

**CANADIAN SPACE AGENCY
2012–13 DEPARTMENTAL PERFORMANCE REPORT**

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3.4.1) Details on Transfer Payment Programs (TPPs)

Contributions under the Canada / European Space Agency Cooperation Agreement	
Start Date: September 20, 2012	End Date: December 31, 2019
<p>Description</p> <p>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 and generic technological activities; foster the participation of Canadian academia and make possible the demonstration of Canadian space technologies in European science and exploration missions. This is achieved through a financial contribution by the CSA to European Space Agency (ESA) optional programs.</p>	
<p>Strategic Outcome</p> <p>Canada's exploration of space, provision of space services and development of its space capacity meet the nation's needs for scientific knowledge, innovation and information.</p>	
<p>Expected Results (Sub-sub Program Level)</p> <p>International Market Access:</p> <p>This sub-Sub-program (SSP) facilitates foreign market access by the Canadian space industry through the negotiation, implementation and management of special international arrangements. For example, in return for Canadian Space Agency (CSA) contributions to the ESA under the longstanding Canada-ESA Agreement, Canadian industry obtains some of the contracts awarded by the ESA; thus gaining market access that would otherwise be limited to Europeans. This SSP is necessary because it opens up opportunities for Canadian scientists and space industrial firms to collaborate with European prime contractors and gain market access for Canadian science and technology.</p> <p>Expected Results Specific to the Transfer Payment Program:</p> <p>Canadian investments under the Canada-ESA Agreement allow Canadian industry to access the European institutional market.</p> <p>The Canadian industrial firms have access to flight opportunities where they may gain flight heritage for their technologies/components.</p>	
<p>Results Achieved</p> <p>In addition to the overall results in line with the strategic outcome, the following achievements resulted from Canada's participation in ESA Programs:</p> <ul style="list-style-type: none"> • Canada's participation in the European Advanced Research in Telecommunications Systems (ARTES) allows our industry to have continuing access to cutting-edge studies on new telecommunications services, as well as to develop new technologies, equipment and applications in the field of multimedia, inter-satellite and mobile communications in partnership with their European industry partners. • By participating in ESA Earth observation programs, the CSA has continued to help Canadian companies become involved in the development of advanced space borne instruments and subsystems and user-oriented applications, and provide Canadian users with access to data. 	

- Through its partnership with the ESA, the CSA has continued to position the Canadian industry and scientists in future scientific and technological developments associated with the European Aurora planetary exploration programs, the Lunar Lander mission and to the Life and Physical Sciences Programs (ELIPS-2 and ELIPS-3).
- The CSA consulted the Canadian space sector (industry and academia) and relevant GoC organizations as part of the program selection process in preparation for the 2012 ESA Ministerial Council meeting during which ESA member states and Canada announced new contributions to the proposed ESA programs. On behalf of the Honourable Christian Paradis, Minister of Industry, Steve MacLean announced a total Canadian investments of 18.6M€ (approx. C\$30.4 million) by the Government of Canada to a series of ESA optional programs that support key government priorities as well as our industry and scientific community.

Contribution under the Canada/ESA Cooperation Agreement

(\$ in millions)

	2010–11 Actual Spending	2011–12 Actual Spending	2012–13 Planned Spending	2012–13 Total Authorities	2012–13 Actual Spending	Variance
Total contributions	33.5	35.1	29.0	28.9	23.3	5.7
Total program	33.5	35.1	29.0	28.9	23.3	5.7

Notes:

1. This table details contribution program with funding in excess of \$5 million during the reporting year.
2. Due to rounding, decimals may not add up to totals shown.

Comment on Variance

The variance of \$5.7 million is due mainly to the following factors: the ESA budgetary cycle differs from the Canadian one; there was a slippage in the planned disbursements under ESA programs; and some of the risks for which provision was made in budgets, such as potential cost increases in ESA programs, inflation and exchange rate fluctuations, did not materialize. A reprofiling of \$5.4 million from 2012–13 to future fiscal years was requested and approved.

