

Canadian Space Agency

2020–21

Departmental Plan
**Supplementary Information
Tables**

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Departmental Sustainable Development Strategy

2020 to 2023 Short-form Departmental Sustainable Development Strategy

Name of department	Canadian Space Agency
Date	February 2020
Context	<p>Although the Canadian Space Agency is not bound by the <i>Federal Sustainable Development Act</i> and is not required to develop a full departmental sustainable development strategy, the Canadian Space Agency adheres to the principles of the Federal Sustainable Development Strategy (FSDS) by complying with the <i>Policy on Green Procurement</i>.</p> <p>The <i>Policy on Green Procurement</i> supports the Government of Canada's effort to promote environmental stewardship. In keeping with the objectives of the policy, the Canadian Space Agency supports sustainable development by integrating environmental performance considerations into the procurement decision-making process through the actions described in the 2019 to 2022 FSDS "Greening Government" goal.</p>
Commitments	All departments must support transition to a low-carbon economy by taking environmental considerations into account in their purchasing decisions. Accordingly, departments, as defined in Section 2 of the <i>Financial Administration Act</i> and listed in Schedules I, 1.1 and II of that Act, that are currently bound by the <i>Policy on Green Procurement</i> are to state their green procurement plans in support of the 2019 to 2022 FSDS "Greening Government" goal by completing the table on the next page.
Integrating sustainable development	<p>By the nature of its activities and mission, the CSA integrates the environment, social and economic considerations in its daily operations. More specifically, the Canadian Space Agency supports sustainable development through the development and operation of Earth observation satellites and related applications and research. The Space Utilization sector ensures that space data reflect the needs and requirements of the public sector and support government plans to promote innovation, science and international collaboration in key sectors such as the environment, climate change, agriculture, security, natural resources, energy, health and the North.</p> <p>By providing data and images that are essential to understanding the signs and effects of climate change, these efforts contribute to the monitoring and protection of the environment, improve natural resource management and uphold the safety and security of Canadians and the international community. Through this work, the Agency supports the following objectives of the Federal Sustainable Development Strategy: effective action on climate change, healthy coasts and oceans, pristine lakes and rivers, sustainably managed lands and forests and safe and healthy communities.</p> <p>To expand the scope of its actions and comply with the greening government objective, the CSA plans to step up its efforts to integrate sustainable development into its policies, internal processes, real estate operations and purchasing. A vision, complete with internal objectives, has been developed to guide its approach and make its commitment official. A strategic plan will also be completed by the end of 2020, to communicate the CSA's commitments to its employees and the public.</p>

Supplementary Information Tables

	The Canadian Space Agency will continue to ensure that its decision-making process includes consideration of FSDS goals and targets through its Strategic Environmental Assessment (SEA) process. An SEA for policy, plan or program proposals includes an analysis of the impacts of the given proposal on the environment, including on FSDS goals and targets.
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FSDS goal: Greening Government

FSDS target	FSDS contributing actions	Corresponding departmental action(s)	Contribution by each departmental action to the FSDS goal and target	Starting point(s), target(s) and performance indicator(s) for departmental actions	Link to the department's Program Inventory
Actions supporting the Greening Government goal and the <i>Policy on Green Procurement</i>	Departments will use environmental criteria to reduce the environmental impact and ensure best value in government procurement decisions	<p>Action 1: Establish the current situation for goods and services purchased:</p> <ul style="list-style-type: none"> Use the services of Public Services and Procurement Canada's Greening Government Operations Office to identify, analyze, and obtain a report on buying patterns and operational requirements to identify top relevant goods and services and their environmental impacts; and; Set departmental targets to reduce the environmental impact on the most relevant goods and services. 		<p>Starting point: 2020 / Baseline data not available</p> <p>Target: By 2022, the report is obtained and targets are identified.</p> <p>Performance indicator:</p> <ul style="list-style-type: none"> Date that the report is obtained; and; Date that the targets identified. 	Internal Services
		<p>Action 2: Implement a Green Procurement Directive to structure the integration of environmental considerations</p>	These actions will help to support the FSDS goal on greening government by reducing the Government of Canada's GHG	<p>Starting point: 2019</p> <p>Target: Green Procurement Directive ready to be implemented by the end of 2020</p>	

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		into our procurement processes.	emissions intensity from goods and services purchases and ensure best value in government procurement decisions.	Performance indicator: Date of implementation for the Green Procurement Directive	
		Action 3: Integrate environmental considerations into procurement management processes and controls, as well as common-use procurement instruments.	Also, incorporating green procurement environmental considerations into purchasing decisions is expected to encourage suppliers to reduce the environmental impact of the goods and services they deliver, and in their supply chains.	Starting point: 2019 / Baseline data not available Target: 50 % of procurement processes will include environmental considerations by 2022 Performance indicator: Percentage of procurement processes which include environmental considerations (e.g. reduce, reuse, or include environmental criteria)	
		Action 4: Include environmental criteria that address carbon reduction, sustainable plastics and broader environmental benefits into procurements for goods and services with environmental impacts.	Finally, including environmental considerations into CSA procurement instruments, management processes, controls and tools will contribute to transitioning to a low-carbon economy, in addition to supporting the Policy on green procurement. United Nations Sustainable Development Goals (UNSDG): 12.7 - Promote public procurement practices that are sustainable, in accordance with national policies and priorities	Starting point: 2018 / Baseline data not available Target: 50% of our request for proposal will include environmental criteria by April 2022 Performance indicator: Percentage of request for proposal that include environmental criteria	
		Action 5: Reduce waste generation	UNSDG: 12.5 - By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse.	Starting point: 2020 / Baseline data for waste generation is 54.3 tons (2018-19) / Baseline data for plastic waste diversion is 37.3% / Baseline data for other diversion rates not available Target:	

