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The Potential for a U.S.-Canadian Spacefaring Partnership

Canada's Role in The U.S. Return to Space Leadership

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Nearly 50 years ago, the U.S. space program sent a manned mission to the Moon and returned everyone safely. That achievement served as an inspiration for people around the world, and next door. In Ottawa, Prime Minister Pierre Trudeau was moved to reach out to Washington and negotiate a partnership between Canadian scientists and NASA that would lead to the formation of the Canadian Space Agency (CSA) in 1989. A young Canadian named Chris Hadfield saw the moon landing and determined to become an astronaut – writing an award-winning children's book about that experience.

Donald Trump as 45th President of the United States has seized upon space as a major policy priority. The Trump administration's ambition to reclaim U.S. leadership in space and remind Americans of their heritage as a "spacefaring nation" could inspire a new generation of Canadians to follow Hadfield into space, and provide Prime Minister Justin Trudeau with an opening to partner with the United States and re-launch the partnership between the United States and Canada in space.

Re-establishing Space as a U.S. National Priority

President Trump is rearranging existing institutional structures to implement the multi-agency, multi-departmental effort in the U.S. federal government to develop policies and priorities to realize the return to space. These institutions have in turn delivered a number of policy directives that have given specific definition to U.S. space policy objectives while coordinating a whole of government effort in support of the expansion of the longstanding NASA role in space science and exploration, the rapidly developing commercial space sector in the United States, and an effort to secure space militarily and regulate use of low-earth orbit.

Canada has a well-developed partnership with NASA that supports space science and exploration, but the changes in U.S. priorities for NASA will require a recalibration of this partnership and open new opportunities for the CSA. Canada's small but highly regarded commercial space sector will similarly see new business opportunities including the chance to enhance supply chain participation in the U.S. space marketplace. But an expanded US space

marketplace also implies expanded application of US rules in space and some in Canada may resist the extraterrestrial application of U.S. law in the same way that prior U.S. efforts to apply rules extraterritorially in Earth-bound geopolitics led to strong objections from many Canadians.

Extending the U.S.-Canadian military relationship into the space domain is an opportunity that requires a strategic rethink by Canada. Will adding space to the operational remit of extant alliance structures like the North American Aerospace Defense Command (NORAD) best meet the current threats to U.S. and Canadian interests in space, or will new alliances be needed? How will Combined Space Operations help enhance the bi-lateral partnership in space and where do legacy alliance structures like NORAD fit in?[1] And, given the many demands on Canada's military budget, is a military role in space feasible, particularly if it can only be achieved at the expense of Canadian defense in other domains?

Before addressing Canadian policy opportunities in the U.S. space policy surge, it is important to consider the specific steps that have been taken in the United States to give effect to the Trump administration's aspirations in space.

New Organizational Structures for U.S. Space Policy

Two bodies have been established to set policy priorities for space policy in the Trump administration: a presidential advisory council on space that was revived and renamed the U.S. National Space Council; and the Users' Advisory Group on Space Policy.

National Space Council

On June 30, 2017, President Trump reinstated[2] the National Space Council through an executive order, a group that had been inactive since the early

1 Combined space operations refers to joint space efforts, such as the U.S. Combined Space Operations Center (CSpOC), that are assembled to strengthen space cooperation between the U.S. and it's allies.

2 The White House, "Presidential Executive Order on Reviving the National Space Council," *The White House*, (June 30, 2017).

1990s. The council functions as an advisory body for the President, with Vice President Mike Pence as Chairman, and is currently in the process of reviewing U.S. space policy. Among its mandates are to maintain relationships and coordination within the space sector, and advise on United States participation in international space activities. So far, the council has convened four times--once in 2017 and three times in 2018--where they have focused on regulatory reform[3], space traffic management[4], military space, and other new strategies to ensure U.S. commercial success in space, and have advised the President on three space policy directives.

