



Space Research and the Innovation Agenda

Input to the Canadian Space Agency on the
Contributions of Canada's Colleges, Institutes,
Cégeps and Polytechnics to Space Research

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Colleges and Institutes Canada is the national and international voice of Canada's publicly supported colleges, institutes and polytechnics. We work with industry and social sectors to train 1.5 million learners of all ages and backgrounds at campuses serving over 3,000 urban, rural and remote communities in Canada. The Association operates in 29 countries via 13 offices around the world.

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Space Research and the Innovation Agenda –

Input to the Canadian Space Agency on the Contributions of Canada’s Colleges, Institutes, Cégeps and Polytechnics to Space Research

Colleges and Institutes Canada (CICan) is the national membership association of Canada’s publicly-funded colleges, institutes, cégeps and polytechnics. Known previously as the Association of Canadian Community Colleges (ACCC), CICan and its members are committed to driving Canadian prosperity by being global leaders in applied education and partnered innovation.

Canada’s colleges, institutes, cégeps and polytechnics have the industry connections and applied research experience to contribute to innovation in space industries and related

sectors. This document builds on CICan’s submission to the Innovation Agenda and provides a sector-specific view of how colleges and institutes can contribute to innovation and research that is supported by the Canadian Space Agency. This document addresses the seven consultations questions CSA has identified and validates the positions outlined in CSA’s paper *Space Research and the Innovation Agenda* and Annex A *Current Understanding of the Space Research Community’s Perspective on Innovation and the Innovation Agenda*.

1. How can business, institutions and governments attract and develop talent and investment in the space research disciplines?

CICan’s submission to the Innovation Agenda emphasized the importance of ensuring Canada has an innovation-ready workforce.

CICan recommended that the federal government increase the number and quality of work integrated learning opportunities, attracting and developing innovators from around the world and providing the infrastructure and equipment necessary to innovate. To develop the full spectrum of innovation talent, we recommend that the CSA provide work integrated learning opportunities for college and institute students to work with SMEs that support the development of space technologies for use in space missions but also to adapt technologies for terrestrial applications.

Increasing opportunities for student engagement is also essential. Students should be engaged via targeted design competitions and course-based capstone projects. Engagement efforts should target students in STEM

related programs at colleges and institutes including the engineering technologies, computer science, apprenticeship programs for key trades, as well as business and communications related programs.

CICan is also recommending that the government fund an international academic mobility program that offers college and institute students opportunities to study, work or participation in applied research projects in other countries. We recommend that the CSA increase funding for partnerships with organizations such as the European Space Agency and include mobility opportunities for students from colleges and institutes. There are also research centres at colleges and institutes that could host research internships for students from European universities.

2. How do we make best use of our science and research strengths in space research?

The college and institute network offers extensive reach across the country, from coast to coast to coast, with a wide range of expertise, infrastructure and facilities that can support space research.

Colleges and institutes occupy a distinct niche in Canada's innovation ecosystem that is complementary to discovery research. Colleges have capitalized on their strong community connections and modest federal investments in applied research to respond to the R&D needs of local and regional partners.

Where colleges and institutes make a big difference is in helping SMEs to innovate and scale up their operations, often in support of the vital roles they play in the supply chains of large companies. In 2014-15 colleges and institutes worked with over 6000 applied research partners, 86% of them SMEs or micro-enterprises, to improve or develop new products, prototypes, processes and services.

Colleges and institutes have applied research expertise and 763 research centres and laboratories that can support space research and innovation, including in advanced manufacturing, environmental science and technology, information and communications technologies and natural resources and energy. Some specific areas of specialization and technology transfer of colleges and institutes that can support space research or the terrestrial application of space technology include:

- GIS and GPS
- Data analytics, digital technology, hardware, software and applications
- Robotics/automation
- Materials/bonding, composites
- Simulation
- Electric and hydrogen energy, fuel cell development
- Climate change adaptation
- Energy management
- Agri-food development
- Satellite technology
- Telemedicine
- Water and wastewater
- Innovative textiles and adaptive clothing
- Electronics, antennas and controls
- Vehicles and locomotion

College and institute applied research can support space research and innovation by providing services for space industries in product validation, prototyping, testing, or to support the improvement or development of new products or technologies. In the majority of applied research projects, private sector partners of colleges and institutes retain the intellectual property. Colleges and institutes value applied research activities for the benefits and opportunities they provide students and faculty, rather than the financial gain, and prefer to avoid the costs associated with registering and managing IP. This makes it very interesting for business and industry partners who are able to retain the IP and therefore better control further developments from products, processes and services emerging from these applied research projects.

