



CONSULTATIONS ON CANADA'S FUTURE IN SPACE: WHAT WE HEARD

Space Advisory Board, August 2017

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EXECUTIVE SUMMARY

The Space Advisory Board was tasked by the Minister of Innovation, Science and Economic Development (ISED) to consult with stakeholders on a new space strategy and to report its findings. The Space Advisory Board held seven roundtable discussions across the country and two webinars focused on youth and the North, involving a broad cross-section of stakeholders in the Canadian Space Program. Members of the Board were impressed with the level of engagement and knowledge shown by all participants, especially their deep conviction in the value of space activities to Canada.

From all that the Space Advisory Board heard from these roundtables, we make two central recommendations for consideration by the Minister as he proceeds to develop a new space strategy:

- **Designate Space as a National Strategic Asset to ensure that:**
 - the country (governments, industry, academia, and civil society) focuses on the importance of space to Canada's economic and social growth;
 - a whole-of-government approach is taken in the development and management of the national space program;
 - the regulatory and procurement regimes support commercialization and export of space technologies;
 - Canada has the capacity to develop and use space to meet national needs; and
 - Canada has the specialized human resources required by government, industry and academia to conduct space activities.

- **Ask the Space Advisory Board to:**
 - engage stakeholders on plans for implementing the Space Strategy;
 - provide independent advice on the implementation of the Space Strategy; and
 - develop metrics for evaluation of the implementation of the Space Strategy.

Participants noted that in the past Canada has had a very successful space program that met national needs and created an internationally competitive space industry and science capability. However, almost all stressed that Canada has lost ground in a world environment driven by rapidly changing technology and substantial increases in space investments by other nations. Participants supported the need for a space strategy, but stressed the urgent need for a reinvigorated and fully funded set of space activities and supporting policies to successfully implement the space strategy. Many felt that action is needed now before too much capacity is lost.

During the consultations, stakeholders raised many significant issues facing Canadian space activities that require urgent Government action if space is to continue to contribute to the economic and social growth of the nation. These issues can be captured in six key themes:



Designate space as a National Strategic Asset



Adopt new policies and regulations to capitalize on technological advances



Outreach and educational activities to inspire and prepare Canadians



Strengthen world-class Canadian capabilities



Continuity of policies and sustainable funding



An urgent call to action

BACKGROUND

The Minister of Innovation, Science and Economic Development (ISED) tasked the Space Advisory Board to “conduct outreach and consultations with stakeholders on a vision that:

- Encourages a growing and sustainable space sector in the long term;
- Inspires Canadians and attracts talent;
- Contributes to scientific advancement and the development of emerging technologies; and
- Supports companies to scale-up as well as clean growth”.

The Minister asked the Space Advisory Board to report on its findings in order to “inform the new space strategy which will use space to drive broader economic growth and innovation while inspiring the next generation of space scientists”.

From April to May 2017, the Space Advisory Board held a series of roundtable discussions across Canada to mobilize and gather bold ideas from stakeholders, as well as to discuss key questions on Canada’s space program.

Roundtable discussions were held in Halifax, Montreal, Ottawa, Toronto (two), Calgary, and Vancouver. In addition, two webinar sessions were held – one session focusing on the North and the other on youth. Participants at the nominal three-hour roundtables represented a broad section of stakeholders in the Canadian Space Program including representatives from industry (both suppliers and users of space technology), academia, industrial and scientific associations, investment houses, provincial governments, museums, amateur groups and educational groups. Summary notes of each roundtable can be found at: https://www.ic.gc.ca/eic/site/ad-ad.nsf/eng/h_ad03983.html .

Many participants also submitted written statements for the Space Advisory Board’s consideration.

WHAT WE HEARD

The roundtables elicited many good suggestions for a bold, aggressive, and inspirational space strategy. These are captured in the following six themes.



