



## Consulting Canadians on a Framework for Future Space Exploration

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The Outer Space Institute (OSI) is a worldwide network of space experts united by their commitment to highly innovative, transdisciplinary research that addresses grand challenges facing humanity's expansion into and growing use of space. This document has been written by seven Canadians who are Fellows of the OSI. It constitutes our response to the call from the Canadian Space Agency, dated 26 October 2020, inviting Canadians to share their vision for Canada's future in space.

We recommend:

**A. That Canada continues to strongly promote a multilateral approach to develop rules and best practices concerning space exploration activities.**

*Commentary: Canada has, over the years, expounded a policy of multilateralism as well as leadership on global challenges ranging from UN peacekeeping to the Law of the Sea to Anti-Personnel Landmines to the International Criminal Court. Global activities related to space exploration are currently being developed in a piecemeal fashion without the international coordination necessary to ensure that outer space remains the "province of mankind" and that "exploration and use" are "carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development" as stipulated in Article I of the Outer Space Treaty.*

*Canada has played a role in ensuring that the 2020 "Principles for Cooperation in the Civil Exploration and Use of the Moon, Mars, Comets, and Asteroids for Peaceful Purposes" (Artemis Accords), currently signed by nine nations, affirm the benefits of coordination via multilateral forums in order to develop a global consensus on critical issues. Nevertheless, we exhort Canada to pursue further initiatives in this direction, including some or all of the following:*

- i) Proposing a working group of the Legal Subcommittee of the UN Committee on the Peaceful Uses of Outer Space (UNCOPUOS) to develop multilateral, best-practice guidelines relating to space exploration activities;*
- ii) Championing the negotiation at UNCOPUOS of a multilateral framework to govern the exploitation of space resources (see B);*
- iii) Updating the 1976 Registration Convention in concert with like-minded states, the private sector and civil society via amendments to be considered by a review conference of that Convention, and;*
- iv) Convening a first ever meeting of states parties of the Outer Space Treaty to consider the adequacy of that instrument in current conditions, as well as possible improvements.*

**B. That Canada urgently pursues a leadership role in multilateral diplomacy related to space resource exploration, exploitation and utilization before space resource exploitation is unilaterally conducted by states under national regulation.**

*Commentary: Since 2015, several states have adopted national legislation that seeks to give private companies legal rights over resources extracted from the Moon, asteroids, and other celestial bodies. In 2020, NASA entered into contracts with four US companies to purchase lunar regolith with the*



*explicit goal of establishing a legal precedent. Such developments have occurred without consultation and negotiation among the 110 states parties to the Outer Space Treaty and despite the fact that these national efforts are based upon treaty interpretations that are not widely shared. Adding to this concern, national efforts to stimulate space mining are proceeding without due regard to scientifically identifiable risks such as the creation of debris streams, planetary contamination and astromaterial alteration, and the perturbation of asteroid trajectories. For these and other reasons, the OSI calls for the establishment of a working group on space mining at the Legal Subcommittee of the UN Committee on the Peaceful Uses of Outer Space. We encourage Canada to support and to consider leading this initiative.*

**C. That Canada urgently develops its position on space exploration activities.**

*Commentary: In early 2019, Canada published a new space strategy, entitled: “Exploration, Imagination, Innovation”. The document, “informed by the work of Canada’s Space Advisory Board, ... acknowledges space as a strategic national asset, requiring a whole-of-government effort to ensure that Canada can continue to rely on space to help meet national needs.” The strategy “seeks to realize the full potential of the Canadian space sector to be a leader in exploration, science excellence and innovation and deliver socio-economic benefits to improve life for all Canadians.” The first building block of the strategy is to “ensure Canada remains a leading spacefaring nation by joining the Lunar Gateway Mission”. This mission will break new ground scientifically, technically and legally. However, essential questions such as the ownership of extracted space materials, the mitigation of space debris in cis-lunar space and lunar orbits, the identification and preservation of scientifically valuable materials during space resource activities, and how best to avoid accidents and interference resulting from the proximity of two or more space resource projects have not yet been seriously addressed in Canada or elsewhere.*

