



MISSION CONTROL
SPACE SERVICES INC.

Written Submission for the Pre-Budget
Consultations in Advance of the 2019 Budget:

By: Ewan Reid, President & CEO

Recommendation #1

That the government increase the A-base budget for the Canadian Space Agency to above the OECD average.

Recommendation #2

That the government support additional large-scale space exploration missions such as planetary rovers.

Recommendation #3

That the government take an active international role in developing policy to facilitate sustainable exploration.

OPINION

Shoot for the moon: Why Canada must become a leader in space

Canada has all the ingredients to be a force on this new frontier, but to do so requires the political will to make the long-term commitments required. The risks are great, but the rewards will be enormous



An artist's impression of a proposed Canadian integrated service and test facility, which would be built on a U.S. space station. It would be used to service, test and repair space vehicles, satellites and other structures.

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SPECIAL TO THE GLOBE AND MAIL

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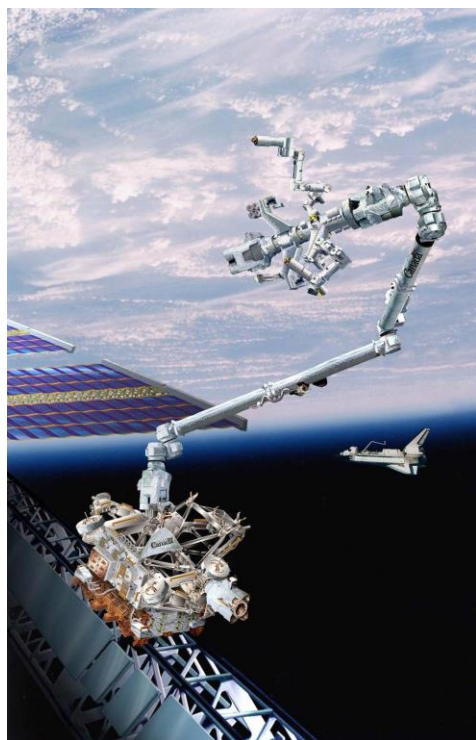
Ewan Reid is the president and CEO of Mission Control Space Services Inc.

A few years ago, I was trapped in the Space Shuttle Endeavour.

It was 2010, and I was an operations engineer for a private Canadian space company contracted by NASA. One of my duties was to test a laser camera system installed on the Canadarm, which was in turn mounted in the shuttle's payload bay.

One day, as we were testing the system, an announcement came over the loudspeaker: A lightning storm was approaching the launchpad. This meant we couldn't complete the test. It also meant we couldn't leave the shuttle for the duration of the storm, which lasted more than 12 hours.

It was impossible to get comfortable or sleep on the floor with all the bright lights and whirring machines. But despite the confinement, I was thrilled to be there, stuck in one of the world's most impressive feats of engineering.



In 2010, Ewan Reid found himself temporarily trapped in the Space Shuttle Endeavour while testing a laser camera system installed on the Canadarm (artistic rendering)

Only eight years have passed, but 2018 represents an entirely different era for the space industry. Soon, space will not only affect people's lives through the technology they use; it will become an active domain – a medium for travel and even a new place to live. Space will no longer be just an area of transit for travel to the moon or Mars, but for efficient intercontinental travel here on Earth. In a generation or two, sleeping in a spacecraft will be as commonplace for kids of the day as it is for our children to doze off on an airplane.

Through inaction, countries that aren't taking steps to be ahead of the game are actually falling behind. Canadians have a colossal problem just above their heads – and they don't even know it.

What was once solely the domain of governments, militaries and big business is evolving. Low-cost access to space, fuelled by technological advancements such as energy storage, computing power and materials science, along with a plenitude of innovative business models, means companies are beginning to exploit space in new and unique ways. The vast majority of these so-called NewSpace companies are "downstream," processing Earth observation data collected in space and selling the information to a variety of customers – governments, banks, farmers – almost like the first fur traders exploiting a nearly untapped market. The next big advancements will be space tourism, intercontinental travel, mining and more.

With the recent success of SpaceX's Falcon Heavy rocket, further validation has been bestowed on chief executive Elon Musk's stated objective of making humans an interplanetary species by transporting us to Mars. Eventually, we must expand our presence in space from the current six people orbiting Earth 400 kilometres up in the International Space Station to the eventual realities of lunar outposts and Martian colonies.

This may seem like science fiction, but humans have only scratched the surface of space. Actually, we, and all life on this planet, are already in space – we just rarely crawl out of our communal cradle and stand up to look around. Mr. Musk's recent success is proof that we're heading toward Mars and beyond. Profound impacts could include our working better together here on Earth. One day we may not think of ourselves as Canadians or Chinese but Earthlings. This will also affect how our economies work. A huge opportunity exists for countries with limited natural resources or land to carve out a new niche for themselves in space.

Canada doesn't necessarily need to be the country that launches the most spacecraft into orbit, nor the one that puts the most people in the first lunar station or orbiting hotel. During the Klondike Gold Rush, the majority of the people who made money weren't prospectors but rather brothel owners, sellers of dried goods and blacksmiths shoeing horses. Canada has been a leader in niche space technologies such as robotics, remote sensing and communications, and is becoming a leader in relevant emerging technologies such as artificial intelligence and quantum computing. We, as Canadians, have all the ingredients to be a force on the new frontier of space, but to do so requires the political will to make the long-term commitments this requires.



