AeroSPACE Review 2012 Submission

Dear David Emerson and the Aerospace Review,

As a keen observer of the space industry, and from my perspective as an investment industry professional, I have been asked by friends and contacts within the space industry to contribute my thoughts to this review.

I am pleased to see a review process initiated to help this crucial industry. The space industry has been one of the keys to the prosperity of Canada, connecting the many parts of our diverse country, and enabling the growth of new and innovative industries such as telecommunications as well as improving the efficiency of our traditional industries, such as farming and mining, through information garnered by space assets. With renewed focus, I believe that importance will continue and grow.

As I understand it, three questions are of primary concern:
Where will your industry be 20 years from now?
What will you need to be competitive in the market?
What can the government do in the next 5 years to help you meet that goal?

These are my thoughts on those questions.

Where will your (the Space) industry be 20 years from now?

Canada's leadership in Space has, to date, been focused primarily on satellite technology, research and robotic operations. The satellite industry is a substantial and successful industry though it is often oddly not perceived as, or called, a space industry. It collaborates with, and is complemented by the activities of, the Canadian Space Agency (CSA) especially with regards to research and new technology development. The smaller (non-satellite) space industry, focused on research, science and robotics, has historically supported CSA and NASA activities (and that of other space agencies to a lesser degree).

I believe we are at, or near, a crossroads in the space sector. The satellite part of space will likely continue as it is, little changed, growing more slowly in an increasing competitive environment and/or starting to stagnate. Niche areas such as Arctic observation, remote sensing and communication satellites may grow for geopolitical reasons, as (or if) the North West Passage becomes navigable; oil exploration and development increases off the north coasts of Alaska and Canada; and/or undersea/under ice "exploration" occurs (as in the case of the 2007 seabed planting of the Russian flag at the North Pole by submarine). The smallsat sector, including cubesat, microsats and satellite swarms, is starting to grow and Canada has an opportunity to become a leader in this area. Universities such as University of Toronto are actively pursuing this opportunity. Competition is fierce as many U.S. and International universities and companies are also very active.

Other crossroads or forks in the road to the future are at least two-fold. First, with the end of the shuttle program, no vehicle is in immediate need of updated robotics or a new Canadarm. The question worth asking is **"What will be Canada's next Space niche?"** Our future role in space seems to be vague and undetermined. Policy is unclear, unfocused and poorly communicated. Adding mining, another industry in which Canada has a stellar reputation, to existing space research, science and robotics expertise could provide a strong niche. Interest in In Situ Resource Utilization (ISRU) and asteroid mining is growing. With the enormous cost to launch materials into space, ISRU is a crucial element for all lunar or martian base plans. Resource scarcity concerns have also led to the start-up of several (non-Canadian) companies focused on mining asteroids or the Moon to provide propellant materials for in-space activities (to aid in further exploration), and to bring minerals back to Earth for sale to terrestrial markets. Canadian mining companies may become very excited at the prospects of working together with the Canadian Space Agency (CSA) to explore these resource rich environments. The space industry could also learn a great deal from the strategies and financing of the mining ecosystem in Canada.

The second fork pertains to the newly emerging commercial space sector and "NewSpace" approach to space exploration and development. This approach differs from the traditional in two ways. Pricing of services and products are based on firm, fixed-price contracts rather than a traditional government contracting cost-plus basis. These firms are also acting on their own initiatives and for their own purposes rather than exclusively as government contractor. This approach is more evident in the United States than in Canada. If this "fork" is the way of the future, Canada and Canadian companies need to take action quickly to participate in this very different future.

What will you need to be competitive in the market?

The space industry, to be a leader in the future, will need to invest in innovative solutions ideally for problems that have applications both terrestrially and in space. The phrase "dual use technologies" usually applies to civilian and military use but can also mean terrestrial and space use. Sources of financing are crucial. With multiple use technologies, financing can be easier to find and obtain. This industry is poorly covered by financial analysts and the capital markets.

A clear policy in favour and support of space would also be highly desirable. A review of constraints such as ITAR and efforts to minimize business limiting government regulations, paperwork and processes would be very valuable for Canadian industry. Manufacturing large systems today involves components from all parts the world, including Canada and our companies need to be able to expedite and export as effectively as possible without restrictive constraints. Lobbying partner countries (the U.S.) on issues such as ITAR would be very helpful. Enabling legislation and incentives are needed for the industry to prosper and grow.

What can the government do in the next 5 years to help you meet that goal?

The government is most effective when it is focused on helping, enabling and enhancing its industries. The space industry would benefit from incentives, including some of the types listed below:

- **Grants**
- Subsidies
- Low interest loans
- Loan guarantees
- Carbon credits/offsets
- Other incentives
- Tax holidays
- Reduced tax rates
- **Investment Tax Credits**
- **Investment Grants**
- Treasury Grants
- New Business Grants and Loans
- Production Tax Credits
- Performance-Based Tax Credits
- **Transferrable tax credits**
- **Prizes**
- **Pre-Purchase Agreements**
- Preferential procurement policies
- Depletion allowances vs Depreciation and applicable rates
- Tariffs, Duties and applicable rates
- Guaranteed annual revenues, etc
- **Funding for selective infrastructure development**
- Payroll rebates
- **R&D Tax Credits**.

(**Bolded** are the types of incentives that I believe could be most valuable.)

The government's role as customer is also crucial. Becoming an anchor customer for satellite services can make a substantial impact as to the viability of a satellite or constellation, especially Arctic focused ones.

R&D funding would not only help in developing the smallsat, cubesat and microsat industry but also increase the interest on the part of students in STEM education. Hands-on projects give students practical, real-world experience. Some business training added to their programs could help increase the entrepreneurial focus of these students and lead to new small business creation.

To increase the focus on the emerging commercial space sector in Canada, there needs to be a shift in thinking. This new sector is interested in space stations, lunar and martian bases and colonies, and planetary and/or asteroid mining. The government needs to revisit and ensure there is an appropriate regulatory and legal regime in place. Property

rights and the ownership of space resources have been subject to much discussion, debate and differing interpretations since the Outer Space Treaty was entered into force by the United Nations in 1967. As the private sector becomes more involved in space, the focus on sovereignty that drove the geopolitical treaties of prior years' needs to give way to one focused on the private property rights that have worked so well for Western economies.

Funding is always a challenge for emerging industries. Incentives (as above) such as transferrable tax credits, grants, R&D tax credits, funding and loans are valuable to help kickstart an industry. Prizes have also proven to be successful. The United States has made excellent use of prizes funded both privately and by the government. Canada has been very slow to follow in these successful footsteps.

To have the Canadian Space Agency as a subsector of a government department diminishes its importance and ability to advance the industry. Space agencies in other countries are independent and autonomous operating agencies working with government departments. Space is an integral and crucial part of our economy and needs to be able to collaborate with ALL departments on the same footing at the highest level.

Thank you for your consideration of my thoughts on the industry. I look forward to reading the results of this review. If I can be of further help to clarify or expand on any of these thoughts or to discuss other ideas, please feel free to contact me.

All the best,

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P.S. Papers that I have written, which expand on some of the above ideas, can be found at http://evainterviews.wordpress.com/about/evas-conference-papers-and-presentations/.