Evaluations completed or planned : 2015–16

Fiscal Year of Previous Evaluation: 2010–11

To learn more, go to: http://www.asc-csa.gc.ca/pdf/evaluation_2010-canada-esa_eng.pdf

General Targeted Recipient Group

Canadian space sector firms, universities and not-for-profit research organizations.

Engagement of applicants and recipients

During 2011–12, the CSA actively consulted the Canadian space sector (industry and academia) and Government of Canada (GoC) organizations as part of the program selection process in preparation for the 2012 ESA Ministerial Council meeting during which ESA member states and Canada announced their position on contributions to the proposed ESA Programs. Similar consultations are planned for future ESA Ministerial Council meetings.

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

Description

The Class Grant and Contribution Program to support Research, Awareness and Learning in Space Science and Technology (S&T) supports knowledge development and innovation in the Canadian Space Agency's (CSA) 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.

The Research component aims at supporting the development of S&T; foster the continual development of a critical mass of researchers and Highly Qualified People (HQP) in Canada; and support information-gathering and space-related studies and research associated with the CSA's priorities.

The Awareness and Learning component aims at providing learning opportunities for Canadian students in various space-related disciplines. As a result of a program review, a decision was made to no longer financially support the initiatives under the Awareness and Learning component. The Program will be limited to initiatives involving university students.

Strategic Outcome

Canada's exploration of space, provision of space services and development of its space capacity meet the nation's needs for scientific knowledge, innovation and information.

Expected Results (Program Level)

1. **Space Data, Information and Services:** This Program utilizes space-based solutions to assist Government of Canada (GoC) organizations deliver expanding, diversified or cost-effective programs and services that fall within their mandates and are related to key national priorities, such as sovereignty, defence, safety and security, resource management, environmental monitoring and the North. It also provides academia with necessary data to carry out its own research.
2. **Space Exploration:** This Program provides valuable Canadian science, signature technologies and qualified astronauts for international space exploration endeavours. This Program contributes to the GoC's S&T Strategy. It fosters the generation of knowledge and technological spin-offs that contribute to a better quality of life for Canadians. It generates excitement within the general population and contributes to nation-building. This Program appeals to the S&T communities.
3. **Future Canadian Space Capacity:** This Program secures the nation's strategic and on-going presence in space in the future and to preserve Canada's capability to deliver internationally renowned space assets for future generations. It is targeted at Canadian academia, industry and youth, as well as users of Canadian space solutions (GoC organizations and international partners).

Expected Results Specific to the Transfer Payment Program:

1. Research Component

- Increased knowledge from research projects in priority space S&T areas.
- Maintained and/or increased space focus in universities, post-secondary institutions, and not-for-profit organizations.

- Partnerships established and/or sustained.
- Leveraged partner contributions.
- Access to international collaboration for Canadian organizations.

Awareness and Learning Component

- Post-secondary level students will have increased knowledge and skills in space-related disciplines.

Results Achieved

In 2012–13, Canadian universities, for-profit and not-for-profit organizations, established and operating in Canada made significant contributions to knowledge creation in space S&T priority areas through more than 90 active research projects and 42 new initiatives including 18 grants to university students to allow them to attending an international conference.

This year was the sunset of an initiative called *Space Science Enhancement Program* (44 projects) creating an important increase of knowledge productions and other research results which is to be expected when project reach maturity. The supported projects resulted in 686 publications and 818 presentations including 444 peer reviewed articles and 64 projects reporting achievements in multidisciplinary research. There were 1024 highly qualified personnel (HQP) directly involved in these works including 343 faculty members, 546 students and post-doctoral fellows, and 135 technicians and other research personnel.

Class Grant and Contribution Program to support Research, Awareness and Learning in Space Science and Technology

(\$ millions)

	2010–11 Actual Spending*	2011–12 Actual Spending	2012–13 Planned Spending	2012–13 Total Authorities	2012–13 Actual Spending	Variance
Total grants	6.0	8.1	6.0	6.9	6.2	(0.2)
Total contributions	1.2	3.6	1.6	1.6	1.0	0.6
Total program	7.2	11.7	7.6	8.5	7.2	0.4

Notes:

1. This table details transfer payment program with funding in excess of \$5 million during the reporting year.
2. Due to rounding, decimals may not add up to totals shown.

