

**CANADIAN SPACE AGENCY  
2011-2012 DEPARTMENTAL PERFORMANCE REPORT**

**ANNEXES**

- 3.4.1) [Details on Transfer Payment Programs \(TPPs\)](#)
- 3.4.2) [Internal Audits and Evaluations](#)
- 3.4.3) [Response to Parliamentary Committees and External Audits](#)
- 3.4.4) [Sources of Respendable and Non-Respendable Revenue](#)
- 3.4.5) [Status Report on Major Crown/Transformational Projects](#)
- 3.4.6) [Status Report on Projects operating with specific Treasury Board Approval](#)
- 3.4.7) [User Fees Reporting](#)

### 3.4.1) Details on Transfer Payment Programs (TPPs)

<b>Contributions under the Canada / European Space Agency Cooperation Agreement</b>	
<b>Start Date:</b> January 1, 2000	<b>End Date:</b> December 31, 2019
<p><b>Description</b></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 ESA optional programs.</p>	
<p><b>Strategic Outcome</b></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><b>Expected Results (Sub-sub Activity Level)</b></p> <p><b>International Market Access:</b>            This Program Sub-Sub-Activity (SSA) facilitates foreign market access by the Canadian space industry through negotiating, implementing and managing special international arrangements. For example, in return for Canadian Space Agency (CSA) contributions to the European Space Agency (ESA) under the longstanding ESA-Canada Agreement, Canadian industry obtains some of the contracts awarded by ESA; thus gaining market access that would otherwise be limited to Europeans. This SSA is necessary because it opens opportunities for Canadian scientists and space industries to collaborate with European Prime contractors and gain market access for Canadian science and technology.</p> <p><b>Expected Results Specific to the Transfer Payment Program:</b>            Canadian investments through the ESA Agreement allow Canadian industry to access the institutional European market.            The Canadian industry has access to flight opportunities where they may gain flight heritage for their technologies/components.</p>	
<p><b>Results Achieved</b></p> <p>Several technologies and skills have been developed and improved through the participation of Canadian companies in ESA programs. Some businesses have integrated these technologies into products, allowing them to sell these products in other than European markets. In addition to generating revenues, the development and improvement of space technologies also created or maintained specialized jobs in Canada. In addition, specialized skills were created in the areas of space hardware, ground segment, and space technology applications.</p> <p>The program served to boost the visibility of Canada in European markets. Canadian contractors see the ESA Contribution program as a means of cultivating business relationships. The program also fosters regional development and access to other markets by virtue of the successes of companies in Europe.</p> <p>More specifically, participation to ESA programs has generated the following accomplishments:</p> <ul style="list-style-type: none"> <li>• Through the Earth Observation Envelop Program, the CSA supported Canadian scientists to access Earth Explorer mission data and Canadian companies to participate in the development of advanced space-borne instruments and user-oriented applications.</li> </ul>	

- The CSA has continued to position the Canadian industry and scientists in future scientific and technological developments relating to the European Aurora planetary exploration program (including the Exomars mission), to the Lunar Lander mission and to the physical and life sciences ELIPS-2 and ELIPS-3 programs. The CSA is also contributing to the International Berthing and Docking Mechanism activity since this represents a key Canadian technology niche.
- Through the ARTES program, our industry can has continued to access forward-looking studies on new telecommunications services, develop new technologies, equipment and applications in multi-media, inter-satellite and mobile communications, and demonstrate satellite-based communications services such as interactive communications services for remote communities and for disaster management.
- In satellite navigation, following the successful launch of the first two Galileo In-Orbit-Validation (IOV) satellites in October 2011, the Canadian contribution to the Galileo ground infrastructure to support the monitoring of the quality of the localisation signal generated is now being used for the Galileo on-going testing and validation campaign.
- Through the GMES Space Component Program, Canadian industry provided SAR (Synthetic Aperture Radar) processor and Active Calibration transponder for Sentinel -1 and a SAR antenna for Sentinel-3.
- Through the General Support Technology Program (GSTP), the CSA has continued to support the maturation of Canadian space technologies in view of their potential use in ESA missions and to support Canadian industry's participation to In-orbit technology demonstration missions such as Proba-V and Proba-3.

