

Canadian Space Agency

2019–20

Departmental Plan

The Honourable Navdeep Bains, P.C., M.P.
Minister of Innovation, Science and Economic
Development

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Minister's message

It is my pleasure to present the 2019–20 Departmental Plan of the Canadian Space Agency (CSA). We are working across the Innovation, Science and Economic Development Portfolio to support and develop the innovation ecosystem, strengthen science to support evidence-based decision making, champion the tourism sector, and help small businesses start up and scale up.

Over the next year, the CSA will embark on a new chapter. Fifty years after the Moon landing, Canada is partnering with NASA on the Lunar Gateway – a project that will see humans return to the Moon and set the stage for further exploration to Mars. This investment will have far-reaching benefits for Canadian society. At the same time, the announcement of the new Canadian Space Strategy – *Exploration, Imagination, Innovation* – on March 6, 2019, will help ensure that Canadians are ready to take advantage of the jobs of tomorrow, and enable our space industry and academic institutions to be part of the new space economy.

Ultimately, the Portfolio's work will create the right environment to generate ideas, commercialize those ideas, and give Canadians the skills to access the jobs and opportunities presented by today's economy.

Together with Canadians of all backgrounds, regions and generations, we are building a strong culture of innovation to position Canada as a leader in the global economy.



The Honourable Navdeep Bains
Minister of Innovation, Science
and Economic Development

Plans at a glance and operating context

A thriving Canadian space sector is of critical importance to Canadians because satellites provide an invisible infrastructure in the daily lives of Canadians as well as the world. Currently, 11 Government of Canada departments and agencies directly depend on space to deliver on their mandate and priorities. Monitoring the environment and climate change, weather forecasting, safety and security, health innovation, and infrastructure all depend on this critical space infrastructure. Space also provides a unique laboratory environment through the International Space Station (ISS). The ISS not only provides the platform for advancements in science, it also allows astronauts on board to inspire Canadians and the world to push for higher learning and achievement. Investments in space result in more high-quality jobs and more innovation in Canada. Working with industry and the Canadian space research community, the CSA encourages further opportunities in space research and development (R&D) and innovation by funding initiatives like the [Space Technology Development Program \(STDP\)](#)ⁱ and Canadian science teams participating in missions such as [NASA’s Curiosity](#)ⁱⁱ rover mission on mars, and the [OSIRIS-REx](#)ⁱⁱⁱ asteroid sample-return mission.

In 2019–20, the CSA’s key priorities are aligned with its Departmental Results Framework and program inventory. These priorities enable the CSA to make progress on achieving its mandate, as well as Government of Canada commitments to and for Canadians. Each of these priorities align with the [Minister of Innovation, Science and Economic Development Mandate Letter](#),^{iv} which states that the minister’s overarching goal is to help Canadian businesses grow, innovate and export, and the [Minister of Science Mandate Letter](#),^v which states that the minister’s overarching goal is to support scientific research and the integration of scientific considerations in our investment and policy choices to create sustainable economic growth and support and grow the middle class. They are also fully aligned with the [Innovation and Skills Plan](#),^{vi} a new microeconomic framework to drive growth – one that aims to succeed by building a culture of innovation and a globally recognized brand as one of the most innovative and competitive countries in the world.

Priority 1 – Lunar Gateway and a whole-of-government Canadian Space Strategy.

On February 28, 2019, the Prime Minister made an historic announcement that Canada is going to the Moon and that the Government of Canada would invest \$2.05B over 24 years in Canada’s Space Program. With this investment, the CSA will not only begin work on the NASA-led Lunar Gateway which includes Canadarm3 but invest \$150M over five years in the new Lunar Exploration Accelerator Program and launch the Junior Astronaut initiative in the Fall of 2019 to inspire the next generation of astronauts and get young Canadians inspired about careers in science, technology, engineering and mathematics (STEM).

At the same time, the CSA will seek implement the whole-of-government approach outlined in the Canadian Space Strategy – *Exploration, Imagination, Innovation* – announced by the Minister of Innovation, Science and Economic Development on March 6, 2019. Canada will create the right conditions for the growth of the Canadian space sector; ensure that Canada’s space scientists are offered a rich environment in which to pursue science excellence; fully realize the benefits of space for Canadians; and ultimately help strengthen Canada’s place in space.

Priority 2 – Launch and commissioning of the RADARSAT Constellation Mission.

The [three-satellite configuration of the RADARSAT Constellation Mission](#) (RCM),^{vii} will provide ongoing high-quality data services after the launch and commissioning in 2019. The RCM will provide multiple daily captures of Canada’s vast territory that will contribute to increased quality of services offered by the CSA as well as create opportunities for new ones.

Priority 3 – Astronaut David Saint-Jacques’s ISS mission: Science and outreach.

The CSA will take advantage of the interest in [David Saint-Jacques’ mission](#)^{viii} to encourage Canadian youth to pursue studies and careers in STEM. It is expected that over two million Canadians will interact with the CSA in 2019–20.

Priority 4 – Canada’s participation in the European Space Agency’s (ESA) 2019 Ministerial Council meeting.

The CSA will support Canada’s participation in ESA’s 2019 Ministerial Council meeting in November 2019 where Canada and ESA Member States will announce new investments in ESA programs. [The Canada-ESA Cooperation Agreement](#)^{ix} allows the Canadian space industry to take part in ESA programs and provide new business opportunities on the European market.

Priority 5 – Scientific satellites - Collaboration with other government departments.

In 2019–20, the CSA will work with other government departments and agencies to not only identify a new scientific micro satellite mission but begin the definition of the satellite and associated infrastructure.

Operating context

Canada has a rich space heritage and an industrial base with niche capabilities in areas such as space operations, satellite communications, space robotics, space-based radar, optical-based science instruments, value-added Earth observation (EO) and geospatial services.