Comment on Variances

No comment.

Audits completed or planned: 2013-2014

Evaluations completed or planned: 2014-2015

Eligible recipients for Grants:

The Research Component includes Canadian universities and post-secondary institutions, not-for-profit organizations established and operating in Canada and not-for-profit international research organizations or a cluster formed by a combination of the above.

The Awareness and Learning Component includes Canadian citizens or permanent residents of Canada, Canadian post-secondary institutions and not-for-profit organizations established and operating in Canada.

Eligible recipients for Contributions:

The Research Component include Canadian universities and post-secondary institutions, for-profit and not-for-profit organizations established and operating in Canada, and not-for-profit international research organizations or a cluster formed by a combination of the above.

The Awareness and Learning Component includes Canadian post-secondary institutions and not-for-profit organizations established and operating in Canada.

Engagement of applicants and recipients:

Since January 2012, an initiative to engage recipients has been undertaken through an automated annual follow-up of projects. The Agency is planning to extend this initiative in order to establish a dialogue with potential applicants and recipients.

Consultations, presentations to and discussions with the academic and industrial communities as well as with other potential recipient groups are ongoing and will continue.

3.4.2) Internal Audits and Evaluations

1. Name of Internal Audit	2. Type	3. Status	4. Completion Date (President's Approbation)	5. Electronic Link to Report
Succession Planning Audit Report	Management Framework	Completed	2012-01-17	http://www.asc-csa.gc.ca/eng/publications/ar-1112-0101.asp
Audit of Major Investment Business Cases	Management Framework	Completed	2012-03-26	http://www.asc-csa.gc.ca/pdf/audit_report_Investment_2012-03-12.pdf
Audit Committee Annual Report 2011-12	Annual Report	Completed	2012-06-20	http://www.asc-csa.gc.ca/pdf/annual-report-2011-2012.pdf
Management Action Plans Follow-up for Internal Audit	Annual Report	Completed	2012-09-25	http://www.asc-csa.gc.ca/pdf/management-2012-audit.pdf
International Space Station Assembly and Maintenance Operations Program	Compliance / Management Framework	Completed	2012-10-17	http://www.asc-csa.gc.ca/pdf/ar-op-prog-mgmt-2012-09.pdf
Management Action Plans Follow-Up for Internal Audit	Annual Report	Completed	2013-07-16	http://www.asc-csa.gc.ca/pdf/eng/publications/management-2013-audit.pdf
Audit of the Process of Preparing the Canadian Space Agency's Annual Financial Statements and Quarterly Financial Reports	Compliance	Completed	2013-07-16	http://www.asc-csa.gc.ca/pdf/eng/publications/ar-1213-0301.pdf
Audit of the Canadian Space Agency Class Grant and Contribution Program to Support Research, Awareness and Learning in Space Science and Technology	Compliance	Completed	2013-07-16	http://www.asc-csa.gc.ca/pdf/eng/publications/ar-1213-0101.pdf
Annual Report by the External Members of the Audit Committee	Annual Report	Completed	2013-07-16	http://www.asc-csa.gc.ca/pdf/eng/publications/annual-report-2012-2013.pdf

1. Name of Evaluation	2. Program Activity	3. Type	4. Status	5. Electronic Link to Report
Evaluation of the Earth Observation Data and Imagery Utilization Program	1.1.3.1	Management Framework	Completed – 2012-01-20	http://www.asc-csa.gc.ca/pdf/Evaluation_EODIUP_2012-01-11.pdf
Management Action Plans Follow-up for evaluation	N/A	Annual Report	Completed – 2012-07-18	http://www.asc-csa.gc.ca/pdf/management-action-plans-2011-2012.pdf
Management Action Plans Follow-up for Evaluation	N/A	Annual Report	Completed – 2013-07-09	http://www.asc-csa.gc.ca/pdf/eng/publications/management-2013-evaluation.pdf
Evaluation of Advanced Exploration Technology Development Program	1.2.2.3	Management Framework	In progress	To come

3.4.3) Response to Parliamentary Committees and External Audits

Response to Parliamentary Committees
No response requested in 2012–13
Response to the Auditor General
No recommendation received in 2012–13.
External audits conducted by the Public Service Commission of Canada or the Office of the Commissioner of Official Languages
No external audits in 2012–13.

