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NORAD IN 2012 – EVER EVOLVING, FOREVER RELEVANT

by Lieutenant-General Tom Lawson with Captain Michael Sawler



Introduction

Military planners are sometimes asked to apply a ‘blank sheet test’ to an organization’s structure. This test simply requires the organization’s purpose, expressed as a list of desired organizational outputs. From that list the planner develops, from scratch, the outline of an organization optimized for the outcomes of interest. Frequently, the optimized organization bears little resemblance to the one in existence, and highlights the fact that many organizations have reached their present state by simple



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Lieutenant-General Thomas J. Lawson

momentum and happenstance. Such organizations likely require tailoring and amendment. By contrast, in the case of

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the North American Aerospace Defence Command (NORAD), one might strongly contend that the blank sheet test would drive planners right back to the NORAD of today. Admittedly, the exercise might not today produce a binational organization, as the uniqueness of such an amalgamation of Canadian and U.S. authorities likely reflects NORAD's birth at a time of immense threat, a threat so great as to require the ease of operations that could only come with shared national command. Arguably, most other characteristics would remain very much as they are. This suggests that NORAD is, and was from the beginning, nicely structured for its purpose: aerospace warning and control, and, more recently, maritime warning. In this article we will have a look at where NORAD has been, and where we believe it will be heading.

Background

The NORAD agreement between Canada and the U.S. was forged in 1958 at a time when the Soviet Union was making rapid advancements in both Long Range bomber Aviation (LRA) and nuclear weaponry. At the height of the Cold War, this was a clear and present danger to the U.S., and, by geographical and political association, to Canada. The requirement for both Canada and the U.S. to defend against this threat resulted in the establishment of the binational North American Air Defence Command. At its stand-up, NORAD's air defence capabilities relied upon radar chains built in the mid-1950s that stretched from coast to coast, and provided for the detection of aircraft entering

North American airspace. The first radar chain was the Pinetree Line of 33 stations built across southern Canada, and completed in 1954. This line provided continuous warning and intercept control but low altitude gaps in the line, and its shallow coverage, necessitated the establishment of two more radar networks.



The trio of early warning radar lines erected on Canadian soil.

By 1957, a Mid-Canada Line, or 'McGill Fence,' was completed about 300 miles north of the Pinetree Line, generally along the 55th parallel of latitude. It consisted mainly of Doppler radars which created a microwave 'fence' for the detection, but not tracking, of low flying aircraft. The third and most challenging joint air defence undertaking of the 1950s was the construction of a transcontinental line across the 70th parallel, roughly 200 miles north of the Arctic Circle. This network of 57 stations, completed in July 1957, was called the Distant Early Warning (DEW) Line. In order to tie all these radar networks together and to provide a complete picture for NORAD decision-makers, a new technology called Semi-Automatic Ground Environment (SAGE) was developed. By the early-1960s, some 250,000 personnel were employed within NORAD operating a multi-layered and interlocking complex of sites, control centres,

Christopher Johnson



NORAD/USNORTHCOM photo

The early days and early interceptors... An RCAF Avro CF-100 *Canuck* and a USAF Convair F-102 *Delta Dagger* in close formation during a patrol.

manned interceptors, and surface-to-air missiles throughout North America, which constituted a formidable defence against a potential bomber attack. Among all the associated sites, the base at Goose Bay, Labrador, was arguably the busiest and most strategic, stocked with tankers, bombers, interceptors, aircrews, maintainers, and support personnel.

of her sovereign air space. As well, the “A” in NORAD’s moniker was changed from “Air” to “Aerospace” to better represent its expanded areas of operation and interest.

With the development of Air Launched Cruise Missile (ALCM) technology in the mid-1980s, NORAD again had to adjust to a new threat, this time by shifting some of its focus back to the manned bomber. This led to the signing of an MOU by Prime Minister Mulroney and President Reagan that formed the basis for the North American Aerospace Defence Modernization Program (NAADM). NAADM was implemented in the early-1990s, and it included wide-ranging upgrades and new systems. The DEW Line’s long range radars were modernized, and short range radars were commissioned. A digital information link between Airborne Warning and Control System (AWACS) aircraft and the Sector Operations Control Centre (SOCC) was designed and implemented for the transfer of track, command, and intelligence information.



DEW Line - Canada

With the emergence of Intercontinental Ballistic Missile technology (both land-based [ICBM] and submarine-launched [SLBM]), NORAD was faced with a new threat that could literally ‘jump’ over the air defence network. NORAD now had to adapt and expand its focus from simple air-breathing threats to include ICBM threats. In order to mitigate this new threat in a time of decreasing budgets, NORAD decommissioned radar chains and reduced alert forces, investing the resulting savings in a space surveillance and missile warning system which, in concert with SAGE, would now provide worldwide air and space detection, tracking, and identification. Additionally, hardened command centres were constructed inside Cheyenne Mountain just southwest of Colorado Springs, and 600 feet beneath the Canadian Shield in North Bay.