1. Designate Space as a National Strategic Asset

Recognize space as a strategic sector essential for our sovereignty, security, and economic growth that is worth sustaining and growing

Participants noted that in the past, Canada's space capacity was generally considered by governments as a strategic national asset capable of providing unique solutions to many of the country's critical national needs. Canadian space technology contributes to unification of the country (communications satellites), is the primary supplier of coastal and remote area information essential for national security and sovereignty (RADARSAT), inspires Canadians as no other capability can (Canadarm, astronauts and space astronomy), and enables Canadian scientists to participate in the world-wide effort to understand the causes and effects of major challenges facing humanity, such as climate change (SciSat, international missions).

Participants felt, however, that despite the ever increasing importance of space due to the rapid pace of technology development and the embedding of space technology and applications in the daily lives of Canadians, successive governments have lost the vision of space as a national strategic asset.

Participants felt there was a need to elevate the space program to the national level once again and for the government to take a whole-of-government approach to designing and implementing a national space program. Participants strongly felt that designating space as a national strategic asset would be one of the most important first steps in re-invigorating the country's space efforts and would be essential to bringing the benefits of space to government operations and everyday life of Canadians.

Designating space as a national strategic asset would require all departments and agencies of the government to focus and synchronize policies and programs to support the development and growth of a national space capacity capable of meeting national needs and competing in the global market. The country has designated other areas (e.g. defence, ship building) as strategic national assets with remarkable success in ensuring a domestic capacity to meet the critical needs of the nation.

Space is strategic since it is the preferred (and often the only) technology capable of addressing many aspects of critical national needs (e.g. security and sovereignty, resource management, climate change, communications to rural and remote areas, pollution control). Indeed, the government's 2014 Space Policy Framework indicates that "Canada's first priority must be to use space effectively in support of these interests." The importance of space assets to Canada has been recognized by being designated part of Canada's critical infrastructure. However, participants expressed concern that many opportunities to use

space to meet national needs are not being identified or pursued with continuity and consistency.

The generation and analysis of data from space-related assets will be vital for the delivery of economic and social benefits in the future. This data covers a wide range of human activities (e.g. agriculture, forestry, mining, pollution monitoring, environmental assessment, sovereignty, national security, urbanization, etc.). Participants are concerned that not enough priority is being given to ensuring the organized collection, analysis, archiving, and distribution of this data (i.e. the downstream side of space activity).

By its very nature, space is international and provides the opportunity for Canada to participate in major international activities that advance critical science and innovative technologies (such as the International Space Station and future space exploration initiatives). These major international activities allow Canada to leverage the investments of other nations and place Canada's agenda and priorities on the world stage, while generating pride and inspiration in Canadians of all ages. But concern was expressed about Canada's readiness and ability to respond quickly when invited to participate in future major international space programs (such as human space flight missions to the Moon or Mars and laboratory class science missions). It was felt that insufficient funding was available for the preliminary studies and project definition activities necessary to allow Canada to negotiate an important role in these potential future international missions.

The allure of space is unique in its ability to attract youth to pursue studies and careers in high technology. The CSA used to have an extensive outreach and educational program in partnership with industry and academia that was aimed at involving Canadians of all ages in the excitement of space. All participants expressed a desire for the re-establishment of a strong outreach and educational program in collaboration with other organizations.

Key Proposal

Adopt a whole-of-government approach that makes the space strategy applicable to all government departments and agencies.



2. Strengthen World-Class Canadian Capabilities

Adopt policies, use procurement and seek international cooperation to support the growth of an internationally competitive space industry and scientific capacity

Over the decades, the Canadian government has been instrumental in developing world-class excellence in space technology, using space to meet national needs, and encouraging an internationally competitive space industry. However, statistics clearly show a steady and

significant decline in the buying power of the Canadian space program and a resulting decline in the capacity of Canada to undertake space technology development, scientific exploration, and user development activities. It was noted that corporate investments are now going off-shore to countries that have been ramping up for some time their support for space. A significant export of Canadian talent is occurring as highly qualified people seek challenging employment elsewhere because of lack of opportunity in Canada. Our international partners are expressing concern about Canada as a reliable partner in space. To sustain a world-class sovereign space capability, many roundtable participants expressed the view that a revitalized vision for Canada's space program and a new space plan with funded programs to implement this vision are urgently needed.