Users' Advisory Group

The National Space Council's Users' Advisory Group, serves to "foster close coordination, cooperation, and technology and information exchange" within the sector. The group is made up of former astronauts and representatives across industry and government. The group, known as the National Space Council's "think tank," held its first meeting[5] on June 19, 2018 with presentations from the Space Council's Scott Pace, the Department of Commerce, and NASA Administrator Jim Bridenstine. The Chairman of the group, retired U.S. Navy Adm. James Ellis, announced the establishment of six subcommittees: exploration and discovery, national security space, economic development and the industrial base, technology and innovation, outreach and education, and space policy and international engagement.

With the advice of the Users Advisory Group, the U.S. National Space Council has issued three U.S. space policy directives to date (referred to here as SPD-1, SPD-2, and SPD-3). A close examination of these objectives offers insight into the objectives and goals of the United States in space, as well as details on the specific projects that will receive priority in the near term.

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3 The U.S. Department of Commerce: Office of Space Commerce, "Space Council Focuses on Regulatory Reform," *The U.S. Department of Commerce: Office of Space Commerce*, (February 21, 2018).

4 The U.S. Department of Commerce: Office of Space Commerce, "Vice President, Secretary Ross Announce New Space Traffic Management Policy," *The U.S. Department of Commerce: Office of Space Commerce*, (April 23, 2018).

5 Jeff Foust, "Space council's "think tank" starts work," *Space News*, (June 20, 2018)

Space Policy Directive-1 (SPD-1): *Return to the Moon and On to Mars*
President Trump's first Space Policy Directive aimed to revitalize U.S. human space capabilities. The memorandum stated that the United States would "lead an innovative and sustainable program of exploration with commercial and international partners to enable human expansion across the solar system and to bring back to Earth new knowledge and opportunities." The signed declaration promised to build up U.S. manned mission capacity in low earth orbit first, followed by the Moon, and eventually Mars. The United States anticipates robotic missions to the moon beginning as early as 2019 and no later than 2021, laying the groundwork for manned missions to follow soon after[6].

The President's FY 2019 budget proposed[7] that $10.9 billion of NASA's funding be used for space exploration and a return to the Moon, more than half of NASA's total $19.9 billion budget.[8] This was an increase of $370 million from the previous year, and further increases that would bring the total budget up to $21.5 billion are currently awaiting approval.[9] The President's priorities are echoed in NASA's Exploration Campaign[10], launched to facilitate the transition of low-earth orbit activities to the private sector, move long-term human spaceflight missions, such as those currently conducted on the International Space Station (ISS), to orbit the moon, and allow for long-term human and robotic exploration of the moon, with the intention of preparing for eventual missions to Mars.

SPD-1.1 Commercial Lunar Payload Services (CLPS)

NASA is already taking steps to return to the moon and, in essence, is transitioning from the role of operator to customer. In May, NASA announced

6 NASA, "NASA Expands Plans for Moon Exploration: More Missions, More Science," *NASA*, (May 3, 2018).
7 NASA, "Fiscal Year 2019 Budget Estimates," *NASA*, (2018).
8 JoAnna Wendel, "Five Takeaways from Trump's Proposed Budget for NASA," *EOS*, (February 15, 2018).
9 Jeff Foust, "House spending bill offers $21.5 billion for NASA in 2019," *Space News*, (May 8, 2018).
10 NASA, "NASA's Exploration Campaign: Back to the Moon and on to Mars," *NASA*, (April 16, 2018).

the cancellation[11] of their Resource Prospector program[12], a lunar mining mission designed to mine resources such as hydrogen, oxygen, and water on the moon. While some components of the Prospector will be kept, the Agency has instead opted for a more commercial approach. On April 27, NASA issued a draft request for proposals[13] for a new Commercial Lunar Payload Services (CLPS). Seeking companies capable of getting 10 kilograms to the lunar surface by 2021. Additionally, NASA sought industry's input on a public-private program to develop two mid-sized lunar landers, which would be complementary to the CLPS mission.

