



Canadian Space Commerce Association (CSCA)  
Pre-Budget Submission to the House of Commons Standing Committee on Finance  
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**Submitted by:**

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## Executive Summary

The Canadian Space Commerce Association will address two suggestions in its submission.

In the past 30 years we've seen nothing less than a wholesale transformation in how Canadians communicate, conduct financial transactions, manage our crops, view and react to natural disasters among many other day-to-day activities enabled and enhanced by satellites, and all the associated technology, whether it's ground based or on-orbit.

These advances were achieved by a combination of private and public investment, including and importantly, Research and Development (R&D) funding.

Unfortunately, Canada is beginning to fall behind in R&D investment as a percentage of GDP as compared to other nations. According to the OECD<sup>1</sup>, Canada's investment in R&D overall has declined and now stands at 1.69% of GDP whereas the global average is 2.4%. What's more, between the period of 2007-2012, Canada's annual growth rate in R&D was -1.4% compared to a +2.0 for the OECD.

In space competitiveness, the Futron 2014 Space Competitiveness Index<sup>2</sup>, shows that in 2011 Canada was surpassed by India and has now fallen into third tier status. Emerging space nations such as South Korea and Israel, also in the third tier, are increasing their competitiveness and are catching up to Canada.

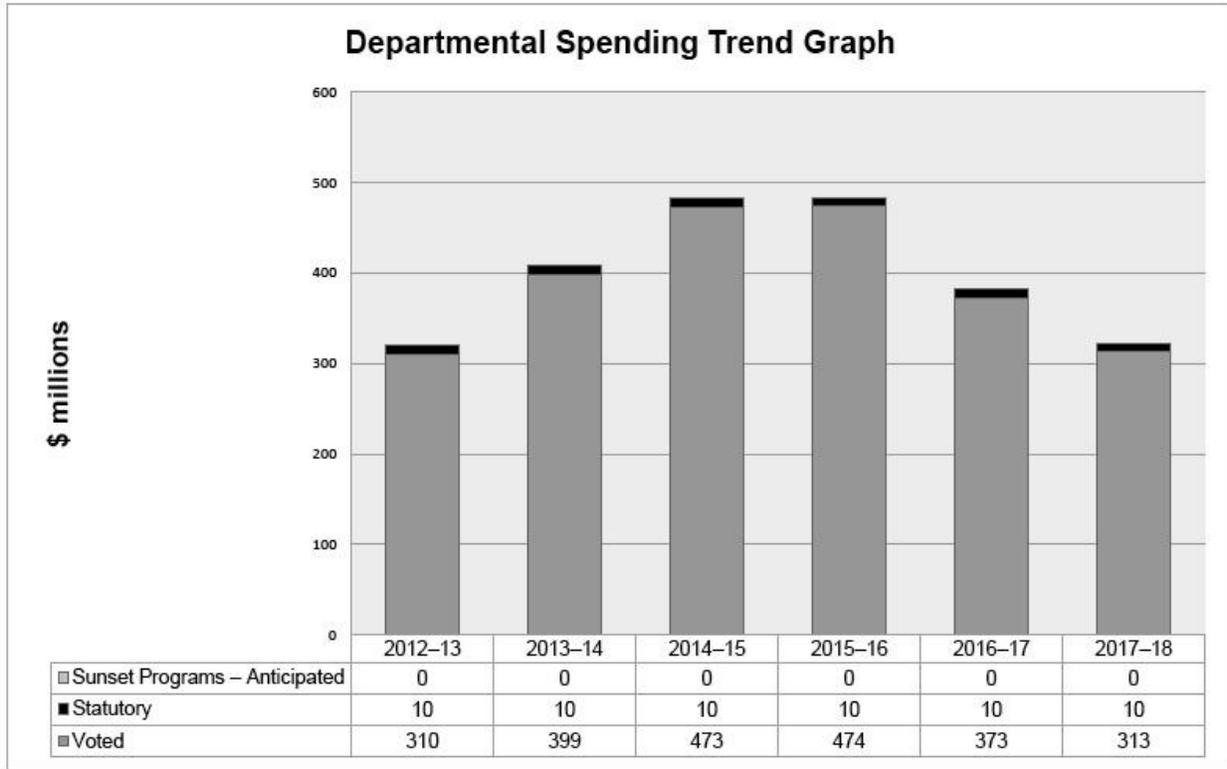
Planned spending for Canada's civil space program led by the Canadian Space Agency (CSA) is \$483 million for 2015-16. Planned spending for the next two years respectively is \$383 million and \$322 million. The decrease in spending is attributed to the result of the RADARSAT Constellation Mission program major funding milestones having been met.