(\$ in millions)	2009-2010 Actual Spending*	2010-2011 Actual Spending	2011-2012 Planned Spending	2011-2012 Total Authorities	2011-2012 Actual Spending	Variance
Future Canadian Space Capacity	30.4	33.5	47.3	45.4	35.1	12.2
<b>Total Program Activity</b>	30.4	33.5	47.3	45.4	35.1	12.2

**Comment on Variance**

The variance of \$12.2 million is mainly due to the following factors: the budgetary cycle of ESA differs from the Canadian one, the slippage in the planned disbursements of ESA programs and the non realisation of some budgeted risks such as potential cost increase in ESA programs, inflation and exchange rate fluctuations. A reprofiling of funds from 2011-2012 to future fiscal years will be requested.

**Notes:**

- Due to rounding, figures may not add to totals shown.
- This table details contribution program with funding in excess of \$5 million per annum.
- \*Actual Spending Crosswalk based on 2011-2012 PAA structure.

**Fiscal Year of Planned Completion of Next Evaluation:** 2015-2016

**Fiscal Year of Previous Evaluation:** 2005-2006

Further to the summative evaluation of the Canada/European Space Agency Cooperation Agreement, the contribution program under this Agreement was recommended for continuation. Therefore, the revised terms and conditions for the contributions under the 2010-2019 Cooperation Agreement were aligned with the new 2011-2012 Program Activity Architecture (PAA).

To learn more, go to: [http://www.asc-csa.gc.ca/pdf/evaluation\\_2010-canada-esa\\_eng.pdf](http://www.asc-csa.gc.ca/pdf/evaluation_2010-canada-esa_eng.pdf)

**General Targeted Recipient Group:**

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

**Initiatives to Engage Applicants and Recipients:**

At the end of 2011-2012, the CSA is actively consulting 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 will announce their position on contributions to the proposed ESA Programs.

**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 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 to support the development of science and technology; 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 pertaining to Canadian Space Agency priorities.

The awareness and learning component aims to increase awareness of Canadian space science and technology among Canadian youth and educators and their participation in related activities; provide learning opportunities to Canadian students and physicians in various space-related disciplines; and support the operations of organizations dedicated to space research and education.

**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 Activity Level)**

1. **Space Data, Information and Services:** This Program Activity utilizes space-based solutions to assist Government of Canada (GoC) organizations in delivering growing, diversified or cost-effective programs and services within their mandate, which is 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.
2. **Space Exploration:** This Program Activity provides valuable Canadian science, signature technologies and qualified astronauts to international space exploration endeavours. This Program Activity contributes to the Government of Canada's Science and Technology Strategy. It fosters the generation of knowledge as well as technological spin-offs that contribute to a higher quality of life for Canadians. It generates excitement within the population in general and contributes to nation-building. This Program Activity appeals to the science and technology communities.
3. **Future Canadian Space Capacity:** This Program Activity 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 (Government of Canada (GoC) organizations) and international partners).

**Expected Results Specific to the Transfer Payment Program:**

**1. Research Component**

- Increased knowledge from research projects in priority space science and technology 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.

**2. Awareness and Learning Component**

**Awareness:** Increased availability and use of the space theme in learning opportunities and materials related to science and technology.

**Learning:** Post-secondary level and physicians will have increased knowledge and skills in space-related disciplines.

**Results Achieved**

**Research Component**

In 2011-2012, Canadian universities have made significant contribution to knowledge creation in space science and technology priority areas through more than 86 active research projects (\$10.4 million actual spending) of which 18 are new initiatives. More than 689 publications and presentations have resulted from these projects among which 184 were peer reviewed. As a result of these projects, 26 scientific and technology breakthroughs occurred and there is a possibility that some of the 26 ideas generated during these projects might be integrated in future space missions. It is to be noted that already, one US patent has been granted for a specialized method and apparatus. 443 Highly Qualified Personnel (HQP) were directly involved in these works among which 174 Faculty, 214 students and 44 technicians and other research personnel. More than 80 organizations have jointly worked in these projects (42% with foreign universities, 10% with foreign research centers), involving indirectly more than 845 HQP. These initiatives have brought 19 new players to space related fields and around 40% of projects hold a multidisciplinary perspective.

**Awareness and Learning Component**

Over 158 awareness development and learning opportunities were supported in 2011-2012. A total of \$1.2 million was awarded to individuals and organization to facilitate conference attendance, workshops, science and engineering competitions and training opportunities targeting audiences ranging from Secondary school to graduate students, as well as supporting not-for-profit organizations and national and international educational institutions in the development of space-focused content, programs and events engaging Canadian youth and students.

