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***ALLIANCE RATIONALES &  
ROADBLOCKS: A U.S.-CANADA  
SPACE STUDY***

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## Abstract

*One need not go farther than the 2018 U.S. Department of Defense (DoD) National Defense Strategy (NDS) to understand the value of alliances to the United States. Within, it states, “our network of alliances and partnerships are the backbone of global security.”<sup>1</sup> Further, the 2017 DoD International Space Cooperation Strategy provides direction on space collaboration with allies because “[c]ooperation cannot be left as an afterthought in planning U.S. national security space activities but must instead be integrated from the beginning into every aspect of space planning.”<sup>2</sup> Indeed, combined operations provide all partners with an asymmetric advantage. But why are these alliances and partnerships so important? And if alliances and partnerships are so important, why is it often difficult to reach their full potential? What experiences can we learn from as we endeavor to expand international security space collaboration? This paper seeks to answer these questions by reviewing the rationales for partnering in national security space, identifying the most common barriers associated with collaborating with allies in the space domain, and assessing what lessons can be learned for overcoming these barriers.*

*Canada has had a lengthy and diverse national security space relationship with the United States and serves as an ideal case study to assess the rationales for partnering, the barriers to maximizing the partnership, and identifying key lessons in driving forward. The taxonomy developed in this paper for understanding alliances and partnerships can be extended to other nations, helping to understand, grow, and enhance partnerships in the space domain.*

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### Summary

This paper identifies five key rationales for alliances and partnerships: Deterrence, resources, information, geography, and legitimacy. An alliance’s price of admission is usually the contribution of resources to help spread the cost of mutual defense. However, relatively speaking, many countries do not have significant material resources to contribute, but that does not mean they do not contribute significantly in the areas of deterrence, information, geography, and legitimacy. These

rationales are illustrated using security space examples, while the case study on U.S.-Canada security space applies the rationales to specific U.S.-Canadian security space collaborative activities.

Next, this paper identifies five common barriers to closer collaboration: Legal/Policy; Organizational; Technological; Budgeting; and Cultural. Even when all partners are acting in good faith these hurdles make combined operations a challenge. The relative significance of these barriers for combined operations varies

with each country, and each case, but appreciation for these roadblocks can help the coalition to anticipate where problems will arise and help prioritize efforts to overcome them. Canada's specific experiences with these barriers is described.

The authors next identify three key lessons learned from the Canadian case for overcoming the barriers and maximizing the potential of alliances and partnerships. First, an alliance needs active leaders to lower the barriers and champion allied and partner contributions. Second, partnerships need to be formalized through some formal instrument agreed upon at senior levels such as a Memorandum of Understanding (MOU), Memorandum of Agreement (MOA), or a treaty, in order to clear a path through domestic political and bureaucratic hurdles. Third, to maximize interoperability, resilience, and alliance cohesion, allied systems and capabilities should be in the front of planners' minds and given due consideration from the start of a program. This will ensure allied contributions are more than simply in the form of policy but are also integrated into technical capabilities. As well, the allies need to understand U.S. requirements so they can harmonize their development efforts.

Finally, this paper describes in detail a sampling of Canada's contributions to the U.S. national security space enterprise.

## **Five Rationales For Alliances and Partnerships**

### ***1. Deterrence***

The 2018 NDS states, "The willingness of rivals to abandon aggression will depend on their perception of U.S. strength and the vitality of our alliances and partnerships."<sup>3</sup> Indeed, allies and partners in security space activities contribute to the perception of U.S. strength and leadership, and thereby bolster strategic and conventional deterrence in many ways. First, allied and partner material, military contributions bring more space forces, capabilities and resources on line. The more interoperable these are, the better. The additional space forces, capabilities, and resources brought to bear help to deny the adversary the ability to successfully launch a strategic or conventional attack, complicating their decision-making and bolstering deterrence even more. Further complicating the adversary's decision-making calculus,

the fact that they would be attacking a coalition of countries, in addition to the United States, widens a conflict beyond the United States which again reinforces deterrence. Effectively, defense space partnerships make it more costly and complicated for an adversary to strike.