Many federal departments and agencies rely on space-based data and applications to deliver on their mandates, and many others expect to do so in the near future. [RADARSAT-2^x](#) delivers EO data to monitor agricultural productivity, track ice in the North, detect pollution in our waters and, most importantly, provide the Canadian Armed Forces with imagery to support their mission to “be strong at home, secure in North America and engaged in the world.” Satellites also monitor our environment and support science and evidence-based decision making on climate change, water and resource management, as well as disaster management.

Going forward, new opportunities are on the horizon. Canada’s involvement in the ISS has been extended to 2024. Disruptive technologies have changed the economics of building, launching, and operating spacecrafts, opening the frontier of space to new and lucrative commercial business opportunities. Around the world, space agencies are set on returning to the Moon and pushing on to Mars.

For countries like Canada with smaller space programs, activities are often carried out in partnership with other space-faring nations. Partnerships not only benefit from shared costs, but also increase the return on Canada’s investments while leveraging Canada’s capabilities in space in order to tackle some of the most pressing global issues such as climate change. To maximize those benefits, the CSA collaborates internationally through committees such as the Global Space Exploration Committee and the Committee on EO Satellites. The CSA also works closely with NASA and has a unique partnership with ESA as the only non-European Cooperating State. The partnership with ESA not only leverages space investments, but has also opened access to European markets for Canadian space companies and academia. Targeted investments in key science and technologies capabilities and flight heritage or demonstration opportunities ensure that the Canadian space sector remains relevant in a dynamic international context.

To fully develop its growth potential and seize opportunities to leverage international space projects, the Canadian space sector must keep pace with an ever-evolving landscape. In line with the [Innovation and Skills Plan](#),^{vi} the CSA invests in the development of people, science and innovative technologies while offering demonstration opportunities to help Canada’s industry maintain and enhance its current competitive edge.

For more information on the Canadian Space Agency’s plans, priorities and planned results, see the “[Planned results](#)” section of this report.

Planned results: what we want to achieve this year and beyond

Core Responsibilities

Canada in space

Description

The CSA coordinates the space policies and programs of the government of Canada; ensures that other government departments and agencies have access to space data, information, and services to deliver on their mandate; plans, directs and manages projects relating to scientific or industrial space research and the development of space science and technology; promotes the transfer and diffusion of space technology to and throughout the Canadian industry; and encourages the commercial exploitation of the space capabilities, technology, facilities and systems. The CSA also aims to build Canada's capacity and engage the next generation of space scientists and engineers and provide opportunities to inspire young people to develop the required skills and to pursue studies and careers in science, technology, engineering and math.

Planning highlights

The planning highlights section below outlines the four departmental results detailed in the CSA's Departmental Results Framework. Each departmental result is an important element that demonstrates the impact of the CSA on the lives of Canadians.

Result 1 – Space research and development advances science and technology

Investments that support the full spectrum of the R&D innovation cycle from inception through to commercialization is critical for the Canadian space industry. In 2019–20, the CSA will invest in the advancement of technology readiness levels and the risk reduction efforts for innovative space technologies that will be required for future space missions.

In the fall of 2019, the CSA will launch the next wave of the STDP investments in promising technologies, estimated at \$20M. The CSA will also fund the ongoing advancement of over 160 space science and technology activities in both industry and academia.

From a space science perspective, planetary exploration and space astronomy missions provide opportunities for Canadian scientists to embark on international space missions and gain access to scientific data. In 2019–20, the CSA will invest \$2.1M in Canadian science teams participating in NASA's Curiosity rover mission, the OSIRIS-REx asteroid sample-return mission, India's [ASTROSAT](#)^{xi} mission, and Japan's [XRISM](#)^{xii} mission. These projects and others are expected to result in 250 peer-reviewed scientific publications by Canadian space researchers in 2019–20.

In support of advancing space and Earth science and technologies, the CSA will invest \$2M to maintain the operation of the Canadian science mission [SCISAT](#).^{xiii} SCISAT is used internationally for monitoring stratospheric ozone and ozone-depleting substances. It is also the only satellite in the world to measure hydrofluorocarbons from space, important to contribute to monitoring efforts of the Kigali Amendment of the United Nations Montreal Protocol. SCISAT's contribution to Arctic research is identified in four areas of the Kigali Amendment: polar ozone depletion, comparison and validation of greenhouse gases, instrument comparisons, and advancement of climate and chemical system models.

In 2019–20, the CSA will select the prime contractor that will design and build the QEYSSat demonstration mission, which is scheduled to launch in 2022–23 on a microsatellite. QEYSSat aims to demonstrate quantum key distribution technology over very long distances and is expected to provide Canada with ultra-secure communications in the age of quantum computing, when traditional encryption will be rendered obsolete. This technology advance is expected to stimulate the pace of innovation towards the quantum key distribution commercialization and position Canadian innovation for the future.

Through these investments, the CSA will contribute to maintaining Canada's Business Expenditures on Research and Development (BERD) in the space sector. At the same time, R&D from the private sector will lead to the development of new cutting-edge space technologies and the advancement of science. As such, it is expected that Canadian businesses will spend \$250M in R&D in the space sector in 2019–20. Furthermore, by providing access to high-quality scientific data and supporting researchers, the CSA will contribute to maintaining Canada's international ranking among OECD nations related to the average relative citation score of space-related publications.

Result 2 – Canadians engage with space

Long-duration astronaut missions on the ISS are high-profile and celebrated achievements that inspire and captivate the Canadian public while sparking interest in Canada's space program.

In 2019–20, the CSA will take advantage of Canadian interest in space and the excitement around [David Saint-Jacques' mission](#)^{viii} aboard the ISS, from December 2018 to June 2019, to engage Canada's youth to pursue studies and careers in STEM. Through a multifaceted communications campaign with a variety of activities and events, multimedia products, national contests and museum exhibitions, David Saint-Jacques' mission is expected to produce a minimum of one million engagements on social media, one million views of mission videos, 250,000 visits to mission webpages, 25,000 museum visits, 10,000 live video chats between participants and David Saint-Jacques in space, and 2,500 media mentions. The STEM activities and initiatives related to David Saint-Jacques' mission are expected to engage a minimum of 20,000 students.