The government has a wide range of procurement policies and practices that could be leveraged to better promote the development of internationally competitive space companies and world-class science. Participants described several instances where these procurement tools are not always utilized in a transparent, consistent, efficient and comprehensive fashion thereby limiting their success.

Participants noted that there is no space industry strategy (similar to the national shipbuilding strategy) to guide procurement decisions. Many other space faring countries have space industry strategies and procurement policies that favour domestic industry in numerous ways. It was strongly felt that Canada needed to level the playing field by aggressively utilizing the appropriate procurement tools already at its disposal.

Participants noted that important elements of a space industry strategy would include: an aggressive program to develop and demonstrate new technologies required to meet national needs, pursue international cooperation, capture export opportunities; procurement of space services from Canadian industry (instead of buying and operating systems); setting aside 10% of the CSA budget for scientific research activities in Canadian universities; providing flight opportunities to test scientific instruments; and conducting preliminary studies and related R&D into new applications of space technology to meet national needs.

Specific mention was made of the need for better application of Canadian content rules in government procurement. Examples were given of situations in which Canadian content requirements were ill-defined or improperly applied.

Further, the approvals process for undertaking space activities is often opaque and cumbersome. As a result, some opportunities (particularly for international cooperation) are lost because decisions cannot be made in a timely manner.

Participants were concerned that the government's intellectual property policy often inhibited private sector investment in the commercialization of space technology. It was felt that the government should follow the example set by most space-faring nations that use intellectual property policy as a tool in support of industry development.

Participants were pleased with the government's 2014 Space Policy Framework, particularly as it pertains to positioning the private sector at the forefront of space activities in Canada

and its commitment to support scientific excellence and technological leadership. Participants are concerned that the government's procurement practices were not always in support of the framework. For example, the inability of the procurement process to recognize excellence in proposals due to the policy of buying systems and services from the lowest cost compliant bidder regardless of the quality of the product or its heritage.

Key Proposals

Utilize all applicable procurement and policy tools as essential elements of a space industry development strategy.

Foster international cooperation and partnerships that support the development and growth of our domestic capacity, enhances Canadian science capacity and furthers the country's international foreign policy objectives.



3. Adopt New Policies and Regulations to Capitalize on Technological Advancements

Adopt policies, and review existing regulations to make them responsive to the realities of the New Space environment

Many participants noted that rapid advances in technology have dramatically transformed the way in which countries engage in space activities. These advances have created the so-called New Space environment with significant opportunities for growth in the development and use of space. New Space is primarily a user focused activity with the ability and flexibility to react quickly to market forces. Many New Space activities are funded mostly from the private sector. Participants are concerned that the policies and activities of the Government of Canada do not take into account these new realities and this is significantly holding back commercial development of space.

The rapid development of space technology has radically changed the way space programs are conducted. Participants strongly noted that Canada needs to adapt its space policies and practices to reflect the realities of today's space environment and to keep up with what other countries are doing. Participants specifically recommended the following:

- Adopt the key recommendations of the 2017 report by McGill University's Institute of Air and Space Law regarding the Remote Sensing Space Systems Act to make it more responsive to global realities affecting the development and exploitation of space technology both in space and terrestrially.
- Update the regulatory regime for space activities to make it more "user friendly", more responsive to emerging technologies and the needs of New Space, more transparent, more flexible, speedier and more aligned with Canada's strategic interests.