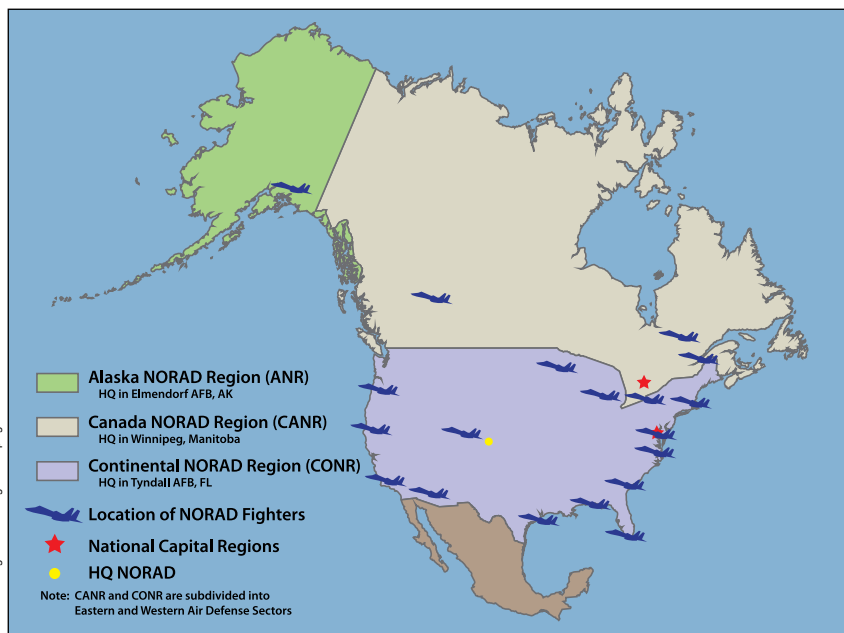
New forward operating locations (FOLs) and deployed operational bases (DOBs) across Canada were identified and developed for the northern deployment of fighters, and to increase aircraft mobility and survivability. Finally, the upgrade of several Pinetree Line radars provided a coastal extension of the North Warning System (NWS), and an overall communications upgrade was installed. These upgrades were complete by the early-1990s, and they provided a system which forms the basis of what NORAD uses today.

This refinement of focus from ‘LRA-centric,’ air-breathing threats, to aviation and space threats in the mid-1960s is illustrative of the adaptability that NORAD has demonstrated throughout its 54 years, in light of ever-changing threats to North American defences. As the SAGE system aged and computer technology improved, a new system called the Joint Surveillance System (JSS) replaced SAGE in the early-1980s. In the United States, implementation of the JSS meant that NORAD and the Federal Aviation Agency (FAA) would, for the first time, share radar data. In Canada, implementation of the JSS meant that Canada for the first time had full control



Cheyenne Mountain Command Center – 1984.

The end of the Cold War brought about more changes for NORAD. North American perimeter security now began to



NORAD Area of Responsibility

shift focus to include the growing importance of counter-drug operations in the North American psyche. NORAD's sensors and interceptors were envisioned to play a role in this new law enforcement mission, furnishing support to law enforcement agencies. This provided the impetus to the development of procedures to coordinate NORAD's efforts with those of Canadian and U.S. law enforcement agencies, a catalyst for the extensive interagency coordination that exists across NORAD today.

In the late-1990s, NORAD looked to modernize the aging JSS system, but, due to cost overruns, the project was cancelled. It was revived after the attacks of 11 September 2001, at which time the JSS modernization project replaced aging computers with today's Battle Control System - Fixed (BCS-F) at all the sectors. As well, the two Canadian SOCCs were amalgamated into the Canadian Air Defence Sector (CADS) in North Bay, and the four U.S. SOCCs were amalgamated into the Eastern Air Defence Sector (EADS), and the Western Air Defence Sector (WADS).

Responding to the attacks of 9/11, NORAD was again faced with refining its focus to include the identification and monitoring of, and reaction to, airborne threats originating within sovereign territory. NORAD was now not only responsible for its traditional military defence role for air-breathing threats and ballistic missiles, but it became a partner with other national agencies and departments in the security of Canada and the U.S. Interestingly, this also tied in with the new 'Whole of Government' approach being adopted by both nations. A plan, named Operation *Noble Eagle* (ONE), was devel-

oped for this new role, and it added several responsibilities to NORAD's mission. NORAD would now monitor and intercept flights of interest within continental U.S. and Canadian territory, and defend National Special Security Events (NSSEs) such as G8 Summits, North American Leadership Summits, political national conventions, the Olympics, and large sporting events, such as the Super Bowl. It also assumed responsibility for conducting city and critical infrastructure air patrols, and for the integrated air defence over National Capital Regions. NORAD would also provide interior continental radar and radio coverage through enhanced interagency cooperation with NAV Canada, Transport Canada, and the Royal Canadian Mounted Police in Canada. In the U.S., NORAD would partner with the Federal Aviation Administration, Transportation Security Agency, and the Department of Homeland Security. Of critical importance is the bina-

tional nature of NORAD, which has resulted in improved rules of engagement accepted by both nations in the interest of North American security.¹