The CSA will stimulate the development of the next generation of space scientists and engineers through a range of initiatives that promote science literacy; increase digital, coding and problem solving skills among Canadian students; and implement a STEM strategy. The CSA will continue to engage Canadians by supporting the development of space science & technology and expertise required for the future through the Science, Technology and Expertise Development in Academia (STEDiA) initiative, and offering demonstration opportunities that will result in flight heritage for Canadian organizations through the Capacity Demonstration initiative.

The CSA will continue to implement the Canadian CubeSat Project (CCP). The CCP provides Canadian professors in post-secondary institutions the opportunity to engage their students in real space missions. Through this national initiative, winning teams are offered the unique opportunity to design and build their own miniature satellite called a CubeSat. In 2019–20, the CSA will invite more than 30 students, who will have been selected by participating teams, to its headquarters in Saint-Hubert Quebec, for a one week hands-on workshop, giving them the opportunity to work side by side with CSA experts to gain the knowledge and skills necessary to become future space experts.

In order for the CSA to continue to adapt to the rapidly evolving global context, in 2019–20 the CSA will establish a consultative committee that will enable interactions with industry and academia and seek to address common challenges such as attracting new people and organizations into the space sector and renew Canadian talented and skill workforce.

Interest in CSA activities is a major factor in inspiring young people to study and seek a career in the STEM sectors. Engagement on social media will be tracked to demonstrate the level of engagement the CSA has with Canadians with regards to its space activities. As such, it is expected that two million engagements on social media related to the CSA will be generated.

Result 3 – Space information and technologies improve the lives of Canadians

There are two significant ways that the CSA improves the lives of Canadians. The first is through space science and technology that is reused on Earth for the benefit of Canadians, and the second is delivering the data and services that Canadians need from space on a daily basis.

Space infrastructure has a planned lifetime and often Canadian satellites and robotic infrastructure deliver data and services beyond their expected operational life. A space infrastructure can stop functioning if it reaches the end of its operational lifetime, if it suffers a technical malfunction or is hit by space debris. To mitigate this risk, the CSA negotiates agreements with international and commercial entities to ensure uninterrupted availability of Synthetic Aperture Radar, and other data, and monitors space objects to take collision-avoidance measures when necessary in order to minimize the risk of serious damage to all CSA space assets to continue delivering on its results.

In 2019–20, the CSA will put in place a big data centre of expertise to improve the management and the use of space data by federal departments and agencies, provinces and territories, academic institutions and Canadian industry. By putting in place this centre, the CSA will have the infrastructure and the expertise required to manage ever increasing volumes of data that can then be made available to others through a big data strategy.

From a science and technology perspective, during David Saint-Jacques' time aboard the ISS, a series of scientific experiments will be conducted including Vascular Echo and At Home in Space. The [Vascular Echo](#)^{xiv} experiment will examine changes in the blood vessels and the heart while the astronauts are in space, and then follow their recovery after their return to Earth. [At Home in Space](#)^{xv} will assess the culture, values, and psychosocial adaptation of astronauts to a space environment shared by multinational astronaut crews on long-duration missions as they deal with the isolated and confined environment of the spacecraft.

In 2019–20, two Canadian-developed technologies will be tested aboard the ISS: Bio-Monitor and Bio-Analyzer. [Bio-Monitor](#),^{xvi} is a smart garment that records six physiological parameters, including heart rate and temperature. [Bio-Analyzer](#)^{xvii} is a new technology which will perform real-time analysis of blood cells and biomarkers and seek to better understand how spaceflight impacts the immunity of astronauts during a mission. Both technologies are used in human research on the ISS and are expected to find applications on Earth in areas such as health monitoring in remote areas.

The CSA will also continue to support the joint NASA-CNES (Centre national d'études spatiales) [Surface Water Ocean Topography](#) (SWOT)^{xviii} science mission by delivering a key component of the radar instrument, a set of extended interaction klystrons. This technology will enable accurate measurements of Canada's water resources, which in turn will provide the scientific community with a better understanding of the dynamics of the world's oceans and terrestrial surface water, allowing them to address important global issues like climate change and improve our management of water as a strategic resource. SWOT data could lead to improvements in water-related services in Canada, such as weather predictions and flood-warning systems thus benefitting the scientists of Environment and Climate Change Canada and the Department of Fisheries and Oceans who will have access to better data in support of their mandates. This contribution secures privileged access for Canadian scientists to data from SWOT, to be launched in 2021.

Also in 2019–20, the CSA will continue to provide high-quality data services to the various government departments and agencies through [RADARSAT-2](#).^x The next-generation RCM satellites will be launched and commissioned in 2019. The data resulting from the RCM will contribute to an increased quality and volume of data and services already being offered, such as land use evolution, coastal change, urban sinking, measuring human activity influences on local environments and improving Canada's space-based capabilities to detect ships and manage marine traffic with the use of automatic identification systems. In total, 11 federal departments and

agencies are using RADARSAT data to deliver on their mandate, including Environment and Climate Change Canada, Fisheries and Oceans Canada, the Department of National Defence, Agriculture and Agri-Food Canada, and the Public Health Agency of Canada.

Approximately 37,000 images from the [RADARSAT-1](#)^{xix} data archives, taken over 17 years, will be made available to the public in 2019–20 in an effort to encourage the development of novel applications and further the socio-economic benefits of this investment. This initiative is expected to increase the number of services offered to Canadians by the government in priority areas such as climate change, the North and innovation. It will also increase the openness of federal scientific activities, demonstrating the CSA's leadership in the management of space-based datasets and commitment to the Directive on Open Government.

The CSA, as part of a joint investment approach (40% CSA and 60% other government departments, industry and academia), will focus on integrating space-based technologies (EO, big data, downstream information products, etc.) to inform Canada's climate change agenda and ensure the development of an operational Government of Canada EO monitoring capability. As a result, the CSA will invest \$1.44M in 2019–20 via the [EO Application Development](#)^{xx} initiative in various projects aimed at Climate Change Impacts and Ecosystem Resilience objectives. For instance, the ScanSol project aims to create new opportunities for mining large quantities of images acquired via the different EO satellites to provide the agricultural community with reliable information on the texture and fertility characteristics of agricultural soils.