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				<ul style="list-style-type: none"> • diverting at least 75% by weight of non-hazardous operational waste from landfills by 2030; • diverting at least 75% by weight of plastic waste from landfills by 2030; • diverting at least 90% by weight of all construction and demolition waste from landfills and striving to achieve 100% by 2030; and; • Reduce by 5% waste generation by 2023. <p>Performance indicator:</p> <ul style="list-style-type: none"> • Percentage of non-hazardous operational waste diverted; • Percentage of plastic waste diverted; • Percentage of construction and demolition waste diverted; and; • Quantity of waste generated (weight). • 	
	Support for green procurement will be strengthened, including guidance, tools and training for public service employees	Action 6 : Ensure that credit card holders, material managers, and employees with procurement and contracting responsibilities undergo compulsory green procurement training.	This will equip CSA employees so they can contribute to the transition to a low-carbon economy. UNSDG: 12.8 - By 2030, ensure that people everywhere have the relevant information and awareness for sustainable	<p>Starting point: 2019 / Baseline data not available</p> <p>Target:</p> <ul style="list-style-type: none"> • 100% of procurement officers and materiel management will have taken Canada School Public Service Green Procurement Course (C215) by the end of 2020; • 100% of all acquisition card holders will have taken Canada School 	

FSDS target	FSDS contributing actions	Corresponding departmental action(s)	Contribution by each departmental action to the FSDS goal and target	Starting point(s), target(s) and performance indicator(s) for departmental actions	Link to the department's Program Inventory
			development and lifestyles in harmony with nature	<p>Public Service Green Procurement Course (C215) by the end of 2021; and,</p> <ul style="list-style-type: none"> • 100% of new acquisition card holders, starting in 2020, are obligated to take the course (C215) in order to receive a card. <p>Performance indicator:</p> <ul style="list-style-type: none"> • Percentage of procurement officers and materiel management functional specialists that have taken the Canada School Public Service Green Procurement Course (C215); • Percentage of all acquisition card holders that have taken Canada School Public Service Green Procurement Course (C215); and; • Percentage of new acquisition card holders that have taken Canada School Public Service Green Procurement Course (C215). 	

Details on transfer payment programs

3-year plan for Contributions under the Canada/European Space Agency (ESA) Cooperation Agreement.

Start date	The renewed Agreement was signed on February 12, 2019, and ratified on June 13, 2019. The revised Terms and Conditions were approved in April 2019, and became effective on November 26, 2019.
End date	January 1, 2030 (end date of the Agreement).
Type of transfer payment	Contribution
Type of appropriation	Annually through Estimates.
Fiscal year for terms and conditions	The revised Terms and Conditions for the contributions, under the 2020-30 Cooperation Agreement, were approved, and became effective in 2019–20.
Link to departmental result(s)	Canada's investments in space benefit the Canadian economy
Link to department's Program Inventory	Space Capacity Development
Purpose and objectives of transfer payment program	Enhance Canadian industry's technological base and provide access to European markets for value-added products and services in the fields of Earth observation (EO), telecommunications, navigation, space exploration and generic technological activities; foster the participation of Canadian academia and make possible the demonstration of Canadian space technologies in European microgravity and space exploration missions and programs. This is achieved through a financial contribution by the CSA to ESA optional programs.

Expected results	<p>Result: Opportunities to advance science and technology.</p> <p>Performance Indicator: Canadian industrial return coefficient (Ratio between the actual value of contracts awarded by ESA to Canadian organizations and the ideal value of contracts awarded by ESA to Canadian organizations).</p> <p>Result: Space science and technology readiness are advanced.</p> <p>Performance Indicator: Number of scientific activities and technologies that have advanced their readiness</p> <p>Result: Canadian space sector competitiveness is increased</p> <p>Performance Indicator: Number of Canadian technologies/products that have flown and/or have been space-qualified as a result of Canada's participation in ESA</p>
Fiscal year of last completed evaluation	2018–19
Decision following the results of last evaluation	The CSA took into consideration the findings of the 2018 Program evaluation as part of its preparation for the ESA Ministerial Council 2019.
Fiscal year of planned completion of next evaluation	2022–23
General targeted recipient groups	Canadian space sector firms, universities and not-for-profit research organizations.
Initiatives to engage applicants and recipients	The CSA will continue to actively consult the Canadian space sector (industry and academia) and Government of Canada organizations as part of the program selection process.