As this graph illustrates Canada's civil space budget is on a downward slope.

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<sup>1</sup> OECD Science, Technology and Industry Outlook 2014 [http://www.keepeek.com/Digital-Asset-Management/oecd/science-and-technology/oecd-science-technology-and-industry-outlook-2014\\_sti\\_outlook-2014-en#page285](http://www.keepeek.com/Digital-Asset-Management/oecd/science-and-technology/oecd-science-technology-and-industry-outlook-2014_sti_outlook-2014-en#page285)

<sup>2</sup> Futron's 2014 Space Competitiveness Index (SCI), Futron [http://www.futron.com/SCI\\_2014.xml](http://www.futron.com/SCI_2014.xml)



Source: Canadian Space Agency<sup>3</sup>

In terms of economic benefit the Canadian space program generated \$3.5 billion in revenues in 2013 according to the Canadian Space Agency. In 2014 the global space market was \$330 billion, up 9% from the previous year according to Space Foundation’s 2015 Space Report<sup>4</sup>.

Canada’s share of the market is only 1.2%, and is far from secure.

While the 9% increase in the market is good it could be much higher going forward. Why? There is a generational change occurring in the space market at the moment. Technology has made it possible for satellites to do more in small form factors and at much reduced costs. There are currently over 1,265 operating satellites<sup>5</sup> in space. In the coming decade there are plans to launch literally thousands of new SmallSats, those under 500kg. In 2014, 107 commercial nano/microsatellites (1-50kg) alone were launched<sup>6</sup>.

<sup>3</sup> Canadian Space Agency 2015-16 Report on Plans and Priorities <http://www.asc-csa.gc.ca/eng/publications/rpp-2015.asp>

<sup>4</sup> The Space Report 2015, Space Foundation <http://www.spacefoundation.org/programs/research-and-analysis/space-report/>

<sup>5</sup> UCS Satellite Database [http://www.ucsusa.org/nuclear\\_weapons\\_and\\_global\\_security/solutions/space-weapons/ucs-satellite-database.html#.VcSoA5NVhBc](http://www.ucsusa.org/nuclear_weapons_and_global_security/solutions/space-weapons/ucs-satellite-database.html#.VcSoA5NVhBc)

<sup>6</sup> 2015 Small Satellite Market Observations, SpaceWorks [http://www.spaceworksforecast.com/docs/SpaceWorks\\_Small\\_Satellite\\_Market\\_Observations\\_2015.pdf](http://www.spaceworksforecast.com/docs/SpaceWorks_Small_Satellite_Market_Observations_2015.pdf)



To summarize, overall, Canada is spending less on R&D and becoming less competitive. How can Canada remain competitive and see economic growth if, in this crucial sector, we are seeing a decline in spending? This is not a trend that we should let continue.

In our submission we are respectfully requesting;

1. An increase in funding to the Canadian Space Agency's Space Technology Development Program<sup>7</sup>
2. The creation of an X Prize style competition, with a specific initial mandate to fund the payload launch to orbit of the winners of three consecutive university led Canadian Satellite Design Challenges over a six year period.

## CSCA Budget Request

### Increasing Funding to the CSA Space Technology Development Program

In February 2012 the government commissioned the Aerospace Review<sup>8</sup>. The resulting report was released in November 2012 in two volumes. Canada's space program was addressed in Volume 2, Reaching Higher: Canada's Interests and Future in Space.

Volume 2 includes material collected and organized by the Space Working Group<sup>9</sup> (SWG). The executive summary contained this ominous quote<sup>10</sup>;

"Once a leading spacefaring nation, Canada is falling behind its competitors in almost every measurable aspect. We have not had a space policy that outlines overarching government priorities or that emphasizes the importance of industrial development since 1994 - meanwhile, our competitors are realigning their policies towards more economic and export-driven objectives."

