Canadian Space Agency

2020–21

Departmental Plan

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Minister of Innovation, Science and Industry

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From the Minister

The Honourable Navdeep Bains
Minister of Innovation, Science and Industry

It is my pleasure to present the 2020–21 Departmental Plan for the Canadian Space Agency (CSA). We are working across the Innovation, Science and Economic Development Portfolio to enhance Canada's innovation performance, improve conditions for business investments, increase Canada's share of global trade, and build a fair and efficient marketplace that promotes consumer choice and competition.

We will continue to work with provinces, territories, municipalities, Indigenous groups, industry, stakeholders and all Canadians to deliver an economic agenda that is growing an internationally competitive, knowledge-based economy, while achieving our environmental goals.

CSA will continue to deliver on Canada's new chapter in space by implementing the Canadian Space Strategy: *Exploration, Imagination, Innovation.*[i] This strategy 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. Canada will also continue to partner 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—through our contribution of the next-generation Canadarm3.

Through all these initiatives and more, we are continuing to deliver on our commitment to fostering a dynamic and growing economy that creates jobs, opportunities, and a better quality of life for all Canadians.

Plans at a glance

On March 6, 2019, the Minister of Innovation, Science and Economic Development announced the Canadian Space Strategy: *Exploration, Imagination, Innovation*[i]. This strategy aims to 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. This strategy is aligned with the Minister's mandate letter[ii], which states that the Minister shall support innovation ecosystems across the country and increase productivity and innovation. As a result, in 2020–21, the CSA's key priorities, as outlined in the Canadian Space Strategy, are fully in line with its Departmental Results Framework and program inventory, and will enable the CSA to make progress on achieving its mandate, as well as Government of Canada commitments to and for Canadians.

Priority 1—Lunar Program

Together, the Government's investment of $2.05 billion over 24 years in a next-generation robotics system for the Lunar Gateway[iii] and the Lunar Exploration Accelerator Program[iv] (LEAP) represent the cornerstone of the new Canadian Space Strategy. These investments will contribute to advancements in science and technology and ensure Canada remains a leading spacefaring nation. In 2020–21, requests for proposals under LEAP will be published for Canadian payloads that will be launched into space, which will be the first step in positioning Canada's commercial space sector to help grow the Canadian economy and create the jobs of the future.

Priority 2—Provide data and new capabilities to Other Government Departments through the operation of the RADARSAT Constellation Mission (RCM)

In 2020-21, RCM[v] earth observation satellites will provide an unprecedented amount of near-real-time Earth observation data. In partnership with thirteen user departments and agencies, the CSA will seize this opportunity to support the development of new capabilities that harness space to solve daily challenges and improve the lives of Canadians.

Priority 3—Engage young Canadians (Junior Astronauts and CubeSat)

The CSA will continue to implement the Junior Astronauts campaign[vi] in an effort to inspire the next generation of space explorers and get young Canadians excited about space and science. The campaign will culminate with a camp to be held in the summer of 2020, at which selected youth from every province and territory will join astronauts, scientists, and engineers for a week of space training at the CSA headquarters.

The CSA will also continue to implement the Canadian CubeSat Project[vii] (CCP) to engage over 450 post-secondary students in real space missions and provide them with an opportunity to gain the knowledge and skills necessary to become future space experts. Both of these initiatives will not only engage Canadians with space but inspire the next generation of Canadians to reach for the stars.

Priority 4—WildFireSat Mission

In 2020–21, the CSA will invest in the WildFireSat[viii] earth observation mission. This initiative aims to monitor, from space, all active wildfires in Canada on a daily basis. The primary goal of WildFireSat is to support wildfire management. In addition, it will provide more precise information on smoke and air quality conditions across Canada, including more accurate measurements of carbon emitted by wildfires, an important requirement of international agreements on carbon reporting. With the support of Natural Resources Canada (NRCan) and Environment and Climate Change Canada (ECCC), the early Definition Phase contracts with industry will be completed in the summer of 2020. Project planning for the following phases will take place over the fall of 2020. Investments in science missions will contribute to the advancement of science and technology and help to ensure Canada harnesses space to solve daily challenges and improve the lives of Canadians.

For more information on the CSA's plans, priorities and planned results, see the "Core responsibilities: planned results and resources" section of this report.

Core responsibilities: planned results and resources

This section contains detailed information on the department's planned results and resources for each of its 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 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 advance science and technology

Through advancements in science and technology resulting from research and development in the space sector, the CSA enables the first steps in the continuum of change that will result in socio-economic benefits for Canadians.