The addition of Operation *Noble Eagle* represented a bellwether change to NORAD's *modus operandi*. Prior to 2001, its focus had always been outwards beyond the borders of North America. While it had been interested in civilian air traffic, its concern was primarily with aircraft entering North America. At that time, any aircraft originating within Canada or the United States had been assumed to be friendly. Post-9/11, tragically, threats were now also seen to potentially originate within North American borders, and subsequently, NORAD was required to look inwards as well. This *was*, and *remains*, a huge undertaking, and one to which NORAD continues to adapt. By comparison with the LRA threat, even if



A United States Coast Guard MH-65 *Dolphin* helicopter from Coast Guard Air Defense Facility Washington flies by the Lincoln Memorial during a training flight.

every peer nation's bombers were to fly into and out of North American Air Defence Identification Zones 'around the clock,' the numbers would be dwarfed by the sheer volume of civilian air traffic flying across, into, and out of North American airspace. As an example, in January 2012, Los Angeles International Airport (LAX) alone registered over 44,000 aircraft flight movements.² NORAD is now responsible for watching it all.

The 9/11 attacks also represented the catalyst behind the creation of new commands to focus upon the security of the Canadian and American homelands. U.S. Northern Command (USNORTHCOM) was established in Colorado Springs in 2002, and Canada Command (CANADACOM) in Ottawa in 2006. It was decided that the Commander of USNORTHCOM would be 'dual-hatted' as the Commander of NORAD, and that the command structures of the two commands would be amalgamated. Additionally, in 2008, the NORAD Command Centre at Cheyenne Mountain was joined with the USNORTHCOM Command Centre at Peterson AFB, Colorado Springs, and renamed the NORAD-NORTHCOM Command Centre, or N2C2 for short.

NORAD's mission, while it has evolved significantly since its inception 54 years ago, still has at its core the defence of North America. What has changed are the means that adversaries have developed to attack the continent. Today, NORAD's mission is defined in the following manner:

In close collaboration with homeland defence, security, and law enforcement partners, prevent air attacks against North America, safeguard the sovereign airspaces of the United States and Canada by responding to unknown, unwanted and unauthorized air activity approaching and operating within these airspaces, and provide aerospace and maritime warning for North America.³

NORAD Organization

The NORAD Agreement states that the NORAD Commander and Deputy Commander shall not be from the same country. Presently, NORAD is commanded by an American four-star general with a Canadian Deputy. These officers are responsible to national command authorities through the Chief of Defence Staff (CDS) of Canada, and the Secretary of Defense (SECDEF) of the United States. The Commander of NORAD has the N2C2 alongside him at NORAD Headquarters, monitoring all domains, Air, Space, Land, Maritime, and Cyber, for potential threats, and operating 24 hours a day, 7 days a week, 365 days a year.

Reporting to the NORAD HQ are the three regions into which North America has been divided to conduct the NORAD mission. These are the Alaska NORAD Region (ANR), the Canadian NORAD Region (CANR), and the Continental U.S. NORAD Region (CONR). The commanders of the individual NORAD Regions are 'dual-hatted' as follows:

- Commander ANR is also commander of the 11th Air Force;
- Commander CANR is also commander of 1 Canadian Air Division; and,
- Commander CONR is also Commander of the 1st Air Force.

Each region has an associated Air Defence Sector, or sectors (CONR has two sectors, EADS and WADS). Sectors function at the tactical level, providing surveillance, identification, tracking, and weapons control. The sectors require three things to successfully complete their mission: radar information, communications capabilities, and information services.

Air and Missile Warning Picture Development

Each sector receives raw radar data from the sensor systems in its Area of Operations (AO). This data, coupled with flight plan information and weather, is processed through the BCS-F system to provide track data. Tracks that trigger interest, due perhaps to flight plan deviation or communication difficulties are pushed to NORAD's common operating picture (COP) in the three NORAD Regions and the N2C2. The missile warning picture is developed from a world-wide network of radars, optical sensors, space-based sensors and ground stations. These various sensor systems allow NORAD the ability to detect a launch in more than one way, which is a key attribute in avoiding false indications.⁴ Usually, a launch is detected via the Space Based Infrared Satellite system (SBIRS), and a supporting detection by one of the radar systems is sought in order to



The Command Center Processing and Display System - Replacement (CCPDS-R) screen.

assist the battle commander in making an attack assessment – this supporting detection is called ‘dual-phenomenology.’

‘questionable’ targets, based upon information they have obtained from the FAA, Nav Canada, or intelligence sources.

For example, if it comes to the attention of any one of these agencies that a suspicious person is aboard an aircraft, the closest air defence sector is directed to keep an eye on the aircraft. Technicians track the aircraft on its flight plan, and watch for deviations. If the aircraft deviates from the flight plan, or if the agencies or the defence sector have reason to believe the aircraft is a threat, the defence sector notifies the NORAD Regional command Centre, which then decides if military aircraft should be scrambled to intercept the aircraft. Once on site, the intercepting crew can provide further information to the command centre, based upon their ‘eyes-on’ assessment of the aircraft. At this point, a decision is made as to what warning or control actions are to be taken by the NORAD Commander or his representative.



