



# **CANADIAN SPACE AGENCY**

**2011–12**

## **Departmental Performance Report**

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**Minister of Industry and  
Minister of State (Agriculture)**



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## MINISTER'S MESSAGE

The Department of Industry and the other members of the Portfolio have made significant progress on a number of priorities in 2011–12.

This past year, the Industry Portfolio has worked to strengthen Canada's business environment, support scientific research and development, encourage business-driven innovation, and modernize our laws for the digital economy. The Government of Canada has made science, technology and innovation a priority since 2006, and, as this report shows, we are continuing to fulfill our commitment.

In 2011–12, the Canadian Space Agency continued to advance the development of the RADARSAT Constellation Mission, the successor mission to the other RADARSAT earth observation remote-sensing satellites. Images produced by these satellites support the critical operational needs of many government departments and agencies, especially in Canada's coastal approaches and the Arctic. The RADARSAT Constellation Mission is expected to build on this capability with enhanced functionality and coverage. The Agency's continuing development of advanced robotics technologies, the next-generation Canadarm and terrestrial prototypes of landers and rovers is helping to position Canada as a credible partner in future international space exploration missions.



Our government understands that innovation is one of the most important contributors to future economic growth. By creating new products and services, opening new markets and rethinking today's technologies, Canadian researchers, entrepreneurs and businesses across the country will help create new jobs, spur economic growth and ensure Canada's long-term prosperity.

As we move forward, the Industry Portfolio will continue to support government priorities while taking important steps to restore fiscal balance in the medium term. Through the right mix of strategic investment, marketplace frameworks and modern programs and services, we will continue to set the conditions for companies to succeed at home and abroad.

It is my pleasure to present the 2011–12 Departmental Performance Report for the Canadian Space Agency.

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Christian Paradis  
Minister of Industry and Minister of State (Agriculture)



## PRESIDENT'S MESSAGE

Over the course of the year, the Canadian Space Agency (CSA) has actively consulted with its stakeholders, enhancing collaboration between Government, academia and space industry to leverage opportunities with other space agencies.

In particular, Government of Canada (GoC) organizations are clearly demonstrating how space assets, data, information and applications are enhancing delivery of their mandates, programs and services to meet the needs of Canadians. Space is increasingly recognized as a strategic asset, greatly supporting departments in their operational activities: securing our safety, sovereignty and security; monitoring Canada's coastal approaches; assuring safe navigation in icy Arctic waters; and, supporting sustainable development, resources management, and disaster relief efforts at home and abroad.



The development of the RADARSAT Constellation is proceeding to the final design definition stage and in fiscal year 2012-2013, construction of the Constellation of three small Earth Observation satellites will be initiated. Canada has delivered its contribution to NASA's Mars Science Laboratory, an X-Ray Spectrometer that will enable scientists to evaluate the composition of Martian soil after its landing in the summer of 2012 on the Red Planet. A suite of advanced robotics, the Next Generation Canadarm, landers, rovers, drilling and other technologies are in the final stages of development, the outcome of Canada's commitment to space funded through the Economic Action Plan. Canadian universities are embracing space, leveraging the Agency's investments dedicated to building Canada's next space generation.

Canada hosted the annual meeting of the International Space Station (ISS) Heads of Agencies meeting in Quebec City, where Minister Paradis confirmed Canada's continuing participation in the ISS to 2020. Astronaut Chris Hadfield continues to train in Russia, Japan, and the United States in preparation for Canada's second six month mission aboard the International Space Station, where he will become Canada's first Commander in 2013. Canada's newest members of the Canadian Astronaut Corps: Jeremy Hansen and David Saint-Jacques have also graduated from NASA's Astronaut Training Program.

The Canadian Space Agency has conducted a rigorous review of its programs and activities and, in 2012-2013, will begin implementing a series of initiatives that will continue to strengthen its ability to respond to the priorities of Government and position Canada as a space-faring and innovation driven nation to the world.

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Steve MacLean,  
President

# SECTION 1: ORGANIZATIONAL OVERVIEW

## 1.1 RAISON D'ÊTRE

The mandate of the Canadian Space Agency<sup>1</sup> (CSA) is *"to promote the peaceful use and development of space, to advance the knowledge of space through science and to ensure that space science and technology provide social and economic benefits for Canadians"*.

The CSA is achieving this mandate in cooperation with Government of Canada (GoC) organizations, industries, and universities, as well as international partners.

### CSA in brief in 2011-2012

**Minister of Industry:**  
The Honourable Christian Paradis

**President:** Steve MacLean

**Budget:** \$442.0 million

**Headquarters:**  
Saint-Hubert, Quebec

**Full Time Equivalent (FTE):** 699.7

**Partners:** Government of Canada (GoC) organizations, Canadian academia and space industry, and international space agencies.

## 1.2 RESPONSIBILITIES

The founding legislation which received Royal Assent in 1990 attributed four main functions to the CSA:

- Assisting the Minister in the coordination of the space policies and programs;
- Planning and implementing programs and projects related to scientific or industrial space research and development, and application of space technology;
- Promoting the transfer and diffusion of space technology to and throughout Canadian industry; and,
- Encouraging commercial exploitation of space capabilities, technology, facilities and systems.

<sup>1</sup> To learn more about the mandate of the Canadian Space Agency, go to:  
<http://www.asc-csa.gc.ca/eng/about/mission.asp>



### 1.3 STRATEGIC OUTCOME AND PROGRAM ACTIVITY ARCHITECTURE

Programs and activities of the Canadian Space Program are finely focused through its overarching 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*”.

The Agency introduced a revised Program Activity Architecture (PAA) on April 1<sup>st</sup>, 2011 and aligned its operations through four Program Activities to generate long-term benefits for Canadians<sup>2</sup>:

**1.1. Space Data, Information and Services:** This Program Activity includes the provision of space-based solutions (data, information and services) and the expansion of their utilization. It also serves to install and run ground infrastructure that processes the data and operates satellites.

**1.2. Space Exploration:** This Program Activity provides valuable Canadian science, signature technologies and qualified astronauts to international space exploration endeavours.

**1.3. Future Canadian Space Capacity:** This Program Activity attracts, sustains and enhances the nation’s critical mass of Canadian space specialists, fosters Canadian space innovation and know-how, and preserves the nation’s space-related facilities capability. In doing so, it encourages private-public collaboration that requires a concerted approach to future space missions.