In addition to providing continuing critical robotic operations on the International Space Station (ISS) with Canadarm2[ix] and Dextre[x], in 2020–21 the CSA will provide opportunities for industry and academia to perform studies and technology developments that will help define options for Canada's participation in international human exploration initiatives beyond low Earth orbit.

Canada's contribution to the Lunar Gateway[iii] will be Canadarm3[xi], a smart robotic system which includes a next-generation robotic arm as well as other equipment and specialized tools which are yet to be determined. Using cutting-edge software and advances in artificial intelligence, this highly-autonomous system will be able to support various activities on this outpost, which will be orbiting the moon by the mid-2,020s.

With the aims of providing new space-based solutions to monitor the Earth and respond to global challenges, the CSA is investigating new technologies such as WildFireSat[viii] which is an

innovative type of infrared sensor. This technology could pave the way for a new satellite concept that would positively impact the lives of Canadians.

Over the course of the year, the QEYSSat[xii] prime contractor will complete the design of the QEYSSat spacecraft and ground segment. 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.

In 2020–21, the CSA will launch the next wave of the Space Technology Development Program (STDP)[xiii] investments in promising technologies, and test innovative systems on demonstration platforms to advance science and technology and to gain flight heritage in preparation for space missions. These investments will lead to the development of new cutting-edge space technologies for the future and ensure Canada remains a leading spacefaring nation. They will also support Canada's Business Expenditures on Research and Development (BERD) in the space sector, which is expected to reach $324M in 2020–21. Another focus for the CSA in 2020–21 is to provide Canadian scientists conducting world-class research with continued access to scientific data.

In support of advancing Earth science and contributing to climate change understanding, the CSA will maintain the operation of the Canadian atmospheric science mission, SCISAT[xiv]. 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, which is critical for the monitoring efforts of the Kigali Amendment of the United Nations Montreal Protocol[xv].

From a space science perspective, CSA's investments in space astronomy and planetary exploration missions will provide opportunities for Canadian scientists to participate in international space missions and gain access to scientific data. In 2020–21, the CSA will continue to support Canadian science teams participating in NASA's Curiosity[xvi] rover mission, the OSIRIS-REx[xvii] asteroid sample-return mission, India's ASTROSAT[xviii] mission, and Japan's X-ray Imaging and Spectroscopy Mission[xix] (XRISM)

By providing access to high-quality scientific data and supporting researchers, the CSA will contribute to science excellence and help maintain Canada's international ranking of 11th place among OECD nations with respect to the average relative citation score of space-related publications.

Result 2—Canadians engage with space

By taking advantage of Canadians' interest in space and by providing opportunities for youth to acquire the skills to pursue studies and careers in Science, Technology, Engineering and Math

(STEM), the CSA will support the development of the next generation of space scientists and engineers.

In 2020–21, the CSA will continue to implement the Canadian CubeSat Project[vii] (CCP). The CCP provides Canadian professors in post-secondary institutions with the opportunity to engage their students in real space missions. Through this national initiative, 15 teams from across Canada are offered the unique opportunity to design and build their own miniature satellite, called a CubeSat. In 2020–21, the CSA will invite more than 40 students 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 2020–21, CSA experts will also visit the teams in Yukon and Northwest Territories, in order to provide training tailored to their specific needs. Finally, CSA experts will attend the regional Critical Design Reviews, where the 15 teams will present the final designs of their CubeSats.

The CSA will also continue to implement the Junior Astronauts[vi] campaign, through which young Canadians can test their skills and knowledge with activities in science and technology, fitness and nutrition, and teamwork and communications. Selected participating schools and youth organizations will be visited by astronauts and space experts in the spring of 2020. In addition, participating students in grades 6 to 9 across Canada can enter a draw to be invited to the CSA's headquarters in the summer of 2020 for a week of training with astronauts, scientists, and engineers.

In 2020-21, CSA's stratospheric balloon program, STRATOS, will provide Canadian academia and industry with the opportunity to test and validate new technologies and perform scientific experiments in a near-space environment, while inspiring and training the next generation of experts.

As part of its commitment to support the development of the next generation of space professionals in Canada and to foster future international collaboration with other countries, the CSA will support the NASA International Internship (NASA I^2) Project. NASA I^2 internships provide selected candidates with the opportunity to work in a NASA research centre, function as a member of a multinational team, benefit from the mentorship of remarkable NASA scientists and researchers, and broaden their hands-on experience to become tomorrow's space experts.