SPD-1.2 Deep Space Gateway

NASA is taking a similarly commercial approach to another important program, the Deep Space Gateway. The Gateway is intended[14] to be a research and development facility stationed near the moon that would allow relatively easy access to both the moon and earth and eventually act as a jumping-off point for Mars missions. NASA has issued a request[15] for public-private partnership proposals from industry on the first element of the Gateway, a power and propulsion craft. Industry is prepared to make use of, or enhance the, capabilities of the Gateway to further commercial space business, payload transportation, resource requirements, and orbital preferences.

SPD-1.3 International Space Station (ISS)

In line with its overall strategy for space exploration and industry, the Trump administration has made an effort to promote the privatization of low-earth orbit, which would include the privatization of the ISS.

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11 Jeff Foust, "NASA argues Resource Prospector no longer fit into agency's lunar exploration plans," *Space News*, (May 4, 2018).
12 NASA, Resource Prospector, *NASA*, (April 27, 2018).
13 The General Services Adminstration: Federal Business Opportunities "Commercial Lunar Payload Services – CLPS," *The General Services Adminstration: Federal Business Opportunities*, (April 27, 2018).
14 NASA, "Deep Space Gateway to Open Opportunities for Distant Destinations," *NASA*, (March 28, 2017).
15 NASA, "NASA Will Seek Partnership with US Industry to Develop First Gateway Element," *NASA*, (June 21, 2018).

NASA Administrator Jim Bridenstine stated that he was speaking with companies interested in jointly assuming operational responsibility of ISS,[16] though walked back from the idea a few months later.[17] Privatization of ISS has been opposed by some in Congress, including Senator Ted Cruz (R-Texas), chairman of the Senate space subcommittee. Additionally, an independent study by the Institute for Defense Analysis questions the station's commercial viability by 2025, [18] and a NASA Inspector General study also questioned the amount of time proposed by the Administration to commercialize the station.[19] In July 2018, Cruz, along with Sens. Bill Nelson (D-Fla.) and Ed Markey (D-Mass.), introduced the Space Frontier Act.[20] Among other things, the bill amended language in the National Aeronautics and Space Administration Authorization Act of 2010 to extend the ISS until 2030. While the bill passed in the Senate in December, it failed to pass in the House, effectively killing it."[21]

SPD-1.4 Commercial Crew Program

NASA's Commercial Crew Program began in 2010 as a way of reinvigorating U.S. human spaceflight capabilities through public-private partnerships. In September 2014, Boeing and SpaceX as the commercial companies that would help NASA carry astronauts to the ISS using services domestically developed and launched. Boeing's CST-100 Starliner will be launched using an Atlas V United Launch Alliance Rocket, while SpaceX's Crew Dragon will be lifted into space aboard a SpaceX Falcon 9 rocket. The first of these astronaut crews were announced on August 3 at the Johnson Space Center. Test flights by both companies are scheduled to begin in 2019. The crew will be the first astronauts to be launched domestically to the ISS since 2011.

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16 Christian Davenport, "NASA's new administrator says he's talking to companies about taking over operations of the International Space Station," *The Washington Post*, (June 5, 2018).
17 Alex Stuckey, "NASA Administrator Jim Bridenstine: 2024 space station funding cut off may not be possible," *Chron*, (August 2, 2018).
18 Jeff Foust, "Study offers pessimistic outlook for commercial space stations," *Space News*, (May 18, 2018).
19 Jeff Foust, "NASA Inspector General skeptical of ISS commercialization plans," *Space News*, (July 31, 2018).
20 Jeff Foust, "Senate introduces bill to streamline commercial space regulations," *Space News*, (July 27, 2018).
21 Jeff Foust, "Commercial space bill dies in the House," *Space News*, (December 22, 2018).