3.4.4) Sources of Respendable and Non-Respendable Revenue

Respendable Revenue

(\$ in millions)	2010–11 Actual	2011–12 Actual	2012–13			
			Main Estimates	Planned Revenue	Total Authorities	Actual
Respendable Revenue	N/A	N/A	N/A	N/A	N/A	N/A
Total Respendable Revenue	N/A	N/A	N/A	N/A	N/A	N/A

Non-Respendable Revenue

(\$ in millions)	2010–11 Actual	2011–12 Actual	2012–13			
			Main Estimates	Planned Revenue	Total Authorities	Actual
Space Data, Information and Services						
Royalty Revenues	1.2	0.7	0.0	0.8	0.0	1.0
Miscellaneous Revenues	0.0	0.1	0.0	0.0	0.0	0.1
Future Canadian Space Capacity						
David Florida Laboratory Testing Facilities and Services	3.7	5.3	0.0	4.0	0.0	2.2
Internal Services						
Royalties from Intellectual Property	0.0	0.1	0.0	0.0	0.0	0.0
Miscellaneous Revenues	0.3	0.3	0.0	0.0	0.0	0.3
Total Non- Respendable Revenue	5.2	6.5	0.0	4.8	0.0	3.6

Notes:

- Due to rounding, figures may not add to totals shown.
- Actual 2010–11 and 2011–12 Crosswalk based on 2012–13 PAA structure.

3.4.5) Status Report on Major Crown/Transformational Projects

RADARSAT Constellation Mission

1- Description

The RADARSAT Constellation Mission (RCM) is the next generation of Canadian Earth observation radar satellites. RADARSAT-1 was launched in 1995 and continued in operation until March 2013. RADARSAT-2, developed in partnership with the private sector, was launched in 2007 for a seven-year mission, but given its current performance, it is expected to remain operational for many more years. Canada has established itself as a leading global supplier of C-band satellite radar data for Earth observation. The RADARSAT Constellation Mission will enhance this leadership and position Canadian industry in technology and value-added product markets.

The RADARSAT Constellation Mission is comprised of three small identical satellites orbiting the Earth. The launch of the constellation is planned in the 2018-2019 fiscal year. With a constellation, the time between successive imaging of a specific point on Earth is significantly reduced. The creation of a three-satellite constellation will increase the frequency of available information, as well as the reliability of the system, making it better suited to the operational requirements of departments. In the event of a satellite failure, the remaining tandem would continue to provide a reduced level of service. The lower cost of satellites facilitates the replacement of individual satellites and makes the system scalable.

The scope of the RCM Major Crown Project includes the requirement definition, design, development manufacturing, integration, testing and launching of the satellites as well as the design, development, manufacturing and installation of the associated ground segment. One year of operation of the three-satellite constellation is also included as well as an applications development program.

The RADARSAT Constellation Mission will provide reliable all-weather day and night data in support of federal departments' requirements and mandates in three main areas: maritime surveillance, environmental monitoring and natural resources management. The three-satellite constellation provides average daily coverage of most of Canada and its surrounding waters. The satellite coverage increases significantly in the North, where the constellation will provide coverage two to three times daily of the Arctic and the Northwest Passage.

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. Only satellite data can offer regular cost effective coverage to task ships and aircraft in order to intercept suspicious vessels. The daily coverage of marine areas will also support fisheries monitoring, ice and iceberg monitoring, pollution monitoring and integrated ocean and coastal zone management. The RCM's maritime

surveillance capabilities also support Canadian sovereignty and security. Recently, the technology was developed 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.

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, response and recovery activities carried out by the Department of National Defence and by Public Safety Canada, as well as to help 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.

