

Pre-Budget Consultation for 2019

Economic Growth: Ensuring Canada's Competitiveness

Space Generation Advisory Council

In support of the United Nations Programme on Space Application

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List of Recommendations

- **Recommendation 1:** That the government urgently secure Canada's posterity in space and its economic output with a competitive budget allocation to the *Canadian Space Agency*, with per capita GDP parity of major spacefaring nations taken into consideration.
- **Recommendation 2:** That the government urgently acknowledges its institutional and financial commitment to deep space initiatives alongside its international partners.
- **Recommendation 3:** That the government increase its financial and institutional commitment across the public and private sector to better encapsulate the Canadian space industry to align with the *UN 2030 Agenda for Sustainable Development*.
- **Recommendation 4:** That the government amend its *Innovation and Skills Plan* to include a funding mechanism to incentivize, sustain and harmonize indigenous capability development programs focused on space science and technology, with a focus on Canadian youth.
- **Recommendation 5:** That the government expands its focus across the four streams of the *Strategic Innovation Fund* by increasing its call for proposals to include the space sector and to specifically bolster small and medium-sized enterprises.
- **Recommendation 6:** That the government extends the implementation of its *model policy on scientific integrity* for the development and urgent release of a long-term *space strategy*.

1. Canada's Outlook in the Global Space Economy

Canada is one of seven member nation of the G7 group, and more prominently it sits among its largest trading partners. With a population of 35.5 million ranking among the lowest of the group, the Canadian economic profile is strongly bolstered with a per capita GDP of 46,705 US\$, lagging behind the United States (US) and Germany by a modest margin. A crowning achievement for the country remains its *heritage*: the third nation to launch a satellite into space, following the Soviet Union and the US, with the launch of Alouette 1 in 1962. Today, it faces a grim future as the country stands at an inflection point amidst a global space market that is embracing commercial supply chains for spacecrafts and launchers and bold endeavors of space exploration, all of which is embedded in a sector with an exponential projected growth over the coming decades.

With the democratization of space infusing the public-private cooperation and a surge in both domestic and export markets, it should be noted that Canada ranks significantly behind in terms of its civilian space program funding. With Budget 2018, the Canadian space program was allocated approximately 333M CAD\$ which stands as the lowest of the G7 group, and remains behind other spacefaring nations such as China and India who are influential actors in today's global economy.

Over the the last four years, the Canadian space program has stagnated by continuously facing an attrition with budgetary cuts. The nation is therefore alarmingly at risk of losing on economic output of a global space sector. Technological benefits spanning years of innovation and new spin-off technologies continue to incur benefits in medicine and environmental monitoring, to name a few. This poses the unsettling reality that the nation is on the verge of losing its seat among major spacefaring nations, many of whom are its allies in international trade agreements.

The urgency of a diminutive trend poses a threat to the development of Canada's domestic, space-based small and medium-sized enterprises as well. They are at risk of leaving for alternatives providing competitive incentives, effectively creating a multilateral loss that goes beyond just an economic output - the nation's capable minds are jeopardized with its *Highly Qualified Personnel* bleeding out of Canada for better prospects. This is best highlighted with recent engagements of the country's youth, who have shown remarkable performances consistently across the many years of the *Intercollegiate Rocket Engineering Competition* (IREC), held in New Mexico.

Furthermore, an exemplary Canadian program, the *Canadian Satellite Design Challenge* (CSDC), has evolved over the years since its inaugural beginning in 2011 to demonstrate the growing talent across Canadian universities with students developing 3U CubeSats. These small satellites range from "1U", or 1 unit, representing a 10x10x10 centimetres "cube" to various other form factors. These have now formed a cornerstone of modern academic research

in space with an increased accessibility and industrialization of commercial off-the-shelf components (COTS), thus enabling their rapid development and ease of access. With the recently announced *Canadian CubeSat Project* led by the Canadian Space Agency (CSA), the government has set in place the grassroots of a major precursor of global competitiveness, featuring a cross-section of academic/scientific research and industry collaborations. Thus, looking at future prospects and Canada's stake as a G7 nation, to hold its competitive standing internationally there is a critical need to reverse the decreasing trend and to empower its civilian space program.

As such, the Space Generation Advisory Council provides the following recommendation for Budget 2019:

That the government urgently secure Canada's posterity in space and its economic output with a competitive budget allocation to the Canadian Space Agency, with per capita GDP parity of major spacefaring nations taken into consideration.

2. Space: Driving Global Competitiveness and Emerging Paradigms

A notable use case is Luxembourg, with its framework "*Law on Use of Resources in Space*" driving further the narrative of space as a profitable venture. This impression is also not lost upon its government, which is actively leading a State-mandated proliferation and adoption of its framework by engaging other international partners. With the sole exception of the US and its *Commercial Space Launch Competitiveness Act*, it is unequivocally clear that space is a self-contained driver with the capability to spur economic returns for nationals of States and thus, capable of leveraging a sustainable output that will yield socioeconomic benefits to its citizens. Moreover, Luxembourg's population stands at roughly 0.5M, which is less than Canada by a factor of 71, and a per capita GDP of 104,175 US\$. This is highly emboldening, considering that a legal framework is paving a roadmap far-reaching than many other sovereign states and effectively heeding the voice of the global market - simply put, space is profitable and is expected to be significantly interwoven in our modern society over the coming years, especially with the advent of artificial intelligence (AI) and Internet of Things.