The report included eight recommendations for Canada's space program including number 7 which states:

"Total funding for the Canadian Space Agency's technology development programs be raised by \$10 million per year for each of the next three years, and that it be maintained at that level."

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<sup>7</sup> Canadian Space Agency Space Technology Development Program <http://www.asc-csa.gc.ca/eng/programs/stdp/>

<sup>8</sup> The Aerospace Review <http://aerospacereview.ca/eic/site/060.nsf/eng/home>

<sup>9</sup> The Aerospace Review Working Group Reports [http://aerospacereview.ca/eic/site/060.nsf/eng/h\\_00066.html](http://aerospacereview.ca/eic/site/060.nsf/eng/h_00066.html)

<sup>10</sup> Aerospace Review Report Cites Insufficient Policy Clarity and Calls for Greater Commitment to the Space Sector <http://spaceref.ca/organizations/the-aerospace-review-report-released.html>



The CSCA recognizes that the government committed to implementing this recommendation, however the reality is an increase by \$10 million is insufficient. If Canada is to regain its competitiveness it must increase what it spends on the space program and in particular on R&D.

The following table illustrates the percentage of their national budget the leading spacefaring nations spend on their civil space program<sup>11</sup>. The table clearly indicates a lack of spending by Canada in comparison.

	Country	Civil Space Budget (US\$)	Year	% of National Budget
1	Russia	\$5,482,000,000	2013	1.34%
2	United States	\$19,537,000,000	2013	0.51%
3	India	\$1,144,000,000	2013	0.41%
4	Ukraine	\$151,000,000	2013	0.33%
5	Japan	\$2,565,000,000	2013	0.27%
6	Europe*	\$4,372,000,000	2012	n/a**
7	Iran	\$139,000,000	2013	0.21%
8	China	\$3,159,000,000	2013	0.14%
9	Canada***	\$369,000,000	2013/2014	0.14%
10	South Korea	\$304,000,000	2013	0.10%

\* European Space Agency

\*\* The European civil space spending as a percent of GDP was sixth among the countries analyzed.

\*\*\* Revised civil space budget based on Canadian Space Agency 2013-14 Departmental Performance Report<sup>12</sup>

By July of 2015 the government had announced<sup>13</sup> \$13.1 million of funding for Space Technology Development Program.

The CSCA is requesting that the government increase the CSA's Space Technology Development Program funding by an additional \$25 million per year for the next four years.

<sup>11</sup> Futron's 2014 Space Competitiveness Index (SCI), Futron [http://www.futron.com/SCI\\_2014.xml](http://www.futron.com/SCI_2014.xml)

<sup>12</sup> Canadian Space Agency 2013-14 Departmental Performance Report <http://www.asc-csa.gc.ca/eng/publications/pr-2014.asp>

<sup>13</sup> Supporting Canadian Research and Innovation in Space Technology <http://news.gc.ca/web/article-en.do?nid=981119>



Furthermore, the CSCA is recommending that the scope of what is funded be broadened. Currently only technology areas outlined by the CSA can be funded. And while the CSA took into account the suggestions of stakeholders in developing the list of areas that get funded, it is our contention that is too narrow. Innovations should not be limited. Stakeholders may come up with innovative ideas that do not fit into the programs funding scope. Why should we limit what might be developed? After all, to innovate it so make something new. How can we know ahead of time what the innovation might be?

## Create an X Prize Style Competition

What is an X Prize? *An XPRIZE is a highly leveraged, incentivized prize competition that pushes the limits of what's possible to change the world for the better*<sup>14</sup>. This is the definition put forward by the XPrize Foundation.

It is time to consider implementing a form of an X Prize competition. NASA has already done so in the form of the NASA Centennial Challenges<sup>15</sup> created in 2005. NASA states that the;

“Challenges were initiated in 2005 to directly engage the public in the process of advanced technology development. The program offers incentive prizes to generate revolutionary solutions to problems of interest to NASA and the nation. The program seeks innovations from diverse and non-traditional sources. Competitors are not supported by government funding and awards are only made to successful teams when the challenges are met.”