Four Canadian medical students and physicians received training in aerospace medicine, enhancing Canadian expertise to be able to support the medical needs of astronauts during all phases of spaceflight. Their research projects addressed potential acute mountain sickness in future spacecraft atmospheres, metabolic aspects of extravehicular activity and analysis of Magnetic Resonance Imagery (MRI) findings of leukoaraiosis (changes in brain tissue) in the astronaut population.

(\$ in millions)	2009-2010 Actual Spending*	2010-2011 Actual Spending*	2011-2012 Planned Spending	2011-2012 Total Authorities	2011-2012 Actual Spending	Variance
Space Data, Information and Services	-	-	0.5	-	-	0.5
Space Exploration	-	0.1	0.3	0.2	0.2	0.0
Future Canadian Space Capacity	0.3	1.1	1.9	3.6	3.3	(1.5)
<b>Total Contributions</b>	<b>0.3</b>	<b>1.2</b>	<b>2.6</b>	<b>3.9</b>	<b>3.6</b>	<b>(0.9)</b>
Space Data, Information and Services	-	0.1	-	0.7	0.7	(0.7)
Space Exploration	-	0.4	0.8	1.0	1.0	(0.2)
Future Canadian Space Capacity	5.7	5.4	4.8	6.4	6.4	(1.7)
<b>Total Grants</b>	<b>5.7</b>	<b>6.0</b>	<b>5.5</b>	<b>8.1</b>	<b>8.1</b>	<b>(2.6)</b>
<b>Total Program Activities</b>	<b>6.0</b>	<b>7.2</b>	<b>8.2</b>	<b>12.0</b>	<b>11.7</b>	<b>(3.5)</b>
<b>Notes:</b>						
<ul style="list-style-type: none"> <li>➤ Due to rounding, figures may not add to totals shown.</li> <li>➤ This table details contribution program with funding in excess of \$5 million per annum.</li> <li>➤ *Actual Spending Crosswalk based on 2011-2012 PAA structure.</li> </ul>						
<b>Comment on Variances</b>						
No comment.						

**Fiscal Year of Planned Completion of Next Evaluation:** 2014-2015

**Fiscal Year of Previous Evaluation:** 2008-2009

The summative evaluation of the previous Class Grant and Contribution Program was completed in 2009.

To learn more, go to: <http://www.asc-csa.gc.ca/eng/publications/ar-0570-2745.asp>

**General Targeted Recipient Groups:**

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 include Canadian citizens or permanent residents of Canada, Canadian elementary, secondary and post-secondary institutions, not-for-profit organizations established and operating in Canada, and international organizations dedicated to space relevant education.

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 include Canadian elementary, secondary and post-secondary institutions, not-for-profit organizations established and operating in Canada, and international organizations dedicated to space relevant education.

**Initiatives to Engage Applicants and Recipients:**

An initiative to engage recipients has been undertaken in January 2012 through a newly automated annual follow-up of projects. Based on this pilot, the Agency is planning to extend this experience to open a dialogue with potential applicants as well as recipients.