In support of environmental monitoring RCM will provide data for wide area change detection in order to provide support for activities such as water monitoring, wetlands mapping, coastal change monitoring and changes in the permafrost in northern Canada. RCM data will contribute to the production of more accurate weather forecasts and warnings pertaining to marine conditions, winds, severe storms and floods.

In support of natural resources management, RCM data will be a critical source of information used by government departments 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 explorations operations to ensure that critical infrastructure is monitored properly for safety and integrity.

In addition, the RADARSAT Constellation Mission sustains 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.

Project phase: D - Implementation

Sponsoring and Participating Departments and Agencies

Sponsoring Agency:	Canadian Space Agency
Contracting Authority:	Public Works and Government Services Canada (PWGSC)
Users and Participating Departments:	Aboriginal Affairs and Northern Development Canada Agriculture and Agri-Foods Canada Canadian Coast Guard Canadian Ice Service Department of Foreign Affairs and International Trade

	Department of National Defence Environment Canada Fisheries and Oceans Canada Industry Canada Natural Resources Canada Parks Canada Public Safety Canada Royal Canadian Mounted Police Statistics Canada Transport Canada
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Prime and Major Sub-Contractors (Phases B/C/D)

Prime Contractor: MDA Systems Ltd (a division of MacDonald, Dettwiler and Associates (MDA))	- Richmond, British Columbia
Major Sub-Contractors: - MDA Montreal - Magellan Aerospace - MDA Halifax - Space X - EADS, Astrium - COMDEV Europe	- Ste.-Anne-de-Bellevue, Québec - Winnipeg, Manitoba - Halifax, Nova Scotia - Hawthorne, California, USA - United Kingdom - United Kingdom
Canadian Tier 2 and Tier 3 Subcontractors: - COMDEV Limited - SED Systems - EADS, Composites Atlantic - IMP Group - DRS - Lemex - STMicroelectronics Canada - Maya	- Cambridge, Ontario - Saskatoon, Saskatchewan - Lunenburg, Nova-Scotia - Halifax, Nova-Scotia - Ottawa, Ontario - Brossard, Quebec - Mississauga, Ontario - Montreal, Quebec

Major Milestones

The following are the major milestones of the RADARSAT Constellation Major Crown Project, by phase:

Phase	Major Milestones	Date (at completion)
A	Requirement Definition	March 2008
B	Preliminary Design	March 2010
C	Detailed Design Review	November 2012
D	Launch satellite #1, #2, and #3	2018-2019
E1	Operations (part of MCP)	2019-2020
E2	Operations (not part of MCP)	2025-2026

Progress Report and Explanation of Variances

On December 13, 2004, the Domestic Affairs Committee of Cabinet granted approval-in-principle to a ten-year program to implement a RADARSAT Constellation Mission aimed at addressing user needs in relation to Canadian sovereignty and marine surveillance, environmental monitoring and change detection, and disaster management. The RCM is to be government-owned and operated.

On June 6, 2005, Treasury Board granted Preliminary Project Approval (PPA) for the RADARSAT Constellation Mission and expenditure authority for the Project Initial Planning and Identification (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 of 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.

A revised Preliminary Project Approval Treasury Board Submission to proceed to Phases B and C was approved in March 2007. Following a competitive Request for Proposal (RFP) process, Public Works and Government Services Canada (PWGSC) obtained authority to enter into a contract with the Prime Contractor, MDA and the contract for Phase B was awarded to MDA in November 2008. The Preliminary Design (Phase B) was completed in March 2010. The contract for Phase B was subsequently amended to include the detailed design (Phase C).

A second revised Preliminary Project Approval was approved by the Treasury Board in December 2010. The purpose of this revised PPA was to provide additional expenditure authority to include the procurement of long-lead items during Phase C and also to include a technology demonstration program for the Department of National Defence funded Automatic Identification System (AIS) payload.

The final review of the overall mission-level system detailed design, the Mission Critical Design Review (CDR), was conducted in November 2012 and marked the completion of the detailed design of the RADARSAT Constellation Mission. This milestone was achieved with a one-month delay with respect to previous planning. The delay was due to technical challenges in the detailed design of the bus and payload sub-systems. A selected set of activities were pursued until December 2013 on Phase C, such as closing actions resulting from the design reviews and the procurement of long-lead items.