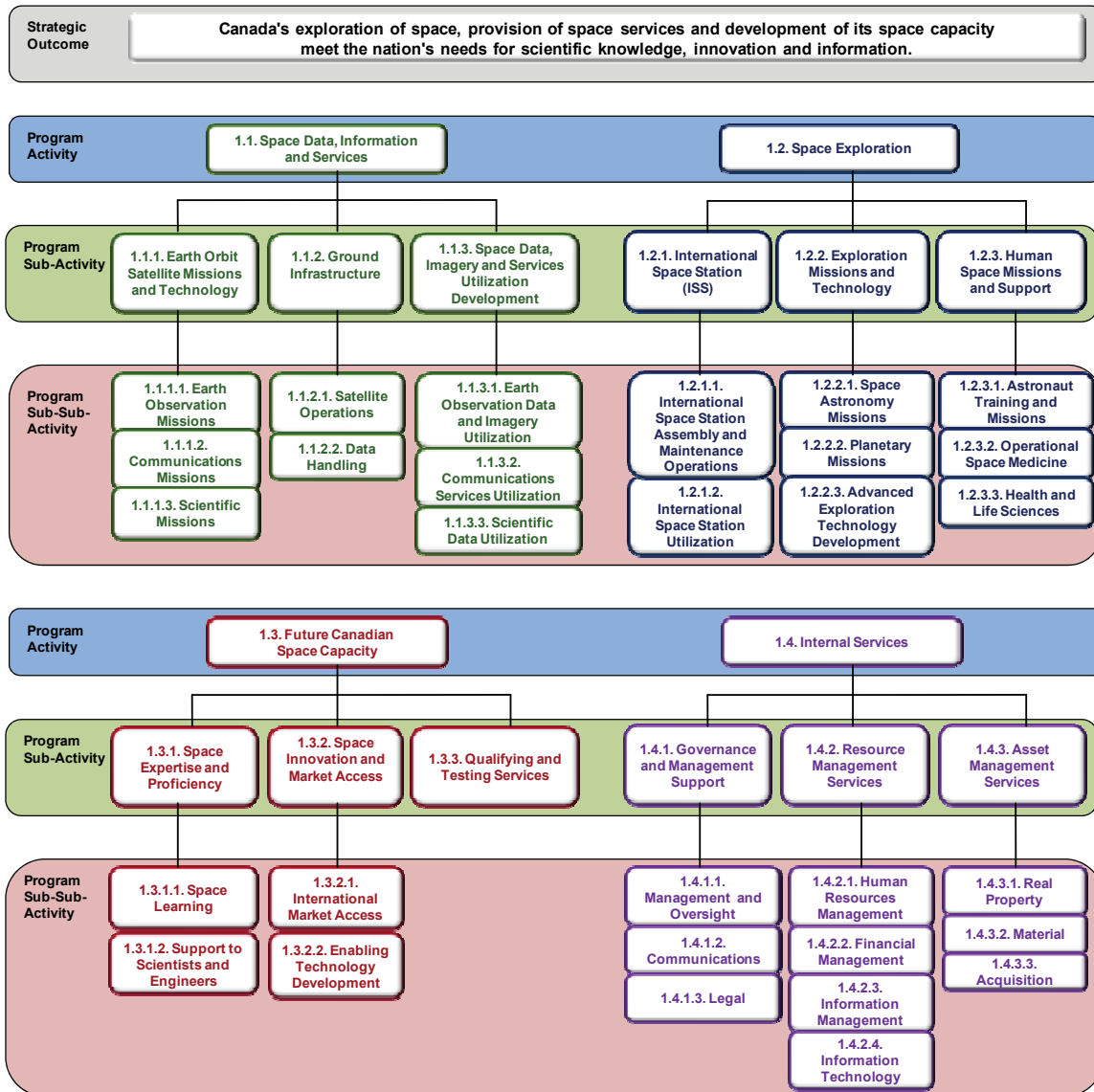
**1.4. Internal Services:** This Program Activity is necessary to implement the government’s commitment to modern public service management. It directly supports the Management Accountability Framework (MAF). Internal Services include only those activities and resources that apply across an organization in the areas of: Governance and Management Support, Resource Management Services and Asset Management Services.

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<sup>2</sup> Description of Programs are taken from the Main Estimates available on line:  
<http://www.tbs-sct.gc.ca/rpp/2011-2012/inst/csa/csa02-eng.asp#s2.2>  
<http://www.tbs-sct.gc.ca/est-pre/20112012/me-bpd/docs/me-bpd-eng.pdf>

The CSA implemented its revised Program Activity Architecture (PAA) in 2011-2012<sup>3</sup>. Therefore, with this cycle of reporting, performance measurements will establish new benchmarks by which to compare Research and Development (R&D) results in subsequent years.

### CSA's 2011-2012 Program Activity Architecture (PAA)



<sup>3</sup> For more information on the Program Activity Architecture, go to: <http://www.asc-csa.gc.ca/eng/publications/rp.asp#rp>

## 1.4 ORGANIZATIONAL PRIORITIES

### SUMMARY OF PROGRESS AGAINST PRIORITIES

The CSA identified eight operational priorities for 2011-2012. Progress being made in each of these priorities is reflected below.

<b>Program Activity: SPACE DATA, INFORMATION AND SERVICES (SDIS)</b>	
<b>SDIS Priority #1</b>	<b>Type<sup>4</sup></b>
Advance the development of the RADARSAT Constellation Mission (RCM). <sup>5</sup>	Ongoing
<p>The RCM progressed with the initiation of the detailed design phase in March 2010. The design phase will be extended to fall 2012. The preliminary design of the Automatic Identification System (AIS), used to identify ocean going vessels on a global scale, and funded by the Department of National Defence (DND) was also successfully completed. The procurement of long lead items undertaken in fiscal year 2011-2012 is still underway. The launch of the first satellite is now planned to occur in 2016, to be followed by the launch of the two remaining satellites on another launcher in 2017. This RCM will enhance Canada's ability to use radar imagery supporting the strategic objectives of Canada related to safety, security and sovereignty, particularly in the Arctic, and the critical operational needs of Government for maritime surveillance, disaster management and ecosystem monitoring, among others.</p>	
<b>SDIS Priority #2</b>	<b>Type</b>
Complete preliminary studies to validate the design and development of the Polar Communication and Weather (PCW) mission.	Ongoing
<p>The northern circumpolar region presents unique challenges and is not presently supported by dedicated meteorological, communications or climate monitoring instruments. GoC organizations operating in this remote region, civil aviation flying over the Arctic, navigating vessels increasingly venturing into northern icy waters and remote communities require these services to safely carry out their operations and sustain their development. The Polar Communications and Weather (PCW) Mission proposes to place a constellation of satellites in a highly elliptical orbit over the North Pole, which will assure continuous broadband communication services and the active monitoring of weather in the Arctic. The mission responds to needs expressed by GoC organizations and Northern communities. A PCW Mission Definition Study, initiated in November 2008, and conducted in collaboration with the Department of National Defence (DND) and Environment Canada was completed in March 2011.</p> <p>Discussions are ongoing with potential Government users and steps are being taken to assess this project as a candidate for delivery via a Public Private Partnership. Consultations continue on the best way to deliver the PCW Mission.</p>	

<sup>4</sup> Type is defined as follows: **previously committed to**—committed to in the first or second fiscal year before the subject year of the report; **ongoing**—committed to at least three fiscal years before the subject year of the report; and **new**—newly committed to in the reporting year of the Report on Plans and Priorities (RPP) or Departmental Performance Report (DPR).