Financial information (dollars)

Type of transfer payment	2019–20 planned spending	2020–21 planned spending	2021–22 planned spending	2022–23 planned spending
Total contributions	32,123,000	39,386,000	45,052,000	33,305,000
Total program	32,123,000	39,386,000	45,052,000	33,305,000

3-year plan for Class Grant and Contribution Program to Support Research, Awareness and Learning in Space Science and Technology

Start date	October 1, 2009
End date	N/A — Ongoing program
Type of transfer payment	Grant and Contribution
Type of appropriation	Annually through Estimates
Fiscal year for terms and conditions	2009–10
Link to departmental result(s)	<p>Space research and development advances science and technology</p> <p>Canadians engage with space</p> <p>Space information and technologies improve the lives of Canadians</p> <p>Canada's investments in space benefit the Canadian economy</p>
Link to department's Program Inventory	<p>Space Utilization</p> <p>Space Exploration</p> <p>Space Capacity Development</p> <p>Internal Services (Communications Services, Management and Oversight Services)</p>
Purpose and objectives of transfer payment program	<p>This program supports knowledge development and innovation in the CSA's priority areas while increasing the awareness and participation of Canadians in space-related disciplines and activities. The program has two components: a) Research and b) Awareness and Learning.</p> <p>The Research Component aims to support the development of science and technology; foster the continual development of a critical mass of researchers and highly qualified people in Canada; and support</p>

	<p>information gathering and space-related studies and research pertaining to Canadian Space Agency priorities.</p> <p>The Awareness and Learning Component aims to provide learning opportunities to Canadian students in various space-related disciplines; to support the operations of organizations dedicated to space research and education; and to increase awareness of Canadian space science and technology among Canadian students and their participation in related activities.</p> <p>This Transfer Payment Program is composed of grants and non-repayable contributions.</p>
<p>Expected results</p>	<p>Research Component</p> <p>Result #1: Increased knowledge from research projects in priority space S&T areas.</p> <p>Performance Indicator: Number of new and ongoing space science and technology initiatives (Announcement of Opportunity) and projects.</p> <p>Performance Indicator: Number of completed space science and technology initiatives (Announcement of Opportunity) and projects.</p> <p>Performance Indicator: Number of highly qualified personnel involved in space science and technology initiatives and projects.</p> <p>Result #2: Maintained and/or increased space focus in universities, post-secondary institutions, and not-for-profit and for-profit organizations.</p> <p>Performance Indicator: Number of universities, post-secondary institutions and not-for-profit and for-profit organizations involved in financed projects.</p> <p>Result #3: Partnerships established and/or sustained.</p> <p>Performance Indicator: Number and type of new partnerships created and sustained.</p>

	<p>Performance Indicator: Number of research partnerships (national and international).</p> <p>Result #4: Partners' contributions leveraged.</p> <p>Performance Indicator: Number of agreements leveraged funding.</p> <p>Performance Indicator: Proportion of leveraged funds vs. grant/contribution funds.</p> <p>Result #5: Access to international collaboration for Canadian organizations.</p> <p>Performance Indicator: Number of agreements leveraged by international funding.</p> <p>Awareness and Learning Component</p> <p>Result #6: Increased knowledge and skills in space-related disciplines among target audience</p> <p>Performance Indicator: Number and type of learning events attended</p> <p>Result #7: Target audience reached through learning activities and materials related to science and technology</p> <p>Performance Indicator: Number of persons reached by audience segments</p>
Fiscal year of last completed evaluation	2016–17
Decision following the results of last evaluation	<ul style="list-style-type: none"> • Continuation
Fiscal year of planned completion of next evaluation	2020–21

General targeted recipient groups	<ul style="list-style-type: none"> ▶ Industry-related (for example, for-profit businesses) ▶ International organizations (for example, non-profit international organizations) ▶ Persons (for example, students) ▶ Non-profit organizations (for example, universities, research institutions)
Initiatives to engage applicants and recipients	<p>Since January 2012, an initiative to engage recipients has been undertaken through an automated annual follow-up of projects. The CSA has extended this initiative via its web page in order to establish a dialogue with potential applicants and recipients.</p> <p>Consultations, presentations to, and discussions with, the academic and industrial communities as well with other potential recipient groups, are ongoing and will continue.</p>

Financial information (dollars)

Type of transfer payment	2019–20 planned spending	2020–21 planned spending	2021–22 planned spending	2022–23 planned spending
Total grants	10,003,000	10,407,000	10,989,000	10,321,000
Total contributions	16,570,000	18,172,000	19,646,000	19,426,000
Total program	26,573,000	28,579,000	30,635,000	29,747,000