The CSA uses social media engagements as an indicator of interest in Canada's Space Program. It is expected that the CSA's social media platforms will generate approximately two million engagements on social media in 2020–21. It is also expected that 500 new people and organizations will enter space-related fields as a result of CSA funding.

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

The CSA currently supports other government departments and agencies in the delivery of their mandates by providing access to space data, information, and services and encourages the development of space technologies that have the potential for use on Earth or re-use in space.

In 2020–21, the CSA will continue to provide high-quality data and delivery services to various government departments and agencies through the operation of RCM[v] earth observation satellites, which entered into service in December of 2019. The data generated from RCM will contribute to an increased quality and volume of products and services already being offered, such as land use evolution, coastal changes, agriculture mapping, 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, 13 federal departments and agencies are using RADARSAT data to deliver on their mandates, including ECCC, Fisheries and Oceans Canada (DFO), the Department of National Defence, Agriculture and Agri-Food Canada, NRCan, and the Public Health Agency of Canada. It is expected that more than 90 products and services will be delivered to Canadians by federal departments and agencies using CSA supported space-based data and services.

The CSA, through its renewed application development initiative, now called smartEarth[xx] initiative, will support the development of innovative solutions derived from satellite data in 2020–21. This will be done through a modernized collaborative approach with stakeholders from the GoC, as well as industry and academia. One of the supported activities for the next 3 years, in collaboration with DFO and Transport Canada, is to explore and develop innovative solutions in which satellite data can be used to contribute to the protection and environmental management of North Atlantic Right Whales (NARW) in Canadian waters.

The CSA will also continue to support the joint NASA-CNES (Centre national d'études spatiales) Surface Water Ocean Topography [xxi](SWOT) hydrological science mission. SWOT data will enable accurate measurements of Canada's water resources, to better understand the dynamics of the world's oceans and terrestrial surface water and address important global issues like climate change and management of water as a strategic resource. This could lead to improvements in water-related services in Canada, such as weather predictions and flood-warning systems. This mission is conducted in collaboration with ECCC and DFO.

In addition, in 2020–21 the CSA will engage in a whole-of-government dialogue to enhance the full exploitation of the value of space-based data and transform them into actionable information for natural resources, agriculture, water management, and security.

Through its participation in the ISS[xxii] , the CSA will also support a series of scientific experiments, such as Vection[xxiii] and Vascular Aging[xxiv]. The latter will use the Bio-Monitor, a Canadian technology, which was deployed on the ISS in 2019–20 by Canadian astronaut David Saint-Jacques to observe and record astronauts' vital signs. These advancements in science and technology are aimed at preparing for long duration space flights and are also expected to find applications on Earth in areas such as cardiovascular disease, ageing, Parkinson's disease, and health-care delivery in remote and isolated areas.

The CSA will also work with partners to launch collaborative R&D initiatives with the health and biomedical sector, and to undertake the planning of a demonstration site in a remote Northern and Indigenous community, where early proof-of-concepts of health care solutions could be conducted, both for human spaceflight and isolated communities.

In 2020–21, it is expected that 12 technological spin-offs resulting from the CSA's past investments will benefit Canadians.

Result 4—Canada's investments in space benefit the Canadian economy

In 2020–21, 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.

Through initiatives such as the STDP[xiii] funding initiative, the CSA will support the development of technologies needed for future space missions and improve the commercial potential of innovative ones. The CSA, through LEAP[iv], will help small and medium-sized companies develop new technologies to be used and tested in lunar orbit and on the moon's surface in fields such as artificial intelligence, robotics and health. In 2020–21, the CSA will support small and medium enterprises to capture the future lunar economy by supporting technology development for future commercialization opportunities for lunar missions, and initiating demonstration opportunities for science and/or technology on the lunar surface, lunar orbit or deep space. Key milestones for the LEAP program in 2020–21 include the award of contributions to Canadian companies to help them insert themselves in the supply chain of lunar spacecraft providers and to enable first-time demonstrations of Canadian technologies on or around the moon.

The CSA will also support the competitiveness and capacity of the Canadian space sector on the international market through the long-standing Canada-European Space Agency (ESA) Cooperation Agreement[xxv]. Investments in selected ESA programs will allow Canadian industry to participate in world-class missions in Earth observation, satellite communications, exploration, and technology development areas.