<sup>5</sup> This priority is from the 2011-2012 RPP on page 12 <http://tbs-sct.gc.ca/rpp/2011-2012/inst/csa/csa-eng.pdf>

<b>Program Activity: SPACE EXPLORATION (SE)</b>	
<b>SE Priority #1</b>	<b>Type</b>
Maintain Canada's active partnership and participation in the International Space Station (ISS). <sup>6</sup>	Ongoing
<p>The CSA continued to showcase Canadian advanced robotics expertise to the world using the Mobile Servicing System (MSS) to execute precision robotic maintenance and resupply operations on the International Space Station. The CSA supported the delivery of critical equipment and cargo brought by the final two U.S. Space Shuttle missions to the Station, supported Russian cosmonaut spacewalks and the capture of the Japanese cargo vehicle using Canadarm2 and Dextre for the transfer of cargo. Through a demonstration of robotic refueling conducted on the International Space Station (ISS), the Canadian MSS successfully replaced critical equipment. Carried out in cooperation with NASA, the demonstration led to the development and certification of new flight products and procedures supporting future MSS operations on the ISS. The CSA continued to upgrade its ground control operations supporting the handling of heavy payloads by Canadarm2. In view of extending the life of the operational use of the ISS, the CSA completed its technical assessment of the Mobile Servicing System. In February 2012, the GoC announced its commitment to continue Canada's participation in the ISS to 2020.</p>	
<b>SE Priority #2</b>	<b>Type</b>
Fostering the development of advanced space robotics and mobility systems. <sup>7</sup>	Ongoing
<p>In 2011-2012, the CSA has continued to work with its industrial contractor team to deliver a series of projects under the Stimulus initiative on space robotics announced as part of Canada's Economic Action Plan. This very successful work has enabled the development of terrestrial prototypes of the Next Generation Canadarm and prototypes of different rovers and their associated technologies for future Moon and Mars exploration missions. A series of robotic systems and tools for in-orbit robotic servicing were delivered to CSA by industry within schedule and budget. Four rovers were delivered in March 2012 and advanced development work will be completed in 2012-2013 as planned. Using Exploration Core funding, the CSA has also issued contracts for the development of science instruments and to support analogue mission deployments.</p>	

<sup>6</sup> This priority is from the 2011-2012 RPP on page 13 <http://tbs-sct.gc.ca/rpp/2011-2012/inst/csa/csa-eng.pdf>

<sup>7</sup> This priority is from the 2011-2012 RPP on page 13 <http://tbs-sct.gc.ca/rpp/2011-2012/inst/csa/csa-eng.pdf>

<b>Program Activity: FUTURE CANADIAN SPACE CAPACITY (FCSC)</b>	
<b>FCSC Priority #1</b>	<b>Type</b>
Renewal of Canada's long-standing Cooperation Agreement with the European Space Agency (ESA). <sup>8</sup>	Ongoing
The renewal of Canada-ESA Treaty was ratified in March 2012. The Agency has actively worked with Foreign Affairs and International Trade Canada (DFAIT) on the legal framework required to support specific cooperation agreements. In preparation for the ESA Ministerial Council in November 2012, the CSA has developed an action plan to foster consultation among government, space industry and universities in order to select participation in ESA Optional Programs that are most aligned with government priorities and the strategic outcome of the Agency.	
<b>FCSC Priority #2</b>	<b>Type</b>
Enhancing Canadian technological and scientific expertise through the development and use of sub-orbital platforms (balloons, aircraft, sounding rockets) and small satellites. <sup>9</sup>	Ongoing
Following an Announcement of Opportunities through the Flight for Advancement of Science and Technology (FAST) Program (FAST AO 2011), the CSA awarded six grants for projects requiring the use of stratospheric balloons to be launched by NASA or France's <i>Centre national d'études spatiales</i> (CNES) and, one project that will fly payloads on sounding rockets. Additional grants will be awarded for projects requiring the use of nanosatellites, aircrafts or ground-based facilities. The purpose of these projects is to develop new space technologies and train Highly Qualified Personnel (HQP). The CSA has selected a balloon launch site in Canada and has entered into negotiations with CNES to secure access to balloon flights, both at home and abroad for Canadian scientists and companies.	

<sup>8</sup> This priority is from the 2011-2012 RPP on page 14 <http://tbs-sct.gc.ca/rpp/2011-2012/inst/csa/csa-eng.pdf>

<sup>9</sup> This priority is from the 2011-2012 RPP on page 14 <http://tbs-sct.gc.ca/rpp/2011-2012/inst/csa/csa-eng.pdf>

<b>Program Activity: INTERNAL SERVICES (IS)</b>	
<b>IS Priority #1</b>	<b>Type</b>
Complete consultations and documentation leading to the implementation of a new CSA Governance framework.	New
<p>Significant progress has been achieved in the definition of roles, responsibilities and relationships exercised by the CSA and its GoC partner organizations on space issues. A roadmap to finalize the review of all internal elements of the governance was produced and guided their development, such as the establishment of filters by which future CSA investments decisions will be considered and selected. A new Guide for the production of Business Cases was approved by the Executive Committee and is now in effect. This proposed Governance will greatly enhance the ongoing and evergreen development of a well documented CSA Investment Plan. The implementation of the Treasury Board Policy on Project Management continues with the development of CSA-wide policy and methodology on project management. Implementation of the revised Governance and the Agency-wide Project Management processes are expected to be achieved in fiscal year 2012-2013.</p>	
<b>IS Priority #2</b>	<b>Type</b>
Development and implementation of CSA's Five-Year Investment Plan. <sup>10</sup>	New
<p>The drafting and revision of the CSA's Investment Plan progressed significantly over the past year and has been advanced to Treasury Board for approval in fiscal year 2012-2013.</p>	

<sup>10</sup> This priority is from the 2011-2012 RPP on page 15 <http://tbs-sct.gc.ca/rpp/2011-2012/inst/csa/csa-eng.pdf>

## **1.5 RISK ANALYSIS**

### **ORGANIZATIONAL CONTEXT (OPERATING ENVIRONMENT)**

#### **NATIONAL CONTEXT**

Over the past fifty years, Canada has established a world-class reputation in areas of satellite communications, Earth Observation (EO), advanced space robotics, vision and optical systems space science and exploration. Compared to other leading space industries, Canadian industry is small, both in terms of the number of firms and human capital. Canada learned early on that it could leverage its technical and scientific expertise through opportunities with other countries, especially the United States and Europe, to gain global niche market advantage. This has become a hallmark of the Canadian Space Program. While the niche strategy has been successful for decades, it has led to a highly concentrated industry. Also, the growth of small companies remains a challenge as they do not have the resources required to market their products and services worldwide. Space is the third largest aerospace sub-sector in Canada with revenues exceeding \$3.4 billion in 2010. Export sales account for 50% of these revenues (50% to the US, 31% to Europe, 9% to Asia). There are over 200 companies (manufacturers, integrators, service providers) and research groups and over 8,200 professionals across the country over half of which are considered Highly Qualified Personnel (HQP).

The future of the Canadian industry is reliant on continued investment in R&D. As commercial opportunities continue to expand, so will the number of private sector players, including new market entrants from emerging economies with significant government support. Consequently, the CSA foresees a continuing role in helping Canadian companies and organizations deepen their investment in R&D, innovation and commercialization (e.g. support for technology demonstration, provision of flight opportunities, seed resources for scientific collaborative research in universities, etc.) in order to maintain a competitive advantage in niche segments. This can include leveraging the role the CSA plays in supporting the development of key Canadian space technologies for the Canadian Space Program and emerging commercial markets through its existing programs.

#### **INTERNATIONAL CONTEXT**

Over the past decade the global space sector has been transformed as governments and civil space agencies positioned space as a strategic asset. The post-war domination by a few “great space powers” has given way to a score of emerging players and strategic alliances. (In 1990, thirteen countries managed space programs with budgets over \$100 million, including Canada.) By 2010, countries with budgets over \$100 million had grown to close to twenty, and the number of small players had grown to well over thirty. While the United States continues to dominate the sector with a combined civil and defence budget of \$57 billion, countries like China, India, South Korea, Japan, and France, to name just a few, have seen their space budgets increase significantly. Despite the continuing uncertainty over the turn-around of the world economy, especially felt in Europe, the European Space Agency saw its budget increase during the 2011-2012 timeframe.