- Adjust the financial regime affecting investment in space to make it competitive with other countries to encourage investment in Canada from both domestic and foreign investors.
- Remove impediments to private sector investment in innovation such as the stacking limitations for government support programs, employment assistance programs, tax credits, angel investment incentives, etc.
- Buy services from industry (e.g. communications services, data services, big data analytics, etc.) rather than procuring and operating its own space systems. With the government as anchor tenant (rather than owner/operator), the private sector is better positioned to raise financing in the commercial market, diminishing the need for capital investment by the government.
- Put more emphasis on development of the “downstream” space industry (e.g. big data analytics, data fusion, data visualization, etc.) to ensure growth in the utilization of space technology to meet user needs.
- Encourage cross-sector collaboration by educating and expanding access to non-space sector industries to include them in the space sector.

Key Proposals

Recognize the New Space environment as critical to future growth and adopt policies (regulatory, procurement, legal, financial) that support and encourage New Space entrepreneurship.

Procure space services (as opposed to owning and operating space systems) whenever possible in order to promote private sector investment.



4. Continuity of Policies and Sustainable Funding

Pursue a balanced space program in program sizes, phasing and category

It was noted that space activity is inherently long-term. It takes years to develop and produce new technology and applications in a risky physical environment. This requires continuity of effort over a long period. Participants noted that government support over the past decades had become more and more fragmented with insufficient resources to meet these long term needs. Participants felt that government programming for space must accommodate the long-term nature of space development.

Space is a risky undertaking where success usually means doing things that have never been done before. In this environment, participants noted that successful space strategies here and abroad have included continuity of vision, balance in program categories, balance in program sizes and balance in program phasing.

Continuity of vision was deemed by participants as essential to marshal private sector funding, encourage the development of highly qualified personnel, and garner international partnerships – all of which are essential to a successful space strategy. Industry, academia and the financial community require a stable, long-term environment in which to plan their investments. It was noted that Canada has not had such an environment since the expiry of the last major space strategy (and plan) more than fifteen years ago.

Balance in program categories (e.g. space science, earth observation, satellite communications, space exploration, user development, R&D) is considered by all participants to be vital to a successful space program. The last long-term space plan (1994) ensured that activities occurred in all of these categories in order to maximize the opportunities for space technology to contribute to Canadian society. Participants lamented the current heavy focus on selected programs in earth observation (RADARSAT Constellation Mission) and exploration (International Space Station) and the lack of support for other space activities.

Balance in program sizes (i.e. major flagship programs, medium scale programs of flight demonstrations and science, and smaller technology development and scientific instrumentation programs) was also deemed essential to a successful space strategy. The flagship programs (e.g. Canadarm, RADARSAT) use space to meet national needs, provide the opportunity for major international cooperation, provide long-term continuous employment, encourage private sector investment, and generate significant national pride and inspiration. The smaller and shorter in duration programs are more suited to technology development, flight demonstration, and scientific instrumentation and can occur on a time-scale consistent with normal university research activities. These smaller activities are more in tune with the needs of the New Space environment and also provide opportunity to develop flight heritage which is a necessary step to involvement in larger programs.

Balance in program phasing (i.e. ensuring that there is always activity underway at all times in the various phases of a space project – preliminary studies, R&D, program planning, engineering development, manufacture, and operations) was also mentioned as an important part of a balanced space program. This type of balance is considered vital to program continuity, sustainable employment, and private sector investment.

In building the priorities of a balanced program, clear specification of selection criteria and a transparent decision-making process with the inputs of the implicated communities are critical to ensuring relevance and engagement.

Key Proposal

Pursue a balanced space program that includes all areas where Canada has world-class expertise, contains activities in all phases (studies, program definition, design, build and operate), and has an appropriate mix of flagship major programs and smaller, shorter duration missions.



5. Outreach and Education Programs to Inspire and Prepare Canadians

Undertake extensive outreach and public education to engage Canadians of all ages in the space program

Space activity has the unique ability to attract national attention, develop national pride and inspire youth to pursue careers in high technology. It was noted, however, that severe cut-backs for space science and educational programs have reduced the country's capacity to capitalize on the allure of space. Participants felt strongly that a revitalized vision for space must provide meaningful opportunities for Canadians of all ages and in all regions to understand the benefits of space and to participate in space activities.