Likewise, in a narrower space security context, allies and partners strengthen deterrence against attacks on the U.S. and partner space capabilities.<sup>4</sup> The space resources allies bring improve deterrence by increasing space domain "mission assurance," which includes resilient capabilities, the ability to rapidly reconstitute lost capabilities, and operations to defend space capabilities.

The more interoperable the partners' forces and capabilities are, the more resilient the overall network architecture will be, and the stronger the deterrent.

### ***2. Resources***

In synergy with strengthening deterrence, allied and partner material contributions bring important contributions to the table. U.S. military space resources are limited and prioritized, so when another nation invests in security space assets, pooling resources lightens the burden on the United States. Allies and partners may also offer niche space capabilities that are driven by domestic priorities and are otherwise unavailable to the United States. In addition, allied and partner capabilities that are interoperable result in a more resilient overall network architecture and help diversify options in a crisis. Burden sharing in this way improves mutual security, makes efficient use of limited resources, broadens military relationships, and strengthens alliance cohesion.

In this regard, U.S. Strategic Command (USSTRATCOM) leads the Combined Space Operations<sup>5</sup> (CSpO) and Multinational Space Collaboration<sup>6</sup> (MSC) initiatives which seek to enhance and integrate allied space collaboration and integration, primarily with respect to Space Situational Awareness (SSA). In addition, various allies and partners contribute to DoD satellite telecommunications capability as partners in the Wideband Global SATCOM (WGS) program, and additional coalition space activities such as missile warning, and positioning, navigation and timing. As noted above, the United States projects strength by leading and supporting coalition space operations which drives the development of interoperable and resilient systems and capabilities.

Note, while this paper considers interoperability to be a key characteristic of allied and partner capabilities, it is not considered a rationale for collaboration in itself. Similarly, this paper considers the resilience of individual capabilities, and the overall resilience of an architecture to be another key contribution that increases an alliance's effectiveness but is not considered a standalone rationale for partnering.

### **3. Information**

The 2018 NDS notes the unique perspectives U.S. allies and partners provide, and the information they bring which may inform U.S. understanding of the broader context in which the U.S. may be operating, such as different political, diplomatic, and social environments as well as unfamiliar regional relationships. The U.S. may have more options when it understands these dynamics, further strengthening deterrence and contributing to the rational development of appropriate response options. Both the U.S. and its partners benefit from mutual understanding of all capabilities available, coordinated planning, and unified efforts toward common objectives.

### **4. Geography**

The 2018 NDS points out, "Allies and partners also provide access to critical regions, supporting a widespread basing and logistics system that underpins the Department's global reach."<sup>7</sup> In short, geography matters. Allies and partners allow U.S. forces on their territory which provides the U.S. the ability to project power, establish forward presence and contribute to shaping the local and regional environment. Likewise, the U.S. gains information, positions forces, capabilities, and resources efficiently, and further bolsters deterrence.

Many U.S. national security space ground stations are located in allied and partner countries around the world. For example, the Air Force Satellite Control Network (AFSCN) has facilities in Greenland (Denmark) and the United Kingdom, and Australia contributes Space Situational Awareness data from facilities located in Australia.

### **5. Legitimacy**

Multilateral security activities generally have more legitimacy than unilateral action in the international community. Therefore, defense activities taken with allies and partners, (the more the better), help garner support

from neutral or non-aligned countries. In addition, allies and partners may be able to provide independent attribution of an adversary's bad behavior in order to justify response options from the global community. The legitimacy created by combined action could potentially dampen domestic political pressure in non-aligned countries to react against a U.S.-led coalition.

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***"In this environment,  
cooperation amongst nations  
is not just a nice-to-have, it's a  
necessity."***

—Gen John "Jay" Raymond, Commander,  
Air Force Space Command<sup>37</sup>

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Likewise, U.S. allies and partners contribute to the legitimacy of U.S. security activities in space. For example, with the growing risk of conflict extending into space the problem of accurately attributing bad behavior in space is a serious issue. Allies and partners that contribute to the U.S. space situational awareness (SSA) mission provide more legitimacy to U.S. claims regarding attribution of interference and attacks. USSTRATCOM currently has SSA data sharing agreements with 13 countries, 2 international organizations, and 67 commercial entities, meaning the U.S. will not stand alone while making its case in the event of an attack in space.