Gender-based analysis plus

General information

<p>Governance structures</p>	<p>Since 2017, Gender-Based Analysis plus (GBA+) is integrated in the requirements of the Investment Governance and Monitoring Framework and is part of the roles and responsibilities of the executive sponsor.</p> <p>A policy has been implemented to state the roles and responsibilities of CSA personnel and stipulates that all initiatives that are new or which need re-approval will be subject to a GBA+. More specifically, the policy requires that:</p> <ul style="list-style-type: none"> • All CSA initiatives (e.g. policies, programs, projects, grants and contributions, budget proposals) that are new or which need re-approval will be subject to GBA+ to ensure they do not have detrimental impacts on certain diverse groups of women and men and that they seek to achieve better results for all Canadians. • Documented evidence of the elaboration of GBA+ is required to support approval of initiatives for Treasury Board (TB) Submissions and Memorandum to Cabinet (MC). • The documented evidence of the elaboration of GBA+ will be collected in order to monitor the implementation and continuous improvement of the GBA+ processes at CSA, and for reporting to Women and Gender Equality Canada (WAGE) on a regular basis. <p>The President is responsible for ensuring that the Government of Canada's commitment to implementing GBA+ is fulfilled at the CSA as per the aforementioned policy requirements.</p> <p>The Executive Committee Members are responsible for:</p> <ul style="list-style-type: none"> • Ensuring that gender and other identity factor considerations are identified and that inequalities are corrected within the context of their respective program's
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	<p>activities, from policy and program development to service delivery, including in MC and TB Submissions.</p> <ul style="list-style-type: none"> • Supporting and encouraging GBA+ training opportunities for their employees. • Appointing one of their members as the GBA+ Champion that will be the functional authority for GBA+ at the CSA. • Appointing a GBA+ Point of contact for each branch of the CSA. <p>The executives and managers are responsible for:</p> <ul style="list-style-type: none"> • Applying GBA+, and for integrating the results thereof, to the decision-making process within their sector. • Supporting their employees who are engaged in applying GBA+ to the initiatives under their responsibilities, from concept to implementation to operations as applicable, and for supporting related adjustments that might be required in this regard. • Providing training opportunities in GBA+ for their employees.
<p>Human resources</p>	<p>If we add up all the portions of full-time equivalents (FTEs) that are partly dedicated to GBA+ implementation it totals 1 FTE. This includes:</p> <ul style="list-style-type: none"> • FTEs that were part of the GBA+ Responsibility Centre, i.e., the Champion, member of the Executive Committee • Ten Departmental GBA+ Focal Points, one in each branch <p>FTEs who draft GBA+ analysis in branches</p>
<p>Planned initiatives</p>	<p>A thematic evaluation on GBA+ will be conducted in 2020–2021, aiming to shed light on GBA+ processes and impacts across all sectors of the CSA and to recommend improvements if needed.</p>

Reporting capacity and data

None of our Program Inventory programs collect individual recipient microdata information.

Status report on transformational and major Crown projects

General information

Project name	RADARSAT Constellation Mission (RCM)
Description	<p>The RADARSAT Constellation Mission (RCM) is the next generation of Canadian Earth observation (EO) radar satellites. RADARSAT-1 was launched in 1995 and continued its operation until March 2013. RADARSAT-2, developed by the private sector in partnership with the Government of Canada (GoC), was launched in 2007 for a seven-year mission, but given its current performance, it is expected to remain operational for several more years. Canada has established itself as a leading global supplier of C-band satellite radar data for EO. The successor mission to RADARSAT-2, the RCM will contribute to maintaining the leadership position of Canadian industry in space radar technology and value-added product markets.</p> <p>The RCM is comprised of three identical satellites equipped with two payloads: a powerful Synthetic Aperture Radar (SAR) and an Automatic Identification System (AIS). The launch of the RCM is planned for 2019. The three-satellite configuration will provide on average daily coverage of Canada's maritime approaches and frequent coverage of Canada's land, as well as the capability to observe a specific point over 90% of the world's surface. It will also provide a four-day exact revisit, allowing coherent change detection using an InSAR mode (as opposed to 24 days with previous RADARSAT missions). The creation of a three-satellite constellation increases the frequency of available information, as well as the reliability of the system, making it better suited to respond to the needs of a large variety of users that develop services and information products.</p> <p>The scope of the RCM Major Crown Project includes the requirement definition, design, development, manufacturing, integration, testing and launch of the satellites as well as the design, development, manufacturing and installation of the associated ground segment. One</p>

year of operation of the three-satellite constellation is also included as well as an application development program.

The RCM will provide reliable data in all weather and illumination conditions in support of federal departments' operations and mandates in areas such as maritime surveillance, disaster management, environmental monitoring and natural resource management. The constellation will have the ability to cover the North Pole region up to four times a day.

In support of the maritime surveillance requirements of federal departments, the RCM is the principal data source envisaged for wide-area surveillance of Canada's remote areas and marine approaches. The daily coverage of marine areas will also support fisheries monitoring, ice and icebergs monitoring, pollution monitoring, and integrated ocean and coastal zone management. The RCM's maritime surveillance capabilities also support Canadian sovereignty and security. Only satellite data can offer regular cost-effective information to task ships and aircraft with intercepting suspicious vessels.