Most participants were familiar with the outreach and educational programs that the CSA once conducted. These programs were very successful in showcasing Canada's achievements in space, demonstrating the benefits to Canadians from the space program, and involving Canadians of all ages in the program. The cancellation of most of these activities was lamented since it was felt that these programs generate national pride in Canadian accomplishments, inspire Canadians, and attract youth to careers in science and technology.

It was recognized that outreach and education are essential elements of making space a "nation-building" undertaking. Participants felt strongly that such activities must be part of a visionary and successful space program. Many felt that a comprehensive outreach and educational program should encompass: K-12 education for younger students; challenges and opportunities for high school students and undergraduates; internships, summer scholarships, co-op and similar opportunities; support for graduate students; engagement of the general public; and outreach to under-represented groups.

The importance of ensuring education that would support a skilled workforce to satisfy the needs of new sectors such as big data and data analysis was also raised.

Key proposal

Establish a comprehensive outreach and educational program to involve Canadians of all ages in the Canadian space program and to encourage youth to pursue careers in science and technology.



6. An Urgent Call to Action

Reverse the decline in Canada's space capability before it's too late

All stakeholder groups noted that there is an urgency to put forward a new space strategy and a follow-on space plan. Participants highlighted the need to provide long-term continuity for Canada's Space Program. They stressed the urgency in establishing the policies, programs and funding necessary to revitalise the program. Several participants suggested that this current effort is the "last chance" to achieve this goal.

Participants also recognized that Canada will not reach its potential for economic growth and employment in the space sector unless the defence space program is also considered as part of the new space strategy. Pleas were made for a "whole of government" strategy that would include all government departments requiring them to work together in pursuit of the strategy's objectives and goals.

It was argued that a whole of government approach would ensure Treasury Board rules and regulations would be supportive of the strategy. It would ensure that the gap between the production of space science instrumentation (CSA) and support for the conduct of the science (Natural Sciences and Engineering Research Council) would be minimized resulting in more science per dollar. It would ensure that there was sufficient flexibility in the program approval process to allow the conduct of a space science program capable of responding quickly to time-sensitive international opportunities.

One of the characteristics of the New Space era is the need to make decisions rapidly. Investors and customers demand this and concern was expressed that the normal government decision processes often takes too much time and opportunities are lost.

Key Proposal

Develop, in time for the next federal budget, a new space strategy and follow-on space plan that provides the policies, programs and funding essential for the revitalization of Canada's space capacity.

SPACE ADVISORY BOARD RECOMMENDATIONS

RECOMMENDATION 1: DESIGNATE SPACE AS A NATIONAL STRATEGIC ASSET

From all that the Space Advisory Board has heard during the roundtable discussions, it is clear that re-establishing space as a national strategic asset is essential to creating a clear vision for space that will focus the country (governments, industry, academia, and civil society) on the importance of space to Canada's economic and social growth. By making space a national strategic asset the Government will be mandating a whole of government approach and signaling its intention to ensure that Canada will continue to have the capacity to develop and use space to meet national needs. As a result, efforts will be focused on ensuring the development of the necessary highly qualified personnel, new technologies and applications, and growth of the country's space industry.

Making space a national strategic asset would encourage the pursuit of the following objectives and actions (in no particular order) that the Space Advisory Board believes would resonate with most of the participants in the roundtable discussions:

➤ **Ensure that Canada has the capacity to develop and use space technologies and applications essential to meet national needs (such as sovereignty, security, environmental and economic prosperity and wellness and quality of life in remote Canadian communities) by:**

- Adopting a whole-of-government approach to space activities that would require all government departments to work together in pursuit of the strategy.
 - Implementing a balanced space program with activities in all areas of importance to Canada (e.g. earth observation, communications, science, exploration).
 - Conducting preliminary studies and related R&D into new applications of space technology to meet national needs.
-

➤ **Ensure that Canada has the specialized human resources required by industry and government for the national space program by:**

- Setting aside at least 10% of the CSA's budget for scientific and research activities in Canadian universities.
- Pursuing international cooperative space science activities to ensure world-class science and research in Canadian educational institutions.
- Providing flight heritage opportunities for scientific instrumentation, space technologies and education.