Consultations, presentations and discussions with the academic community and 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
Values and Ethics	Management Framework	Completed	2010-06-23	<a href="http://www.asc-csa.gc.ca/eng/publications/ar-0809-0103.asp">http://www.asc-csa.gc.ca/eng/publications/ar-0809-0103.asp</a>
IT Technology Dependence	Management Framework	Completed	2010-06-23	<a href="http://www.asc-csa.gc.ca/eng/publications/ar-0910-0103.asp">http://www.asc-csa.gc.ca/eng/publications/ar-0910-0103.asp</a>
IT Planning and development risks	Management Framework	Completed	2010-06-23	<a href="http://www.asc-csa.gc.ca/eng/publications/ar-0910-0104.asp">http://www.asc-csa.gc.ca/eng/publications/ar-0910-0104.asp</a>
IT System and Data Security	Management Framework	Completed	2010-06-23	<a href="http://www.asc-csa.gc.ca/pdf/ar-0910-0105.pdf">http://www.asc-csa.gc.ca/pdf/ar-0910-0105.pdf</a>
Proactive Disclosure Process	Management Framework	Completed	2010-09-27	<a href="http://www.asc-csa.gc.ca/eng/publications/ar-0910-0102.asp">http://www.asc-csa.gc.ca/eng/publications/ar-0910-0102.asp</a>
David Florida Laboratory Test Facilities Management	Management Framework	Completed	2010-12-21	<a href="http://www.asc-csa.gc.ca/eng/publications/ar-0910-0107.asp">http://www.asc-csa.gc.ca/eng/publications/ar-0910-0107.asp</a>
Official Languages	Management Framework	Completed	2011-03-21	<a href="http://www.asc-csa.gc.ca/eng/publications/ar-0910-0106.asp">http://www.asc-csa.gc.ca/eng/publications/ar-0910-0106.asp</a>
Procurement and Contract Management	Management Framework	Completed	2011-03-21	<a href="http://www.asc-csa.gc.ca/eng/publications/ar-1011-0102.asp">http://www.asc-csa.gc.ca/eng/publications/ar-1011-0102.asp</a>
Audit Committee Annual Report 2010-2011	Annual Report	Completed	2011-07-19	<a href="http://www.asc-csa.gc.ca/eng/publications/ar_2010-2011.asp">http://www.asc-csa.gc.ca/eng/publications/ar_2010-2011.asp</a>
Succession Planning Audit Report	Management Framework	Completed	2012-01-17	<a href="http://www.asc-csa.gc.ca/eng/publications/ar-1112-0101.asp">http://www.asc-csa.gc.ca/eng/publications/ar-1112-0101.asp</a>
Audit of Major Investment Business Cases	Management Framework	Completed	2012-03-26	<a href="http://www.asc-csa.gc.ca/pdf/audit_report_Investment_2012-03-12.pdf">http://www.asc-csa.gc.ca/pdf/audit_report_Investment_2012-03-12.pdf</a>
Audit Committee Annual Report 2011-2012	Annual Report	Completed	2012-06-20	<a href="http://www.asc-csa.gc.ca/pdf/annual-report-2011-2012.pdf">http://www.asc-csa.gc.ca/pdf/annual-report-2011-2012.pdf</a>

1. Name of Evaluation	2. Program Activity	3. Type	4. Status	5. Electronic Link to Report
Summative Evaluation of the 2000-2009 Canada/ESA Cooperation Agreement - Final Report	Four Program Activities (EO, SC, SE and GTA).	Summative	Completed 2010-02-22	<a href="http://www.asc-csa.gc.ca/pdf/evaluation_2010-canada-esa_eng.pdf">http://www.asc-csa.gc.ca/pdf/evaluation_2010-canada-esa_eng.pdf</a>
Evaluation of the Space Technology Development Program (STDP) for the period of 2002-2003 to 2007-2008	Program Activity: GTA / Space Capacity	Summative	Completed 2011-07-19	<a href="http://www.asc-csa.gc.ca/pdf/stdp_evaluation_2002-03_2007-08.pdf">http://www.asc-csa.gc.ca/pdf/stdp_evaluation_2002-03_2007-08.pdf</a>
Evaluation of the Earth Observation Data and Imagery Utilization Program	Program Activity: Space Data, Information and Services	Summative	Completed 2012-01-20	<a href="http://www.asc-csa.gc.ca/pdf/Evaluation_EODIUP_2012-01-11.pdf">http://www.asc-csa.gc.ca/pdf/Evaluation_EODIUP_2012-01-11.pdf</a>

### 3.4.3) Response to Parliamentary Committees and External Audits

<b>Response to Parliamentary Committees</b>
Steve MacLean, President of the Canadian Space Agency, appeared before the Standing Committee on Natural Resources on October 24 <sup>th</sup> , 2011. No further follow-up was required.
<b>Response to the Auditor General</b>
No recommendation was received in 2011-2012.
<b>External Audits conducted by the Public Service Commission of Canada or the Office of the Commissioner of Official Languages</b>
No external audits in 2011-2012.

### 3.4.4) Sources of Respendable and Non-Respendable Revenue

#### Respendable Revenue

(\$ in millions)	2009-2010 Actual	2010-2011 Actual	2011-2012			
			Main Estimates	Planned Revenue	Total Authorities	Actual
Respendable Revenue	-	-	-	-	-	-
<b>Total Respendable Revenue</b>	-	-	-	-	-	-