In the spring of 2020, 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 ISED's Innovative Solutions Canada[xxvi] 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 determine which technologies should progress to a second phase of funding.

The CSA's investments presented in this Departmental Plan seek to ensure that the Canadian space sector develops value-added services and ensures that the value of Canada's space sector

exports is maintained. As such, in 2020–21, it is expected that CSA investments will contribute to the Canadian space sector's $2B in exports and maintain 4,250 highly qualified jobs in Canada.

Gender-based analysis plus

The space sector is a science, technology, engineering, and mathematics (STEM)-intensive sector. As a result, the anticipated increase in these types of jobs is expected to directly benefit men more, given that they are more likely to have pursued studies and be employed in these areas. For example, approximately 20 per cent of workers are women in the aerospace products and parts manufacturing sector, which includes both space and non-space aerospace manufacturing.

The CSA is committed to encouraging firms to actively consider women and underrepresented groups in their hiring plans related to Lunar Gateway[iii] robotics and LEAP[iv] activities. Women and underrepresented groups can benefit from the anticipated increase in STEM jobs that LEAP will help create, because an increasing number of women and underrepresented groups are graduating with STEM degrees. Furthermore, procurement and contributions by the CSA for activities under the LEAP Science and Technology and Health streams will include provisions in corresponding contracts to encourage firms to actively consider women and underrepresented groups.

All Junior Astronaut campaign activities will be accessible, inclusive, and easily available to all young Canadians. Measures have been put in place to encourage the participation of youth living in locations that are hard to reach digitally. For example, in addition to working with many partners across the country, the CSA has awarded a contract to distribute and deliver Junior Astronauts campaign activities across Canada with emphasis on Northern or remote Canadian communities.

United Nations' 2030 Agenda for Sustainable Development and the UN Sustainable Development Goals (SDGs)

Many of CSA's satellites and missions contribute to the achievement of the UN SDGs[xxvii]. For example, RCM's earth observation data will help to ensure sustainable food production systems and strengthen capacity for adaptation to climate change, extreme weather, drought, flooding, and other disasters (SDG 2.4[xxviii]). In addition, CSA's science and earth observation missions, including, SciSat[xiv], SWOT[xxi], and WildfireSat[viii], will strengthen resilience and adaptive capacity to climate-related hazards and natural disasters. (SDG 13.1[xxix].)

CSA's initiatives such as LEAP[iv] and STDP[xiii] contribute to the reduction of Canadians living in poverty (SDG 1.2[xxx]) by contributing to higher levels of economic productivity through

diversification, technological upgrading, and innovation (SDG 8.2[xxxi]) and by supporting job creation, entrepreneurship, and innovation. (SDG 8.3[xxxi])

Through the Junior Astronaut[vi] campaign and the Canadian CubeSat[vii] project, the CSA contributes to increasing the number of youth and adults who pursue education and skills development (SDG 4.4[xxxii]). Both projects are designed to empower and promote the social, economic, and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion, economic, or other status. (SDG 10.2[xxxiii])

The implementation of internal measures, such as the introduction of workplace composting, will result in less waste generation (SDG 12.3[xxxiv]). The modernization of CSA's fleet to zero emission or hybrid vehicles and other measures will improve the agency's energy efficiency. (SDG 7.3[xxxv])

Finally, through the equal representation of women and men on the executive committee, the CSA helps to ensure women's full and effective participation and equal opportunities for leadership. (SDG 5.5[xxxvi])

Experimentation

In 2020–21, the CSA will approve a Lunar STEM Strategy implementation plan, and in doing so is experimenting with new ways to reach out to Canadian youth and encourage them to consider STEM opportunities for their studies and future careers. The implementation plan will address how to target K-12 age groups in different geographic locations (including region-specific opportunities in the North), using the following five streams of activities:

- Teach the Teachers,
- Space Brain-hack,
- Building an AI-enabled robot,
- Commanding a rover, and
- Mars on Earth analogue activities.

These streams will be scaled up and scaled back based on their individual performance. Lessons learned from the Junior Astronauts[vi] campaign (which will fall under the umbrella of this Lunar STEM Strategy) will also be considered in the development of the streams.