- Establishing a comprehensive outreach and educational program to involve Canadians of all ages in the Canadian space program and encourage youth to pursue impactful careers in science, technology, engineering and mathematics.

➤ **Grow the Canadian space industry by:**

- Managing a space program that includes an appropriate mix of large long-duration flagship programs aimed at meeting national needs, medium scale exploratory and demonstration programs to advance technology and science, and small scale programs suitable for developing new space industries and capabilities in academia.
- Undertaking an aggressive technology development program to develop and demonstrate new technologies required to meet national needs, pursue international cooperation, or capture export opportunities.
- Revising on a regular basis the regulatory regime affecting space activities (e.g. the Remote Sensing Space Systems Act, export control, spectrum rights, etc.) to support commercialization and export of space technologies and services.
- Expanding international cooperation and partnerships that enhance access to new technology, foreign investment and international cooperation relationships.
- Procuring, to the extent possible space services from Canadian industry (instead of buying and operating space systems) to meet government needs.
- Using procurement policies and procedures that support industry development, encourage entrepreneurship, and reward excellence.
- Revising industry support policies to remove impediments to private sector investment in innovation (e.g. intellectual property policies, stacking policies, etc.).

**RECOMMENDATION 2: FUTURE ROLE OF THE SPACE
ADVISORY BOARD**

The members of the Space Advisory Board were impressed with the level of engagement and knowledge expressed by all participants in the consultation process. Almost without exception, participants were convinced of the value of space activities to Canada and overwhelmingly in favour of continuing and expanding such activities. Participants could point to specific advantages flowing from these activities that went far beyond the space sector and penetrated into many areas of Canada's economic and social fabric. There was recognition of challenges and areas where we could improve significantly and participants talked passionately about their visions for the future of the Canadian space sector. The task

of harnessing these ideas into a few strategic directions has been difficult due to the large number of creative suggestions provided.

The consultation process that the Minister asked the Space Advisory Board to undertake has generated enormous interest in the future of Canada's space program among its many stakeholders. Many participants made specific suggestions for programs and projects which go beyond the requirements of a space strategy and these should be examined in more detail as the government moves from defining the strategy to its implementation.

All participants recognize and support the need for a renewed space strategy aimed at providing the vision for a revitalized space program capable of contributing significantly to the Government's Innovation and Skills Plan. All were pleased to see the renewal of the Space Advisory Board and saw the Board as a good mechanism for ensuring their views were heard by the Government. All were expecting the Space Advisory Board to be involved somehow in the implementation of the Space Strategy.

The Space Advisory Board is interested in building upon the contacts established during the roundtables and offers the following recommendations for its future role:

➤ **It is recommended that the Board be asked to provide independent advice on the implementation of the Space Strategy by:**

- Continuing discussions with ISED and the CSA on implementation plans
- Continuing a dialogue with the community of stakeholders to follow-up and expand on the creative ideas made by participants to ensure they are considered during the implementation of the strategy
- Discussing, as appropriate, the space activities of other government departments
- Developing metrics for evaluation of the implementation plans
- Evaluating implementation plans against agreed metrics
- Advising the Minister on our findings

ANNEX I

Biographies of the Space Advisory Board Members

Space Advisory Board Chair



Marie Lucy Stojak,
*Director of the School on Management of Creativity and
Innovation at HEC Montréal*

Dr. Marie Lucy Stojak is the Director of the School on Management of Creativity and Innovation at HEC Montréal, Canada's oldest business school. She is a space law expert and has over 25 years of international experience in the aerospace sector, including interests in space commercialization, space and security, and Earth observation data policy issues.