In November 2012, PWGSC successfully completed the negotiation of a firm-fixed price contract with MDA for the manufacturing (Phase D) and early operations (Phase E1) of the RCM. The 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. The contract for Phase D and E1 was awarded on January 9, 2013.

Industrial Benefits

Significant industrial benefits in the space and Earth Observation sectors are expected from the RADARSAT Constellation program. It is expected to generate employment growth in the Canadian knowledge-based economy and spur the growth of small and medium-sized businesses as the Canadian infrastructure and services industry continues to grow. As of March 31, 2013, the CSA had provided the Canadian industry with funding of more than \$201.9 million to carry out work resulting directly from the design of the RADARSAT Constellation Major Crown Project.

Regarding Canadian content and the distribution of contracts within Canada, the prime contract includes a requirement for 70% Canadian content, excluding launch services and sub-systems for which there are no suppliers available in Canada. The Prime Contractor is also required to meet the CSA's overall regional distribution targets on a "best efforts" basis. In addition, given previous difficulties in achieving the targets in Atlantic Canada, a minimum requirement of 3.5% of the 70% Canadian content has been set for that region. This objective was met in March 2012. The prime contract includes reporting obligations and performance measurements as well as financial penalties for not meeting the minimum Atlantic Canada content requirement. The CSA works closely with the Atlantic Canada Opportunities Agency (ACOA) to monitor regional distribution and to help support the Prime Contractor achieve the said targets.

Regional Distribution of RADARSAT Constellation Mission Contracts to Canadian Industry (\$ in millions) (As of March 31st, 2013)

	British Columbia	Prairies	Ontario	Quebec	Atlantic Provinces	Total Canada
Targets (%)	10%	10%	35%	35%	10% (3.5 % min.)*	100%
Actual (%)	29.3%	13.7%	21.9%	32.8%	2.3%	100%
Actual (\$)	59.2	27.7	44.2	66.2	4.7	201.9

* The absolute Canadian Content requirement for the Atlantic Canada Region is of 2.45% of the total contract value (3.5% of the 70% Canadian Content Requirement).

Summary of Non-Recurring Expenditures (\$ in millions) (As of March 31, 2013)

	Current Estimated Total Expenditure	Actual at March 31, 2013	Future Years
RADARSAT Constellation Mission	1,085.3	314.9	770.4

James Webb Space Telescope (JWST)

1- Description

The James Webb Space Telescope (JWST) is a joint mission of NASA, the ESA, and the Canadian Space Agency. The mission concept is for a large field-aperture telescope to be located 1.5 million km from Earth. Like Hubble, the JWST will be used by the astronomy community to observe targets ranging from objects within our solar system to the most remote galaxies which can be seen during their formation in the early universe. The science mission is centered on the quest to understand our origins and is focused on the following:

- 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 4 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.

Following NASA's replanning exercise, the JWST is now scheduled for launch in 2018. JWST instruments will be designed to work primarily in the infrared range of the electromagnetic spectrum, with some capability in the visible range. JWST will have a large mirror, 6.5 meters in diameter and a sun shield that will be the size of a tennis court once deployed in outer space.

Canada is providing the Fine Guidance Sensor (FGS) and Near Infra-Red Imager and Slitless Spectrometer (NIRISS). The NIRISS instrument replaces the Tuneable Filter Imager (TFI) originally planned. The FGS is integral to the attitude control system of JWST, and consists of two fully redundant cameras that will report precise pointing information of JWST. Canadian expertise in this area has been established with the successful fine error sensors for the FUSE mission. Packaged with the FGS but functionally independent, the Near Infra-Red Imager and Slitless Spectrometer 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 extra-solar planets.

Developed in partnership with COM DEV Canada, the JWST-FGS Major Crown Project consists of the design, development, integration and testing and integration into the spacecraft, launching and commissioning of the Fine Guidance Sensor and Near Infra-Red Imager and Slitless Spectrometer. By participating in this leading-edge international space exploration mission, the Canadian Space Agency is actively promoting Canadian scientific expertise and innovative, advanced space technologies.