It is also noteworthy that significant increases in investments in space activities are being made by Russia, Japan, France, China, Germany, India, the European Union, Italy and in the United Kingdom which has recently adopted a Space Policy and created its own Space Agency.

Canada continued to be regarded as a reliable partner that possesses unique technical and scientific capabilities and as a nation that brings “signature” space technologies to the initiatives led by foreign space agencies. In particular, developments in Asia and Russia offer important opportunities for cooperation at both the government and commercial levels. Thus, in 2011-2012, Canada deployed efforts to gain a foothold in these critical space markets, working closely with its stakeholders to position Canadian scientists and companies in civil and commercial space initiatives.

## **GOVERNMENT CONTEXT AND CSA CONTEXT**

### *1- The Canadian Government’s Science and Technology Strategy*

The objective of the Government Science and Technology (S&T) Strategy is to "make Canada a world leader in science and technology and a key source of entrepreneurial innovation and creativity". In order for Canada to achieve this objective, the S&T Strategy identifies three underlining conditions for success: a strong private-sector commitment to S&T, a strengthened knowledge base and, a dynamic sector that functions as a magnet for talent<sup>11</sup>.

In 2011, as a follow-up to the Government’s S&T Strategy, an expert panel was tasked to propose recommendations that would maximize the impact of federal support to research and development (R&D) *Innovation Canada: A Call to Action* also referred to as the *Jenkins Report*<sup>12</sup>, and recommends making Canadian business innovation one of the core objectives of procurement. The CSA took note of the report’s recommendation and will ensure that its future R&D activities are aligned with this new direction.

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<sup>11</sup> To learn more about Government’s Science and Technology (S&T) Strategy, go to:  
[http://www.ic.gc.ca/eic/site/icgc.nsf/eng/h\\_00231.html](http://www.ic.gc.ca/eic/site/icgc.nsf/eng/h_00231.html)

<sup>12</sup> To learn about the report *Innovation Canada: A Call to Action*, go to:  
[http://rd-review.ca/eic/site/033.nsf/vwapj/R-D\\_InnovationCanada\\_Final-eng.pdf/\\$FILE/R-D\\_InnovationCanada\\_Final-eng.pdf](http://rd-review.ca/eic/site/033.nsf/vwapj/R-D_InnovationCanada_Final-eng.pdf/$FILE/R-D_InnovationCanada_Final-eng.pdf)



## 2- The Canadian Space Strategy

Approved by the GoC in February 2005, the Canadian Space Strategy was developed in full consultation with GoC organizations and Canadian stakeholders<sup>13</sup>. This strategy provides one of the frameworks that guides the activities of all CSA programs. Although the Canadian Space Strategy preceded the S&T Strategy, it embraces the well-founded principles of world-class excellence and innovative national and international partnerships.

## 3- CSA's implementation of a new PAA

As noted earlier, in order to better align its activities and expected outcomes with the broader governmental strategies outlined above, the CSA implemented a new PAA and aligned organisational structure on April 1<sup>st</sup>, 2011. Therefore, the CSA started managing its programs by measuring results and outcomes against new indicators.

## **RISK DISCUSSION**

### **CORPORATE RISKS IDENTIFIED IN THE 2011-2012 REPORT ON PLANS AND PRIORITIES**

#### 1-Integration and Implementation

The 2011-2012 Report on Plans and Priorities (RPP) highlighted the possibility that CSA would be unable to align its strategies, priorities, funding levels, planning operations and capacity to deliver, and obtain clear understanding and buy-in from managers and staff at all levels. In order to contain that risk, the following mitigation actions were performed:

- an Acquisitions Strategy and a multi-year Acquisition Plan was developed;
- a CSA Guide on cost estimates was developed;
- Configuration Management was integrated with Information Management;
- CSA's performance measurement capacity was enhanced to support the implementation of the PAA Performance Management Framework (PMF) outlined in this Departmental Performance Report (DPR);
- a five-year evaluation plan was implemented;
- CSA's governance structure was reviewed and will be implemented in fiscal year 2012-2013;

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<sup>13</sup> To learn more about the Canadian Space Strategy (CSS), go to:  
<http://www.asc-csa.gc.ca/eng/publications/default.asp#css>

- the Integrated Risk Management (IRM) Policy was approved in February 2012, which will lead to the review of the CSA Corporate Risk Profile (CRP) in fiscal year 2012-2013; and,
- an incremental integrated approach to planning will align human, financial and technical resources with the management of program operations in fiscal year 2012-2013.

All these measures contributed in mitigating the risk of integration and implementation. Furthermore, the ongoing work on the CSA's governance renewal now includes clear criteria for investment planning and project approval. These criteria ensure strong alignment with all elements listed in the risk description above.

## 2-Workforce

The risk that the CSA would be unable to hire and maintain a required qualified workforce, to deliver its mandate within the Government legislative frameworks, policies and rules was also identified as a corporate risk in the 2011-2012 RPP. The following mitigation actions were undertaken in 2011-2012:

- The implementation of the 2010-2013 Human Resources Integrated Plan (HRIP) led to the creation of qualified candidate pools for the principal employment groups, namely engineer and clerk positions; the development of succession programs for scientific and technical and corporate sector positions; and, the implementation and continuous update of a management competency development program for current and potential managers.
- The CSA reviewed his Staffing Management Accountability Framework and implemented its monitoring process that will serve to assess progress achieved on the basis of planned results and to actively monitor areas at risk.
- A mid-way status report on the 2010-2013 HRIP revealed that 44% of actions were completed, 44% undertaken and the remaining 12% was to be initiated. Based on the assessment of CSA's 2011-2012 Departmental staffing accountability report, the Public Service Commission plans to identify the CSA to Committee of Senior Officials in recognition of the improvement made over the past three years.
- Responses to issues raised in the 2008 and 2010 Public Service Employee Surveys were reviewed to measure success, updated and approved by Executive Committee.

- The Area of Management (AoM) People obtained a “strong” MAF assessment rating this year. This improvement can be attributed to the implementation of a thorough Integrated HR plan that effectively prioritized its activities, identified specific targets and used performance measurement tracking mechanisms to periodically assess progress against set targets.
- Integrated planning ensures that CSA have the ability to maintain capacity and achieve organizational goals while having the flexibility to adapt to changing government priorities. Integrated planning ensures that key areas and positions, which are critical to meeting the mandate of the organization, are managed through recruitment, staffing, retention, talent management and succession planning.
- Cutting edge projects such as the RADARSAT Constellation, Next Generation Canadarm, Landers, Rovers and the renewal of Canada’s commitment to participate in the International Space Station (ISS) were contributing factors helping the Agency attract and retain its qualified workforce.

#### **OTHER CORPORATE RISKS**

Although not specifically identified in the 2011-2012 RPP, the following risk identified in the Corporate Risk Profile impacted the CSA’s operational management.