Space Advisory Board Members



James Drummond,
Professor, Dalhousie University

Dr. James Drummond holds the Canada Research Chair on Remote Sounding of Atmospheres at Dalhousie University. He has been involved in many space and space-related experiments, both in the U.K. and in Canada, for over 40 years. He is the Principal Investigator of the MOPITT space instrument measuring pollution in the Earth's atmosphere and a Co-Investigator on Canada's SciSat spacecraft.



William MacDonald Evans,
President, W. MacDonald Evans Consulting Inc.

William MacDonald Evans is President of W. MacDonald Evans Consulting Inc. and a member of the Board of Directors of a public start-up remote sensing company in Vancouver. His space career has spanned more than 45 years in several Canadian government departments and in industry, working in all areas of the Canadian space program (R&D, program management, policy development, stakeholder consultations and international relations). He was President of the Canadian Space Agency for seven years (1994 to 2002).



Stéphane Germain,
President and CEO, GHGSat Inc.

Stéphane Germain is President and CEO of GHGSat Inc. He has over 25 years of experience in aerospace engineering, project management and business development. He has held executive management positions over a period of 15 years in both small and large Canadian aerospace companies.



Douglas Hamilton,
*Clinical Associate Professor of Internal Medicine and Adjunct Professor of Electrical
Engineering, University of Calgary*

Dr. Douglas Hamilton is Clinical Associate Professor of Internal Medicine and Adjunct Professor of Electrical Engineering at the University of Calgary. Dr. Hamilton, a former flight surgeon and engineer who worked at NASA Johnson Space Center in Houston, Texas, has supported 49 space shuttle missions and 29 ISS missions.



Michelle Mendes,
Executive Director, Canadian Space Commerce Association

Michelle Mendes is the Executive Director of the Canadian Space Commerce Association. Since 2009 she has worked on space outreach and education in her roles at the Canadian Space Commerce Association and the Space Education Foundation, as well as on behalf of the United Nations Office of Outer Space Affairs (UNOOSA) for World Space Week Association and for the Google Lunar XPRIZE.



Gordon Osinski,
Associate Professor, Western University and Natural Sciences and Engineering Research Council of Canada Industrial Research Chair in Earth and Space Exploration

Dr. Gordon Osinski is an associate professor at Western University and has a Ph.D. in geology. He is currently Natural Sciences and Engineering Research Council of Canada Industrial Research Chair in Earth and Space Exploration, and a co-investigator on an instrument that is on the European Space Agency's ExoMars rover for launch in 2020. He is also involved in the MoonRise mission concept that is currently being proposed to NASA's New Frontiers competition.



Michael Pley,
Pley Consulting Inc. and Chair of the Aerospace Industries Association of Canada's Space Committee

Michael Pley is President of Pley Consulting Inc. He retired as CEO of Cambridge-based COM DEV International in 2016 after a 30-year career. Mr. Pley currently supports technology SMEs and space companies through his management consulting company. He is an Executive Committee member of the Board of Directors of the Aerospace Industries Association of Canada and currently chairs its Space Committee.



Afzal Suleman,
Canada Research Chair in Computational and Experimental Mechanics and Professor in the Department of Mechanical Engineering and Director of the Centre for Aerospace Research, University of Victoria

Dr. Afzal Suleman is Canada Research Chair in Computational and Experimental Mechanics and a professor in the Department of Mechanical Engineering and Director of the Centre for Aerospace Research at the University of Victoria. He has been a national delegate at UN-COPUOS (1999-2005). He has been involved in the space engineering research and development as a student and educator for 30 years.



Christine Tovee,
independent consultant

Christine Tovee, an independent consultant, is the former chief technology officer of EADS NA (now Airbus Group North America), becoming the first woman appointed CTO within the EADS/Airbus Group. She has been instrumental in establishing research partnerships in the space sector.