The SpaceX Falcon Heavy rocket lifts off from launch pad 39A at Kennedy Space Center on Feb. 6, 2018 in Cape Canaveral, Fla.

JOE RAEDLE/GETTY IMAGES

The upside of making space a priority – a true national strategic asset – is that space can help address an array of political issues. It enables Arctic sovereignty; is the main

technology domain to help us understand climate science; can inspire the next generation to pursue studies in STEM fields; provides data to drive an efficient and productive agricultural sector; facilitates communications across physically disparate communities; improves health care; protects our fisheries by monitoring and detecting dark ships; and can be leveraged to support international development, not to mention our economy and aspects of day-to-day life such as the internet and GPS.

Supporting the space industry now will create jobs in the near and long terms. It will support the sectors mentioned above and, most importantly, will allow Canada to re-establish its position as a world leader.

The current federal government has inherited a problem from its predecessor: About 15 years of flat or declining space budgets of about one-seventh of what NASA gets, taking population into account. Since then the government has thrown very limited money at a handful of specific projects – the equivalent of addressing universal poverty by opening shelters in one city.

Supporting students to attend conferences abroad and creating satellite design competitions are examples of the great work the Canadian Space Agency (CSA) has accomplished on a limited budget.

But for these and other programs to create truly impactful change, there needs to be long-term political will and the consistent and predictable budgetary support that goes with it.

With long time frames for returns on investment and high levels of technological risk, the private sector is disinclined to undertake the big research-and-development projects required to make space missions possible. The government has a role to play in supporting these R&D initiatives – such as the way the United States Department of Defence funded the development of the internet. By doing so, they will allow the private sector to commercialize the developments that are successful and turn the government's investment into GDP growth. This will also allow for the creation of a pipeline of programs, both small and large, that advance Canada's objectives and encourage companies to maintain R&D facilities here in Canada, in turn providing an incentive to complete other R&D locally.

I often hear people say Canada punches above its weight in space. This is bogus. Even if we do, the analogy itself demonstrates how unsustainable the situation is: A middleweight can punch above their weight for a round or two – but is doomed to lose a 12-round bout to a heavyweight opponent. And this is a fight Canadians don't want to lose.

There is also a common misconception that because we are leaders in space (having been the third country to launch a satellite), we can continue with the status quo and not fall behind. While Dextre and the Canadarm II are proudly depicted on the \$5 bill and represent impressive achievements of engineering, we shouldn't forget that they were conceived and implemented decades ago. Importantly, partly as a result of the long lack of a comprehensive space strategy, the company that developed this technology is now American – Maxar Technologies Ltd. And while the company's teams in Brampton, Ont., Richmond, B.C., and Sainte-Anne-de-Bellevue, Que., will continue to do remarkable work, their leadership clearly saw more long-term potential in the United States than in Canada – and who can blame them?

Canada's critical contribution to the James Webb Space Telescope, the project that will succeed Hubble, was the fine guidance sensor developed by Com Dev, a company that has since been purchased by Honeywell and is now also American.

Where does this leave the rest of the industry – the experts who supported the development of the Canadarm, our astronaut program and satellite radar technology? Canada has all the industrial capabilities to lead big, bold space missions. We can design a rover for prospecting on the moon. And with only a tiny bit of political will, Canada could become the first country to demonstrate resource extraction on the moon – and in so doing, position Canadian industry at the leading edge of space divining.

Luxembourg, a country rarely associated with industries such as mining, robotics or telecommunications, recently announced far-reaching policies for funding and regulation of off-world mining. It is an investment in the future that its government clearly believes will pay vast dividends.

Asteroid and lunar mining is real. It hasn't started yet, but several companies are working on it, backed by entrepreneurs such as Larry Page and Eric Allen. It may sound farfetched to some of us here on Earth, but we should remember that all the water on our planet – all of it – came from asteroids.

We have a fantastic astronaut core, and the CSA does a great job leveraging them to inspire young people. We need to expand this effort and give all youth a chance to be challenged and a goal worth striving for.

Some people are even calling for Canada to have our own launch capability. At the very least, our government must establish the necessary regulatory environment to allow the private sector to develop long-term plans and cut the risks of early-phase R&D, support knowledge transfer to the next generation, inspire young Canadians to pursue careers in STEM, increase support for Canadian universities and their students to conduct research in space and support Canadian companies to hire new graduates to keep talent in Canada. Companies will make money if they are positioned to support this burgeoning space economy, but only with government leadership now.

Space is the ocean, not the fishery, and needs support as the most important piece of infrastructure of the 21st century. It should be seen as a domain that actually facilitates numerous industries and one whose full potential hasn't come close to being understood, let alone realized. Revolutionary developments within the airspace above us are inevitable. Whether they will be Canadian remains to be seen.

I reflect on those 12 hours in 2010, stuck in the payload bay, sitting there, looking up at the huge Canadarm, close enough to touch it, with a sense of pride and excitement. Both at what I was doing, for the camera system we'd created, for the robotic arm my country was known for and even for the fact that humans were travelling to space at all. I hope the next generation of engineers and scientists from across Canada can have a similar experience, their own moment, and not just be along for the ride – like a mannequin in a Tesla.