##### *Stakeholders Support*

While international collaboration gives opportunities to leverage resources and share expertise, participation in long term projects with many partners is subject to uncertainties induced by changes in foreign government and/or agency priorities. These uncertainties had an impact on CSA’s plans and schedules and/or on efforts to gain a foothold in the international projects and markets. In order to mitigate these risks, the CSA augmented its participation in international program and project boards regularly reviewed its activities and weighed opportunities. With this approach, following the decision of NASA to cancel the 2016 ExoMARS/MATMOS mission which included a Canadian-built spectrometer, the CSA opened discussions with Roscosmos, the Russian Space Agency, on the possibility of including this technology in a future Russian mission to Mars. Another example of the positive effects of this mitigation approach was the investment of funds from the Economic Action Plan to develop a large array of rover prototypes, which could be used on a number of future international planetary missions. Despite these efforts, it is not always possible to mitigate all risks related to international collaboration. For example, the launch of the Canadian scientific and telecommunication satellite CASSIOPE was again delayed due to arising difficulties by the foreign launch provider. The launch is now expected to take place in 2013.

As mentioned in the international and national contexts, space activities by their nature imply the participation of many stakeholders. This is especially true in the field of space data where the CSA plays a key role coordinating the various needs and resources of different departments, while proposing integrated solutions for the GoC. The slow recovery of the global economy and the government-wide review of all programs and expenditures have empowered GoC organizations to review their priorities including those requiring space solutions. In this respect, the CSA too will be optimising business practices, aligning its programs and adjusting its long-term planning activities. In order to ensure strong relevance of its missions with the strategic priorities of Government, the CSA has initiated a review of its processes to enhance the level of active consultations and broaden decision making with its GoC organizations and agency partners.

## 1.6 SUMMARY OF PERFORMANCE

### 2011-2012 Financial Resources (\$ in millions)

Planned Spending	Total Authorities*	Actual Spending*
424.6	442.0	409.1
*Excludes amount deemed appropriated to Shared Services Canada (SSC).		

Any significant variance reported against Planned Spending set out in the 2011-2012 RPP is explained in [Section 4.2.1 – Spending by Program Activity](#).

### 2011-2012 Human Resources (FTEs)

Planned	Actual	Difference
710.2	699.7	10.5

### 1.6.1) Summary of Performance Tables

#### Progress being made to deliver CSA's Strategic Outcome

CSA 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.		
PERFORMANCE INDICATORS	TARGETS	2011-2012 PERFORMANCE
1. Depth and breadth increase of needed scientific knowledge.	First measurement / benchmark to be established in September 2012.	Though no formal measure of the indicator was performed, a survey in the S&T community revealed that 741 publications, reports or conference proceedings were released due to funding by the CSA.
2. Space-generated Innovation Index.	Methodology to be introduced in DPR 2013.	Though no formal measure of the indicator was performed, the 2010 report on <i>The State of the Canadian Space Sector</i> <sup>14</sup> , total revenues generated by the Canadian space sector have increased by 38% over the last five years; an indication of an innovation driven space sector.
3. Acknowledgement/success stories by GoC organizations of impact on mandate delivery.	First measurement to be conducted in September 2013.	Consultations held in 2011-2012 allowed to collect preliminary results: eleven GoC organizations have stated the positive impact, the use of space applications has in delivering their mandates and operational programs. Two of these members have also identified new opportunities that would increase the use of space in their departments.

<sup>14</sup> The State of the Canadian Space Sector: <http://www.asc-csa.gc.ca/eng/industry/state.asp>

### Performance Summary, Excluding Internal Services

Program Activity	2010-2011 Actual Spending**	2011-2012 (\$ in millions)				Alignment to Government of Canada Outcomes <sup>15</sup>
		Main Estimates	Planned Spending	Total Authorities*	Actual Spending*	
Space Data Information and Services	105.8	136.6	136.6	141.5	137.3	<a href="#">Well-managed and efficient government operations</a>
Space Exploration	138.9	152.4	152.4	160.3	146.3	<a href="#">An innovative and knowledge-based economy</a>
Future Canadian Space Capacity	72.7	86.1	86.1	88.1	69.6	<a href="#">An innovative and knowledge-base economy</a>
<b>TOTAL</b>	<b>317.4</b>	<b>375.2</b>	<b>375.2</b>	<b>389.9</b>	<b>353.2</b>	
*Excludes amount deemed appropriated to Shared Services Canada.						
**Actual Spending 2010-2011 Crosswalk based on 2011-2012 PAA structure.						

### Performance Summary for Internal Services

Program Activity	2010-2011 Actual Spending**	2011-2012 (\$ in millions)			
		Main Estimates	Planned Spending	Total Authorities*	Actual Spending*
Internal Services	55.4	49.4	49.4	52.1	55.9
*Excludes amount deemed appropriated to Shared Services Canada.					
**Actual Spending 2010-2011 Crosswalk based on 2011-2012 PAA structure.					

#### 1.6.2) Strategic Environmental Assessment

The CSA is subject and complies with the Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals. During 2011-2012, the CSA did not have any initiatives subject to this Directive.

<sup>15</sup> Treasury Board Secretariat Website – Government of Canada Outcomes:  
<http://www.tbs-sct.gc.ca/ppg-cpr/frame-cadre-eng.aspx>

## 1.7 EXPENDITURE PROFILE

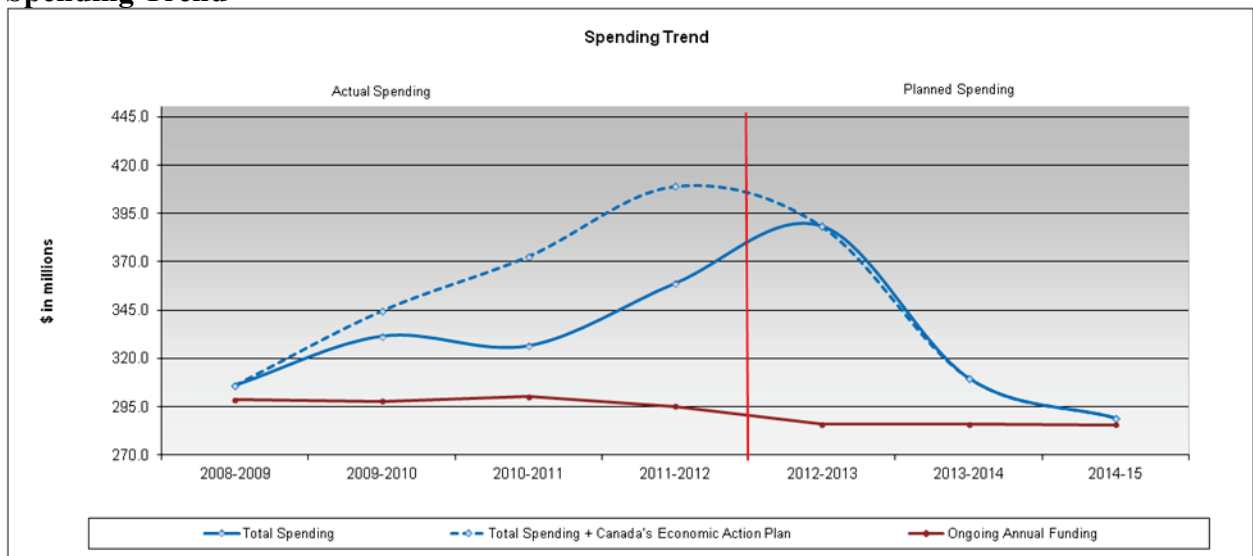
This sub-section examines the spending trend of the CSA, as illustrated in the graph below.