Investments in space enables the development of new space technologies and applications that will find potential uses on Earth. These novel uses provide economic benefits in addition to improving the quality of life of Canadians, particularly in the health sector. As such, it is expected that 87 services dependent on CSA information (i.e. remote sensing data, including satellite imagery and science observations) will be offered to Canadians in 2019–20.

Result 4 – Canada’s investments in space benefit the Canadian economy

In 2019–20, the CSA will continue to foster innovation in the space sector and enable Canadian innovators and entrepreneurs to take advantage of growth opportunities that create well-paying jobs and grow the middle class. These benefits are the ultimate goal of the [Innovation and Skills Plan](#)^{vi} which is an ambitious effort to make Canada a world-leading centre for innovation.

Since 2001 the number of countries with a space program has increased from 26 to over 65 in 2015. This rapidly evolving landscape has resulted in increased competition from new space-faring countries. To keep its place as a leader, Canada participates in space missions in collaboration with multiple stakeholders and partners. However, committing to new opportunities in a timely fashion can be challenging due to integration of partner components, scheduling concerns and cost increases. The CSA mitigates this complexity by maintaining an active presence with international partners and forums to gather timely information on upcoming plans.

The [Canada-European Space Agency Cooperation Agreement](#)^{ix} fosters Canadian space industry exports and facilitates access to European markets. In November 2019, Canada and ESA member States will announce investments in ESA programs during ESA’s Ministerial Council meeting. In 2019–20, the CSA will spend \$32M in these new ESA programs and investments.

In the Spring of 2019, the CSA will also announce a second challenge to small businesses to prove the scientific and technical feasibility, and commercial potential, of a novel idea that addresses a public sector challenge as part of Innovation, Science and Economic Development Canada’s Innovative Solutions Canada initiative. The CSA will also review and assess the results of its first challenge, which focused on applying artificial intelligence and big data analytics to bring tangible advancements in the operation and utilization of satellites, their data and ground infrastructure in support of government operations, public safety, public health and discovery. Most promising advancements could receive up to \$1M of support from the CSA to pursue the development phase of a prototype.

The CSA’s investments presented in this Departmental Plan seek to ensure that the Canadian space sector develops value-added services, and ensures that Canada’s space sector maintains the value of exports overall. As such, in 2019–20, it is expected that CSA investments will contribute to support the space sector generate \$2B in exports and maintain 4,250 highly qualified jobs.

Planned results

| Departmental Results | Departmental Result Indicators | Target | Date to achieve target | 2015–16 Actual results | 2016–17 Actual results | 2017–18 Actual results |
|---|---|---------------------|------------------------|------------------------|------------------------|------------------------|
| 1: Space research and development advances science and technology | I1: Business Expenditures in Research and Development (BERD) in the space sector | \$250M ¹ | March 31, 2020 | \$146M | \$256M | \$254M |
| | I2: Canada's rank among OECD nations on the citation score of space-related publications | 11 ² | March 31, 2020 | N/A New indicator | N/A New indicator | 11 |
| 2: Canadians engage with space | I3: Number of new people and organizations entering space related fields as a result of CSA funding | 330 | March 31, 2020 | N/A New indicator | N/A New indicator | N/A New indicator |
| | I4: Number of engagements on social media related to the CSA | 2M ³ | March 31, 2020 | N/A New indicator | 2,351,059 | 2,591,031 |

¹ The CSA is using a five-year rolling average to set the target based on the fluctuations of the Canadian space sector over time as missions proceed through their lifecycles. The current target is \$49M more than the five-year rolling average.

² Scientific publications take several years to be published and even more time is needed in order to be cited. The impact of the Canadian scientific context in the early 2010s suggests that Canada's rank will remain stable for 2019–20.

³ 2017–18 was an exceptional year for the CSA's social media accounts with the highly successful and visible Astronaut Recruitment Campaign. A benchmark of two million engagements sets an ambitious target that is more commensurate with the CSA's expected levels of social media activity, and one which also factors in the significant impact of recent algorithm changes announced by Facebook, which have had a significant impact on our results (as a federal agency that chooses not to advertise, our reach is penalized, which in turn limits potential engagements).

| Departmental Results | Departmental Result Indicators | Target | Date to achieve target | 2015–16 Actual results | 2016–17 Actual results | 2017–18 Actual results |
|--|--|-------------------|------------------------|------------------------|------------------------|------------------------|
| 3: Space information and technologies improve the lives of Canadians | I5: Number of services offered to Canadians dependent on CSA information (such as remote sensing data, including satellite imagery and science observations) | 87 | March 31, 2020 | N/A New indicator | N/A New indicator | 83 |
| | I6: Number of Canadian space technologies adapted for use on earth or re-use in space | 7 ⁴ | March 31, 2020 | 4 | 6 | 13 |
| 4 Canada's investments in space benefit the Canadian economy | I7: Number of highly qualified people in the Canadian space sector | 4,250 | March 31, 2020 | 4,226 | 4,264 | 4,085 |
| | I8: Value of export of the Canadian space sector | \$2B ⁵ | March 31, 2020 | \$1.6B | \$1.6B | \$2B |

⁴ The CSA uses a seven-year rolling average for this measure and given multiple years had only six technology transfers or less, the target is lower compare to last year's result.

⁵ The CSA is using a five-year rolling average to set the target based on the fluctuations of the Canadian Space Sector over time as missions proceed through their lifecycles. The current target is \$300M more than the five-year rolling average.