NORAD/USNORTHCOM photo

Alaskan NORAD Air Defense Sector Operations Center

The N2C2, Regions and Air Defence Sectors

Prior to 9/11, the battle commander’s task in an Air Defence Sector control room was to sort through the tracks on a computer-generated image of the North American continent. It was a *simpler*, if no less *critical* mission than that of today, and the potential adversary was a world power with relatively predictable motives. Post 9/11, with non-state actors and their proxy agents as potential aggressors, the battle commander and his team have the task of sorting hundreds of tracks on high-resolution screens to bring order to the picture, and to identify any that might represent a terrorist vector.

This identification process normally begins with the two organizations having primary responsibility for commercial air traffic over our nations; the FAA and Nav Canada. The events of 9/11 provided the catalyst for these and other Canadian and U.S. government agencies to lash together their capabilities in order to provide a credible air defence shield within our borders. Since 2001, FAA and Nav Canada representatives sit in the combined air operations centre in each sector. Since Operation *Noble Eagle* is considered a second front in the war on terrorism, these representatives are part of the commander’s battle staff, and they help identify aircraft that behave erratically.

Working attentively over the sea of tracks, technicians isolate possible

Potential actions depend upon what the aircraft does after being intercepted. For example, on 3 June 2005, a Virgin Atlantic Airbus A340 aircraft over the Atlantic was observed to be transmitting a transponder code meant to signify that a hijack was under way (i.e., Code 7500). Canadian CF-18 fighter jets were scrambled for intercept. The arrival of the fighters alerted the crew to its mistake and no further military intervention was required. Indeed, the response to this incident worked quite well. The CF-18s intercepted the jet in time to avert a more serious incident, and it was escorted to Halifax where a police response unit was prepared to meet the airliner.⁵



NORAD/USNORTHCOM photo

A pair of SU-27 fighters move into position to escort a simulated hijacked airliner during the second day of flying for Exercise *Vigilant Eagle* in Russia, August 2011, a joint exercise conducted between NORAD and Russia.

**NORAD's Threat Evolution:
Symmetric to Symmetric/Asymmetric**

At its inception, NORAD was conceived to deal with air threats originating from the USSR. In such a symmetric peer 'competition,' both sides have similar military capabilities, in this case, access to fighters, long-range bombers, radars, nuclear bombs, ballistic missiles, satellites, and cruise missiles. Another feature of a symmetric war is the presence of a defined front line, in this case, the boundaries of respective Air Defence Identification Zones (ADIZ). Unidentified or unauthorized aircraft entering these zones would be intercepted in short order, and their intention established. A third feature of symmetric warfare is being easily able to differentiate the combatants from the civilian population and each other, by uniforms and by equipment insignia.

Quite simply, symmetric warfare has 'rules.' Some of these are formalized in internationally accepted instruments, such as the Geneva and Hague Conventions. Others are implicit between the combatants, such as the concept of Mutually Assured Destruction (MAD) advanced during the Cold War; so long as the TU-95 Bears approaching the ADIZ did not do anything too provocative, the interceptors merely observed their actions. Until 2001, this was the type of threat NORAD dealt with, easy to identify, and demonstrating a rough idea of intent. Asymmetric warfare is completely different, and constitutes, in many respects, a more difficult problem.

In asymmetric warfare, if the weaker side fights according to symmetric 'rules,' they will lose. So they do not. They do not wear uniforms. They hide among civilians, they hit and run, and they attack whatever targets their enemy values but has left undefended. Often, those targets are non-combatants.⁶

"In asymmetric warfare, if the weaker side fights according to asymmetric 'rules,' they will lose."

Therefore, the spectrum of threats which NORAD now faces, and will for the foreseeable future, ranges from interstate threats from traditional actors, to asymmetric threats from transnational terrorist organizations which have both the ability and the willingness to cause a level of destruction once reserved solely for nation-states.⁷ Indeed, the latter presents a higher probability of threat than the former, but usually with greatly reduced consequence levels, and they are, in many ways, more difficult to defend against. Additionally, the nightmare scenario of a terrorist attack employing weapons of mass destruction has forced Western societies to view their national security in a new light, including the enhancement of law enforcement and other domestic security practices, and also the establishment of stronger links between the military and lead civil authorities.⁸ While NORAD interceptors certainly have the ability to down any threat aircraft, it is better for all concerned if hijackers are barred from boarding airliners in the first place. This is why NORAD has established strong ties with organizations such as the FAA, the Transportation and Security Administration (TSA), the Department of Homeland Security (DHS), the CIA, NAV Canada, Transport Canada, and the RCMP. These organizations have exchange representatives inside each other's operations centres.