### **The Whole is Greater than the Sum of Its Parts**

Some observers might focus exclusively on the resources a partner provides to a coalition. Indeed, the price of admission into a coalition includes the willingness to pool resources and share the burden. Furthermore, a partner's level of commitment is often judged by the level of resources they are willing to provide. However, it is important to note that smaller countries, with fewer capabilities and resources, still make significant contributions to a coalition by bolstering deterrence, supplying information, providing geographic advantage, and enhancing the international legitimacy of U.S. actions.

The relative weight of these rationales for collaborating varies with each country and U.S. appreciation for these differences can only strengthen alliance cohesion, and perhaps help smooth the way as roadblocks to closer cooperation pop up. As the Air Force Space Command Space Warfighting Construct<sup>8</sup> notes, integrating partnerships into the U.S. national security enterprise is a key to success—but that does not make it easy.

## **Five Barriers To Partnerships**

Although there are many good reasons for allies and partners to collaborate, many roadblocks inhibit alliances from fully realizing their potential, even when all partners are acting in good faith.

The relative significance of these barriers for combined operations varies with each country, but appreciation for these roadblocks can help the coalition to anticipate where problems will arise and help prioritize efforts to overcome them.

### ***1. Legal and Policy***

In some cases, allied collaboration is discouraged or blocked by domestic law, regulation, and political factors including industrial base and trade strategies that are embedded in domestic laws and regulation. An example includes the prohibition of foreign satellite navigation signal use in the U.S. without an end user license. As most smart phones are equipped with multi-GNSS chipsets (global navigation satellite systems), each individual smartphone would require a license to use the foreign signal and therefore this policy results in a reduction of redundancy for position, navigation, and timing (PNT) signals. Although a waiver process was established recently as a workaround, it is these types of protective laws that create barriers to more fully benefiting from collaboration with allies.

With regard to the case at hand, Canada has not always been in policy lockstep with the United States with regards to national security space policy due to long-standing concerns over the weaponization of space. When Canada did not join the United States in the Strategic Defense Initiative of 1985 and declined to join Missile Defense in 2004, there were repercussions in access to space information that impacted the roles of Canadians at both North American Aerospace Defense Command (NORAD) and space units. Today, Canada is stepping up to contribute personnel and resources

for SSA and recognizing space as a threatened environment for which allied partnerships are key. And, after a lengthy gap in Canadian personnel at U.S. space surveillance operations, Canadian servicemen and women are now Joint Space Operations Center (JSpOC) crewmembers, currently being renamed to the *Combined Space Operations center*, or, CSpOC to signify allied and commercial integration.<sup>9</sup>

### ***2. Organizational***

Organizational bureaucratic barriers are probably the most challenging to overcome. This category includes organizational scale, priorities, rules, regulations, work flow processes, and organizational culture. For example, security clearance and classification roadblocks are very significant challenges to coalition security space operations and information sharing. But differing priorities among bureaucratic stakeholders produces inertia that may not be transparent and is difficult to overcome.

Regarding U.S.–Canada security space cooperation, U.S. security regulations on foreign access to space data is a large roadblock for allies and partners, perhaps due in part to gaps in allied participation in space operations. The result is a risk adverse culture of sharing space information, burdened by regulation and the foreign disclosure review process, rather than one that leans towards allied collaboration. U.S. leadership is starting to recognize this issue to permit the needed changes that will allow allied partners to be fully engaged in the CSpOC.

In addition, some partners may simply not have enough people or resources to create a “mirror-image” of the U.S. organization and fill it with people of a comparable rank or similar expertise. This is a problem of scale. For example, the U.S. Air Force has a space career field with 2,400 personnel, and growing. In contrast, most partners only have a handful of space positions with no space career field or requisite training. And with their limited resources, many partners operate their own Space Operations Center making their pool of expertise comparatively thin.

### ***3. Technological***

U.S., allied and partner interoperability issues often result from incompatible technology, systems, networks, and data. Overcoming these challenges may require significant resources for relatively marginal gain. Over the long

term, foreign military sales of U.S. equipment, coalition agreement on interface standards, data standards, and other common specifications may mitigate this problem, but short-term solutions are often difficult to find.