Budgetary financial resources (dollars)

| 2019–20 Main Estimates | 2019–20 Planned spending | 2020–21 Planned spending | 2021–22 Planned spending |
|---------------------------|-----------------------------|-----------------------------|-----------------------------|
| 278,432,275 | 278,432,275 | 242,931,635 | 236,054,783 |

Human resources (full-time equivalents)

| 2019–20 Planned full-time equivalents | 2020–21 Planned full-time equivalents | 2021–22 Planned full-time equivalents |
|--|--|--|
| 399.9 | 395.7 | 395.7 |

Financial, human resources (HR) and performance information for the Canadian Space Agency's Program Inventory is available in the [GC InfoBase](#).^{xxi}

Internal Services

Description

Internal Services are those groups of related activities and resources that the federal government considers to be services in support of Programs and/or required to meet corporate obligations of an organization. Internal Services refers to the activities and resources of the 10 distinct services that support Program delivery in the organization, regardless of the Internal Services delivery model in a department. These services are:

- Management and Oversight Services
- Communications Services
- Legal Services
- Human Resources Management Services
- Financial Management Services
- Information Management Services
- Information Technology Services
- Real Property Management Services
- Materiel Management Services
- Acquisition Management Services

Budgetary financial resources (dollars)

| 2019–20 Main Estimates | 2019–20 Planned spending | 2020–21 Planned spending | 2021–22 Planned spending |
|---------------------------|-----------------------------|-----------------------------|-----------------------------|
| 50,516,301 | 50,516,301 | 48,503,296 | 48,973,195 |

Human resources (full-time equivalents)

| 2019–20 Planned full-time equivalents | 2020–21 Planned full-time equivalents | 2021–22 Planned full-time equivalents |
|--|--|--|
| 294.7 | 292.4 | 292.4 |

Planning highlights

In order to ensure modern, efficient and relevant delivery of internal services, in 2019–20, the CSA will continue to improve its internal services processes and business models in order to be strategically and operationally aligned with international partners, stakeholders, academia, and other government departments. In 2019–20, the CSA will seek to streamline its corporate risk processes and improve its performance measurement methodologies to ensure the data being collected remains relevant and timely. As part of its effort to apply a Gender-Based Analysis Plus (GBA +) approach, the CSA will also review its program indicators and current methodologies to

better monitor its impacts on youth, gender, and diversity. The CSA will also launch and report on the results of the 2019 Canadian Space Sector Survey.

From an employee wellness perspective, in 2019–20, the CSA will merge its three-year Employment Equity and Diversity Plan for an inclusive workplace with its three-year Mental Health and Wellness Plan in an effort to ensure a safe and healthy workplace and establish a Psychological Health and Safety Management System. At the same time, through the enhancement of the skills model to support a talent-based management approach, the CSA will provide continuous development to its employees and create an agile workforce. Finally, the CSA will widen the scope of HR Analytics to strengthen its integrated HR management capacity to better support transition towards the workplace of the future.

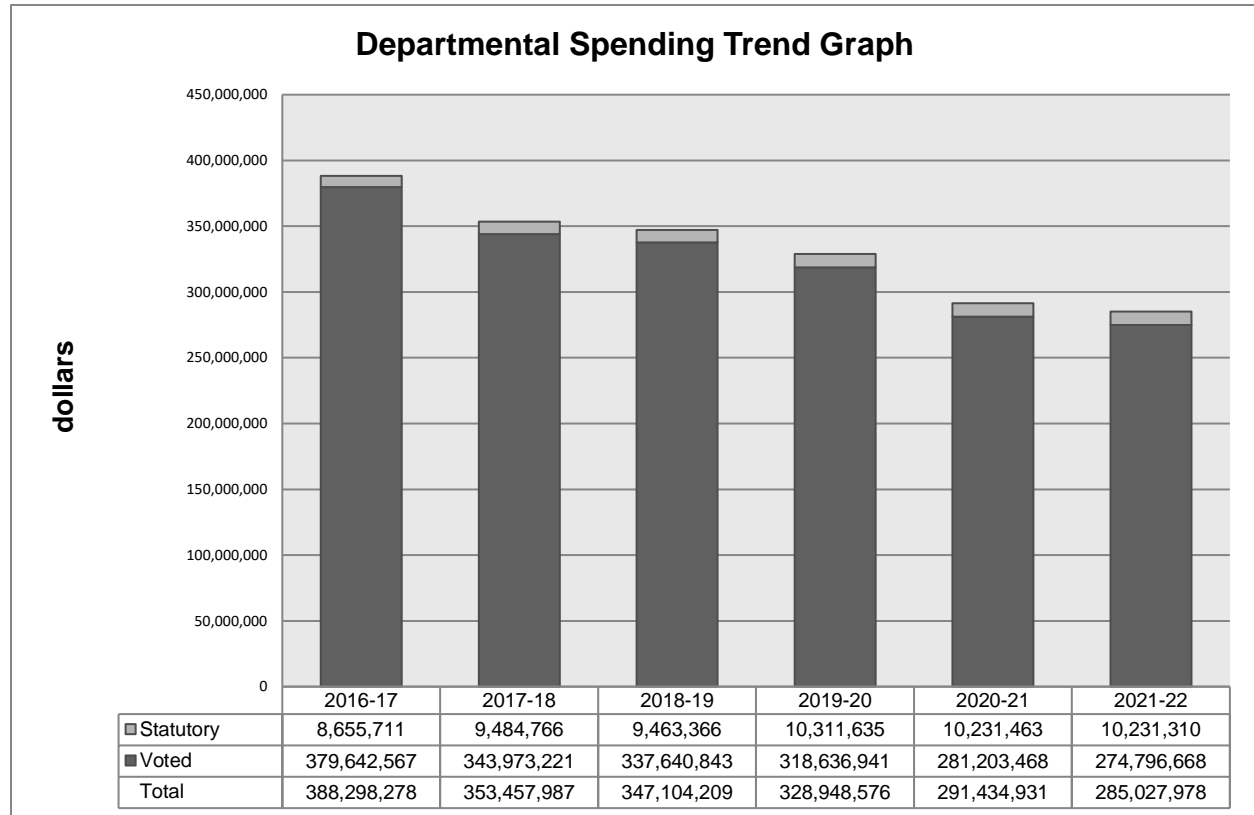
In 2019–20, the CSA will begin the implementation of its 3-year Departmental Security Plan to mitigate key corporate security risks and continue to raise staff awareness on the importance of security issues. The CSA will also continue the implementation of its Greening of Government Long-Term Action Plan to achieve low-carbon operations and meet government targets.