Symmetry, Sovereignty and Canada's Next Fighter

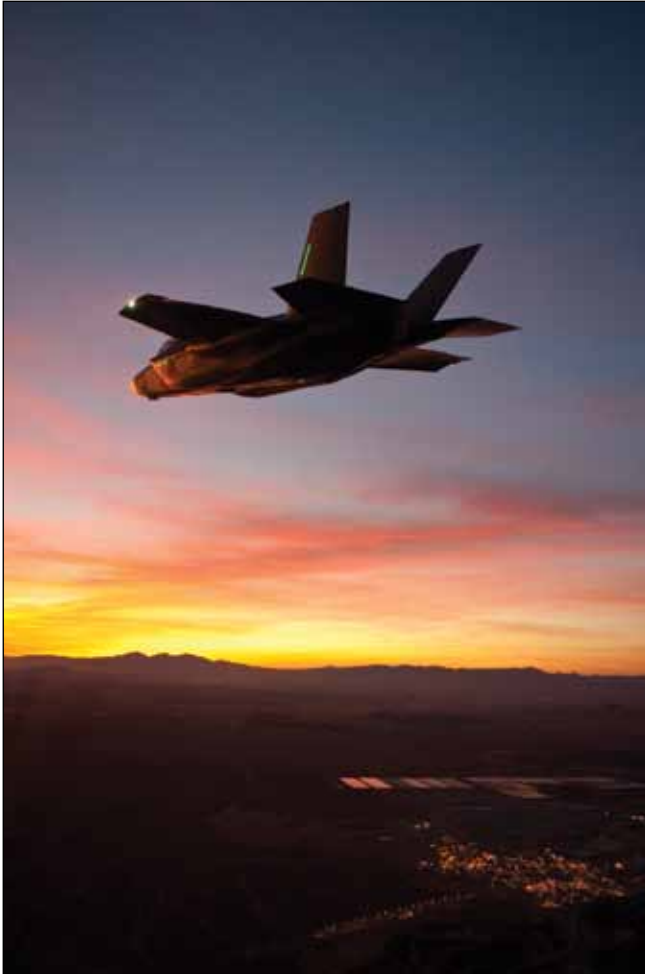
As mentioned earlier, one of the characteristics of symmetric warfare is a clearly delineated front line. In peacetime, these are the borders between sovereign nations. A nation's claim to sovereignty over a region implies that nation's ability to exercise and enforce its national will, providing security and rule of law for its people within the region. NORAD's mission of aerospace control is how Canada and the U.S. largely perform this task within North American airspace. This is accomplished by tracking, identifying, and, if necessary, intercepting and potentially destroying aircraft that enter the airspace with malicious intent. It is this final option that brings us to the choice of the subject of Canada's next fighter.

Fighter aircraft must possess a wide variety of capabilities, including extensive range, endurance, speed, survivability, the ability to perform air-to-air refueling, advanced reconnaissance capabilities, and interoperability with other military assets. While our current fighter aircraft, the CF-18 Hornet, is capable of performing its tasks at this time, it is reaching the end of its effective operational lifespan. It needs to



This F-16 Fighting Falcon continues to meet NORAD mission requirements for operations such as Operation Noble Eagle and other air sovereignty alert missions assigned to the command.

be replaced. Analysis of these capability requirements for a new fighter has "... made it clear that only a 5th generation fighter could satisfy our needs in the increasingly complex future security environment. We need a capability that helps us carry out our core missions of defending the sovereignty of Canadian and North American airspace through NORAD, providing Canada with an effective and modern capability for international operations, and effectively conducting joint operations with our Allies through NATO or a coalition."⁹



Lockheed Martin photo LM-6726150067

Currently, both Russia and China are in the process of developing 5th generation fighters of their own. If they have the capabilities provided by these advanced aircraft, and NORAD cannot match them, the current symmetry would end. As a simple example, a 5th generation fighter, due to its stealth properties and its more advanced sensor suite, will 'see' a 4th generation fighter well before it is spotted in return. Also, it must be noted that it is impossible to upgrade a 4th generation fighter into a 5th generation fighter. Stealth must be *expressly designed and built into* a fighter from the outset.

Maritime Warning: A new frontier for NORAD

Maritime security is critical to Canada and the United States. The reliance of both countries upon sea lanes of communication for trade and commerce is well established. Almost 90 percent of all world trade is conducted by sea. By comparison, only .25 percent is conducted by air.¹⁰ Canadian

Defence Scientist R.J. Sutherland assessed that the economic strength of Canada relies upon a community of interests that *was*, and *remains*, shared between the U.S. and Canada, uniquely presenting North America as a 'whole' comprised of two nations, as opposed to two singular disparate nations.¹¹ Hence, the binational nature of the NORAD agreement makes it an elegant tool through which to address the role of maritime warning.

Maritime Domain Awareness (MDA) is the *cornerstone of and enables all* maritime security activities. The Maritime Domain is defined as "... all areas and things of, on, under, relating to, adjacent to, or bordering on sea, ocean, or other navigable waterway, including the maritime related activities, infrastructure, people, cargo and vessels and other conveyances."¹² And yet, MDA represents a daunting challenge when one considers not only the vastness of the North American maritime areas, with 222,000 kilometres of coastline extending from the Arctic to the U.S. southern borders, but also the global reach of maritime entities, and the overlapping compendium of government departments and agencies with jurisdictional interests at stake.

In Canada, the 2004 creation of the Marine Security Operations Centres (MSOCS) on each coast demonstrated the development of cross-departmental efforts to develop MDA to assist in safeguarding this domain.¹³ The function of the MSOCs is to enable departments and agencies to work collaboratively to collect and analyze intelligence and other information in an effort to develop a solid awareness in their area of responsibility with regard to marine security.¹⁴ These centres continue to evolve, and they have



NORAD/USNORTHCOM photo

Lockheed Martin F-22A Raptors from the 94th Fighter Squadron – The 'other' American 5th generation fighter.

worked extensively to reduce roadblocks associated with sharing information across government departments, and across law enforcement agencies.