Canada already has an ongoing space competition. It is called the Canadian Satellite Design Challenge<sup>16</sup> (CSDC). The first CSDC began in 2011. According to the CSDC;

“It is a competition for teams of university students (both undergraduate and graduate) to design and build a "Cubesat" - a small, fully-operational satellite - which will conduct a science mission.”

“Unlike many university competitions which are focused on only one department, successful teams in the CSDC are comprised of students from many disciplines - not just from Engineering (Mechanical, Electrical, and Computer), but Science (Computer Science, and the department of any science instruments which are flown), and usually benefit by having students from Management, Commerce, or Education departments.”

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<sup>14</sup> What is an X Prize, XPRIZE Foundation <http://www.xprize.org/about/what-is-an-xprize>

<sup>15</sup> NASA Centennial Challenges, NASA  
[http://www.nasa.gov/directorates/spacetech/centennial\\_challenges/](http://www.nasa.gov/directorates/spacetech/centennial_challenges/)

<sup>16</sup> The Canadian Satellite Design Challenge <http://www.csdcms.ca>



The experience and expertise that participating CSDC students gain - in science, engineering, and management - gives them opportunities to enter graduate studies or industry (space industry or any related challenging high-tech domain), as several prior CSDC participants have done.

The CSDC has also given several universities the opportunity to represent Canada internationally, at conferences (IAC, Japan Nanosatellite), graduate studies (U. Colorado), at the International Space University Summer Session (three former CSDC participants have attended), and even at the European Space Agency (Concordia participated in the ESA "Fly Your Satellite" programme, one of six teams selected from 17 universities in ESA-member countries).

The CSDC has completed two competitions to date. In 2012 Concordia<sup>17</sup> University won the challenge. In 2014 the University of Victoria<sup>18</sup> won. Unfortunately for the first two winners, neither of their satellites, in this case small satellites called CubeSats, have flown to space. The reason is simple, funding.

The competition receives in-kind funding, university funding and some corporate sponsorship. What's lacking is funding to launch their CubeSat. And this is an integral part of working on a mission. After putting in an effort to win the competition, teams then don't have the opportunity to complete the experience. The experience of having your satellite launched, doing the science it was designed for, analyzing the data are all missing.

Currently the third challenge is underway.

The CSCA is proposing that as a first step in Canada developing an X Prize style competition that the government fund the winner of the current competition and the subsequent next two. The Canadian Space Agency working with the CSDC management team would make sure that the winner met all the criteria for the satellite to fly, a condition for winning the challenge.

To be clear, the CSCA is proposing that the government, through the CSA, fund only the launch of the winning project. The universities would continue to fund their entries through in-kind donations, corporate sponsorship and university funding.

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<sup>17</sup> Concordia University Wins First Canadian Satellite Design Challenge, SpaceRef Canada  
<http://spaceref.ca/education/satellite-design-challenge/concordia-university-wins-canadian-satellite-design-challenge.html>

<sup>18</sup> Canadian Satellite Design Challenge Announces University of Victoria as the Winner, SpaceRef Canada  
<http://spaceref.ca/education/canadian-satellite-design-challenge-announces-university-of-victoria-as-the-winner.html>



The CSCA recommends securing launch contracts with NanoRacks in the U.S. to fly the CubeSats through their commercial launch services. NanoRacks currently offers the lowest and most reliable launch services for CubeSats. The satellites are transported to orbit on a U.S. commercial launch provider, currently Orbital ATK or SpaceX, and are received at the international Space Station (ISS) where astronauts deploy them from the ISS. As a public relations bonus, one of Canada's astronauts set to fly within the timeframe of this competition, could deploy one of the CubeSats.

The cost to launch three CubeSats from the ISS using NanoRacks would be, at current prices, around \$221,000 (US\$). So the total cost in Canadian dollars, based on current exchange rates would be approximately \$925,000 distributed over three competitions in six years. For the benefit this program brings, this is a good investment.

### **About the CSCA**

The Canadian Space Commerce Association, founded in 2007, is a registered not-for-profit industry organization that advances the economic, legal and political environment for space companies.

The CSCA hosts bi-monthly member meetings, an annual conference and symposiums. We work with industry, all levels of government, academia, non-governmental organizations and of course support and represent our members.