Planned results for Canada in space

Departmental result	Departmental result indicator	Target	Date to achieve target	2016–17 actual result	2017–18 actual result	2018–19 actual result
1: Space research and development advances science and technology	I1: Business Expenditures in Research and Development (BERD) in the space sector	$324M[1]	March 31, 2021	$256M (2015)	$254M (2016)	$363M (2017)
	I2: Canada's rank among OECD nations on the citation score of space-related publications	11[2]	March 31, 2021	N/A New indicator	11 (2016)	11 (2017)
2: Canadians engage with space	13: Number of new people and organizations entering space-related fields as a result of CSA funding	500	March 31, 2021	N/A New indicator	N/A New indicator	206 (2017)
	I4: Number of engagements on social media related to the CSA	2,000,000[3]	March 31, 2021	2,351,059 (2017)	2,591,031 (2017)	3,884,506 (2018)

1 The CSA uses a three-year rolling average, which includes unpublished data from 2018.

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 past decade suggests that Canada's rank will remain stable for 2020–21.

3 2018–19 was an exceptional year for the CSA's social media accounts with the highly successful and visible campaign around Astronaut David Saint-Jacques' mission to the International Space Station. 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 which also factors in the 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 restricted, which in turn limits potential engagements)

Departmental result	Departmental result indicator	Target	Date to achieve target	2016–17 actual result	2017–18 actual result	2018–19 actual result
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)	100	March 31, 2021	N/A New indicator	83 (2017)	96 (2018)
	I6: Number of Canadian space technologies adapted for use on Earth or re-use in space	12[4]	March 31, 2021	N/A New Indicator	13 (2016)	16 (2017)
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, 2021	4,264 (2015)	4,085 (2016)	4,302 (2017)
	I8: Value of exports of the Canadian space sector	$2B[5]	March 31, 2021	$1.6B (2015)	$2B (2016)	$2.1 B (2017)

Financial, human resources and performance information for the Canadian Space Agency's program inventory is available in the GC InfoBase[xxxvii].

[4] The CSA uses a seven-year rolling average for this measure and given that multiple years had fewer technology transfers, the target is lower compared with last year's result.

[5] The CSA uses 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.

Planned budgetary financial resources for Canada in space

2020–21 budgetary spending (as indicated in Main Estimates)	2020–21 planned spending	2021–22 planned spending	2022–23 planned spending
273 383	342 260	316 803	321 966

Financial, human resources and performance information for the Canadian Space Agency program inventory is available in the GC InfoBase[xxxvii].

Planned human resources for Canada in space

2020–21 planned full-time equivalents	2021–22 planned full-time equivalents	2022–23 planned full-time equivalents
401.1	400.9	400.3

Financial, human resources and performance information for the Canadian Space Agency's program inventory is available in the GC InfoBase[xxxvii].

Internal Services: planned results

Description

Internal Services are groups of related activities and resources that the federal government considers to be services in support of Programs and/or required to meet the corporate obligations of an organization. Internal Services refer 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

Planning highlights

To ensure the modern, efficient and relevant delivery of internal services, in 2020–2021 the CSA will continue to improve its internal services processes and its business models, in order to align itself, strategically and operationally, with its international partners, stakeholders, academia, and other government departments.

In 2020–21, the CSA will implement an Integrated Investment Planning Framework to deliver on the space strategy objectives. The framework would build on processes and practices already in place within the organization and its added value will be the strengthening of end-to-end integrated portfolio planning to ensure delivery of a balanced space program aligned with recognized priorities. The CSA will also update its investment plan to deliver on the Strategy.

In 2020–21, the CSA will continue to improve its performance measurement methodologies, to ensure that the data collected remain relevant. As part of its efforts to implement the Gender-based Analysis Plus (GBA+), the CSA will review its program performance indicators, to ensure that the relevant gender and diversity data are available to support decision-making. The CSA will also launch and present the results of the 2020 study for the Canadian space sector.

To ensure a healthy, safe, diversified and inclusive workplace that provides employees with the best possible conditions to support the achievement of dedicated initiatives to serve the interests of Canadians and fosters an agile, inclusive and equipped public service, the CSA will focus its efforts in 2020–2021 on:

- updating its workforce management strategic planning;
- developing and improving psychologically safe leadership, renewing its continuous learning strategy, and skills development;
- recruiting and integrating the next generation;
- modernizing and automating its human resources and financial management business processes, based on HR and Finance data analysis;
- pay system stabilization efforts.