The CSA will also continue to implement departmental and government-wide solutions to improve its information management and information technology tools to promote openness and accountability and to enhance business effectiveness, collaboration and mobility (i.e. Wi-Fi, mobile devices, collaborative space). Finally, the CSA will develop its data strategy in response to the government of Canada digital roadmap and will implement appropriate structures, such as its big data centre of expertise, and activities in order to make scientific data and information more accessible to Canadians and to comply with the Plan to the Open Government Partnership, released in December 2018.

Spending and human resources

Planned spending

Departmental spending trend graph



Budgetary planning summary for Core Responsibilities and Internal Services (dollars)

| Core Responsibilities and Internal Services | 2016–17 Expenditures | 2017–18 Expenditures | 2018–19 Forecast spending | 2019–20 Main Estimates | 2019–20 Planned spending | 2020–21 Planned spending | 2021–22 Planned spending |
|---|----------------------|----------------------|---------------------------|------------------------|--------------------------|--------------------------|--------------------------|
| Canada in space | 341,948,633 | 293,157,159 | 292,360,707 | 278,432,275 | 278,432,275 | 242,931,635 | 236,054,783 |
| Subtotal | 341,948,633 | 293,157,159 | 292,360,707 | 278,432,275 | 278,432,275 | 242,931,635 | 236,054,783 |
| Internal Services | 46,349,645 | 60,300,828 | 54,743,502 | 50,516,301 | 50,516,301 | 48,503,296 | 48,973,195 |
| Total | 388,298,278 | 353,457,987 | 347,104,209 | 328,948,576 | 328,948,576 | 291,434,931 | 285,027,978 |

The variance in the CSA's expenditure profile since 2016–17 is primarily due to investments related to the development of the RCM announced in Budget 2010, as well as the building

infrastructure maintenance projects for the David Florida Laboratory (DFL) and the John H. Chapman Space Centre (JHCSC). The CSA also received additional funding from other government departments in support of the RCM mission, as well as additional federal funding for the accelerated infrastructure plan in support of the building infrastructure maintenance projects.

It should be noted that the funding profile of the CSA's projects and missions varies based on the stage of each mission and results in variances from year to year and therefore has an impact on the Expenditures, Forecast Spending and Planned Spending.

Planned human resources

Human resources planning summary for Core Responsibilities and Internal Services (full-time equivalents)

| Core Responsibilities and Internal Services | 2016–17 Actual full-time equivalents | 2017–18 Actual full-time equivalents | 2018–19 Forecast full-time equivalents | 2019–20 Planned full-time equivalents | 2020–21 Planned full-time equivalents | 2021–22 Planned full-time equivalents |
|---|--------------------------------------|--------------------------------------|--|---------------------------------------|---------------------------------------|---------------------------------------|
| Canada in space | 361.6 | 387.3 | 387.2 | 399.9 | 395.7 | 395.7 |
| Subtotal | 361.6 | 387.3 | 387.2 | 399.9 | 395.7 | 395.7 |
| Internal Services | 252.4 | 266.7 | 292.1 | 294.7 | 292.4 | 292.4 |
| Total | 614.0 | 654.0 | 679.3 | 694.6 | 688.1 | 688.1 |

The progressive increase in the number of FTEs starting in 2016–17 is mainly due to additional resources required to address some gaps and priorities, which include:

- Revised departmental requirements related to internal services;
- Increased investment in students in line with attracting the next generation of public servants;
- Increased operational support for the RCM; and
- Additional scientific and technical personnel required to support ISS activities until 2024–25.

Estimates by vote

Information on the Canadian Space Agency's organizational appropriations is available in the [2019–20 Main Estimates](#).^{xxii}

Future-Oriented Condensed Statement of Operations

The Future-Oriented Condensed Statement of Operations provides a general overview of the Canadian Space Agency's operations. The forecast of financial information on expenses and revenue is prepared on an accrual accounting basis to strengthen accountability and to improve transparency and financial management. The forecast and planned spending amounts presented in other sections of the Departmental Plan are prepared on an expenditure basis; as a result, amounts may differ.

A more detailed Future-Oriented Statement of Operations and associated notes, including a reconciliation of the net cost of operations to the requested authorities, are available on the [Canadian Space Agency's website](#).^{xxiii}

Future-Oriented Condensed Statement of Operations
for the year ending March 31, 2020 (dollars)

| Financial information | 2018–19 Forecast results | 2019–20 Planned results | Difference (2019–20 Planned results minus 2018–19 Forecast results) |
|--|-----------------------------|----------------------------|--|
| Total expenses | 354,216,898 | 344,613,956 | (9,602,942) |
| Total revenues | 24,799 | 24,799 | 0 |
| Net cost of operations before government funding and transfers | 354,192,099 | 344,589,157 | (9,602,942) |

Expenses

Total expenses, estimated on an accrual basis, are planned to be \$344,613,956 in 2019–20 which is a slight decrease of \$9,602,942 (-2.7%) from the 2018–19 forecast.

Expenses are mainly related to professional and special services, amortization and salaries and fringe benefits. The expenses include planned spending presented in this Departmental Plan as well as expenses not mentioned such as amortization, services provided without charge by other government departments, and severance benefits and vacation pay liability adjustments.

Revenues

Total revenues are projected to be \$1,115,190 in 2019-20. Most of the revenues are generated from the sales of goods and services such testing services provided at the DFL. The Agency's spendable revenues are projected to be \$24,799 and represent revenues from Crown Asset Disposition.

Additional information

Corporate information

Organizational profile

Appropriate minister:

Minister of Innovation, Science and Economic Development:

The Honourable Navdeep Bains, P.C., M.P.