The red bottom line (Ongoing Annual Funding), illustrates the evolution of the CSA's ongoing annual A-Base budget. The reduction from the \$300 million initially set in Budget 1999 is the result of government-wide priority review exercises; the most recent one, as an example, led to the transfer of resources towards the newly created Department of Shared Services Canada.

The solid blue line (2011-2012 and before for Actual Total Spending and 2012-2013, and beyond for Planned Total Spending) is greater than the annual A-Base budget (Ongoing Annual Funding) because of reprofiling of funds related to the implementation of projects and programs, as well as additional funding provided in Budget decisions for specific initiatives.

The dotted blue line (Total Spending plus Canada's Economic Action Plan funding) shows the Agency's total spending with an additional \$110 million announced in the 2009 Budget.

### Spending Trend



The CSA's annual A-Base budget of \$300 million was established in Budget 1999. The difference in the spending trend shown above is attributable to a number of factors including:

- The cumulative impact of reprofiling funds associated with the rigorous management of high-risk projects and programs (e.g., high technology risks, long term development cycle, uncertainties with work schedules, implementation delays).

- The incremental use of funds earmarked for the RCM following the government decision to provide CSA with additional \$111 million over five years (2005-2006 to 2009-2010) to work with the Canadian space industry on developing the next generation of advanced radar remote sensing satellites.
- In Budget 2009, Canada's Economic Action Plan (Action to Support Businesses and Communities) provided the CSA with \$110 million over three years to contribute to the development of terrestrial prototypes for space robotic vehicles, such as the Mars Lander and Lunar Rover, and for the further development of other technologies and space robotics. The CSA plays an important role by working with the private sector to support advanced research, development and prototyping for new space technologies.
- In Budget 2010, the CSA was granted a sum of \$397 million over five years (2010-2011 to 2014-2015) and was directed to invest \$100 million of its own funds over the same period to develop the RCM.
- On August 4, 2011, an Order in Council (OIC) established Shared Services Canada, a Department of the Public Works and Government Services Canada with a mandate to streamline and reduce duplication in the government's IT services. Shared Services Canada has consolidated the personnel and financial resources supporting email, data centers and networks. In 2011-2012, the transfer of authorities to Shared Services Canada represented \$3.4 million.

## 1.8 ESTIMATES BY VOTE

For information on the CSA's organizational Votes and/or statutory expenditures, please see the Public Accounts of Canada 2012 (Volume II). An electronic version of the Public Accounts 2012 is available on the [Public Works and Government Services Canada's Website](http://www.pwgsc.gc.ca)<sup>16</sup>.

<sup>16</sup> <http://www.tpsgc-pwgsc.gc.ca/recgen/txt/72-eng.html>



## SECTION 2: ANALYSIS OF PROGRAM ACTIVITIES BY STRATEGIC OUTCOME

### 2.1 STRATEGIC OUTCOME

All CSA Program Activities contribute to achieving the Agency's 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.*

With the implementation of the revised CSA Program Activity Architecture and Performance Measurement Framework in April 2011, new performance targets and indicators are being introduced by which to measure achievements of programs. Therefore, with this cycle of reporting, performance measurements will establish new benchmarks by which to compare R&D results in subsequent years.

PERFORMANCE INDICATORS	TARGETS	2011-2012 PERFORMANCE
1. Depth and breadth increase of needed scientific knowledge: i) Production of knowledge (SK) (number of publications); ii) Dissemination of knowledge (number of citations); and, iii) Relevance of knowledge (number of publications under targeted areas of knowledge).	First measurement/benchmark to be established in September 2012.	Though no formal measure is available this year, progress toward the expected outcome is summarized below.
<p><b>Summary of Progress:</b> A survey among the S&amp;T community revealed that 741 publications, reports or conference proceedings were released in 2011-2012 acknowledging CSA support. These represent an increase of 49% over the 2008-2009 performance. Those results were identified in a number of priority fields of interest to Canada such as Astronomy Science, Earth System Science, Life Science, Physical Science, Planetary Science and Solar-Terrestrial Science. These results were captured by 75 organizations involving 950 Canadians, ensuring a strong dissemination of knowledge in all parts of the country. Many foreign organizations also partnered in those activities, thus contributing to the strategic positioning of Canada's S&amp;T excellence and expertise at the international level.</p>		
2. Space-generated Innovation Index (based on methodology by Council on Competitiveness) including: i) Idea Generation; ii) Idea Development; and, iii) Commercialization and Utilization (number of applications used, data provided).	Methodology to be introduced in DPR 2013.	Though no formal measure is available this year, progress toward the expected outcome is summarized below.
<p><b>Summary of Progress:</b> The CSA's national survey <i>The State of the Canadian Space Sector</i><sup>17</sup> reveals that total revenues of \$3,439 billion were generated by Canada's space sector in 2010 reflecting a 14% increase over 2009 results. These figures indicate that total space sector revenues have increased by 38% over the last five years. The substantial progress is an indication of the strong innovation capacity and commercialization activities of Canada's dynamic space sector.</p>		

<sup>17</sup> The State of the Canadian Space Sector: <http://www.asc-csa.gc.ca/eng/industry/state.asp>

<p>3. Acknowledgement/success stories by GoC organizations of impact on mandate delivery (i.e. quality of programs and services attributable to data utilization, information, research results or space services).</p>	<p>First measurement to be conducted in September 2013.</p>	<p>Though no formal measure is available this year, progress toward the expected outcome is summarized below.</p>
<p><b>Summary of Progress:</b> Eleven GoC organizations have stated that they use space assets, applications and data to meet their mandates and improve the delivery of programs and services. Two have proposed new uses of space that would enhance delivery of their programs and services in the future. As examples, RADARSAT-2 images of the land, coastal approaches and the ocean in the Arctic has allowed the Department of National Defence (DND) to improve maritime surveillance and strengthen their capacity to protect Canadian sovereignty. RADARSAT-2 data has also contributed to more precise meteorological forecasting and supported emergency responses in the north. RADARSAT data was also used by Natural Resources Canada to expand knowledge of Canada’s continental mass and natural resources and in turn has strengthened security and safety, while contributing to a better management of natural resources. The Department of Fisheries and Oceans uses Earth observation from space to increase its surveillance over Canada’s three oceans and surrounding coastal regions. Environment Canada works closely with Natural Resources Canada, Agriculture and Agri-Food Canada and the CSA to develop and enhance cooperation mechanisms for the use of geospatial information that will in turn improve Environment Canada’s weather prediction capabilities.</p>		

## 2.2 PROGRAM ACTIVITY PERFORMANCE AND LESSONS LEARNED

### 2.2.1) Program Activity – Space Data, Information and Services

**Program Activity Description:** This Program Activity includes the provision of space-based solutions (data, information and services) and the expansion of their utilization. It also serves to install and run ground infrastructure that processes the data and operates satellites<sup>18</sup>. 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.

The services delivered through this Program Activity are rendered, and the data and information are generated and processed, with the participation of the Canadian space industry, academia, GoC organizations, national and international organizations, such as foreign space agencies, not-for-profit organizations, as well as provincial and municipal governments. This collaborative effort is formalized under national and international partnership agreements, contracts, grants or contributions.

#### 2011-2012 Financial Resources (\$ in millions)

Planned Spending	Total Authorities*	Actual Spending*
136.6	141.5	137.3
*Excludes amount deemed appropriated to Shared Services Canada (SSC).		

Any significant variance reported against Planned Spending set out in the 2011-2012 RPP is explained in [Section 4.2.1 – Spending by Program Activity](#).