In 2020–21, the CSA will continue to roll out its three-year departmental security plan, with the objective of mitigating the main organizational risks to departmental security, and will continue to raise employees' awareness of the importance of security issues. The CSA will also pursue the roll-out of its five-year workforce retention plan and its long-term greening government action plan, so that its activities have a low carbon footprint and meet government targets.

The CSA will also continue its digital transformation efforts by modernizing its infrastructure and tools, so as to optimize the work environment and promote employee mobility. Adopting cloud solutions will, for example, make Information Technologies more agile in responding to employees' needs. Moreover, the coming into force of the Directive on Service and Digital in April 2020 will help the CSA to update its digital operations, by providing greater flexibility, openness, and user-friendliness. The introduction of the Data Expertise Centre will also enable the CSA to advance the activities needed to develop a new data-based governance and culture.

Planned budgetary financial resources for Internal Services

2020–21 budgetary spending (as indicated in Main Estimates)	2020–21 planned spending	2021–22 planned spending	2022–23 planned spending
52 643	52 643	55 576	54 369

Planned human resources for Internal Services

2020–21 planned full-time equivalents	2021–22 planned full-time equivalents	2022–23 planned full-time equivalents
303.1	300.9	300.5

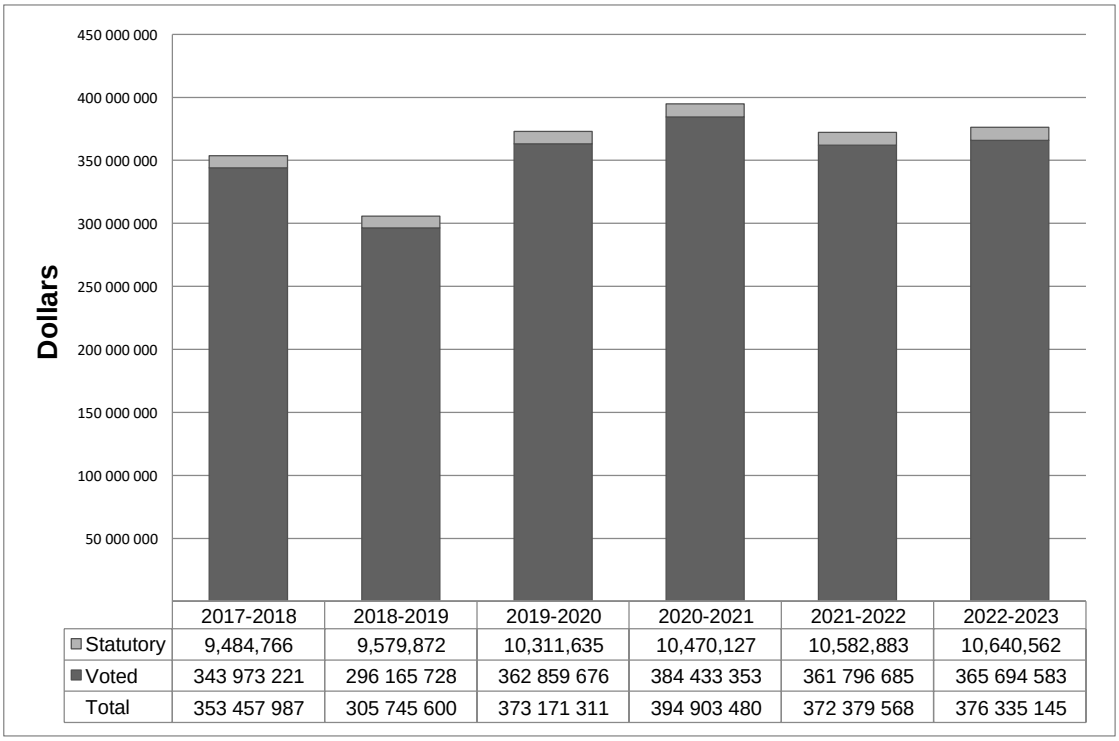
Spending and human resources

This section provides an overview of the department's planned spending and human resources for the next three consecutive fiscal years, and compares planned spending for the upcoming year with the current and previous years' actual spending.

Planned spending

Departmental spending 2017–18 to 2022–23

The following graph presents planned (voted and statutory) spending over time.



	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
Statutory	9,484,766	9,579,872	10,311,635	10,470,127	10,582,883	10,640,562
Voted	343 973 221	296 165 728	362 859 676	384 433 353	361 796 685	365 694 583
Total	353 457 987	305 745 600	373 171 311	394 903 480	372 379 568	376 335 145

Budgetary planning summary for core responsibilities and Internal Services (dollars)

The following table shows actual, forecast and planned spending for each of Canadian Space Agency's core responsibilities and for Internal Services for the years relevant to the current planning year.