The RCM's maritime surveillance capabilities also support Canadian sovereignty and security. The RCM satellites will be able to capture ship-originated Automatic Identification System (AIS) signals from space. The combination of space-based radar images and AIS signals will provide a powerful surveillance capacity over Canada's maritime approaches and elsewhere in the world.

In support of disaster management, both in Canada and around the world, the RCM will provide critical and timely data to support disaster mitigation, warning, and response and recovery activities, while helping Canada meet its obligations with respect to international disaster relief. The types of disasters for which RCM data will be used for monitoring and relief purposes include floods, oil spills, volcanic eruptions, earthquakes and hurricanes. RCM data will also contribute to the production of more accurate weather forecasts and warnings pertaining to marine conditions, winds, severe storms and floods.

In support of environmental monitoring, the RCM will provide data for wide-area change detection in order to provide support for activities

	<p>such as water management, wetlands mapping, coastal change monitoring and changes in the permafrost in northern Canada.</p> <p>In support of natural resource management, RCM data will be a critical source of information to monitor the changing state of Canada's agricultural areas, forests and wildlife habitats. RCM data will also be used in the mining and energy sectors for resource exploration operations to ensure that critical infrastructure is monitored properly for safety and integrity.</p> <p>In addition, the RCM will sustain the development of Canadian high-technology design and manufacturing capabilities and the integration of satellite data into information products and services. Canada's space and geomatics industries will benefit from better positioning in international markets and privileged access to data deemed essential by many international users.</p>
Project outcomes	<p>This Major Crown Project (MCP) contributes to the Space Utilization program, which includes the provision of space-based solutions and the progression of their utilization. It also serves to install and run ground infrastructure that operates satellites, receives, processes and distributes the data This Program utilizes space-based solutions to assist Government of Canada (GoC) organizations in delivering growing, diversified and cost-effective programs and services within the purview of their respective mandates, each related to key national priorities such as sovereignty, defence, safety and security, resource management, environmental monitoring and the North. It also provides academia with data required to perform its own research.</p> <p>The contribution of the MCP to the program objectives is measured through the Performance Information Profile results and indicators for the Space Utilization program. The primary performance indicator for this program is the number of data scenes acquired from CSA-supported SAR satellites.</p>
Industrial benefits	<p>The RCM is expected to generate significant industrial benefits in the space and Earth Observation sectors, such as employment, innovation, economic growth, competitiveness and improved</p>

	<p>productivity. Investments in the RCM also support the growth of small and medium-sized companies as well as Canadian capabilities in terms of infrastructure and services.</p> <p>The prime contract includes a requirement for 70% Canadian content, excluding launch services and subsystems for which there are no suppliers available in Canada. As of March 31, 2019, this corresponds to a Canadian content requirement of \$514.2 million. For the same period, the CSA provided the Canadian industry with funding of more than \$614.7 million to carry out work resulting directly from the design of the RCM MCP, thus surpassing the requirement.</p> <p>The prime contract also requires that 3.5% of the 70% Canadian content be subcontracted in the Atlantic Canada region. For the same period, the actual Atlantic Canada content was \$25.9million, considerably higher than the requirement of \$18.0 million.</p> <p>The prime contract includes reporting obligations and performance measurements as well as financial penalties for not meeting the minimum Atlantic Canada content requirement.</p>
Sponsoring department	Canadian Space Agency (CSA)
Contracting authority	Public Services and Procurement Canada (PSPC)
Participating departments	<p>Agriculture and Agri-Food Canada</p> <p>Canadian Coast Guard</p> <p>Environment and Climate Change Canada</p> <p>Fisheries and Oceans Canada</p> <p>Global Affairs Canada</p> <p>Indigenous and Northern Affairs Canada</p> <p>Innovation, Science and Economic Development Canada</p> <p>National Defence and the Canadian Armed Forces</p> <p>Natural Resources Canada</p>

	<p>Parks Canada</p> <p>Public Safety Canada</p> <p>Royal Canadian Mounted Police</p> <p>Statistics Canada</p> <p>Transport Canada</p>
Prime contractor	<p>MDA Systems Ltd. (a division of MacDonald, Dettwiler and Associates), Richmond, British Columbia</p>
Major subcontractors	<p>Tier 1 Major Subcontractors:</p> <ul style="list-style-type: none"> —MDA Montreal, Ste-Anne-de-Bellevue, Quebec —Magellan Aerospace, Winnipeg, Manitoba —MDA, Halifax, Nova Scotia —SpaceX, Hawthorne, California, USA —Airbus Defence and Space, United Kingdom —Honeywell Aerospace, United Kingdom <p>Tier 2 and Tier 3 Canadian Subcontractors:</p> <ul style="list-style-type: none"> —Stelia Aerospace North America, Lunenburg, Nova Scotia —IMP Group, Halifax, Nova Scotia - DRS, Ottawa, Ontario —Mecachrome, Mirabel, Quebec —Maya, Montreal, Quebec
Project phase	<p>Phase D—Implementation</p>