#### Non-Respendable Revenue

(\$ in millions)	2009-2010 Actual	2010-2011 Actual	2011-2012			
			Main Estimates	Planned Revenue	Total Authorities	Actual
<b><i>Space Data, Information and Services</i></b>						
Royalty Revenues	1.1	1.2	N/A	0.7	N/A	0.7
Miscellaneous Revenues	0.0	0.0	N/A	0.0	N/A	0.1
<b><i>Future Canadian Space Capacity</i></b>						
Testing Facilities and Services of the David Florida Laboratory	1.7	3.7	N/A	5.0	N/A	5.3
<b><i>Internal Services</i></b>						
Royalties from Intellectual Property	0.1	0.0	N/A	0.0	N/A	0.1
Miscellaneous Revenues	0.4	0.3	N/A	0.0	N/A	0.3
<b>Total Non-Respendable Revenue</b>	<b>3.2</b>	<b>5.2</b>	<b>N/A</b>	<b>5.7</b>	<b>N/A</b>	<b>6.5</b>

#### Notes:

- Due to rounding, figures may not add to totals shown.
- Actual 2009-2010 and 2010-2011 Crosswalk based on 2011-2012 PAA structure.

### **3.4.5) Status Report on Major Crown/Transformational Projects**

#### **RADARSAT Constellation**

##### **1- Description**

The RADARSAT Constellation is the follow-on to RADARSAT-1 and 2. RADARSAT-1 was launched in 1995 and is still operating. RADARSAT-2, developed in partnership with the private sector, was launched in 2007 for a seven-year mission. Canada has established itself as a leading global supplier of C-band satellite radar data. The RADARSAT Constellation will enhance this leadership and position Canadian industry in technology and value-added product markets.

The RADARSAT Constellation is designed as a scalable constellation of three small satellites. The launch of the first satellite is planned to occur in fiscal year 2016-2017 followed by the other two satellites in fiscal year 2017-2018. With a Constellation, the time between successive imaging of a specific point on Earth (revisit time) 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 operational requirements of Departments. In the event of a satellite failure, the other satellites 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 RADARSAT Constellation Major Crown Project includes the requirement definition, design, development manufacture, integration, test and launch of the satellites plus the design, development, manufacture and installation of the associated ground segment. One year of operation of the 3-satellite constellation is also included as well as an applications development program.

The RADARSAT Constellation will provide all-weather day and night data in support of three main user areas: maritime surveillance, disaster management and ecosystem monitoring. The three satellite constellation provides average daily coverage of most of Canada and its surrounding waters. Coverage increases significantly in Canada's North. The constellation will provide coverage two to three times daily of the Northwest Passage.

In support of maritime surveillance requirements of Environment Canada, Department of National Defence, Department of Fisheries and Oceans, Canadian Coast Guard and Transport Canada, the RADARSAT Constellation 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 to intercept suspect 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.

In support of disaster management, both in Canada and globally, the RADARSAT Constellation can provide high resolution (3 m), all-weather imagery of most places in the world on a daily basis. This data is critical to disaster mitigation, warning, response and recovery. Disaster types supported include flood monitoring and relief, oil spills, volcano eruptions, earthquakes and hurricanes.

In support of ecosystem monitoring of Natural Resources Canada, Environment Canada, Parks Canada and Agriculture and Agri-foods Canada, the RADARSAT Constellation will be a critical source of information for agriculture, forestry, changes in the permafrost in the northern Canada and wildlife habitat. The Constellation will also provide medium resolution data for wide area change detection, supporting water quantity monitoring, wetlands mapping and coastal change monitoring.

In addition, the RADARSAT Constellation develops 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 increased positioning on international markets and privileged access to data essential to many international users.

**Leading and participating Departments and Agencies**

<b>Sponsoring Agency:</b>	Canadian Space Agency
<b>Contracting Authority:</b>	Public Works and Government Services Canada
<b>Participating Departments:</b>	Natural Resources Canada Environment Canada National Defence Foreign Affairs and International Trade Industry Canada Fisheries and Oceans Agriculture and Agri-foods Canada Transport Canada Public Security Indian and Northern Affairs Canada Parks Canada

### Prime and Major Sub-Contractors

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

### Major Milestones

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

Phase	Major Milestones	Date (at completion)
A	Requirement Definition	March 2008
B	Preliminary Design	March 2010
C	Detailed Design	October 2012
D	Launch satellite #1 Launch satellite #2 and #3	August 2016 December 2017
E1	Operations (part of MCP)	April 2019
E2	Operations (not part of MCP)	2019 to 2025

### 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 aimed at addressing user needs in relation to Canadian sovereignty and marine surveillance, environmental monitoring and change detection, and disaster management. The RADARSAT Constellation is to be government-owned and operated.