#### 2011-2012 Human Resources (FTEs)

Planned	Actual	Difference
103.7	98.3	5.4

<sup>18</sup> To learn more about satellites go to: <http://www.asc-csa.gc.ca/eng/satellites/default.asp>

**SPACE DATA, INFORMATION AND SERVICES  
2011-2012 PROGRAM ACTIVITY PERFORMANCE MEASUREMENT**

<u>EXPECTED RESULT</u>	<u>PERFORMANCE INDICATORS</u>	<u>TARGETS</u>	<u>ACTUAL RESULTS</u>
The GoC organizations offer more diversified or cost-effective programs and services due to their utilization of space-based solutions.	1. Number of GoC programs serviced by space data / services that are outlined in reports to parliament (RPP, DPR) of such users.	No quantitative target was set because this year marked the first measurement.	Four GoC organizations.
	2. Degree of appreciation expressed by the GoC organizations through formal and informal structures.	The governance structure responsible for the data collection is in place and starts collecting data from GoC organizations about the degree of appreciation.	Indicator discarded (see explanation below).

**PERFORMANCE SUMMARY AND ANALYSIS OF PROGRAM ACTIVITY**

Within this Program Activity, CSA provided space-based solutions (space data, information and services) to GoC organizations and assisted them in the delivery of cost-effective programs and services related to key national priorities. For example, the Department of National Defence (DND) stated that: “Current work with RADARSAT-2 has exceeded expectations and has given Defence a space-based Arctic surveillance capability [...], contributing to our ability to protect our sovereignty as well as improve the safety of Canadians living in the Arctic [...]” (DND’s 2010-2011 DPR<sup>19</sup>).

This Program Activity also fostered the increased use of CSA space-based solutions. Two main partners – namely Environment Canada (EC) and DND – highlighted the use of operational and R&D space data / services in their RPP as contributors to the achievement of their expected results:

- In 2011-2012, DND expected to “enhance awareness of Canada’s Arctic region and maritime approaches” by “exploiting Canada’s RADARSAT-2” (DND’s 2010-2011 RPP<sup>20</sup>).
- In 2012-2013, EC is expecting to “enhance weather prediction capabilities”, by developing and enhancing “cooperation mechanisms for geospatial information” with CSA (EC’s 2012-2013 RPP<sup>21</sup>).

GoC organizations continued to benefit from the capabilities offered by RADARSAT-1 and 2 as new applications are introduced and become operational.

As a result, expanded awareness and interest in the use of space by GoC organizations was observed in 2011-2012. The CSA also noted an increase in the volume of space data used by GoC organizations supporting sovereignty and security, disaster management, climate observations,

<sup>19</sup> DND’s 2010-2011 DPR: <http://www.tbs-sct.gc.ca/dpr-rmr/2010-2011/inst/dnd/dnd-eng.pdf>

<sup>20</sup> DND’s 2010-2011 RPP : <http://www.tbs-sct.gc.ca/rpp/2012-2013/inst/dnd/dnd-eng.pdf>

<sup>21</sup> EC’s 2012-2013 RPP : <http://www.tbs-sct.gc.ca/rpp/2012-2013/inst/doe/doe-eng.pdf>

weather forecasting and trans-border pollution. GoC use of the RADARSAT-2 data credit has increased since commissioning in 2008 rising from 8% in 2009-2010, and 8% in 2010-2011 to reach 11% in 2011-2012. Over this same period, demands for RADARSAT-1 data have also increased due to its use in resolving imaging conflicts with RADARSAT-2. Note that in order to ensure sound management of total RADARSAT-2 capacity credit 10% is the optimal yearly target. The CSA has produced a report<sup>22</sup> which highlights the use of 17 Earth Observation applications as critical space solutions that are supporting the priorities of the Agency's partners within Government, the private-sector, academia and the international community in 9 societal benefit areas such as agriculture, ecosystems and biodiversity.

Investments in the development of new space assets, notably the RCM will focus on meeting user needs and provide the operational continuity and enhancements required in the future – the launch of the first satellite of the Constellation is planned for 2016 with the launch of the two remaining two satellites together in 2017.

Over the past year, an interdepartmental Enhanced Maritime Order Coordination Group (EMOC) was established to improve the prioritization of users' data requests.

### **LESSONS LEARNED**

#### Program Efficiency:

- The CSA captures information and reports monthly on the use of the GoC's RADARSAT-2 credit. When demand exceeds planned requests by 20%, an investigation is conducted with the user to more clearly define needs and mitigate conflicts. Moreover, activities are carried out with users to raise awareness both on the impact of the use of data on our credit consumption and also the impact of requesting urgent demands on the service costs.
- The CSA also intends to enlarge the mandate of the EMOC to add coastal and terrestrial areas to the maritime element. More GoC organizations will be invited to participate in the coordination group in order to rationalise and increase the efficiency in the use of the RADARSAT-2 credit.

#### Governance:

- The CSA has opened consultations on the renewal of its governance structure to promote more active stakeholders participation in its decision-making process.

#### Results-Based Management:

- An action plan has been developed to respond to recommendations of an Evaluation of the Earth Observation Data and Imagery Utilization Program released in June 2011. The Evaluation concluded that the Program is effective and relevant, but improvements could be made to maximize the use of resources to achieve the expected outcomes. The CSA has reviewed its projects selection criteria and initiated a pilot project to enhance industry participation in the development of applications.
- It has been determined that the investment of resources required to fully document the level of satisfaction of GoC organizations and their use of space assets, application to serve their mandates, programs and services is far too costly. Therefore, this indicator, as mentioned above, will no longer be used.

<sup>22</sup> Space Utilization Earth Observation – Space Applications Linked to Government Priorities/Departments: <http://www.asc-csa.gc.ca/pdf/solintermed-manuel-eng.pdf>

## 2.2.2) Program Activity – Space Exploration

**Program Activity Description:** This Program Activity provides valuable Canadian science, signature technologies and qualified astronauts to international space exploration endeavours. This Program Activity contributes to the GoC’s Science and Technology Strategy. It could also generate spin-offs that contribute to a higher quality of life for Canadians and could foster nation-building. This Program Activity appeals to the science and technology communities and generates excitement within the population in general. It is targeted mostly towards Canadian academia and international space exploration partnerships. Canadian industry also benefits from the work generated within this Program Activity<sup>23</sup>.

This Program Activity is delivered with the participation of foreign space agencies and GoC organizations. This collaborative effort is formalized under international partnership agreements, contracts, grants or contributions.

### 2011-2012 Financial Resources (\$ in millions)

Planned Spending	Total Authorities*	Actual Spending*
152.4	160.3	146.3
*Excludes amount deemed appropriated to Shared Services Canada (SSC).		

Any significant variance reported against Planned Spending set out in the 2011-2012 RPP is explained in [Section 4.2.1 – Spending by Program Activity](#).