Core responsibilities and Internal Services	2017–18 expenditures	2018–19 expenditures	2019–20 forecast spending	2020–21 budgetary spending (as indicated in Main Estimates)	2020–21 planned spending	2021–22 planned spending	2022–23 planned spending
Canada in Space	293,157,159	254,711,091	320,299,330	273,383,417	342,260,480	316,803,345	321,965,782
Subtotal	293,157,159	254,711,091	320,299,330	273,383,417	342,260,480	316,803,345	321,965,782
Internal Services	60,300,828	51,034,509	52,871,981	52,643,000	52,643,000	55,576,223	54,369,363
Total	353,457,987	305,745,600	373,171,311	326,026,417	394,903,480	372,379,568	376,335,145

The difference in the CSA's expenditures profile since 2017–2018 is mainly attributable to investments in the RCM announced in Budget 2010, as well as the accelerated infrastructure plan to support capital infrastructure maintenance projects. The CSA also received additional funding from other departments to support the RCM.

The difference in the planned expenditures profile until 2022–23 is mainly attributable to investments in Canada's participation in the International Space Station (ISS) until 2024, announced in Budget 2016, as well as investments in the Lunar Exploration Accelerator Program announced in Budget 2019.

It is noteworthy that the CSA's project and mission funding profile varies from year to year, depending on the status of each mission, which has an impact on expenditures, forecast spending, and planned spending.

Planned human resources

The following table shows actual, forecast and planned full-time equivalents (FTEs) for each core responsibility in the Canadian Space Agency's departmental results framework and for Internal Services for the years relevant to the current planning year.

Human resources planning summary for core responsibilities and Internal Services

Core responsibilities and Internal Services	2017–18 actual full-time equivalents	2018–19 actual full-time equivalents	2019–20 forecast full-time equivalents	2020–21 planned full-time equivalents	2021–22 planned full-time equivalents	2022–23 planned full-time equivalents
Canada in Space	387.3	390.3	392.3	401.1	400.9	400.3
Subtotal	387.3	390.3	392.3	401.1	400.9	400.3
Internal Services	266.7	271.2	301.1	303.1	300.9	300.5
Total	**654.0**	**661.5**	**693.4**	**704.2**	**701.8**	**700.8**

The gradual increase in the number of FTEs since 2017–2018 is mainly attributable to the additional resources required to fill certain gaps and follow up on priorities, including:

- additional scientific and technical staff to support the activities of the International Space Station (ISS) until 2024;
- increased investments in student programs, to attract the next generation of public servants;
- new departmental requirements for internal services, such as managing Phoenix, setting up a data expertise centre, results-based accountability, and policy reset.

Estimates by vote

Information on the Canadian Space Agency's organizational appropriations is available in the 2020–21 Main Estimates[xxxviii].

Condensed future-oriented statement of operations

The condensed future-oriented statement of operations provides an overview of the Canadian Space Agency's operations for 2019–20 to 2020–21.

The amounts for forecasts and planned results in this statement of operations were prepared on an accrual basis. The amounts for forecasts and planned spendings presented in other sections of the Departmental Plan were prepared on an expenditure basis. Amounts may therefore 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[xxxix].

Condensed future-oriented statement of operations for the year ending March 31, 2021 (dollars)

Financial information	2019–20 forecast results	2020–21 planned results	Difference (2020–21 planned results minus 2019–20 forecast results)
Total expenses	360,185,432	355,965,295	(4,220,137)
Total revenues	23,825	23,825	0
Net cost of operations before government funding and transfers	360,161,607	355,941,470	(4,220,137)

Expenses

Total expenses, estimated on an accrual basis, are planned to be $355,965,295 in 2020–21 which is a slight decrease of $4,220,137 (-1.17%) from 2019-20 forecast.

Expenses are mainly related to professional and special services, amortization, salaries and fringe benefits and transfer payments. 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 $890,801 in 2020–21. Most of the revenues are generated from the sales of goods and services such as testing services provided at the David Florida

Laboratory, and are not respendable. The Agency's respendable revenues are projected to be $23,825, and represent revenues from Crown Asset Disposition.