Beyond policy and organizational hurdles, systems that were designed and built without consideration of allied participation not surprisingly are difficult to use in an allied construct. An example is that of the SIPRNet, a widely-used system to share SECRET-level information in the DoD, including normal day-to-day communications at space units. The inability to partition SECRET REL (releasable) data from SECRET NOFORN (not to be shared with foreign nationals) data means that allies are unable to conduct the most basic communications while serving in the unit. Further, in-development space mission systems such as Joint Space Operations Center Mission System (JMS) run the same risk if allied collaboration is not considered at the forefront of the system acquisition.

#### **4. Budgeting**

The U.S. budget and acquisition process and associated timelines are highly complex which makes it difficult for allies and partners to synchronize efforts. Allies and partners try to align the timing of their contributions with U.S. timelines in order to maximize their contribution to burden sharing and justify their investments to their domestic political leaders and public. When that does not happen, misalignment of efforts may result in the inefficient use of precious national resources and endanger domestic leadership enthusiasm for future contributions.

For example, Canada's defense spending is a fraction of that of its southern neighbor. For every \$100 the U.S. government spends on defense, Canada spends less than three dollars.<sup>10</sup> When considering a space capability for defense and security, Canada must do more with less and be selective when participating in its procurement, maximizing niche areas for which to contribute. Additionally, there is no dedicated space budget for the Canadian Department of National Defence (DND) and therefore, provision of long-term clearly-stated requirements with sustained spending levels in space-related defense activities is a challenge. Further, acquisition timelines can be mismatched with the U.S. due to differing budget processes. Finally, the Canadian Armed Forces (CAF) has a single dedicated one-star

equivalent space general with a relatively small number of Canadian space cadre (albeit growing). Creating engagements, maintaining relationships, and ensuring leadership dialogue in the day-to-day U.S.-Canada defense space relationship requires both sustained fiscal and personnel resources.

#### **5. Cultural**

Language is the most obvious cultural barrier for combined operations but not the only one. Barriers also arise from military jargon, confusing acronyms, and specialized, technical vernaculars. Education helps mitigate these challenges along with combined training, personal exchanges, and combined exercises. As the alliance leader, the U.S. is advantaged in this regard due to partners' ability to communicate in English, or to learn American military vernacular. Nevertheless, U.S. contributions to combined training, exercises and personnel are important. Cultural barriers also may arise regarding differences in values, openness, pace of society, and more. The United States military must be well versed in understanding and working among these differences among its allies and partners. Continuous investment in this area is required.

### **Lesson Learned from the U.S.-Canada Security-Space Partnership**

The case study below revealed three key lessons which are generalizable across other partnerships and may inform decision-makers on ways to maximize partner contributions to U.S. and partner security.

#### **1. Leadership and Champions**

General Curtis LeMay advocated for Canadians to be embedded in space units in the early 1960s.<sup>11</sup> General Robert Herres supported Canadians to be included in space surveillance operations at NORAD. General John Hyten revised the Security Classification Guidelines to permit better sharing of space data with allies.<sup>12</sup> These and many other U.S. space leaders have worked with Canadians and allies to resolve many impediments to these important relationships. It is not simply enough to develop policy that supports allied collaboration in space, but to carry that message throughout the organization and ensure changes are followed through. In a similar vein, it requires consistent leadership from Canada's defense space representatives to continue to build upon these partnerships despite challenges.

## 2. Formalizing Partnerships

When USSTRATCOM took the lead for space surveillance operations in 2002, it created a gap in a formalized space partnership with Canada as this had been previously enabled under the NORAD agreement. Having an MOA or other official recognition of the partnership helps to integrate allies into the mission but also supports the planning for and defense of the resources required to participate in allied space operations. Today, the Combined Space Operations MOU<sup>13</sup> and USSTRATCOM-Canada space data sharing agreement<sup>14</sup> help to fulfill this requirement.



BGen Lalumiere, DND's former Director General Space participates in preparations for exercise GLOBAL THUNDER alongside RADM Brian Brown, then deputy Commander, JFCC Space. Space Training and exercises help break down cultural barriers and build unity of purpose. Image credit: Adam Hartman, Air Force Space Command.