*We propose that the Government of Canada urgently develop a White Paper or equivalent through a whole-of-government process and a nationwide consultation. We further recommend that the current Space Advisory Board be the vehicle to conduct such a consultation. Finally, in order to provide transparency to our national and international partners and provide clarity to space companies and investors, we urge the Government to review its procurement regime and to create, with exigency, the modern regulatory framework for space-related activities outlined in the 2019 space strategy.*

**D. That Canada significantly expands its scientific and technological contributions to space exploration, including in ways that help solve everyday challenges for Canadians.**

*Commentary: If Canada is to fulfill the vision of the 2019 space strategy, as outlined above, we believe that the country needs to develop a much broader palette of activities in relation to space exploration. Canada’s current vision in this domain includes the development of a next-generation, AI-enabled, deep-space robotic system; scientific opportunities and global partnerships in planetary atmospheres, planetary geology, planetary space environment and geophysics and prospecting via the Lunar Exploration Accelerator Program (LEAP); continuity of Canada’s astronaut program; and a program to inspire the next generation of Canadians. There is also a suggestion in the strategy document that “through the Lunar Gateway project and via new efforts on Earth, Canada will explore questions key to improving health care and quality of life for Canadians”.*

*The Outer Space Institute strongly encourages the Government of Canada to significantly increase the financial support and pace of activity through the LEAP to ensure that Canadian scientists,*



*engineers and entrepreneurs are in the forefront of some of the exciting new opportunities and initiatives that are emerging.*

*Furthermore, we are impressed by the 2018 report of the Expert Group on the Potential Canadian Healthcare and Biomedical Roles for Deep-Space Human Spaceflight led by Dr. Robert Thirsk. We believe that given Canadian world-class expertise in this area, combined with a strategic vision with bold objectives and an ambitious timeline, Canada could “lead the planet” in this area and “develop national capacity in virtual healthcare for the benefit of all Canadians”, especially those in rural and remote communities. We urge the Canadian Space Agency to seize this opportunity for both global leadership and benefits to Canada beyond the space domain.*

**E. That Canada, as part of this expansion of space exploration, develop a regular call schedule for Canadian-led deep space science missions, while continuing to contribute meaningfully to missions led by other countries.**

*Commentary: Canada has had notable success in space exploration as a minor but reliable partner on NASA, ESA, and JAXA missions. On one hand, this has worked well in allowing Canadians to have some involvement in a wide range of space missions. Examples include: MESSENGER (Mercury); Phoenix, the Mars Science Laboratory, MAVEN and InSight (Mars); OSIRIS-REx (the asteroid Bennu); and New Horizons (Pluto and the Kuiper Belt). On the other hand, this Canadian involvement has been opportunistic, with a limited and sporadic planning schedule and with scientist inclusion often relying on haphazard arrangements with US and other institutions. This approach, when pursued as the principle means for space exploration, hampers the Canadian science community, contributes to the loss of critical Highly Qualified Personnel and limits Canadian space industry development and growth. If Canada is to build upon its proven expertise, competency and success in this domain, provide continuity and predictability to its academic and private sectors, and generally strengthen the capacity of Canada’s space sector to compete globally as recommended by Canada’s Space Advisory Board, the Canadian Space Agency should, as a priority, develop a regular Request For Proposal schedule with open, competitive calls for deep space exploration and astronomy missions. Budgetary constraints would require the missions to be more modest than those of NASA, for example, but such missions would still have significant impact. With objectives and decisions driven by the scientific community, Canada could build on the successes of MOST and Sapphire, as well as the lessons learned from NEOSat, to develop low-cost missions to the Moon, asteroids, and planets. Space-based astronomy could be conducted from a Lagrange point, selenocentric orbit, or cis-lunar space. Some areas of study of growing importance to Canadian and global security, such as planetary defence and orbital debris characterization, would also benefit from such an open call schedule.*

**Final comments.**

The authors of this document have purposefully kept our recommendations concise. We would, however, welcome any questions or other engagement on the above.

We wish the Canadian Space Agency and the other government stakeholders success in this important work and look forward to learning about the results of this consultation process in due course.



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