Institutional Head:

Sylvain Laporte, President

Ministerial Portfolio:

Innovation, Science and Economic Development

Enabling Instrument(s):

[Canadian Space Agency Act, S.C. 1990, c. 13](#)^{xxiv}

Year of Incorporation / Commencement:

Established in March 1989

Other:

The Canadian Space Agency was established in 1989. Approximately 84% of its employees work at the headquarters located at the John H. Chapman Space Centre, in St-Hubert, Quebec. The remaining personnel serve the CSA at the David Florida Laboratory in Ottawa, Ontario and its Policy and planning offices in Gatineau, Quebec, with officials in Houston, Washington and Paris.

Raison d’être, mandate and role: who we are and what we do

“Raison d’être, mandate and role: who we are and what we do” is available on the [Canadian Space Agency’s website](#).^{xxiii}

Reporting framework

The Canadian Space Agency Departmental Results Framework and Program Inventory of record for 2019–20 are shown below:

| | | | |
|---------------------------------------|--|--|--------------------------|
| Departmental Results Framework | Core Responsibility: Canada in space | | Internal Services |
| | Departmental Result: Space research and development advances science and technology | Indicator: Business Expenditures in Research and Development in the space sector | |
| | | Indicator: Canada’s rank among OECD nations on the citation score of space-related publications | |
| | Departmental Result: Canadians engage with space | Indicator: Number of new people and organizations entering space related fields as a result of CSA funding | |
| | | Indicator: Number of engagements on social media related to the CSA | |
| | Departmental Result: Space information and technologies improve the lives of Canadians | Indicator: Number of services offered to Canadians dependent on CSA information | |
| | | Indicator: Number of Canadian space technologies adapted for use on earth or re-use in space | |
| | Departmental Result: Canada’s investments in space benefit the Canadian economy | Indicator: Number of highly qualified people in the Canadian space sector | |
| | | Indicator: Value of export of the Canadian space sector | |
| | Program Inventory | Program: Space Capacity Development | |
| Program: Space Exploration | | | |
| Program: Space Utilization | | | |

Supporting information on the Program Inventory

Supporting information on planned expenditures, human resources, and results related to the Canadian Space Agency's Program Inventory is available in the [GC InfoBase](#).^{xxi}

Supplementary information tables

The following supplementary information tables are available on the [Canadian Space Agency's website](#).^{xxiii}

- ▶ Departmental Sustainable Development Strategy
- ▶ Details on transfer payment programs of \$5 million or more
- ▶ Gender-based analysis plus
- ▶ Status report on transformational and major Crown projects

Federal tax expenditures

The tax system can be used to achieve public policy objectives through the application of special measures such as low tax rates, exemptions, deductions, deferrals and credits. The Department of Finance Canada publishes cost estimates and projections for these measures each year in the [Report on Federal Tax Expenditures](#).^{xxv} This report also provides detailed background information on tax expenditures, including descriptions, objectives, historical information and references to related federal spending programs, as well as evaluations, research papers and gender-based analysis. The tax measures presented in this report are the responsibility of the Minister of Finance.

Organizational contact information

[Canadian Space Agency](#)^{xxvi}
Communications and Public Affairs
Telephone: 450-926-4370
Fax: 450-926-4352
Email: asc.medias-media.csa@canada.ca
Website: <http://www.asc-csa.gc.ca>

Appendix: definitions

appropriation (crédit)

Any authority of Parliament to pay money out of the Consolidated Revenue Fund.

budgetary expenditures (dépenses budgétaires)

Operating and capital expenditures; transfer payments to other levels of government, organizations or individuals; and payments to Crown corporations.

Core Responsibility (responsabilité essentielle)

An enduring function or role performed by a department. The intentions of the department with respect to a Core Responsibility are reflected in one or more related Departmental Results that the department seeks to contribute to or influence.

Departmental Plan (plan ministériel)

A report on the plans and expected performance of an appropriated department over a three-year period. Departmental Plans are tabled in Parliament each spring.

Departmental Result (résultat ministériel)

Any change that the department seeks to influence. A Departmental Result is often outside departments' immediate control, but it should be influenced by Program-level outcomes.

Departmental Result Indicator (indicateur de résultat ministériel)

A factor or variable that provides a valid and reliable means to measure or describe progress on a Departmental Result.

Departmental Results Framework (cadre ministériel des résultats)

The department's Core Responsibilities, Departmental Results and Departmental Result Indicators.

Departmental Results Report (rapport sur les résultats ministériels)

A report on the actual accomplishments against the plans, priorities and expected results set out in the corresponding Departmental Plan.

evaluation (évaluation)

In the Government of Canada, the systematic and neutral collection and analysis of evidence to judge merit, worth or value. Evaluation informs decision making, improvements, innovation and accountability. Evaluations typically focus on programs, policies and priorities and examine questions related to relevance, effectiveness and efficiency. Depending on user needs, however, evaluations can also examine other units, themes and issues, including alternatives to existing interventions. Evaluations generally employ social science research methods.

experimentation (expérimentation)

Activities that seek to explore, test and compare the effects and impacts of policies, interventions and approaches, to inform evidence-based decision-making, by learning what works and what does not.

full-time equivalent (équivalent temps plein)

A measure of the extent to which an employee represents a full person-year charge against a departmental budget. Full-time equivalents are calculated as a ratio of assigned hours of work to scheduled hours of work. Scheduled hours of work are set out in collective agreements.

gender-based analysis plus (GBA+) (analyse comparative entre les sexes plus [ACS+])

An analytical process used to help identify the potential impacts of policies, Programs and services on diverse groups of women, men and gender-diverse people. The “plus” acknowledges that GBA goes beyond sex and gender differences. We all have multiple identity factors that intersect to make us who we are; GBA+ considers many other identity factors, such as race, ethnicity, religion, age, and mental or physical disability.

government-wide priorities (priorités pangouvernementales)

For the purpose of the 2019–20 Departmental Plan, government-wide priorities refers to those high-level themes outlining the government’s agenda in the 2015 Speech from the Throne, namely: Growth for the Middle Class; Open and Transparent Government; A Clean Environment and a Strong Economy; Diversity is Canada's Strength; and Security and Opportunity.

horizontal initiative (initiative horizontale)

An initiative where two or more departments are given funding to pursue a shared outcome, often linked to a government priority.

non-budgetary expenditures (dépenses non budgétaires)

Net outlays and receipts related to loans, investments and advances, which change the composition of the financial assets of the Government of Canada.

performance (rendement)

What an organization did with its resources to achieve its results, how well those results compare to what the organization intended to achieve, and how well lessons learned have been identified.

performance indicator (indicateur de rendement)

A qualitative or quantitative means of measuring an output or outcome, with the intention of gauging the performance of an organization, Program, policy or initiative respecting expected results.