Interestingly, 2006 witnessed the addition of Maritime Warning to NORAD's mission. As retired Canadian colonel and NORAD academic Alan Stephenson notes: "In theory, (maritime warning) is similar to aerospace warning, but in practice, it is far more difficult and complex. Aircraft movements are generally of short duration, conducted on predetermined routes, and moderate in numbers compared to maritime traffic that is of longer duration, conducted on less regulated routes, and voluminous in numbers."¹⁵ With this new role, NORAD became the sole bi-nationally-mandated organization with the responsibility to warn the governments of Canada and the United States in the event of a maritime threat to North America. The NORAD agreement does not specifically assign any assets to this mission, but rather, it seeks to leverage established MDA efforts in both nations to build a consolidated maritime Common Operational Picture (COP). This COP enables the NORAD Commander to assess when a maritime warning should be issued.¹⁶

The assignment of the maritime warning mission to NORAD stirred controversy among many agencies and organizations that had long been employed in developing their own MDA, and, in some cases, in acting upon that awareness. However, maritime stakeholders had often observed that achieving MDA is exceptionally complex and too broad in scope to be the sole responsibility of any one department in either nation. Hence, the complex arrangement of departments and agencies with overlapping authorities and jurisdictions that have to deal with littoral and internal waters. Upon NORAD's arrival on the MDA scene in 2006, the question became: What value could NORAD add in this arena? This was particularly germane, given that NORAD's mission in this regard was to be only maritime warning, the success of which would rely upon MDA provided by many external sources.

But since 2006, maritime security stakeholders have converged upon the realization that NORAD could indeed add a very valuable element. NORAD's global area of operations, developed much earlier to fulfill its mandate of providing warning of ICBM launches worldwide, gave it a global perspective into which MDA could fit naturally. NORAD was therefore well positioned to become a strong binational advocate for MDA, since this is a primary requirement to successfully executing the maritime warning mission.

NORAD's efforts in this arena have therefore focused upon several tasks: advocating for MDA, and drawing together the products of dozens of MDA intelligence sources into a single COP; developing processes to assess that information and effectively identify threats; and identifying the organizations to be warned in order to affect a response. Unlike NORAD's aerospace warning and control missions, the maritime warning mission is 'information-based only.' Maritime threats are defended against by Canada and the United States under their own national maritime security and defence plans.

As an example of how the process can work effectively, in August 2011, the crew of the vessel *Sun Sea* attempted to smuggle 492 Tamil migrants into a western Canadian port. The development of this event provided a good example of binational information-sharing and collaboration months in advance of the vessel's arrival within 500 miles of the coast. When it became necessary, NORAD provided a consolidated warning, ensuring that both nations were aligned to this potential maritime threat. In response, the *Sun Sea* was intercepted by the Canadian Navy, the RCMP, and the Canada Border Services Agency (CBSA) off British Columbia's coast in a well-coordinated effort.

The development of effective maritime warning and response procedures require an assessment of a spectrum of threats. At the most serious end of such a spectrum would be a threat involving a rogue state-sponsored vessel arriving off the North American coastline with the ability of launching either a ballistic or a cruise missile. The 1998 Rumsfeld Commission report assessed such a threat as credible. In 2004, then-Secretary of Defense Rumsfeld emphasized that "... one of the nations in the Middle East had launched a ballistic missile from a cargo vessel. They had taken a short-range, probably Scud missile, put it on a transporter-erector launcher, lowered it in, taken it out into the water, erected it and fired it, and the ship that they used was using radar and electronic equipment



DND photo H52011-H003-008 by Corporal Rick Ayer

HMCS *Summerside* photographed during sovereignty exercise Operation *Nanook 11*, 10 August 2011.

that was no different than 50, 60, 100 other ships operating in the immediate area.”¹⁷ Although credible, the likelihood of such a threat is low, and it is even more unlikely that such a system could make it to within firing distance of North America without being identified and dealt with in international waters. Nevertheless, the proliferation of cruise missiles, and the possibility of disguising such a missile within a standard 20-foot shipping container, is debatably becoming more likely. The U.S. National Strategy for Maritime Security has made it clear that motivated terrorists would, most likely, use the maritime domain to transport weapons of mass destruction into attack range. Clearly, the importance of an effective MDA strategy cannot be overstated.

At the other end of the spectrum are events involving incursions into national Economic Exclusion Zones (EEZ), which may require simple awareness, or manifest themselves as other potential situations that could require months to develop into threats. Clearly, there was a need for another form of maritime communication less urgent than a warning. For this purpose, NORAD has introduced the NORAD Maritime Advisory message, which enables the Command to advise the two governments and binational mission partners, with much greater lead time, of an *emerging* potential threat. It is intended to ensure all players have full situational awareness long before it may become necessary to take action to defeat that maritime threat. It can be expected that the NORAD Maritime Advisory message may become much more commonplace in the future than NORAD Maritime Warnings.

As the NORAD Maritime Warning mission moves into its sixth year, NORAD has become recognized as one of the major players in MDA, and has embraced this role with equal priority to its aerospace warning and control missions.