Space Policy Directive-2 (SPD-2): *Streamlining Regulations on Commercial Use of Space*

On February 21, 2018, the National Space Council met to discuss regulatory reform options that would encourage commercial space activities. Since the Department of Commerce (DOC) and the Department of Transportation (DOT) oversee many of the regulations for the industry, they were the regulatory bodies the council focused on. The council determined that DOC would lead this regulatory overhaul and become a "one-stop shop" for companies operating in the sector. Additionally, they discussed reforming launch and re-entry licensing, commercial remote sensing, radio frequency spectrum, and a review of export licensing regulations. This led to the signing of Space Policy Directive 2 by the President in May 2018.[22]

SPD-2.1 Commerce Department Reorganization

In May 2018, SPD-2 directed space-faring agencies to reform regulations in order to create an environment more conducive for commercial space. The memorandum directed[23] the Department of Commerce to develop a proposal for Congress to create an entity responsible for DOC space regulations. The new entity will be known as the Space Policy Advancing Commercial Enterprise (SPACE) Administration, and Secretary Ross has directed the Bureau of Industry and Security, International Trade Administration, National Institute of Standards and Technology, National Oceanic and Atmospheric Administration (NOAA), and the National Telecommunications and Information to establish a liaison to work with the new office. Additionally, DOC will consolidate the Commercial Remote Sensing Regulatory Affairs Office with the new SPACE Administration to review DOC's commercial remote sensing regulations, coordinate with the National Space Council to review export licensing procedures, and develop a report on DOC spectrum management policy.

SPD-2.2 Launch and Re-entry Licensing Reform

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22 The White House, "Space Policy Directive-2, Streamlining Regulations on Commercial Use of Space," *The White House*, (May 24, 2018).

23 The U.S. Department of Commerce, "Secretary Ross Praises President Trump's Signing of Space Policy Directive – 2," *The U.S. Department of Commerce*, (May 24, 2018).

In addition to the proposed changes to DOC, SPD-2 also directed DOT to review and adapt launch and re-entry licensing and regulation for a rapidly changing commercial spaceflight industry, including a single license for all types of commercial space flight launch and re-entry operations; and replacing prescriptive requirements in the commercial space flight launch and re-entry licensing process with performance-based criteria. Additionally, the directive requested that DOT coordinate with the Department of Defense and NASA on evaluate operations at federal launch sites.

Space Policy Directive-3 (SPD-3): *Space Traffic Management and Debris Mitigation*

SPD-3[24], outlines U.S. policies and goals for space traffic management. The Directive focuses on Space Situational Awareness and updating standards, practices, and guidelines for debris mitigation, satellites, and space traffic management. Additionally, the memorandum encourages international standards and cooperation to mitigate risks caused by increased traffic in low-earth orbit.

SPD 3.1 Data Sharing

The Directive designates DOC to take over the facilitation of Space Situational Awareness (SSA) information sharing from DoD. Additionally, Commerce will be the primary civil agency responsible for maintaining a public SSA data repository, developing standards and protocols for the use of SSA data, and partnering with industry and academia to ensure that information is shared effectively.

SPD-3.2 Orbital Debris Mitigation Standard Practices

SPD-3 directs NASA to lead a number of standard practice and guideline updates in coordination with the relevant departments and agencies. This will include updating the U.S. Orbital Debris Mitigation Standard Practices and developing new satellite design and operation guidelines.

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24 The White House, "*Space Policy Directive-3, National Space Traffic Management Policy*," *The White House*, (June 18, 2018).

SPD-4 U.S. Space Force

SPD-4, establishes a U.S. Space Force as a separate military branch within the Department of Defense. Six recommendations are under consideration by the President that will eventually be incorporated in SPD-4. Recommendations included establishing a U.S. Space Command and Space Development Agency, directing the Pentagon to submit a legislative proposal and a budget request for FY 2020, and to enhance coordination between the space force and the intelligence community.

President Trump initially announced his intention to establish the space force during the Council's meeting in in June. This policy proposal was again echoed in August by Vice President Mike Pence, who laid out twenty-five of the Administration's plans to establish a space force as a separate branch of the U.S. military by 2020, pending Congressional approval. The establishment of a space force as a separate branch of the military goes against previous statements from the Pentagon on the issue, including a letter[25] that was sent last year to Congress by Secretary of Defense James Mattis, who stated that "at a time when we are trying to integrate the department's joint warfighting functions, I do not wish to add a separate service that would likely present a narrower and even parochial approach to space operations."