The National Research Council's National Science Infrastructure (NSI), formerly known as Herzberg Institute of Astrophysics, is a key Government of Canada partner for activities related to the development of science instruments and distribution of telescope data. In return for its overall investment in the JWST, Canada will obtain a minimum of 5% of the time on this unique space telescope.

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.

Project phase: D - Implementation

Sponsoring and Participating Departments and Agencies

Sponsoring Agency:	Canadian Space Agency
Contracting Authority:	Public Works and Government Services Canada for the Canadian Space Agency
Participating Departments:	NRC's National Science Infrastructure Industry Canada

Prime and Major Sub-Contractors

Prime Contractor: - COM DEV Canada	 - Ottawa, Ontario
Major Sub-Contractors: - Teledyne - Corning Netoptix - IMP Aerospace Avionics - ABB Bomem - MDA - INO - BMV - CDA - ESTL - Bach Research Corporation - Materion - Camcor	- USA. - USA. - Canada - Canada - Canada - Canada - Canada - Canada - USA. - Europe - USA. - USA. - Canada

Major Milestones

The following are the major milestones, by phase:

Phase	Major Milestones	Date
A	Requirement Definition	2003-2004
B	Preliminary Design	August 2004 to May 2005
C	Detailed Design	July 2005 to September 2008
D	Manufacturing/Assembly; Integration/Testing; Pre-launch preparations, Launch/System Commissioning	May 2007 to March 2019
E	Operations	2019 to 2024

Note: The Major Crown Project terminates with the completion of Phase D.

Progress Report and Explanation of Variances

In March 2004, the Treasury Board granted Preliminary Project Approval for Phases B, C and D at an indicative cost of \$67.2 million. In December 2006, before the completion of the detailed design of the FGS, the CSA requested increased expenditure authority to complete the project. In February 2007, the Treasury Board granted Effective Project Approval for a substantive total cost estimate of \$98.4 million with the condition "that the Canadian Space Agency provide reports to Treasury Board at the completion of Phases C and D of the JWST project which include up-to-date information on the project scope, costs, schedule and risks". At the same time, the project became a Major Crown Project.

In March 2007, the first Critical Design Review (CDR) for the guider function of the FGS, revealed some technical issues which required additional effort to resolve. This review took place after the Effective Project Approval (EPA) received in February 2007. During the preparation of the system level CDR, new issues requiring additional analysis became apparent. Testing of the Tunable Filter Imager prototype also revealed technical issues that needed to be addressed.

On December 2007, the Treasury Board granted a revised Effective Project Approval (EPA) of \$151.0 million after the CSA's costs had risen significantly at the end of the detailed design phase.

In 2011-12, the participants in the project were very busy with hardware and software development. COMDEV Canada, the prime contractor for the JWST Fine Guider Sensor (FGS) project, worked on the Proto Flight Model (PFM). The Proto Flight Model FGS successfully completed a very stringent environmental test campaign during which the instrument was subjected to cryogenic temperatures over a period of 80 continuous days.

The FGS Engineering Test Unit (ETU) was integrated into the NASA Goddard Space Flight Center (GSFC) test set-up and underwent system level testing with the other science instrument engineering units. An integration test onto the integrated science instrument module (ISIM) of the JWST was successfully conducted.

On the Tunable Filter Instrument (TFI), development of the etalon proved to be technically challenging. In July 2011, the CSA decided to halt all etalon activities because the challenges facing this subsystem could not be resolved within the delivery timeframe defined by NASA. As a result, the Principal Investigator for the TFI proposed a plan to salvage the Canadian science instrument. From this was born the Near Infrared Imager and Slitless Spectrograph (NIRISS). This new instrument relied on all existing components of the old TFI with the exception of the etalon. The function of the etalon was replaced by selecting new optical elements capable of covering the light spectrum required for the science mission. Significant progress was achieved during this period. All the optical components were procured and most were received. As a result of this progress the PFM FGS/NIRISS was delivered to NASA during the summer of 2012. Manufacturing, integration and testing of the FGS was completed during Fiscal Year 2012-13.