Ballistic Missile Defence

In 2005, then-Prime Minister Paul Martin decided that Canada would maintain its established policy of not participating in Ballistic Missile Defence (BMD). This policy has lasted to this day. The U.S. has not asked Canada to change its mind, although Canadian participation would likely be welcomed.

“The current design of the U.S. system is not intended to alter the strategic balance.”

In order for Canada to reconsider its position on BMD, there would likely have to be a significant change in the threat level associated with ballistic missiles. Currently, the countries possessing these weapons have been governed implicitly by MAD, wherein if one nation launched, the resulting counterstrike would annihilate the attacking nation. However, in recent years, new nations have been working on or have developed nuclear capabilities, specifically, Iran and North Korea. Each of these nations has ICBMs that *can, or will soon be able to be* armed with nuclear warheads. These states can best be described as ‘unpredictable,’ and their motivations are opaque at best. In addition, North Korea has proliferated these technologies, further increasing the threat.

The logic behind the U.S. decision to pursue BMD is simple: if even one missile impacts on North America or her allies, the consequences would be catastrophic. Potentially, there would be millions of deaths, cities rendered uninhabitable, large drifting clouds of radioactive dust, and an electromagnetic pulse that could devastate electronics in a large swath around the blast.

The current design of the U.S. system is not intended to alter the strategic balance. It would be overwhelmed if any of the major nuclear powers launched, even if every interceptor was successful. It is intended to stop a limited attack wherein only a few missiles are launched.

The problem is that Canada currently has no say in how the system would be postured or employed. Except for Canada, all other major U.S. allies (Australia, Japan, the U.K., and NATO) are involved in BMD to some degree. The primary factor in their decisions is the aforementioned proliferation. Whether Canada should join them in participating in BMD will remain an issue for the Canadian government. Should someday the answer be in the affirmative, the NORAD agreement will provide effective refuge for this role.



NORAD/USNORTHCOM photo

A CF-18 *Hornet* refuelling in support of Operation *Podium*, part of the airborne security provided to the 2010 Vancouver Winter Olympics.



NORAD/USNORTHCOM photo

An F-15E *Strike Eagle* witnesses the launch as Space Shuttle *Atlantis* heads into space for the last time, 8 July 2011.

The Way Ahead

In his book *From Good to Great*, author Jim Collins identifies a key common trait of highly successful organizations as being the ability to narrowly focus resources upon their field of competence.¹⁸ It may be argued that much of NORAD's successful longevity relates to just such a continuity of focus, and the command having 'kept its eye on the ball' throughout its adaptations. It has, since its inception, been focused upon aerospace warning and control, and has continued to adapt appropriately to outpace its threats. Certainly, while the number of serving NORAD personnel has dropped by an order of magnitude since peaking in the 1960s, NORAD now more heavily leverages technology to carry out its missions. With this in mind, it can be expected that NORAD will in the future continue to focus on getting better at what it does. To do so, it will *advocate for* and *aid in* the development of technologies and techniques that will ensure its ability to identify and track the movements of long range bombers, to better detect missile launches and track objects in space, to more quickly identify aircraft in North American airspace that could represent threats,

and to more effectively intercept such threats and others that may arise from among the large numbers of general aviation aircraft at hundreds of civilian airfields across Canada and the United States. For example, the North Warning System, last upgraded in the early-1990s, will require refurbishment or replacement beginning around 2020. The current radar infrastructure, tied to sites of the former DEW Line, does not provide coverage over the Canadian Arctic Archipelago. There are difficult cost-benefit questions to be answered regarding a NWS upgrade, and the eventual extent of its reach, and NORAD will certainly advocate for the development of systems that will push the air defence perimeter as far north as possible, exemplified by the project to modernize and upgrade ageing ground-based ballistic missile warning radar systems. This project will modernize the Phased Array Warning System (PAVE PAWS), the Ballistic Missile Early Warning System (BMEWS), and the Perimeter Acquisition Radar Attack Characterization System (PARCS).¹⁹ Similarly, for the maritime warning role, NORAD is highly interested in incorporating the surveillance capabilities of innovative equipment such as the High Frequency Surface Wave Radars under consideration by Defence Research and Development Canada (DRDC).²⁰

Although there has been little change to NORAD's fundamental role over the years, there has been a continuous evolution of its mission. As discussed earlier, NORAD's early mission of deterring, detecting, and intercepting Soviet bombers, soon expanded to missile detection and warning, with the later inclusion of internal air traffic, and, much later, the warning of threats from the seas. The uniqueness of the binational agreement encourages the use of NORAD to address threats of interest to Canada and the United States. One could therefore



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The sheer mass of Canada's Arctic is dramatically reinforced by this overlay of it by Central and Southern Europe.



CSA image

RADARSAT 2-01

shore surveillance. However, even with such satellite coverage, there would remain a requirement for air surveillance and coastal maritime radars in the area to effectively provide real time MDA.