## 3. Planning for Allied Contributions to Systems and Capabilities

Allies are contributing niche capabilities to the space partnership that truly make the whole greater than the sum of the parts. These capabilities can result in a diverse and innovative space architecture and set of services. However, in order to harmonize efforts, there needs to be an understanding of U.S. requirements. Sharing information from Analyses of Alternatives or other informational documentation can shed light on where these niche capabilities can best serve. Even better, having close collaboration with allies when developing requirements for future space capabilities and systems can result in greater interoperability and alliance cohesion. This ensures allied space collaboration is not simply in the form of policy but is also integrated into technical solutions.

## Case Study: the U.S.-Canadian Security Space Partnership

Canada's military space program began decades ago by contributing resources to U.S. national security space programs rather than a program that developed capability solely for internal domestic programs. Historically, partnering in national security space supported Canada's overarching policy of defending North America.<sup>15</sup>

Today, the space domain plays a more fundamental role in Canadian defense and security objectives as the nation builds a defense space program that is an integral component of Canadian operations.<sup>16</sup> Space as a warfighting domain is recognized in Canada's recent 2017 Defence Policy, stating that the nation will "modernize its space capabilities and will take steps to protect these critical assets against sophisticated threats."<sup>17</sup> The policy also signals growth in its space cadre, which will help integrate space capabilities into all areas of CAF operations and bolster support to Allied space operations.<sup>18,19</sup>

The following case study identifies key rationales for U.S.-Canadian partnership in specific security space activities, and catalogues a sampling of Canada's contributions to the U.S. National Security Space Enterprise.

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***"We are the critical partner of your country in sharing that burden in space and making sure that we're ready for the future."***

—Lieutenant-General Michael Hood,  
Commander, Royal Canadian Air Force<sup>38</sup>

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## Ballistic Missile Warning

*Strengthening Deterrence; Providing Resources; Legitimacy.*

For 60 years, the bi-national NORAD Command has contributed to the continental security of North America through aerospace warning, aerospace defense, and more recently, maritime warning. Today, the threat of aggression toward North America continues,



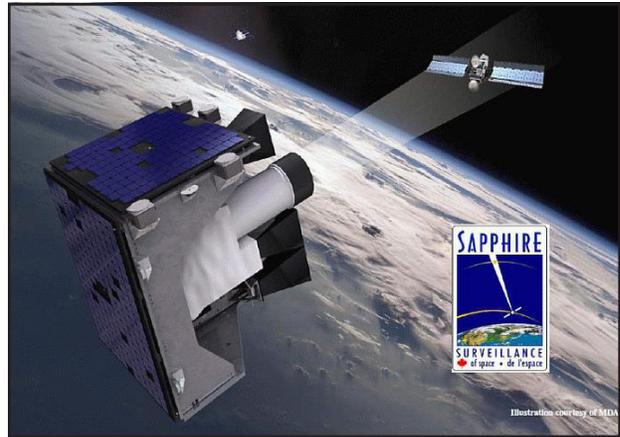
Canadians serve on crew at early warning radar installations, providing resources to the partnership. (Image credit: Air Force Space Command).

as does the need for early detection and warnings. The mission of aerospace warning includes detection of threats “whether by air, missile or space vehicles.”<sup>20</sup> As the longest standing example of U.S.-Canada defense space collaboration, Canadians have been stationed and working alongside Americans since the 1980s at various ballistic missile warning radar installations in the United States and Greenland, at the 2nd Space Warning Squadron at Buckley AFB, and as staff at headquarters in NORAD, USNORTHCOM, and Air Force Space Command (AFSPC).<sup>21</sup> Radar sites, in the course of operations to detect ballistic missile launches, also contribute thousands of daily space observations to the U.S. Space Surveillance Network.