With a diversifying global portfolio infusing new actors across the private sector, it must be highlighted that Canada ranks second with the largest amount of non-US start-up companies in the space sector (*Bryce Start-Up 2018 review*), after the United Kingdom. The public-private partnership paradigm is perhaps best illustrated when contrasted to our major partners, the US and the EU, who are collectively affirming a political and economic stance towards the advancement of space exploration while developing regulatory frameworks for future infrastructures, such as space mining. Likewise, the recently published report "*Patents in Space*" by the Canadian Intellectual Property Office remarks the following:

This report highlights the importance of small and medium sized enterprises (SMEs) for innovation in the Canadian space sector. SMEs account for 83% of organizations with patented inventions and are responsible for 83% of all patented inventions in the sector. SMEs are also responsible for 30% of the revenue and 30% of the expenditures spent on research and development (R&D). Looking at value-chain segments, between 2000 and 2015, Canadian patent activity in the downstream value chain component has increased from 23% to 60% and follows the Canadian and international shift towards private sector space activity and revenues.

Beside, another point of significant interest highlights the incremental growth of patent filing with an impact on Canada, *“potentially signalling a technological advantage for its space sector”*.

As such, the Space Generation Advisory Council provides the following recommendation for Budget 2019:

That the government expands its focus across the four streams of the Strategic Innovation Fund by increasing its call for proposals to include the space sector and to specifically bolster small and medium-sized enterprises.

3. The case for Sustainable Development

The UN platform that established the *2030 Agenda for Sustainable Development* has highlighted 17 sustainable development goals (SDGs) which has been embraced by Canada along with 192 UN member states. With the recently-held high-level forum UNISPACE +50 by the *United Nations Office for Outer Space*, space was prominently featured to drive benefits ranging from security, safety and sustainability *from* space and *in* space, and therefore molding itself to be preeminent in facilitating the achievement of SDGs. More importantly, though, is the emphasis on a cooperative model among sovereign nations for the *benefit of humankind*, which is also enshrined as a key mandate of the CSA.

Canada’s Radarsat program has delivered increasingly beneficial results, both to Canadians and international regions with useful data for disaster relief, adhering to the *International Charter on Space and Major Disasters*, of which the CSA is a founding member. Also, moving towards international treaties that the country has ratified and is party to, such as the *Paris Agreement*, the Radarsat lineage will see its continuation of a pivotal promise by the government with the soon to be launched *Radarsat Constellation Mission (RCM)* providing strategic data towards reducing environmental footprints and thus leveraging its efforts to mitigate global warming. Of worthy note here is another hallmark of Canadian contribution that has no replacement in sight, *SCISAT*, monitoring and providing key data to scientists across the world about our ozone while nearing its 15th anniversary. This marks a remarkable technological feat of Canadian innovation and capability.

As such, the Space Generation Advisory Council provides the following recommendation for Budget 2019:

That the government increase its financial and institutional commitment across the public and private sector to better encapsulate the Canadian space industry to align with the UN 2030 Agenda for Sustainable Development.

4. Space: A National Strategic Asset

The RCM also holds significant benefits towards the Arctic with the monitoring of the ecosystem and its preservation, in addition to being an essential asset to meet the needs of communities in North. Thus, it is clear that space is polyvalent and permeates across national and international endeavors. It is therefore abundantly evidenced that Canada's national priorities and its alignment **must urgently** designate space as a *national strategic asset*, a recommendation previously made by the Space Advisory Board to *Innovation, Science and Economic Development Canada*. The *space strategy* must emerge itself sooner than later, otherwise the possibility of being dwarfed with competing economic entities internationally brings considerable risks to the Canadian industry which saw its space industry bringing **a revenue of around 5.5 billion CAD\$ in 2016** (*State of the Canadian Space Sector*, 2018). It is also along these lines that the immediate commitment required by NASA as it steers decisively towards the establishment of a cislunar station, the *Deep Space Gateway* (DSG), for Canada to imminently acknowledge its stance. This will require a commitment from the government to ensure Canada is not left behind towards an endeavor that will yield intergenerational benefits and economic output. The DSG will play a significant role for today's youth as well, who will inherit the legacy of decisions made now as to whether they will have a platform for a workforce to transition into. Otherwise, the country is at risk of facing an economic loss with an *intellectual brain drain*. Lastly, the space strategy must hold its integrity against political bias and should be shielded in ways that are paralleled and uncontested for protecting our scientists: **the space industry cannot be afforded to be undermined as it becomes a pivotal staple of Canada's economy, its society, its heritage in space and its international standing in the face of a global competing market.**

As such, the Space Generation Advisory Council provides the following recommendations for Budget 2019:

That the government urgently acknowledges its institutional and financial commitment to deep space initiatives alongside its international partners; and

That the government extends the implementation of its model policy on scientific integrity for the development and urgent release of a long-term space strategy.