Conclusion

NORAD will soon celebrate its 54th birthday. Throughout its existence to date, it has experienced remarkable consistency with respect to its role, although its mission and operational techniques have been refined and augmented frequently. The numbers of servicemen and women wearing NORAD insignia has dropped from hundreds of thousands to around 7000, but government leaders nevertheless rely just as heavily upon the threat assessments and warnings provided by the NORAD Commander, and upon his aerospace control alert

broaden the discussion to speculate upon what else could fit into the NORAD mission. An area of interest that immediately comes to mind is the Arctic.

The Arctic region has always been of great interest to NORAD, as it represents the most direct route from Russia to North America. However, increasing numbers of parties wish to make use of international Arctic airspace and sea lanes in order to shorten itineraries, optimize trade routes, and seek new adventures. From a NORAD perspective, the Arctic region is of interest with respect to both the aerospace and maritime domains. But the Arctic region is huge, remote, and relatively uninhabited. The Yukon, Northwest Territories, and Nunavut alone have more surface area than the entire continent of Europe. NORAD's Arctic AO includes all of the aforementioned territory, plus the state of Alaska. There are few highways in the region. Therefore, transportation lines are by air, supplemented by sea during the summer months. In addition, the Arctic coastline makes up a vast portion of the 220,000 kilometres mentioned earlier. Each Arctic cove has the potential to act as a haven for smuggling goods or people. Developing an effective method of surveillance over this area of operations is a significant challenge.

It is clear that effective Arctic surveillance will require the bolstering of space assets of the type represented by Canada's Radarsat III. A constellation of such satellites would provide near-persistent Arctic off-

aircraft standing by at all times.

The NORAD brand often represents much more than NORAD's focused missions. As evidenced by its frequent citation in the speeches of national leaders, the NORAD Agreement represents the best of what can be produced when Canada and the United States seek similar goals. Lessons will certainly be drawn from the binational NORAD experience for application in other areas of common interest such as the Arctic, Cyber Warfare and Beyond the Border initiatives. Meanwhile, the men and women of NORAD will continue to maintain the watch.



Lockheed Martin photo LM-241028739

NOTES

1. George Gaines and General Victor Renuart, *The Enduring Value of North American Aerospace Command*, Joint Force Quarterly, July 2009.
2. www.lawa.org.
3. *About NORAD*, at <http://www.norad.mil/about/index.html>.
4. *Ibid.*
5. CBC News Online Staff, "Jet leaves Halifax after false hijack alert," 3 June 2005, at <http://www.cbc.ca/news/canada/story/2005/06/03/airplane-diverted050603.html>.
6. Doug Muder, "Flies vs. Hammers: How Asymmetric Warfare Works," at www.dailykos.com, 31 July 2006.
7. The number of fatal casualties suffered on 11 September 2001 was 2965, inflicted by 19 terrorists and four aircraft (number taken from Wikipedia). The number of fatal casualties suffered during the Pearl Harbour attack of 7 December 1941 was 2388 (number taken from USS *Arizona* Memorial website at <http://www.nps.gov/usar/phcas.html>), by 353 aircraft dispatched from six aircraft carriers.
8. Brad W. Gladman. "Strengthening the Relationship: NORAD expansion and Canada Command," in *Journal of Military and Strategic Studies*, Summer 2006, pp. 2-3.
9. Lieutenant-General Andre Deschamps, Address to the House of Commons Standing Committee on National Defence, 28 October 2010.
10. U.S. Environmental Protection Agency, at <http://www.epa.gov/oia/trade/transport.html>.
11. R.J. Sutherland, "Canada's Long Term Strategic Situation," in *International Journal*, Vol. 17, No. 3 (Summer 1962), p. 208
12. Government of Canada, Interdepartmental Marine Security Working Group, "Canada's Maritime Domain Awareness Strategy," Government of Canada., Ottawa, 2011, p. 2.
13. Government of Canada. "Securing an Open Society: Canada's National Security Policy," Ottawa: Her Majesty the Queen in Right of Canada, April 2004.
14. Government of Canada, Marine Security Operations Centres Project. at <http://msoc-cosm.gc.ca/index-eng.asp>, accessed 23 February 2012.
15. Alan Stephenson, "Securing the Continent: Where is NORAD Today?" in *Strategic Studies Working Group Papers*, Canadian Defence & Foreign Affairs Institute, November 2011, p.7.
16. NORAD Agreement, 2006.
17. Independent Working Group on Missile Defense, *The Space Relationship & the Twenty-First Century*, Cambridge, Massachusetts, 2007.
18. J.C. Collins, *Good to Great* (New York: HarperCollins, 2001).
19. Military and Aerospace Electronics, "Air Force eyes upgrades to PAVE PAWS, BMEWS, and PARCS ballistic missile warning radar," 01 February 2012, at <http://www.militaryaerospace.com/articles/2012/02/air-force-to-upgrade-pave-paws-and-bmews-and-parc-radar-systems.html>.
20. Canada Newswire, "Raytheon Canada awarded contract for NextGen HFSWR," 13 January 2012, at <http://www.newswire.ca/en/story/905377/raytheon-canada-awarded-contract-for-nextgen-hfswr>.



US Army photo by Major Mike Humphries

A pair of F-22 *Raptors* operating over Alaska as part of Exercise *Vigilant Eagle*, 8 August 2010.