In Budget 2005, the CSA was provided with an additional \$111 million over five years (2005-2006 to 2009-2010) and was directed to contribute \$89 million over the same period to work with the Canadian space industry on the development of the constellation of advanced radar remote sensing satellites. This funding covered Phases A (Initial Planning and Identification Phase) through C (Detailed Definition Phase) of the RADARSAT Constellation Major Crown Project.

On June 6, 2005, Treasury Board granted Preliminary Project Approval (PPA) for the RADARSAT Constellation and expenditure authority for the Project Initial Planning and Identification (Phase A). During Phase A, feasibility studies were finalized, user requirements were defined, and risk mitigation activities and options analysis for the BUS and payload were performed. 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, 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).

Budget 2010 allocated \$397 million in additional funds and directed the Agency to contribute \$100 million, while a Memorandum to Cabinet in June 2010 granted authorization to pursue the development of the RADARSAT Constellation. This funding supports a portion of the manufacturing, integration and testing of the space and ground segment during the subsequent five-year fiscal framework.

A second revised Preliminary Project Approval was approved by 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 National Defence funded Automatic Identification System payload.

The RADARSAT Constellation Mission (RCM) is now well advanced in its detailed design phase. Critical Design Reviews for the space segment subsystems have started in winter 2011-2012 and are planned to continue over summer 2012. The Phase C schedule has increased by eight months, mainly due to the realization of technical risks. Phase C is planned to be completed in fall 2012 with the achievement of the Mission Critical Design Review and acceptance by the RADARSAT Constellation stakeholders. In January 2012, a launch reservation agreement was signed with the commercial space company, Space X for the launch of the first spacecraft onboard a Falcon-9 launch vehicle.

The contract for Phase D (Manufacturing) will be awarded once CSA and PWGSC will have obtained the appropriate authorities from Treasury Board.



## 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, 2012, the CSA has funded over \$146.2 million worth of work to Canadian industry directly attributable to the design of RADARSAT Constellation Major Crown Project.

Regarding the Canadian content and the distribution of contracts within Canada, the prime contract includes a requirement for 70% Canadian content, excluding launch services. The Prime contractor is also required to apply CSA's overall regional distribution targets on a "best efforts" basis. In addition, considering the past difficulty 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 measures as well as financial penalties for not meeting the minimum Atlantic Canada content. CSA works closely with the Atlantic Canada Opportunities Agency (ACOA) to monitor regional distribution achievements and to support the prime contractor in the delivery of the given targets.

### Regional Distribution of RADARSAT Constellation Mission Contracts to Canadian Industry (\$ in millions) (As of March 31st, 2012)

	British Columbia	Prairies	Ontario	Quebec	Atlantic Provinces	Total Canada
Targets	10%	10%	35%	35%	10% (3.5 % min.)*	100%
Actual (%)	28.5%	12.6%	21.2%	35.2%	2.5%*	100%
Actual (\$)	\$41.64	\$18.46	\$30.97	\$51.41	\$3.71	\$146.19

\* 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). As of March 2011 this contractual requirement has been met since 2.5% of the total contract value has been achieved in the Atlantic Canada region. This 2.5% corresponds to 3.57% of the 70% Canadian Content Requirement.

### Summary of Non-Recurring Expenditures (\$ in millions) (As of March 31, 2012)

Program	Current Estimated Total Expenditure	Forecast to March 31, 2012	Future Years
RADARSAT Constellation	290.3	215.5	74.8

## James Webb Space Telescope (JWST)

### 1- Description

The James Webb Space Telescope (JWST) is a joint mission of NASA, 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 are seen during their formation in the early universe. The science mission is centered on the quest to understand our origins. It is specifically aimed at:

- Observing the very first generation of stars to illuminate the dark universe when it was less than a 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 micrometers 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, launch 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.