Corporate information

Organizational profile

Appropriate minister:
Minister of Innovation, Science and Industry:
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[xl]

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[xxxix].

For more information on the department's organizational mandate letter commitments, see the "Minister's mandate letter"[xli]

Operating context

Information on the operating context is available on the CSA's website[xxxix].

Reporting framework

The Canadian Space Agency's approved departmental results framework and program inventory for 2020–21 are as follows.

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[xxxvii].

Supplementary information tables

The following supplementary information tables are available on the Canadian Space Agency's website[xxxix]:

- Departmental Sustainable Development Strategy
- Details on transfer payment programs
- Gender-based analysis plus
- Horizontal initiatives
- Status report on transformational and major Crown projects
- Up-front multi-year funding

Federal tax expenditures

The Canadian Space Agency's Departmental Plan does not include information on tax expenditures that relate to its planned results for 2020–21.

Tax expenditures are the responsibility of the Minister of Finance, and the Department of Finance Canada publishes cost estimates and projections for government-wide tax expenditures each year in the Report on Federal Tax Expenditures[xlii]. This report provides detailed information on tax expenditures, including objectives, historical background 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 solely the responsibility of the Minister of Finance.

Organizational contact information

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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 a department over a 3-year period. Departmental Plans are tabled in Parliament each spring.

departmental priority (priorité ministérielle)

A plan or project that a department has chosen to focus and report on during the planning period. Departmental priorities represent the things that are most important or what must be done first to support the achievement of the desired departmental results.

departmental result (résultat ministériel)

A consequence or outcome that a department seeks to achieve. 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)

A framework that consists of the department's core responsibilities, departmental results and departmental result indicators.

Departmental Results Report (rapport sur les résultats ministériels)

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

experimentation (expérimentation)

The conducting of activities that seek to first explore, then test and compare, the effects and impacts of policies and interventions in order to inform evidence-based decision-making, and improve outcomes for Canadians, by learning what works and what doesn't. Experimentation is related to, but distinct from innovation (the trying of new things), because it involves a rigorous comparison of results. For example, using a new website to communicate with Canadians can be an innovation; systematically testing the new website against existing outreach tools or an old website to see which one leads to more engagement, is experimentation.

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 assess how diverse groups of women, men and gender-diverse people experience policies, programs and services based on multiple factors including race, ethnicity, religion, age, and mental or physical disability.

government-wide priorities (priorités pangouvernementales)

For the purpose of the 2020–21 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 in which two or more federal organizations 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 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.

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.

strategic outcome (résultat stratégique)
A long-term and enduring benefit to Canadians that is linked to the organization’s mandate, vision and core functions.

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] *Exploration, Imagination, Innovation* — A New Space Strategy for Canada, https://www.asc-csa.gc.ca/pdf/eng/publications/space-strategy-for-canada.pdf
[ii] Minister Mandate Letter, http://www.ic.gc.ca/eic/site/062.nsf/eng/home
[iii] Lunar Gateway, https://www.asc-csa.gc.ca/eng/astronomy/moon-exploration/lunar-gateway.asp
[iv] LEAP, https://www.asc-csa.gc.ca/eng/funding-programs/programs/leap/about.asp
[v] RCM, https://www.asc-csa.gc.ca/eng/satellites/radarsat/default.asp
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[xviii] ASTROSAT, https://www.asc-csa.gc.ca/eng/sciences/astrosat.asp
[xix] XRISM, https://www.asc-csa.gc.ca/eng/satellites/xrism/default.asp
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[xxi] SWOT, https://www.asc-csa.gc.ca/eng/satellites/swot.asp
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[xxiii] Vection, https://www.asc-csa.gc.ca/eng/sciences/vection.asp
[xxiv] Vascular, https://www.asc-csa.gc.ca/eng/sciences/vascular.asp
[xxv] Canada-ESA Cooperation Agreement, https://www.asc-csa.gc.ca/eng/funding-programs/canada-esa/about-cooperation-agreement.asp
[xxvi] Innovative Solutions Canada, https://www.ic.gc.ca/eic/site/101.nsf/eng/home
[xxvii] UN SDG, https://sustainabledevelopment.un.org/?menu=1300
[xxviii] SDG 2, https://sustainabledevelopment.un.org/sdg2
[xxix] SDG 13, https://sustainabledevelopment.un.org/sdg13
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[xlii] Report on Federal Tax Expenditures, https://www.canada.ca/en/department-finance/services/publications/federal-tax-expenditures.html