### Space Situational Awareness (SSA)

*Strengthening Deterrence; Providing Forces, Capability, and Resources; Information; Legitimacy.*

Canadian personnel and resources have been involved in supporting the space surveillance mission since 1961.<sup>22,23</sup> Baker-Nunn cameras, some of the most advanced optical surveillance capabilities at the time, were operated in Canada by the Royal Canadian Air Force (RCAF) and later, Canadian personnel became a fixture in Cheyenne Mountain Air Force Station supporting tasking, operations, and analysis of space situational awareness data.<sup>24</sup> In 2013, DND’s own space-based surveillance satellite named Sapphire was launched and now serves as a contributing sensor to the U.S. Space Surveillance Network, helping to improve space tracking accuracy of space traffic and debris, and serving as a possible template for integration of partner data into a future space traffic management system. Further,



The Sapphire satellite is a contributing sensor to the U.S. SSN, supporting resiliency of the network, and providing additional capability that is used to maintain space situational awareness as part of the U.S.-Canada defense space partnership. (Image credit: MDA)

Canadian officers assigned to the CSpOC in Vandenberg AFB share ideas and perspectives with U.S. colleagues and carry these lessons and perspectives back to Canada which helps to align interests and strengthen Canada’s own space cadre.

### Satellite Communications

*Providing Forces, Capability, and Resources.*

The CAF have traditionally leveraged U.S. military capability or commercial capacity to fulfill satellite communications requirements. Two such examples are: Protected Military Satellite Communications (PMSC) project, as partner to the USAF’s Advanced Extreme High Frequency satellites (AEHF) and Mercury Global, Canada’s participation in the Wideband Global SATCOM (WGS) constellation.

In 1999, Canada signed a memorandum of understanding (MOU) with the U.S., along with the UK and the Netherlands to access protected and assured AEHF communications. The use of the AEHF system in the CAF is providing “near-worldwide assured, secure, survivable, and jam-resistant communications to the CAF for the command and control of deployed Canadian commanders and forces, as well as interoperability with some of our principal allies, the United States, the United Kingdom, and the Netherlands,” according to the 2016 program update.<sup>25</sup>

Similarly, in 2012, an MOU was signed between the United States and Australia, Canada, Denmark, Luxemburg, the Netherlands, and New Zealand to

collaborate toward the development of a ninth WGS satellite.<sup>26</sup> In exchange, the partners gain access to the entire WGS constellation while increasing the overall capacity of WGS. The “Allied” WGS satellite, WGS-9, was launched in 2017 and the agreement made for both a cost-effective and flexible wide-band solution for the United States and its partners, enabling effective wide-band communications around the world.

The ongoing USAF Wideband Analysis of Alternatives (AoA) is considering both allied and commercial participation to create diversity, and hence resiliency, in the future of military wideband satellite communication.<sup>27</sup>

### **Geospatial Intelligence (GEOINT)**

*Deterrence; Providing Forces, Capability, and Resources.*

Canada has a 23-year history in synthetic aperture radar (SAR) satellite technology beginning with Radarsat-1 in 1995. However, it was the launch of Radarsat-2 in 2007 that revealed defense and security benefits in particular for maritime domain awareness. Being commercially operated from Canada, Radarsat-2 images are more easily shared among partners and allies than some of the more highly classified U.S. intelligence imagery. Later in 2018, the Radarsat Constellation Mission (RCM), comprised of three SAR satellites with an Automated Identification System (AIS) payload will launch, providing a more persistent surveillance capability for the CAF. Because Canada and the U.S. share a maritime warning mission through NORAD, this capability can be used to deter against illegal activity or threats to North America.

Further, Canada’s SAR capability over the past decade has helped develop defense research and development partnerships.<sup>28</sup> The wide-area swath capability of Radarsat-2, and in the future RCM, has and will result in a better initial detection and cueing for other sensors. Additionally, algorithms and analysis unique to Canada’s surveillance needs are a niche contribution to a broader allied surveillance capability. By focusing on both its domestic surveillance needs and folding in this capability among allies, Canada contributes valuable resources and geospatial analysis expertise for missions such as maritime domain awareness.