**Leading and Participating Departments and Agencies**

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

**Prime and Major Sub-Contractors**

Prime Contractor:  - COM DEV Canada	  - Ottawa, Ontario
Major Sub-Contractors: <ul style="list-style-type: none"> <li>- Teledyne</li> <li>- Corning Netoptix</li> <li>- IMP Aerospace Avionics</li> <li>- ABB Bomem</li> <li>- MDA</li> <li>- INO</li> <li>- BMV</li> <li>- CDA</li> <li>- ESTL</li> <li>- Bach Research Corporation</li> <li>- Materion</li> <li>- Camcor</li> </ul>	<ul style="list-style-type: none"> <li>- U.S.</li> <li>- U.S.</li> <li>- Canada</li> <li>- Canada</li> <li>- Canada</li> <li>- Canada</li> <li>- Canada</li> <li>- U.S.</li> <li>- Europe</li> <li>- U.S.</li> <li>- U.S.</li> <li>- Canada</li> </ul>

## Major Milestones

The major milestones, by phase, are the following:

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, Treasury Board gave 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, 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 became apparent requiring additional analysis. Testing of the Tunable Filter Imager prototype also revealed technical issues that needed to be addressed.

On December 2007, Treasury Board granted a revised Effective Project Approval (EPA) of \$151.0 million (excluding contingency) after the CSA encountered a significant cost growth at the end of the detail design phase.

During 2011-2012, the project has been very busy with the hardware and software development. COMDEV Canada, the prime contractor for the JWST Fine Guider Sensor (FGS) project, has been working 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 with the FGS Engineering Test Unit at NASA's Goddard Space Flight Center.

On the Tunable Filter Instrument (TFI), development of the etalon proved to be technically challenging. In July 2011, CSA decided to stop all etalon activities as 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 (Dr. René Doyon, *Université de Montréal*) 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 has been accomplished during this period. All optical elements were procured and most were received. This progress will allow the delivery of the PFM FGS/NIRISS to NASA during the summer of 2012. Manufacturing, integration and testing of the FGS will be completed during Fiscal Year 2012-2013.

### **Industrial Benefits**

As of March 31, 2012, the CSA has funded close to \$108.4 million worth of work to Canadian industry 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 central regions of Canada. 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, 2012)**

	<b>Ontario</b>	<b>Quebec</b>	<b>Atlantic Provinces</b>	<b>Total Canada</b>
Actual (%)	90%	8.3%	1.7%	100%
Actual (\$)	\$97.7	\$9.0	\$1.8	\$108.4

#### **Summary of Non-Recurring Expenditures (\$ in millions) (Forecasts to March 31, 2012)**

<b>Program</b>	<b>Current Estimated Total Expenditure</b>	<b>Actuals at March 31, 2012</b>	<b>Future Years</b>
JWST-FGS and NIRISS	151.0	143.2	17.8

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

Program Activity/Project (\$ in millions)[5]	Original Estimated Total Cost [1]	Revised Estimated Total Cost [2]	Actual Cost Total [3]	2011-2012				Expected date of close-out [4]
				Main Estimates	Planned Spending	Total Authorities	Actual	
<b>Space Data, Information and Services</b>								
RADARSAT Constellation MCP (PPA)	600.0	854.8	215.5	88.5	88.5	93.3	93.3	2018-2019
<b>Space Exploration</b>								
Alpha Particle X-Ray Spectrometer (EPA) (APXS)	8.6	9.7	9.7	0.1	0.1	0.3	0.3	2012-2013
James Webb Space Telescope MCP (EPA) (JWST)	67.2	151.0	143.2	4.5	4.5	8.9	6.7	2018-2019
Near Earth Object Surveillance Satellite (EPA) (NEOSSat)	5.4	8.8	6.6	3.6	3.6	3.3	0.7	2012-2013
<b>Future Canadian Space Capacity</b>								
Maritime Monitoring and Messaging Micro-Satellite (EPA) (M3MSAT)	5.4	7.7	3.0	3.6	3.6	4.3	0.3	2012-2013
<b>Total [3]</b>	<b>686.6</b>	<b>1,032.0</b>	<b>378.0</b>	<b>100.2</b>	<b>100.2</b>	<b>110.1</b>	<b>101.2</b>	

[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 20 new requests for access to information and had 3 that were outstanding from the previous period. One was reported to be processed in the following year, for a total of 22 processed requests. CSA routinely waives fees in accordance with TBS guidelines. The response time was within time limits in 95% of the requests.

(\$ in thousands)					
2010-2011			Planning Years		
Forecast Revenue	Actual Revenue	Full Cost	Fiscal Year	Forecast Revenue	Estimated Full Cost
0.1	0.1	90	2012-2013	0.1	90
			2013-2014	0.1	90
			2014-2015	0.1	90

**Other Information:** The CSA collects user fees for information requests in accordance to the *Access to Information Act*. The total user fees collected in 2011-2012 are for application fees. There was no need to charge for preparation and search fees.