the aircraft to avoid the pending operational gaps.

Canada's aerial readiness is not just a question of fighter jets. Dr. Byers produced an extensive procurement list for aerial readiness including the need to upgrade the fixed-wing search and rescue planes which are nearing 50 years old. Additionally he states that the Air Force only has 14 long-range search and rescue helicopters while "… the Royal Canadian Air Force, is on record as saying that they need at least 18 to do the job properly."[3]

Dr. Byers also stated that the Canadian Air Force should increase its capabilities in the Arctic. There are 14 Aurora maritime patrol aircraft currently undergoing a major refit process and he suggested that all 18 should undergo the process. Additionally, "Transport Canada has two Dash 8s, and one Dash 7. They overfly every foreign vessel visiting Canada's Arctic."[4] An increase to this capability would significantly enhance Canada's Arctic surveillance capabilities. While RADARSAT-2 is the leader in Arctic surveillance, the RADARSAT Constellation is showing significant benefit for the first three satellites in the system and there is potential to increase the number of satellites to the originally proposed six. This list demonstrates that the decision on which aircraft

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[2] NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (Dr. Michael Byers).

[3] NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (Dr. Michael Byers).

[4] NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (Dr. Michael Byers).

to replace the CF-18s with must be balanced with the other capital investments the Royal Canadian Air Force requires.

While this study failed to focus on search and rescue as part of aerial readiness, it should be an important part of these discussions. Based on recommendation 7.100 of 2013 Auditor General report, a formal national Search and Rescue policy framework should be implemented. National Defence, in consultation with Fisheries and Oceans Canada, Transport Canada, and other federal departments, and the provinces and territories, should take steps to improve the governance structure, including developing objectives, performance indicators, and reporting that would enhance search and rescue service and coordination.

The terms of reference for the Liberal's Defence Review re-opened the question of Canadian participation in the U.S. Ballistic Missile Program. While Canada made the decision not to take part in ballistic missile defence a decade ago, it is important to reiterate the reasons why that decision should stand. Peggy Mason, Canada's former Ambassador for Disarmament to the United Nations, and former International Security Policy Advisor to Joe Clark during his time as Foreign Minister in the Mulroney government, and the current President of the Rideau Institute, has been working in the field of non-proliferation for many years. Her argument is that strategic BMD systems do not adequately defend against such attacks and are always outdated to the latest offensive technology. As she puts it, "it is infinitely cheaper to build more offensive systems."[5] A decade later, the U.S. ballistic missile defence program has achieved a success rate of only 50% even in controlled conditions and, despite billions of dollars spent, the U.S. still has too few interceptors to be effective against Russian or Chinese attacks.

While the Americans have gone to great lengths to explain to countries like China and Russia that their BMD system is not aimed at them, Ms. Mason has asserted that "BMD is a spur for Russia and China to build ever more and better offensive systems in order to overwhelm these defences in case they should ever work and be directed at them."[6] In addition to encouraging the further development of next-generation offensive ballistic missile technology, BMD also has the effect of promoting nuclear weapons modernization. The decision of the U.S. under George W Bush to move away from the Anti-Ballistic Missile Treaty to pursue BMD development in the name of greater security, has actually led to greater destabilization of global security.

Some government witnesses claimed that Canada getting involved in ballistic missile defence now would yield economic opportunities for Canada, provide us with a place at the decision-table, and not cost any money to sign on to. However, several witnesses testified that none of these assertions are likely true. Ms. Mason testified that "there is very little likelihood that Canadian participation in ballistic missile defence would give

[5] NDDN, *Evidence*, 1st Session, 42nd Parliament, 05 May 2016 (Peggy Mason).

[6] NDDN, *Evidence*, 1st Session, 42nd Parliament, 05 May 2016 (Peggy Mason).

Canada the much sought-after seat at the BMD table."[7] U.S. Ballistic Missile Defence is under the U.S. NORTHCOM and not NORAD, meaning "participation would not provide Canada with any guarantee of a meaningful operational role in BMD, or even a guarantee that Canadian cities would be defended."[8]

Dr. Byers was skeptical that Canada would be able to join BMD for free.

> "We know how much the U.S. government Has spent on its mid course interceptor system here in North America: $40 billion U.S. We know how much they a re spending per year to maintain and grow that system: $1 billion U.S. You might imagine, and perhaps you might want to ask, whether the United States will let Canada join for free. I doubt it. If we say that perhaps they would want us to pay our share of the retrospective costs of building up the system, the Canadian population is one-tenth of the United States, so that's $4 billion."[9]

A government witness that was in support of Canadian involvement in BMD, Dr. James Fergusson, even admitted that there would likely be no economic benefits for Canadian companies in regards to joining BMD.

> "In terms of technologies, in terms of opportunities in the missile defence world, that train left the station two decades ago. Canada did not engage. The American research and development program is well advanced across the board in missile defence. The likelihood that there are any opportunities for Canadian firms or Canadian technology is extremely low."[10]

Finally, when it comes to priorities for the Canadian Armed Forces, many witnesses agreed that BMD should not be a top priority. Dr. Adam Lajeunesse, agreed with Dr. Byers and Peggy Mason that there were simply more important procurement and recapitalization costs facing the Armed Forces that should take precedence over BMD.

> "As Canada is facing the recapitalization of both its navy and its air force simultaneously, I do agree with Dr. Byers that in terms of priorities, which have to be set, missile defence - depending on the cost, which we do not know - will be toward the bottom end of that priority list."[11]

We urge the new Liberal government to not get caught up in the headlines of ballistic missile defence and to instead focus on the important work of modernizing the Royal Canadian Air Force. It is clear that BMD is not effective, that the U.S. would in all likelihood keep the system under their own command and not make it a part of NORAD, and that the costs to join such a system this late would be astronomical, especially when considering Canada's other recapitalization needs. Additionally, New Democrats

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[7] NDDN, *Evidence*, 1st Session, 42nd Parliament, 05 May 2016 (Peggy Mason).

[8] NDDN, *Evidence*, 1st Session, 42nd Parliament, 05 May 2016 (Peggy Mason).

[9] NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (Dr. Michael Byers).

[10] NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (Dr. James Fergusson).

[11] NDDN, *Evidence*, 1st Session, 42nd Parliament, 10 May 2016 (Mr. Adam Lajeunesse).

recommend that Canada focus on its efforts to promote non-proliferation of ballistic missiles and not join a system that is likely to spur a new arms race in offensive missile technology.

Despite the major concerns already discussed, there are still some recommendations adopted by the Committee that New Democrats can support. We support the second recommendation requiring making pilot safety a key consideration for any CF-18 replacement. Recommendation 4 recognizing the importance of acquiring new air-to-air refueling planes is also consistent with witness testimony and reflective of the need to be mindful of the entirety of the air force's recapitalization efforts.

Recommendation 12 which calls for the modernization of the North Warning System was emphasized by several key witnesses and New Democrats agree the system should be modernized or replaced with new capabilities. New Democrats are also supportive of recommendation 13 highlighting the need to protect Canada from cyber-attacks and the defence review should look at this as a key area of 21st Century defence.

New Democrats remain concerned that the Committee approved the final report without having a finalized version of the text before it. This in turn required the preparation of our dissenting opinion also without seeing the final text. We continue to regret that the Liberal members of the Defence Committee abandoned the attempt to reach consensus on this important report.