2018 Midterm Elections

Last year's U.S. midterm elections, which resulted in a Democratic majority in the U.S. House of Representatives, have generated an air of uncertainty regarding the future of Trump's space agenda. Democrats are expected to use their new majority to oppose the creation of the Space Force. Adam Smith (D-WA), the ranking Democrat on the House Armed Services Committee (HASC), has assumed the role of Chairman in the new Congress. HASC approval will be required in order to establish a Space Force. While Smith has been open to similar proposals in the past, he has opposed[26] the creation of Space Force, at

25 Jay Bennett, "Space Corps Moves Forward Despite Opposition From Mattis," *Popular Mechanics*, (July 13, 2018).
26 Gregory Hellman, "House and Senate conferees to meet on defense spending," *POLITICO*, (September 13, 2018).

least in its present form. Results of the midterms also included the defeat of many representatives from key space states who have been allies in Congress, including representatives from Texas, California, and Colorado.

Canada's Space Policy Framework: Ready to Partner

The origins of Canadian activity in space date back to rocket development activity conducted by the Canadian military in the late stages of the Second World War. Canada was the third country (after the United States and the Soviet Union) to have designed an orbital satellite, the Alouette 1, launched by NASA in September 1962.

In 1969, Canada's partnership with NASA expanded to include joint development of orbital research projects. Canada's federal Ministry of State for Science and Technology was responsible for non-military space policy since 1974 as the National Space Policy called for the development of a Canadian astronaut recruitment and training program. Marc Garneau, now a Member of Parliament and Canada's Minister of Transport, became the first Canadian in space on October 5, 1984. The creation of the Canadian Space Agency (CSA) followed on March 1, 1989 under Prime Minister Brian Mulroney and the CSA's first director Larkin Kerwin.

Canada's objectives for its presence in space evolved from an early emphasis on space science and research to encompass space-related aspects of commercial innovation and national defense. Although, on a smaller scale, Canada's capacities and ambitions in the space domain run parallel to those of the United States. The two space programs have experienced frequent interaction, intersection, and collaboration. Canada is a natural partner today as the U.S. emboldens its spacefaring heritage.

Organizational Structures for Canadian Space Policy

Several federal government departments have activities in the space domain. The Department of National Defence Canada takes the lead on military and intelligence uses of space, coordinating the satellite-based intelligence work

of the Canadian Security Establishment (CSE), Canada's counterpart to the National Security Agency (NSA). The civilian scientific and commercial activity of Canadians in space is the purview of the federal Ministry of Innovation, Science, and Economic Development Canada (ISED), the cabinet department that includes the CSA. There are additional federal government agencies and departments with equities in space including the Ministry of Environment and Climate Change to the Ministry for Natural Resources.

The coordination of these activities has been governed by a series of Long Term Space Plans (LTSPs) developed by the CSA that provide guidance on needed public investments, research priorities, and opportunities for cooperation with international partners. LTSPs adopted by the Government of Canada in 1986, 1994, and 2003 expanded partnerships with the United States, encouraged the commercial space sector in Canada, and led to Canadian development of the Canadarm for use in the U.S. Space Shuttles, Canadian participation in multinational efforts to develop and operate the International Space Station, and an important scientific role for Canada in the soon-to-launch James Webb Space Telescope by NASA, the European Space Agency, and the CSA.

The most recent LTSP was completed in 2008 but was not adopted by the then-Harper government in Canada, a setback for the Canadian space community. In its 2011 budget, the Harper government called for a National Aerospace and Space Review chaired by David Emerson. The Emerson Review took 11 months and produced a two-volume report in 2012, one volume addressing Canadian aerospace, and the other Canadian space policy.

In response to recommendations by the Emerson Review, two new structures were established to develop Canadian presence and activity in space: a Space Advisory Board and a Space Program Management Board.