Major milestones	<p>Phase A: Requirement Definition (March 2008)</p> <p>Phase B: Preliminary Design (March 2010)</p> <p>Phase C: Detailed Design Review (November 2012)</p> <p>Phase D: Launch satellite #1, #2, and #3 (2019)</p> <p>Phase E1: Operations (part of MCP) (2020)</p> <p>Phase E2: Operations (not part of MCP) (2026)</p>
Progress report and explanation of variances	<p>On December 13, 2004, the Domestic Affairs Committee of Cabinet granted approval-in-principle to a 10-year program to implement a RADARSAT Constellation Mission (RCM) aimed at addressing the operational needs of users from the public and private sectors in relation to Canadian sovereignty and marine surveillance, environmental monitoring and change detection, and disaster management. The RCM would be government owned and operated.</p> <p>On June 6, 2005, Treasury Board granted Preliminary Project Approval (PPA) for the RCM and expenditure authority for the Project Initial Planning and Identification (i.e. Phase A). During Phase A, feasibility studies were completed, user requirements were defined, and risk mitigation activities and options analysis for the bus and payload were carried out. The initial scope of work for Phase A was completed in December 2006. Phase A was then extended to allow additional technical risk reduction activities to continue during the period prior to the Phase B contract award. This was completed in March 2008.</p> <p>In March 2007, Treasury Board approved a revised Preliminary Project Submission to proceed to Phases B and C. Following a competitive Request for Proposal (RFP) process, Public Services and Procurement Canada (PSPC) obtained authority to enter into negotiations with MDA, the prime contractor, and awarded the contract for Phase B in November 2008. The Preliminary Design (i.e. Phase B) was completed in March 2010. The contract for Phase B was subsequently amended to include the detailed design (i.e. Phase C).</p> <p>A second revised PPA was approved by Treasury Board in December 2010. The purpose of this revised PPA was to provide additional</p>

	<p>expenditure authority to include the procurement of long-lead items during Phase C and also to include a technology demonstration for Automatic Identification System (AIS) payloads, funded by the Department of National Defence.</p> <p>The final review of the overall mission-level system detailed design, the Mission Critical Design Review (CDR), was conducted in November 2012. A selected set of activities, such as completing the design qualification activities and the procurement of long-lead items, were pursued under Phase C and were completed in March 2015. These selected activities were scheduled to be completed in March 2014 but were delayed due to technical difficulties encountered during the building of the qualification models. The delay has no impact on the project.</p> <p>Treasury Board granted Effective Project Approval for the RCM in December 2012, which provides expenditure and contracting authorities to complete the project and carry out the first year of RCM operations (Phases D and E1). The contract was awarded on January 9, 2013. Since the contract award, planning activities have been completed and major milestones achieved to initiate the implementation phase of the satellites and associated ground systems.</p> <p>In 2013, a Deputy Ministers' Governance Committee on Space (DMGCS) was established to provide oversight, coordination and accountability on the RCM MCP. The DMGCS reports to the Minister of Innovation, Science and Economic Development and provides strategic direction while making timely decisions to address issues and risks that could affect the success of the MCP.</p> <p>In 2016–17, assembly, integration and testing of the last of the three synthetic aperture radar (SAR) and automatic identification system (AIS) payloads were completed, and the payloads were delivered. Challenges in completing the flight software were addressed. Assembly and integration of the first satellite was completed, and its testing was well underway.</p> <p>Significant progress continued to be achieved in the manufacturing of the RCM satellites throughout 2017–18. The third satellite bus was</p>
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delivered, and the remaining five ground segment subsystems were completed. Upgrades to CSA headquarters in Saint-Hubert to accommodate the RCM ground segment subsystems were also completed in 2017–18, and mission control centre was ready to receive the ground segment subsystems when delivered in the latter part of 2017–18. In addition, seven of the nine Government Furnished Equipment (GFE) ground segment subsystems had passed acceptance testing by the end of 2017-18.

In 2018–19, the assembly, integration and testing of the three satellites was completed; the satellites were transported to a location near the launch site in California for storage until the start of the launch campaign; the training of the operations personnel was completed; and in the latter part of 2018–19, the full-up rehearsals were completed in preparation for the launch of the three satellites, which was planned for the spring of 2019. The launch date was first delayed from the fall of 2018 to the winter of 2019 due to delays in the launch service provider's launch schedule and subsequently to the spring of 2019 due to a mishap with the recovery of the Falcon 9 launch vehicle first stage that was assigned to the launch of the RCM.

The three spacecraft were successfully launched into orbit in June 2019 and the system commissioning was completed five months later in November 2019. Shortly thereafter, in December 2019, routine operations and the provision of SAR data to users commenced. The RCM Major Crown Project also includes the first year of operations, until the end of November 2020. The project will be completed and closed following this initial period of routine operations in 2021.