3. How can academic-industry-government collaboration be enhanced and how can commercialization gaps be addressed?

Colleges and institutes can contribute to commercialization of space-related technologies by contributing to research clusters and collaborations with industry and universities. In 2014-15, colleges and institutes worked with 64 universities in Canada and other countries. As noted above, there are 763 research centres and laboratories at colleges and institutes that are supporting the R&D and commercialization needs of companies across the country. As part of the college-specific funding envelope, the Natural Sciences and Engineering Research Council (NSERC) is funding 30 technology access centres (TACs) at colleges and institutes across the country. TACs serve the research and innovation needs of specific regional economic clusters representing nine technology sectors:

- Advanced manufacturing
- Agriculture
- Construction technology
- Digital media and graphic communications
- Environmental technology/biotechnology
- Food technology
- Healthcare technology
- Nanotechnology
- Transportation.

The 30 TACs are led by an Advisory Board and are coordinated through Tech-Access Canada. This could be a powerful network to cover key sectors that can support space research.

TACs were created based on the model of the 49 college centres for the transfer of technology (CCTTs) in Quebec. The Centre Technologique en Aérospatiale (CTA) at Cégep Edouard-Montpetit is an example of a CCTT which is already working with the CSA on research projects and is also supporting knowledge transfer through the CTA's annual symposium. This collaboration is facilitated by the close proximity of CTA to the CSA in St-Hubert which allows for exchanges in human resources and the use of the state-of-the-art equipment at the CTA. CTA also offers research placements for university students working on space research.

4. What policy and funding changes are needed to enhance space research capabilities and innovation?

CICan recommends that the CSA open opportunities for colleges and institutes to contribute to its research program. To strengthen applied research support for companies involved in space research, we recommend that CSA create a college-specific envelope. The Tri-agency College and Community Innovation (CCI) Program administered by NSERC is currently the main vehicle for supporting college and institute applied research projects, and serves as an excellent example. A college-specific program needs to include funding to cover institutions' overhead costs as colleges and institutes are not eligible for the

Research Support Fund. To allow for international research collaboration a college-specific envelope should include permission for international travel, which is currently a limitation under the CCI program.

In order to foster more research collaborations with universities, CSA should also open up eligibility within existing programs to colleges and institutes.

5. What more can be done to increase business enterprise R&D (BERD) spending in space research?

First, the federal government must increase support for college and institute applied research services to support business innovation. Colleges and institutes are increasingly serving as vehicles which can facilitate business investment in R&D. Many of their partner SMEs are getting into R&D for the first time. The CIGan 2014-15 survey of college and institute applied research survey found that government funding for college and institute is matched dollar for dollar by the private sector. CIGan members have reported that in many cases, they are required to turn away private sector partners due to limitations in the funding which restrict their ability to respond.

A second key measure is to invest in more incubators and accelerators and related infrastructure on college and institute campuses. Colleges and institutes are increasingly complementing their applied research services with entrepreneurship and incubator initiatives. This makes college and institute facilities and leading-edge equipment available to potential and existing entrepreneurs.

And a third measure is to offer explicit SR&ED eligibility for Canadian companies working with post-secondary institutions on peer-reviewed research projects with a view to incenting business and industry to work closer with the PSE sector while at the same time increasing BERD investments. This approach would support more companies to work collaboratively with colleges and institutes and universities to adapt and improve products and processes and integrate technology, while at the same time being exposed to students who would be potential employees.

6. How can Canada better harness space-based technology and applications to better serve the needs of Canadians and strengthen competitiveness (e.g., big data or quantum encryption)?

Given colleges and institutes strong connections with business and industry, they are well placed to facilitate the application of space-based technology, including the increased support for start-up businesses to support

innovation in areas such as climate change adaptation, diversifying agriculture production based on satellite data, and telemedicine for rural communities.