Canadian Space Advisory Board

The Canadian Space Advisory Board reports to the ISED minister, providing

input through the minister to the Canadian Cabinet on the setting of national space priorities and opportunities. The Space Advisory Board members are drawn from industry, the research and academic communities, provinces and territories, and federal departments and agencies. The first Space Advisory Board was appointed in November 2014 by the Harper government. The Space Advisory Board was renewed with a change in membership by the Trudeau government in 2017.

Canadian Space Program Management Board

Within the government, a deputy minister-level Space Program Management Board was created to coordinate federal space activities. All agencies and departments with a role in the Canadian space program are required to report to the Space Program Management Board on implementation of the policy priorities set out by Cabinet, and Space Program Management Board also monitors and evaluates projects on the basis of timelines and cost.

In 2014, Canada's Space Advisory Board contributed to the development of a Space Policy Framework that encapsulated the Harper government's policy priorities related to civilian uses of space. The 2014 Framework established five guiding principles for Canada in space: (1) Placing Canadian Interests First; (2) Positioning the Private Sector at the Forefront of Space Activities; (3) Progress through International Partnerships; (4) Excellence in Key Capabilities; and (5) Providing Inspiration to Canadians. This last principle related to inspiring young Canadians to pursue education in Science, Technology, Engineering, and Math (STEM) subjects to enable them to participate in space-related career fields. In an introduction to the 2014 Framework document, then-Industry Minister James Moore noted, "Canada's space industry provides about 8,000 highly-skilled jobs and contributes $3.33 billion to Canada's economy every year." This recognition of the growth of Canada's commercial space sector, reflected in the Framework's emphasis on private sector leadership in setting goals and seizing opportunities was a milestone in the Canadian government's approach to space policy.

While the 2014 Framework provided a clear rationale for the expansion of Canadian activity in the space domain (apart from national security) it fell short of a fully-developed Canadian Space Policy backed by specific programs and expenditures.

The federal election in 2015 ended the Harper government and the new Trudeau government took time to revisit space policy. It appointed a new Space Advisory Board (retaining several members of the Harper SAB) in 2017 and the 2018 federal budget included increases in funding for science, some of which may be space-related. Yet the 2018 budget did not feature a new commitment to space akin to that underway in the United States.

Canada's military capabilities in the space domain have been identified as a priority within the Trudeau government's Defence Policy review, entitled Strong, Secure, Engaged: Canada's Defence Policy[27], which was released in late 2017. The new Canadian defense policy calls for investment in expanded operational capabilities in space, modernizing existing Canadian satellites, protecting Canada's interests in the space domain, and supporting the peaceful use of outer space. The Royal Canadian Air Force (RCAF) is given responsibility to coordinate and oversee the defense space program with an emphasis on serving both domestic and international purposes while achieving seamless integration with Canada's defense partners, including most prominently the United States.

The Trudeau government has yet to put its stamp on Canadian space policy, and in particular, it has not taken decisions on major new spending or projects in which the Government of Canada will invest. The structures put in place to develop Canadian space policy and priorities are adequate to the task, but decisions must be taken to transform Canadian ambitions for a continued role

27 The Government of Canada, "Strong, Secure, Engaged: Canada's Defence Policy," *The Government of Canada*, (August, 30, 2018).

in the space domain into achievements.

Will a U.S.-Canadian Spacefaring Partnership Emerge?

There is great potential for the Trump administration's space policy drive to clarify the choices and opportunities available to Canada and catalyze the Trudeau government to respond with a new Canadian Space Policy. If it does, the two countries' similar priorities for greater capabilities in scientific, commercial, and military activity in space could extend from research cooperation to joint development and operations.

A future partnership will build on decades of successful U.S.-Canadian collaboration in the past, but will also require a recognition of some of the ways that the Trump administration has changed the paradigm for activity in space.