Finally, the geospatial intelligence partnership with Canada merits attention.<sup>29</sup> This decades-long relationship can be traced back to the provision of results

to Canadian officials of the Corona program in the 1960s.<sup>30</sup> Today, Canada, Australia, New Zealand, and the United Kingdom enjoy a trusted GEOINT partnership with the U.S. National Geospatial Intelligence Agency (NGA) exchanging information, developing common standards, and building a common operating picture for missions around the world.<sup>31,32</sup>

### **Search and Rescue**

*Providing Forces, Capability, and Resources.*

Canada is an original signatory of a 1980 interagency MOU developing the COSPAS-SARSAT global search and rescue system along with the United States, France and the Soviet Union (now Russian Federation). The program provides emergency beacon alert and location information of end users in distress and has been activated over 41,000 times over land, on water or while airborne.<sup>33</sup> Canada’s involvement in COSPAS-SARSAT has enabled domestic technological advances and industry capability in personal beacon locators.<sup>34</sup> Further, Canada is contributing an enhancement to the system, hosted on the GPS Block III constellation, as part of the Mid-Earth Orbit Search and Rescue (MEOSAR) program. By providing funding for search-and-rescue repeaters in the GPS block III satellites, Canada is supporting an additional capability for search and rescue operations for which a strong partnership exists with the United States. The end result will be a reduction in time to detect and respond to emergencies in both U.S. and Canadian territory, and worldwide.<sup>35</sup>

### **Personnel Exchanges and Liaison Officers**

*Information.*

Above and beyond Canadian personnel assigned to missile warning operations and staff positions, additional exchanges and liaison positions dedicated to space missions help break down cultural barriers and bring different perspectives into U.S. national security space discussions. Further, the exchange officer, whether Canadian or American, will return to their country with experiences and know-how that will subsequently be used in future operations. Policy and security barriers can impede full integration and access for exchange officers, but they need to be overcome to achieve the mutual goals of the exchange.

Because of these opportunities, Canadians have had a wide variety of experiences in U.S. units beginning in



A Canadian officer serving on the CSpOC ops floor converses with another Allied colleague. Embedded personnel and exchange officers enable closer collaboration, help align skillsets and missions, displaying leadership and providing greater resiliency in space operations. Image credit: JFCC Space

the 1960s. The first among them were championed by General Curtis LeMay, when a set of 12 Canadian officers were assigned to various U.S. space facilities, including work on the Mercury and Gemini programs.<sup>36</sup> Today, Canadians serve in policy, operational, and research and development space positions within the United States while U.S. counterparts support Canadian defense space operations and programs.

## Conclusion

The 2018 NDS describes alliances and partnerships as “providing a durable, asymmetric advantage that no competitor can rival or match,” and states that today’s security environment drives the need for a strong network of allies and partners. Certainly then, allied partnerships in national security space are not solely about the space mission area. They represent a larger unity of purpose in collective defense and deterrence in a threatened environment. Over the past decade, the United States has recognized, both in policy and action, the value of these partnerships. However, there still exist multiple hurdles to fully integrate and leverage all that allies can contribute. Over the past 60 years, Canada has demonstrated a willingness to partner with the United States in space, with both nations benefitting from that relationship. Looking to the future, the U.S.-Canada partnership in national security space holds great promise and Department of Defense efforts to build allied space partnerships are on the right track. Still, improvements can be made, particularly in addressing regulatory and organizational challenges so that Canadians can work more effectively with and within U.S. space units.

The analysis above revealed three key lessons: Alliances need active leaders to lower barriers; alliances need to be formalized; and allied systems and capabilities need to be considered from the start of a program. Now, the leaders and champions involved will determine future success while the taxonomy developed here can serve as a tool to help shape understanding of alliances and partnerships, and help grow and enhance partnerships in the space domain.