7. What role can space science missions play in delivering the Government's Innovation Agenda objectives?

Canada's contributions to space science missions are investments that will encourage young Canadians to study in STEM related fields, will help develop expertise in specialized areas and will strengthen and advance innovation in key industry sectors. College and institute

applied research can make a difference by supporting companies involved in space research and technology development, including the terrestrial application of these technologies.

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Yukon

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Northwest Territories

- Aurora College
- Collège Nordique Francophone*

Nunavut

- Nunavut Arctic College

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- British Columbia Institute of Technology (BCIT)
- Camosun College
- Capilano University
- Collège Éducentre*
- College of New Caledonia
- College of the Rockies
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- Emily Carr University of Art + Design
- Justice Institute of British Columbia
- Kwantlen Polytechnic University
- Langara College
- Native Education College**
- Nicola Valley Institute of Technology (NVIT) **
- North Island College
- Northern Lights College
- Northwest Community College
- Okanagan College
- Selkirk College
- Thompson Rivers University
- University of the Fraser Valley
- Vancouver Community College
- Vancouver Island University (VIU)

Alberta

- Alberta College of Art + Design
- Bow Valley College
- Grande Prairie Regional College (GPRC)
- Keyano College
- Lakeland College
- Lethbridge College
- Medicine Hat College
- NorQuest College
- Northern Alberta Institute of Technology (NAIT)
- Northern Lakes College
- Olds College
- Portage College
- Red Deer College
- SAIT Polytechnic: Southern Alberta Institute of Technology

Saskatchewan

- Carlton Trail College
- Collège Mathieu*
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- Dumont Technical Institute**
- Great Plains College
- North West College
- Northlands College
- Parkland College
- Saskatchewan Indian Institute of Technologies**
- Saskatchewan Polytechnic
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Manitoba

- Assiniboine Community College
- École technique et professionnelle, Université de Saint-Boniface*
- Red River College
- University College of the North
- Manitoba Institute of Trades and Technology

Ontario

- Algonquin College
- Cambrian College
- Canadore College
- Centennial College
- Collège Boréal*
- Conestoga College Institute of Technology and Advanced Learning
- Confederation College
- Durham College
- Fanshawe College
- First Nations Technical Institute**
- Fleming College
- George Brown College
- Georgian College
- Humber College Institute of Technology & Advanced Learning
- Kenjgewin Teg Educational Institute (or KTEI)**
- La Cité*
- Lambton College
- Loyalist College
- The Michener Institute of Education at UHN
- Mohawk College
- Niagara College
- Northern College
- Sault College
- Seneca College
- Sheridan College
- St. Clair College
- St. Lawrence College

Quebec

- Cégep André-Laurendeau*
- Cégep de Chicoutimi*
- Cégep de Jonquière*
- Cégep de l'Abitibi-Témiscamingue*
- Cégep de la Gaspésie et des Îles*
- Cégep de La Pocatière*
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- Cégep de Rivière-du-Loup*
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- Cégep de Rimouski*
- Institut de tourisme et d'hôtellerie du Québec*
- John Abbott College
- TAV College*
- Vanier College

Newfoundland and Labrador

- Centre for Nursing Studies
- College of the North Atlantic
- Fisheries and Marine Institute of Memorial University of Newfoundland

New Brunswick

- Collège communautaire du Nouveau-Brunswick (CCNB)*
- New Brunswick College of Craft and Design
- New Brunswick Community College (NBCC)

Prince Edward Island

- Collège Acadie Î.-P.-É.*
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Nova Scotia

- Université Sainte-Anne - Collège de l'Acadie*
- Dalhousie Agricultural Campus, Dalhousie University
- Nova Scotia Community College

Associates

- Association des collèges privés du Québec*
- Association québécoise de pédagogie collégiale*
- Atlantic Provinces Community College Consortium (APCCC)
- BC Colleges (BCC)
- Canadian Association of Diploma in Agriculture Programs (CADAP)
- Canadian Association of College and University Student Services (CACUSS)
- Colleges Ontario
- Fédération des cégeps*
- Forum for International Trade Training (FITT)
- Tra Vinh University

* *Francophone*

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