- *From science-forward to utility-forward missions.* In the past, the shared interest in scientific discovery and exploration made it simpler for the U.S. and Canadian programs to work together for common and relatively noncontroversial goals. Today, the U.S. has established a set of specific missions including sending humans to the Moon and to Mars, protecting U.S. interests in space, and regulating private and public sector activity in low earth orbit. Decisions on funding and priorities in the United States will shift from a science-forward approach to a utility-forward approach. To partner with the United States, Canada must share the U.S. mission objective, and while science generates knowledge for the wider world to share, utility will produce capabilities that will be available to fewer actors and may not be shared. While picking and choosing missions and project will suffice for a time, a larger debate in Canada about the objectives and orientation of Canadian space policy will be needed.
- *Governments as Customers of the Private Sector, Not as Independent Owner-Operators.* For decades the U.S. government drove innovation by setting goals and then contracting with the private sector to

respond with bespoke solutions that would have few, if any, additional customers. For new technology start-ups, a space related government contract was a lifeline. For established firms that often operated in the aerospace and defense sectors, such contracts fueled research and development and generated spin-offs that could be sold to government for defense or commercialized and sold to the private sector. Today, the Trump administration is seeking to leverage the growing commercial space sector to reach its goals quickly and at an affordable cost by positioning the federal government as one customer among many others, including foreign governments and private firms. In practice this means that governments that once represented most of a company's market and could set their own terms must now adjust to competition from others for the time and attention of a growing but still limited number of space sector firms.

A U.S.-Canadian partnership can benefit the United States in two ways as it shifts to being one customer among many for the commercial space sector. First, Canada has been in the position of being one customer among many ever since it developed a space program, and so in contracting, cost-control, and the management of relationships Canada's experience has value as a model for how U.S. government entities might adapt. Second, Canada's commercial space sector adds to and complements the same sector in the United States. In the Trump administration's 2017 National Defense Strategy a distinction is drawn between pushing the development of new defense capabilities through costly research and development and expanding allied capacity to deploy these capabilities. In military technology, the U.S. sees its role in capability development, and the allies adding to overall capacity. Something similar can be said with regard to the space sector, and as the U.S. establishes goals that push for new technologies from space sector firms, Canada is already adding to the capacity of the space industrial base.

To carry the analogy between defense and space further, Canada might consider expanding the mandate of the Canadian Commercial Corporation to promote exports by the Canadian space sector even to commercial customers

in the United States and elsewhere. The Canadian Commercial Corporation's experience with sensitive intellectual property and the U.S. export licensing and controls system would help firms to navigate these issues as the space sector supply chains develop.

- *A Whole of Government Approach to Space*. The establishment of a National Space Council in the United States, with broad representation from federal departments and agencies, is intended to foster a coordinated, inter-agency effort to attain national goals in space. Canadian federal government space activity and responsibility is less fragmented than in the United States, but as more federal and even provincial government authorities become relevant stakeholders and prospective partners in space, Canada will need to consider a similar whole of government approach to space. Here, the role of the National Space Council is a useful model as it incorporates cabinet level representatives with academic and private sector expertise through the Users Advisory Group. At a minimum, greater input from the Space Program Management Board could be formally introduced to the deliberative process of the Space Advisory Board, but the relationship of both groups to the Canadian cabinet is different, suggesting a cabinet committee on space policy that met regularly with the Space Advisory Board and the Space Program Advisory Board could reduce the chances of siloed decision making.

Next Steps in the Partnership

Overcoming the fragmentation of responsibility and authority within government is important, but a further challenge in the development of a U.S.-Canadian spacefaring partnership is overcoming similar divisions between U.S. and Canadian space policymakers. Government remains the leading entity in space, despite the rise in scale and expertise of the commercial space sector in both countries. By partnering, the U.S. and Canadian governments can take steps to remove obstacles to deepening the collaboration between the two

countries in space. Specifically, as part of an expanded partnership, the U.S. and Canadian federal governments should consider:

- *Take steps to enable seamless cross-border research and development, and supply chain integration of production.* This will require border facilitation for flows of products and specialized personnel.