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- <sup>13</sup> Cheryl Pellerin, DoD News, Sep 23, 2014. “STRATCOM, DoD sign space operations agreements with allies”. <https://www.defense.gov/News/Article/Article/603303/stratcom-dod-sign-space-operations-agreement-with-allies/>
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- <sup>17</sup> Strong, Secure, Engaged: Canada’s Defence Policy (2017).
- <sup>18</sup> Ibid.
- <sup>19</sup> LGen Michael Hood, Commander Royal Canadian Air Force. <https://breakingdefense.com/2017/08/who-stands-on-guard-for-thee-canadas-contribution-to-northern-defense/>.
- <sup>20</sup> NORAD Agreement, renewed and signed 2006. <https://www.state.gov/documents/organization/69727.pdf>.
- <sup>21</sup> Interview with former Director of Space Requirements, Col (ret’d) Andre Dupuis, RCAF, former Director of Space Development. Feb 6, 2018.
- <sup>22</sup> NORAD/CONAD Historical Summary Jan-Jun 1962. Accessed March 11, 2018. [http://www.northcom.mil/Portals/28/Documents/Supporting%20documents/\(U\)%201962%20NORAD%20CONAD%20History%20Jan-Jun.pdf](http://www.northcom.mil/Portals/28/Documents/Supporting%20documents/(U)%201962%20NORAD%20CONAD%20History%20Jan-Jun.pdf).
- <sup>23</sup> Weeden, C. *A NORAD Space History*, 2006.
- <sup>24</sup> Space surveillance operations underwent several organizational changes in Cheyenne Mountain starting with the Space Defense Center, Space Defense Operations Center (SPADOC), and finally the Space Control Center (SCC) and Space Analysis Center (SAC) prior to re-locating to Vandenberg AFB under USSTRATCOM’s Joint Space Operations Center. Canadians were part of space surveillance operations in Cheyenne Mountain Air Force Station until 2007, when the mission re-located to Vandenberg AFB under USSTRATCOM’s Joint Space Operations Center. They continue to support the space surveillance mission through both the JspOC (now CSpOC) and Canada’s own space operations center named CanSpOC.
- <sup>25</sup> Status report on transformational and major Crown projects, 2017. <http://www.forces.gc.ca/en/about-reports-pubs-report-plan-priorities/2017-status-report-on-transformational-and-major-crown-projects.page#p23>.
- <sup>26</sup> Canadian Forces backgrounder on Canada’s participation in the Wideband Global Satellite Communications System, Jan 14, 2012. <http://www.forces.gc.ca/en/news/article.page?doc=canada-rsquo-s-participation-in-the-wideband-global-satellite-communications-system/hgq87xyn>.
- <sup>27</sup> Peter B. de Selding, *SpaceNews*, Nov 10, 2016. “U.S. defense officials say partnership with allied satcom is a priority” <http://spacenews.com/u-s-defense-officials-say-partnership-with-allied-satcom-systems-is-a-priority/>.
- <sup>28</sup> Interview with Dr. Maria Rey, former Director General of Defence Research and Development Canada, March 2, 2018.
- <sup>29</sup> James Cox, OpenCanada.org, Dec 18, 2012. <https://www.opencanada.org/features/canada-and-the-five-eyes-intelligence-community/>.
- <sup>30</sup> Godefroy, Andrew. *Defence and Discovery: Canada’s Military Space Program, 1945-1974*. UBC Press 2011.
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- <sup>32</sup> *Pathfinder Magazine*, Nov/Dec 2012. Forward by former Director of NGA, Letitia Long. [https://www.nga.mil/MediaRoom/Pathfinder/Documents/Pathfinder\\_2012/2012\\_nov-dec.pdf](https://www.nga.mil/MediaRoom/Pathfinder/Documents/Pathfinder_2012/2012_nov-dec.pdf).
- <sup>33</sup> <http://www.sarsat.noaa.gov/>. Accessed Mar 11, 2018.
- <sup>34</sup> <http://www.friendsofrcrc.ca/Projects/SarSat/sarsat.html>. Accessed Feb 18, 2018.
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- <sup>36</sup> Godefroy, A. *Defence and Discovery: Canada’s Military Space Program, 1945-1974*. UBC Press 2011.
- <sup>37</sup> Gen John “Jay” Raymond remarks, AFA Mitchell Institute Space Breakfast Series, Dec 8, 2017 <http://www.afspc.af.mil/About-Us/Leadership-Speeches/Speeches/Display/Article/1402301/space-breakfast-series/>.
- <sup>38</sup> Robbin Laird, “Who Stands on Guard for Thee: Canada’s Contribution to Northern Defense,” *Breaking Defense*, Aug. 17, 2017. <https://breakingdefense.com/2017/08/who-stands-on-guard-for-thee-canadas-contribution-to-northern-defense/>.