Industrial Benefits

As of March 31, 2013, the CSA had funded close to \$112.2 million of work for Canadian industry that was directly attributable to the JWST-FGS Major Crown Project. Direct industrial benefits from the construction of the JWST-FGS, TFI and NIRISS system will benefit Canada's central regions. Although there is no regional distribution requirement for this project, the following table provides an approximate distribution:

Regional Distribution of JWST Contracts to Canadian Industry (\$ in millions) (As of March 31, 2013)

	Ontario	Quebec	Atlantic Provinces	Total Canada
Actual (%)	90.4%	8.0%	1.6%	100%
Actual (\$)	101.4	9.0	1.8	112.2

Summary of Non-Recurring Expenditures (\$ in millions) (Forecasts to March 31, 2013)

	Current Estimated Total Expenditure	Actual at March 31, 2013	Future Years
JWST-FGS and NIRISS	156.7	148.3	8.4

3.4.6) Status Report on Projects operating with specific Treasury Board Approval

Program / Project (\$ in millions) [5]	Original Estimated Total Cost [1]	Revised Estimated Total Cost [2]	Actual Cost Total [3]	2012-13				Expected close-out date [4]
				Main Estimates	Planned Spending	Total Authorities	Actual	
Space Data, Information and Services								
RADARSAT- CONSTELLATION MCP - EPA	600.0	1,085.3	314.9	73.3	87.0	124.1	99.4	2018- 2019
Space Exploration								
OSIRIS-Rex LASER ALTIMETER (OLA) - PPA	26.7	26.7	4.2	6.1	6.1	4.6	4.2	2016- 2017
CANADIANMETROL OGYSYSTEM (CAMS) ON JAPAN's ASTRO-H SPACE OBSERVATORY SATELLITE - EPA	4.8	4.8	1.5	3.1	3.1	3.0	1.5	2014- 2015
JAMES WEBB SPACE TELESCOPE MCP (JWST) - EPA	67.2	156.7	148.3	6.0	6.0	6.0	5.1	2018- 2019
NEAR EARTH OBJECT SURVEILLANCE SATELLITE (NEOSSAT) - EPA	5.4	9.5	9.2	0.1	2.2	3.2	2.7	2013- 2014
Future Canadian Space Capacity								
MARITIME MONITORING AND MESSAGING MICRO- SATELLITE (M3MSAT) - EPA	5.4	7.7	3.4	0.9	3.7	4.5	0.4	2014- 2015
Total [3]	709.5	1,290.7	481.6	89.4	107.9	145.5	113.3	

[1] Very first Total Estimated project cost approved by Treasury Board.

[2] Most recent Total Estimated project cost approved by Treasury Board.

[3] All expenditures to date including the current year.

[4] Expected date (fiscal year) for the start of operations.

[5] Excluding GST.

3.4.7) User Fees Reporting

User Fee: Fees charged for the processing of access to information requests filed under the Access to Information Act (ATIA)

Fee Type: Other products and services (O)

Fee-Setting Authority: Access to Information Act

Date Last Modified: 1992

Performance Standards: Response provided within 30 days following receipt of request; the response time may be extended pursuant to section 9 of the ATIA. Notices of extension are to be sent within 30 days after receipt of request. The Access to Information Act provides fuller details.

Performance Results: The Canadian Space Agency (CSA) received 23 new requests for access to information and had 1 that was outstanding from the previous period. Six were reported to be processed in the following year, for a total of 18 processed requests. CSA routinely waives fees in accordance with TBS guidelines. The response time was within time limits in 83% of the requests.

2012-13 (\$ in thousands)			Planning Years (\$ in thousands)		
Forecast Revenue	Actual Revenue	Full Cost	Fiscal Year	Forecast Revenue	Estimated Full Cost
0.1	0.1	95	2013-14	0.1	95
			2014-15	0.1	95
			2015-16	0.1	95

Other Information: The CSA collects user fees for information requests in accordance with the Access to Information Act. The total amount of user fees collected in 2012-13 are for application fees. There was no need to charge for preparation and search fees.