Performance Information Profile (profil de l'information sur le rendement)

The document that identifies the performance information for each Program from the Program Inventory.

performance reporting (production de rapports sur le rendement)

The process of communicating evidence-based performance information. Performance reporting supports decision making, accountability and transparency.

plan (plan)

The articulation of strategic choices, which provides information on how an organization intends to achieve its priorities and associated results. Generally a plan will explain the logic behind the strategies chosen and tend to focus on actions that lead up to the expected result.

planned spending (dépenses prévues)

For Departmental Plans and Departmental Results Reports, planned spending refers to those amounts presented in the Main Estimates.

A department is expected to be aware of the authorities that it has sought and received. The determination of planned spending is a departmental responsibility, and departments must be able to defend the expenditure and accrual numbers presented in their Departmental Plans and Departmental Results Reports.

priority (priorité)

A plan or project that an organization has chosen to focus and report on during the planning period. Priorities represent the things that are most important or what must be done first to support the achievement of the desired Departmental Results.

Program (programme)

Individual or groups of services, activities or combinations thereof that are managed together within the department and focus on a specific set of outputs, outcomes or service levels.

Program Inventory (répertoire des programmes)

Identifies all of the department's programs and describes how resources are organized to contribute to the department's Core Responsibilities and Results.

result (résultat)

An external consequence attributed, in part, to an organization, policy, Program or initiative. Results are not within the control of a single organization, policy, Program or initiative; instead they are within the area of the organization's influence.

statutory expenditures (dépenses législatives)

Expenditures that Parliament has approved through legislation other than appropriation acts. The legislation sets out the purpose of the expenditures and the terms and conditions under which they may be made.

sunset program (programme temporisé)

A time-limited program that does not have an ongoing funding and policy authority. When the program is set to expire, a decision must be made whether to continue the program. In the case of a renewal, the decision specifies the scope, funding level and duration.

target (cible)

A measurable performance or success level that an organization, Program or initiative plans to achieve within a specified time period. Targets can be either quantitative or qualitative.

voted expenditures (dépenses votées)

Expenditures that Parliament approves annually through an Appropriation Act. The Vote wording becomes the governing conditions under which these expenditures may be made.

Endnotes

- i STDP, <http://asc-csa.gc.ca/eng/funding-programs/programs/stdp/default.asp>
- ii Curiosity, <http://www.asc-csa.gc.ca/eng/astronomy/mars/curiosity.asp>
- iii OSIRIS-Rex, <http://www.asc-csa.gc.ca/eng/satellites/osiris-rex/default.asp>
- iv Minister of ISED mandate letter, <https://pm.gc.ca/eng/minister-innovation-science-and-economic-development-mandate-letter>
- v Minister of Science mandate letter, <https://pm.gc.ca/eng/minister-science-mandate-letter>
- vi Innovation and Skills Plan, <http://www.ic.gc.ca/eic/site/062.nsf/eng/home>
- vii RCM, <http://www.asc-csa.gc.ca/eng/satellites/radarsat/default.asp>
- viii David Saint-Jacques's Mission, <http://www.asc-csa.gc.ca/eng/missions/expedition58-59/default.asp>
- ix Canada-European Space Agency Cooperation Agreement, <http://asc-csa.gc.ca/eng/funding-programs/canada-esa/about-cooperation-agreement.asp>
- x RADARSAT-2, <http://www.asc-csa.gc.ca/eng/satellites/radarsat2/default.asp>
- xi ASTROSAT, <http://www.asc-csa.gc.ca/eng/sciences/astrosat.asp>
- xii XRISM, <http://www.asc-csa.gc.ca/eng/satellites/xrism/default.asp>
- xiii SCISAT, <http://www.asc-csa.gc.ca/eng/satellites/scisat/default.asp>
- xiv Vascular Echo, <http://www.asc-csa.gc.ca/eng/sciences/vascular.asp>
- xv At Home in space, <http://www.asc-csa.gc.ca/eng/sciences/at-home-in-space.asp>
- xvi Bio-Monitor, <http://www.asc-csa.gc.ca/eng/sciences/bio-monitor.asp>
- xvii Bio-Analyzer, <http://www.asc-csa.gc.ca/eng/iss/bio-analyzer.asp>
- xviii SWOT, <http://www.asc-csa.gc.ca/eng/satellites/swot.asp>
- xix RADARSAT-1, <http://www.asc-csa.gc.ca/eng/satellites/radarsat1/Default.asp>
- xx EOADP, <http://www4.asc-csa.gc.ca/auot-eoau/eng/eoadp/Home.aspx>
- xxi GC InfoBase, <https://www.tbs-sct.gc.ca/ems-sgd/edb-bdd/index-eng.html#start>
- xxii 2018–19 Main Estimates, <https://www.canada.ca/en/treasury-board-secretariat/services/planned-government-spending/government-expenditure-plan-main-estimates.html>
- xxiii Reports to Parliament, <http://asc-csa.gc.ca/eng/publications/rp.asp>
- xxiv Canadian Space Agency Act, <http://laws.justice.gc.ca/eng/acts/C-23.2/page-1.html>
- xxv Report on Federal Tax Expenditures, <http://www.fin.gc.ca/purl/taxexp-eng.asp>
- xxvi Canadian Space Agency, <http://asc-csa.gc.ca>