Project name	James Webb Space Telescope
Description	<p>The James Webb Space Telescope is a joint international mission involving National Aeronautics and Space Administration (NASA), the European Space Agency (ESA) and the Canadian Space Agency (CSA). The mission concept is for a large field-aperture telescope to be located 1.5 million km from Earth. Like Hubble, the James Webb Space Telescope will be used by the astronomy community to observe targets ranging from objects within our solar system to the remotest galaxies which can be seen during their formation in the early universe. The science mission is centred on the quest to understand our origins:</p> <ul style="list-style-type: none">• Observing the very first generation of stars to illuminate the dark universe when it was less than one billion years old;• Understanding the physical processes that have controlled the evolution of galaxies over cosmic time and, in particular, identifying the processes that led to the assembly of galaxies within the first four billion years after the Big Bang;• Understanding the physical processes that control the formation and early evolution of stars in our own and other nearby galaxies; and• Studying the formation and early evolution of proto-planetary disks, and characterizing the atmospheres of isolated planetary mass objects. <p>The James Webb Space Telescope is scheduled for launch in 2021. James Webb instruments will be designed to work primarily in the infrared range of the electromagnetic spectrum, with some capability in the visible range. The James Webb Space Telescope will have a large mirror, 6.5 metres in diameter and a sun shield that will be the size of a tennis court once deployed in outer space.</p> <p>Canada is providing the Fine Guidance Sensor (FGS) and the Near-Infra-Red Imager and Slitless Spectrometer (NIRISS). The FGS is</p>

	<p>integral to the attitude control system of the James Webb Space Telescope, and consists of two fully redundant cameras that will report precise pointing information. Canadian expertise in this area was established previously with the successful fine error sensors for the former Far Ultraviolet Spectroscopic Explorer (FUSE) mission. Packaged with the FGS but functionally independent, the NIRISS covers the 0.7 to 5 micrometer spectral range. NIRISS provides a specialized capability for surveys of objects such as primeval galaxies, for the study of transiting planetary systems and for high-contrast imaging applications such as the detection of extrasolar planets.</p> <p>With COM DEV Canada as the prime contractor, the James Webb Space Telescope-FGS Major Crown Project consists of the design, development, testing and integration into the spacecraft, launching and commissioning of the FGS and NIRISS. By participating in this leading-edge international space exploration mission, the CSA is actively promoting Canadian scientific expertise and innovative, advanced space technologies.</p> <p>The National Research Council's Herzberg Astronomy and Astrophysics (NRC Herzberg) is a key Government of Canada (GoC) partner for activities related to the development of science instruments and distribution of telescope data. In return for its overall investment in the James Webb Space Telescope, Canada will obtain a minimum of 5% of the time on this unique space telescope.</p> <p>Already, the news of Canada's involvement in this international space exploration mission is inspiring youth, educators and amateur astronomers, and rallying members of Canada's world-renowned astrophysics community.</p>
<p>Project outcomes</p>	<p>The JWST project supports the CSA's Space Exploration program by expanding Canada's presence in space through space exploration missions. The performance indicator for this program is the number of space exploration missions in operation. For 2020-21, CSA's target for this indicator is between 15 and 20 missions. Once operational, the JWST will directly contribute to CSA's capacity to achieve this program target.</p> <p>More specific outcomes of the JWST project are as follows:</p>

	<ul style="list-style-type: none"> • Technological know-how acquired through Space Exploration endeavours. (Astronomy and planetary), • Canada maintains a strategic positioning which supports its capacity to influence space exploration missions and decision-making process in key international space exploration forums, and • CSA’s participation in space exploration missions provides access to scientific data about the Solar system and the universe. Canadian know-how and expertise allow Canada to lead or participate in international space astronomy missions. <p>Furthermore, the beneficiaries of this project include:</p> <ul style="list-style-type: none"> • Canada’s Astronomy Community: the access to data that will be granted to Canadian researchers will be essential for the Astronomy Community. • Canadian Industry: The high visibility of this international mission contributes to the international competitiveness of Canadian industry and academia by demonstrating and branding a successful application of Canadian Science &Technology. • Canada’s Science Community: Canada’s participation will advance Canada’s scientific capacity to generate important new knowledge of the universe and of our solar system, while forging collaborative research with other leading scientists working in the field. It will allow Canada to develop a new expertise in the area of astronomy and maintain Canadian scientists’ world renown in the field of science. • Highly Qualified Canadians: The JWST project is directly contributing to the retention and attraction of Highly Qualified People (HQP) for both academia and industry in Canada. The project continues to employ highly skilled personnel at Honeywell (formerly COMDEV). The experience gained by these HQPs enable Honeywell gain expertise for possible spin-off work in the future. Canadian scientists will be directly involved in the mission planning for the utilization of NIRISS and the operations of this instrument. This level of activity will enhance their international profiles through their involvement in the international JWST mission. • Next Generation of Canadians: Canada’s participation in JWST will inspire young Canadians to pursue education and
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	careers in the fields of science, math, technology, engineering and project management, thus contributing to Canada's overall science and technology capacity.
Industrial benefits	The high visibility of this international mission contributes to the international competitiveness of Canadian industry and academia by demonstrating and branding a successful application of Canadian Science & Technology. The JWST project is directly contributing to the retention and attraction of Highly Qualified People (HQP) for both academia and industry in Canada.
Sponsoring department	Canadian Space Agency (CSA)
Contracting authority	Public Services and Procurement Canada (PSPC)
Participating departments	NRC Herzberg Astronomy and Astrophysics Innovation, Science and Economic Development (ISED)
Prime contractor	—Honeywell Aerospace, Ottawa, Ontario
Major subcontractors	—Teledyne, USA —Corning Netoptix, USA —IMP Aerospace Avionics, Canada —ABB Bomem, Canada —MDA, Canada —INO, Canada —BMV, Canada —CDA Intercorp, USA —ESTL, Europe —Bach Research Corporation, USA —Materion, USA —Camcor, Canada

