

# 2019 Pre-Budget Consultation

Submission to the Standing Committee on Finance

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***Submitted By:***

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## List of Recommendations

- **Recommendation 1:** That the Government of Canada add “Launch vehicle technology and technology for launch sites” as admissible research categories for NSERC grants providing funding for aerospace or space research and development.
- **Recommendation 2:** That the Government of Canada invests in and incentivizes new business practices through partnerships with Canadian companies, not-for-profits and charities, such that the youth may be equipped with STEM skills relevant to the launch industry and the overall space industry.

## **Launch Vehicle Technology and the Case for a Holistic Canadian Space Program**

Canada has made impressive contributions to space exploration. Our contributions to the International Space Station have been invaluable and the CanadArm has become an icon of Canadian ingenuity and innovation. Much of the Canadian involvement in international space exploration can trace its origins to the 1967 Special Study No. 1 to the Canadian Science Secretariate, titled *Upper Atmosphere and Space Programs in Canada*, commonly known as the Chapman Report. Many of the recommendations in the report were followed, with the sole exception of one: the development of a launch capability for small spacecraft within Canada, and the broad technology base to enable it.

Canada has so far gone without a launch capability, and while the Canadian space community has managed to make great strides without one, it is placing our international competitiveness. Space assets are becoming ever more vital to the everyday lives of Canadians. They allow us to communicate, navigate, and keep track of our territory, our environment, and the impacts of climate change. Yet Canada remains the only G7 nation without the ability to launch them into orbit. Thus, the following is a presentation of reasons and evidence as to why the development of a domestic launch capability, and the pool of talent and technologies to enable it, will significantly contribute to Canada's domestic space industry and overall competitiveness.

The small satellite market is undergoing a period of exponential growth. The miniaturization of electronic components have led to small satellites becoming commercially viable and relatively easy to develop. The growth in the satellite market is so great that it is expected that the demand to launch small satellites alone will be worth over 62 billion USD (Frost & Sullivan). Such is the future demand for launch vehicles in future space applications that the market, traditionally dominated by players from the United States, Russia and China, has seen the appearance of new prospective entrants from countries like Spain, Australia, the United Kingdom, Singapore and New Zealand. It is of note that New Zealand, a small country with one-eighth of Canada's GDP and population, is the country of operation for RocketLab, the world's first small satellite launch vehicle startup to successfully put a satellite in orbit.

Current developments in launch vehicle capabilities have also proven to be beneficial to rural communities. For instance, Maritime Launch Services is developing their spaceport near the rural community of Canso, Nova Scotia. It is predicted that the spaceport development should bring between 130 jobs to the area by 2021, and 250 by 2028, helping to boost the local economy. Similarly, Reaction Dynamics is working with the community of Thetford Mines in Quebec. They plan to set up a rocket engine test facility using land which was previously used for mining asbestos. Moreover, the benefits of launch sites and launch vehicle development extends much more widely. Spaceports have always served as powerful high-tech hubs, attracting and growing related companies in much the same way that major airports do and have a demonstrated ability to create sustainable manufacturing jobs.

The lack of a Canadian launch capability is also contributing to a loss in HQPs. According to a report presented to the Space Advisory Board in 2017, there are currently over 300 students involved in rocket engineering in Canada who would likely remain in Canada if the HQP loss was reversed. This participation, in spite of Canada's relative lack of support for rocketry, reflects the very powerful ability of rocketry to capture the imagination of Canadian youth. It can be seen to be growing, especially at the Intercollegiate Rocket Engineering Competition, hosted in New Mexico, in which Canadian university teams are allowed to compete. Canadian teams have consistently won a disproportionate percentage of the top awards at the competition, yet they find little support in their home country and few opportunities to pursue the rocket innovation that they are demonstrably passionate about and talented at. Far too often, they are left with no option but to either give up their passion or leave the country. In the increasingly knowledge-driven and global economy, this is a loss of HQP and a reduction in Canadian global competitiveness.

Finally, the lack of launch capability and a Canadian space industry which is in an overall decline, contributes to a more negative impression of space among the Canadian public. Canada has traditionally been a leader in the space industry. The country was the third globally in space with the Alouette I and, as was previously mentioned, projects like the Canadarm remain iconic symbols of Canadian ingenuity. Investment in Canadian launch capability, and indeed any major investment in the Canadian space industry, would have aspirational effects on the Canadian populace. Indeed, the Canadian public is already starting to wonder as to the Canadian space program, or lack thereof. Recent articles from the CBC, such as "Why doesn't Canada have a rocket program?" by Nicole Mortillaro and "Failure to launch: Canada's lack of a rocket program leaves us grounded, say experts" from CBC radio both ask the questions about why Canada isn't stepping up in space and also cover the current loss of HQPs caused by this failure. It's clear that a renewed Canadian space industry could help boost national pride, while also stemming the loss of talented Canadians.

### **Explanation of the Recommendations:**

Thus, to address the deficiencies caused by Canada's lack of a launch capability and to garner the shown benefits of a launch capability the recommendations on page 2 of this briefing were drafted.

The first recommendation intends to open up launch vehicle technology development as a legitimate field for the government, in this case, through NSERC, to fund. For many new companies pursuing this sort of technology, funding in the form of direct private investment or debt financing can be difficult to come by, given that it is often years before the company will start shipping products. Thus, it is often the case that the government will provide the first leg up for these companies. For instance, Reaction Dynamics relies on various NSERC programs to help pay for labour and it would greatly increase the chances of success for Reaction Dynamics and other such Canadian companies if this area was specifically mandated for NSERC.

The second recommendation involves the government incentivizing the private sector to create new educational opportunities for students attempting to gain STEM skills in the space sector and, more specifically, the launch vehicle sector. This could be done, for instance, by building a cooperative federal program for students to develop or work with experimental sounding rockets. This would be relevant since, despite existing programs implemented through Canada's role as a cooperative state within the ESA's framework, there is a significant deficiency both in terms of participation and capacity building to external programs such as the REXUS/BEXUS program from the Swedish Space Corporation. As was mentioned previously, the prospects of new HQPs who are susceptible to leave the workforce for opportunities abroad should incentivize the government to act in preventing this loss of talent by providing them opportunities at home.

## **Description of the Organizations Submitting this Briefing**

**Maritime Launch Services:** Maritime Launch Services Ltd (MLS) in Halifax, Nova Scotia is well on its way to expanding the Canadian commercial space industry. With the rapidly growing global demand for space launch services, MLS will bring the long established and mature space launch technology of Ukraine to Nova Scotia. In cooperation with Yuzhnoye and Yuzhmash in Ukraine, MLS will commercially develop and operate a highly competitive launch services company.

**Reaction Dynamics:** Reaction Dynamics is a Montreal-based launch vehicle manufacturer that aims to provide orbital launch services for small satellite operators. Reaction Dynamics is leveraging a new type of hybrid rocket propulsion and advanced manufacturing techniques to provide these launch services at lower prices with significantly shorter lead times.

**AT Aerospace:** AT Aerospace (Adam Trumpour) performs consulting, contract and R&D work in the field of rocket propulsion and launch vehicle design for a range of private and government clients, and possesses deep expertise in the design, development and testing of liquid propellant rocket propulsion systems. AT also actively leverages this expertise to support the next generation of aerospace innovators through mentoring a number of Canadian student rocket teams and developing rocket competitions. AT assisted in the design of the Base 11 Space Challenge, a major \$1 million US-based student rocket competition, and is leading the development of Canada's first ever rocket innovation competition.