- *Institutionalize platform/mission collaboration.* When a partnership is established with political support, that mutual commitment needs to be formalized and institutionalized. This was how the two governments acted in creating NORAD in 1957 for air defense of North America. In the sixty years since, and notably in securing U.S. airspace on September 11, 2001, the institutionalized partnership let the professional military to act quickly without first querying elected leaders for approval. Where partnership makes sense, formalizing the arrangement can create a stable understanding that fosters collaboration at the working level.

- *Establish a Dialogue and Work Together to Regulate Activity in Space.* Rules made by the United States on a unilateral basis will inevitably be challenged by other powers. Canada's participation in the rules, and assistance in building multilateral support for regulation of space activity will add to the legitimacy and acceptance of the U.S. desired order. Even a dialogue with Canada on regulation of space-based activity by governments and private entities will make the rules more transparent and open to discussion. A U.S.-Canadian partnership on the regulation of activity in low earth orbit could form the basis for a wider, multilateral dialogue. The Canadian-instigated Arctic Council provides a model, since this organization helped to develop rules for activity in the Arctic domain and coordinate international efforts at monitoring and enforcement.

- *Develop Bilateral or Multilateral Alliance for Defense in (or from?) Space.* A formal alliance aligns perceptions of national interest and shared, mutual responsibilities that can help reinforce the need for

expensive capabilities when other fiscal priorities loom larger in voter perceptions. As the smaller partner, Canada must work to avoid the public characterization of space as an opt-in, opt-out domain for the defense of Canadian interests; the opt-in opt-out approach to nuclear weapons and missile defenses led to Canada opting out while the United States bore the responsibility and cost of defending both countries on its own. "The weaponization of space" is a charge that the United States has addressed directly, countering that China and Russia have already developed offensive capabilities in low earth orbit and integrated space into their war fighting plans against satellite-dependent U.S. technology. Canada's new defense policy echoes the need to catch up to the vulnerability of space-based assets, so the government to government dialog on this point should be straightforward, but formalizing this understanding in an alliance will make the public case for collaboration in space defense. The newly formed U.S. Combined Space Operations Center (CSpOC), which was erected to strengthen space cooperation between the U.S. and its allies, as well as space situational awareness are natural opportunities for in-space partnership. Boosting collaboration on missions that are supported by space, such as Navigational Warfare (NAVWAR), could also improve the alliance.

The NORAD Agreement might be adaptable as a platform for alliance in low earth orbital defense. Originally focused on threat assessment and warning in the air defense of Canada and the United States, in 2006 the two governments added maritime threat assessment and warning to the NORAD mandate. There is a precedent and some complementarity to adding space responsibility to NORAD, and this would make further sense for Canada since the Royal Canadian Air Force has the lead role in Canada's space defense.

Conclusion

The United States and Canada have a great deal in common in space interests and aspirations, and a long history of successful space collaboration to build upon. Realizing the potential for the U.S.-Canadian partnership will require leadership and vision in both governments, and the good will to pursue shared interests together.

The Trump administration has catalyzed a resurgence of U.S. leadership and action evolving America's role as a pioneering and spacefaring nation. It has done so carefully, establishing national decision-making structures to translate vision into quick results.

Canadian governments have put in place a similar structure, and have deliberated seriously on how Canada can participate in the scientific, commercial, and national security opportunities in space building on a partnership with the United States and other spacefaring nations that had its origins in the Second World War.

This review of recent space policy decisions taken in the United States and Canada point to the potential for the two countries to work together. The countries have similar goals, and now the structures necessary in place to facilitate action and partnership. With smaller budgets and a smaller space sector, as well as a preference for collaborating with other countries on space related scientific endeavors, Canada's space policy development has been held back while the United States put its attention and resources elsewhere. The renewed U.S. engagement on space provides the missing element for Canada: a set of missions and goals it can consider and even partner with the United States to attain.

If they do, as young Americans and Canadians watch the first human set foot on Mars in the not too distant future, they may be inspired by this shared achievement to take innovation to new heights and reinforce the partnership, alliance, and friendship of the United States and Canada.

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