<p>Project phase</p>	<p>Phase D—Implementation</p>
<p>Major milestones</p>	<p>Phase A: Requirement Definition (2004)</p> <p>Phase B: Preliminary Design (May 2005)</p> <p>Phase C: Detailed Design (September 2008)</p> <p>Phase D: Manufacturing/Assembly, Integration/Testing, Pre-launch preparations, Launch/System Commissioning (2021)</p> <p>Phase E: Operations (part of MCP) (2024)</p>
<p>Progress report and explanation of variances</p>	<p>In March 2004, Treasury Board gave Preliminary Project Approval at an indicative cost of \$71.7 M (including applicable taxes). This approval gave the authorization to proceed with the definition phase (preliminary design).</p> <p>In April 2005, Treasury Board gave revised Preliminary Project Approval and Expenditure authority for the entire Definition Phase at a substantive cost estimate of \$35.1 M (including applicable taxes). Before the completion of the detailed design of the FGS, CSA requested increased expenditure authority to complete the project.</p> <p>In February 2007, Treasury Board granted Effective Project Approval for a substantive total cost estimate of \$104.2 M (including applicable taxes). The project was also designated at that time as a Major Crown Project. Before the completion of the detailed design of the FGS, CSA requested increased expenditure authorities to complete the project under the Implementation Phase.</p> <p>In December 2007, Treasury Board granted revised Effective Project Approval for a substantive cost estimate of \$165.8 M (including applicable taxes) with four conditions which were met. These conditions were as follows: (1) That the CSA provide to Treasury Board Secretariat (TBS) a copy of the quarterly reviews prepared for</p>

the President of the CSA, (2) That the CSA provide to Treasury Board Secretariat with a viable plan for removal of the Tuneable filter, 30 days after the completion of the second Critical Design Review (CDR), (3) That the CSA conduct a review of the recent projects (10 years), and explore new costing approaches or risk contingency estimation methods which might better serve the CSA, within 6 months and (4) That the CSA provide to Treasury Board Secretariat with a report on approaches to ensure appropriate cost verification.

Besides the significant launch date slippage, NASA also discovered in 2010 that the infrared detectors, extremely sensitive cameras capable of “seeing” light produced by heat, were showing signs of performance degradation due to a design issue. Following an extensive investigation, NASA concluded that all detectors, including the four procured by Canada, need to be replaced. Teledyne Scientific & Imaging LLC (Teledyne), the supplier of detectors, was subcontracted to COM DEV and Canada has been responsible for assuming the costs associated with this procurement since 2007, as per the terms of an agreement with NASA. Indeed, two years after their acceptance, the detectors started to show the same degradation during extensive testing. This type of technical issue was covered by the risk contingency granted under the 2007 authorities which had identified the risk associated with cutting-edge technology and potential design changes due to the complexity of this mission. As a result, the risk contingency fund enabled the procurement of these four new detectors without contributing to a project cost increase.

In February 2014, the Treasury Board granted revised effective project approval at a substantive cost estimate of \$185.9M (including applicable taxes). This represented an increase of \$20.2M from the previous authorities received in 2007. In 2007, when the project obtained TB approval for the revised EPA the mission launch date was anticipated to be May 2013. Following a re-planning exercise conducted by National Aeronautics and Space Administration (NASA) to implement a JWST mission plan with a high certainty of achieving

	<p>the launch date, the launch date was slipped to October 2018, extending the project life by 5.5 years. In addition to schedule adjustment by NASA, there was an associated increase in the mission's integration and test phase, which ultimately resulted in the cost increases that could not be absorbed by the CSA project's original contingency.</p> <p>The project is running on budget for the revised NASA JWST launch date of March 2021. Any additional slips in the NASA launch schedule will be beyond the TB authorities received in 2014. This situation is being monitored very closely.</p> <p>The JWST project is expected to meet all its performance objectives set in 2014 Revised TB Submission because this project is contributing to the engagement of Canadian scientists in this mission and the employment of HQP in industry. Furthermore, our Canadian science community is positioning itself to take full advantage of the 5% of guaranteed time of this space telescope. Once launch, it is anticipated that this mission will inspire all Canadians with its discoveries and fascinating imagery.</p> <p>The project is to be completed, as per the current NASA launch of March 2021, by January 2022. The Canadian contribution to this mission, the Fine Guidance Sensor and Near Infrared Imager and Slitless Spectrograph, are fully integrated into the spacecraft. The spacecraft is in its final stages of integration and testing required before being transported to the launch site in French Guyana.</p>
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