### 2011-2012 Human Resources (FTEs)

Planned	Actual	Difference
189.1	190.5	-1.4

SPACE EXPLORATION 2011-2012 PROGRAM ACTIVITY PERFORMANCE MEASUREMENT			
<u>EXPECTED RESULT #1</u>	<u>PERFORMANCE INDICATOR</u>	<u>TARGETS</u>	<u>ACTUAL RESULTS</u>
Expansion of scientific knowledge acquired through space exploration endeavours.	1. Number of peer-reviewed scientific publications, reports and conference proceedings using space exploration information and produced by researchers (sciences and technologies) in Canada.	Approximately 100 publications per year for a target of 500 peer-reviewed scientific publications, reports and conference proceedings over a 5-year timeframe.	139

<sup>23</sup> To learn more about Space Science and Exploration, go to: <http://www.asc-csa.gc.ca/eng/sciences/default.asp> and, <http://www.asc-csa.gc.ca/eng/exploration/default.asp>

<u>EXPECTED RESULT #2</u>	<u>PERFORMANCE INDICATOR</u>	<u>TARGETS</u>	<u>ACTUAL RESULTS</u>
Multiple use and applications of knowledge and know-how acquired through space exploration endeavours.	1. Number of terrestrial applications and of space re-utilization of knowledge and know-how acquired through space exploration endeavours.	Target confirmed and set at 5.	5

**PERFORMANCE SUMMARY AND ANALYSIS OF PROGRAM ACTIVITY**

All space exploration missions are conducted under international partnerships. The CSA's success in space depends on its ability to contribute to world class science, technology and know-how. In order for Canada's space program to generate knowledge, economic returns and be sustainable, a combination of elements must work closely together: a competitive industry mastering advanced technologies; highly qualified scientists producing leading-edge research; terrestrial applications from space activities that positively impact the lives of Canadians; and smart and timely positioning of Canadian science and technology with our international space partners.

The Canadian space program has attained notable international successes through Canadian scientists' contributions to space astronomy and planetary sciences. A total of 139 scientific publications were produced by 36 different faculties and research centers using information made available by CSA funded space exploration instruments, advancing our understanding of the solar system and the universe. For example, Dr. Jaymie Matthews, Professor at the University of British Columbia and mission scientist for the MOST mission, used the Canadian built space telescope MOST to confirm the observation of a newly discovered planet outside our solar system named *55 Cancri-e*.

In 2011-2012, space exploration missions and programs generated a number of signature technologies that found their way into terrestrial applications and commercial markets or will be re-utilized in future space exploration endeavours. For example, as a spinoff of R&D investments made by the CSA to develop terrestrial prototypes of future lunar rovers, Bombardier Recreational Products (Valcourt, QC) announced in March 2012 a new line of electric all-terrain vehicles called *e-Commander*. In July 2011, the US-based Orbital Sciences announced the selection of the *TriDAR* system developed by Neptec (Ottawa, ON) for approach and rendez-vous of their *Cygnus* commercial spacecraft with the International Space Station. The CSA has invested in R&D and in-orbit demonstrations of the *TriDAR* technology since 2007. In March 2012, MDA (Brampton, ON) delivered a series of advanced prototypes for in-orbit robotic servicing as part of the *Next Generation Canadarm* program. The government's R&D investment enabled the company to offer state-of-the-art technologies to the US Government DARPA (Defence Advanced Research Projects Agency) for a satellite servicing mission called *Phoenix*.

Cooperating with major international space powers brings advantages but also poses particular challenges. The CSA has strategies to mitigate risks associated with the delivery and the operations of unique, leading edge scientific instruments and never-before tried robotic systems that must function flawlessly and for extended periods of time in the harsh environment of space. Teams at the CSA, in universities and in industry must meet the challenges of time, budget, technological readiness and any change brought by our international partners. The CSA has to adapt to changing conditions, not only on a project-by-project basis but also on its strategic plan for space exploration. Two examples in 2011-2012 illustrate this environment. In February 2012, due to budgetary reallocations, NASA cancelled its participation in the European-led

ExoMARS/MATMOS mission, thereby cancelling CSA's contribution of a Canadian-built instrument that would study the atmosphere of Mars and look for evidence of life. This setback had a major impact on the industry and on Canada's planetary science from which the CSA will recover by identifying new opportunities with other international partners. At the same time, NASA delayed the launch of the James Webb Space Telescope (JWST) by four years. Instruments provided by the CSA will be delivered as planned in 2012 but the financial impact now needs to be readdressed in order to maintain the Canadian engineering and science teams. One of the JWST instruments delivered by the CSA to NASA has undergone a significant redesign to provide better science to the international astrophysics community, demonstrating the prowess and adaptability of our scientists, industry and the CSA's project managers.

With the end of the Shuttle Program in 2011, the CSA adapted successfully to the transition from the construction to the operations phase of the International Space Station (ISS). Every day, 400 km above earth, *Canadarm-2* and *Dextre* are accomplishing routine robotic tasks to maintain the ISS and during 2011-2012, they were also programmed to perform new roles and duties such as the capture of new visiting commercial spacecraft and carry out experiments on robotic refuelling.

#### **LESSONS LEARNED**

The performance indicators for Space Exploration have not been in place long enough to produce sufficient and significant information to initiate corrective measures for improvement or to guide future directions. The CSA will review and consolidate the measurement tools for the indicators to ensure that they capture the encompassing impact of program investments. In parallel, Performance Measurements Strategies are being developed for each sub-activity under Space Exploration.

Lessons learned from program activities include:

- **Strategic Planning:** Develop and update plans and roadmaps for space exploration (astronomy, planetary sciences, advanced technologies, and International Space Station) in order to have a balanced and conservative portfolio of R&D activities and missions with the highest rate of return for innovation and benefits.
- **Timeliness and Preparedness:** Given our dependency on international partnerships and the scope and technical challenges of space missions, the CSA needs to initiate concept studies and planning for participation in space projects taking into account project approval timelines and long term availability of funds.
- **Program Risk:** the CSA has little or no control when major partners decide to change or cancel space missions. The CSA mitigates the program risk by having a portfolio of alternative systems and technologies that can be offered to other potential international missions.



### 2.2.3) Program Activity – Future Canadian Space Capacity

**Program Activity Description:** This Program Activity attracts, sustains and enhances the nation’s critical mass of Canadian space specialists, fosters Canadian space innovation and know-how, and preserves the nation’s space-related facilities capability. In doing so, it encourages private-public collaboration that requires a concerted approach to future space missions. This Program Activity secures the nation's strategic and ongoing presence in space in the future and preserves 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).

This Program Activity is conducted with the participation of funding agencies, GoC organizations along with government facilities and infrastructure, foreign space agencies, not-for-profit organizations and provincial governments. This collaborative effort is formalized under contracts, grants, contributions or national and international partnership agreements.

#### 2011-2012 Financial Resources (\$ in millions)

Planned Spending	Total Authorities*	Actual Spending*
86.1	88.1	69.6
*Excludes amount deemed appropriated to Shared Services Canada (SSC).		

Any significant variance reported against Planned Spending set out in the 2011-2012 RPP is explained in [Section 4.2.1 – Spending by Program Activity](#).

#### 2011-2012 Human Resources (FTEs)

Planned	Actual	Difference
121.5	119.2	2.3

**FUTURE CANADIAN SPACE CAPACITY  
2011-2012 PROGRAM ACTIVITY PERFORMANCE MEASUREMENT**

<u>EXPECTED RESULT</u>	<u>PERFORMANCE INDICATORS</u>	<u>TARGETS</u>	<u>ACTUAL RESULTS</u>
Canada has a space community (academia, industry and government) able to contribute to the sustained and strategic Canadian use of space.	1. Vitality index of the Canadian space community (academic, industrial and government communities in terms of HQP (Highly Qualified Personnel), S&T investments and development facilities, university space-related programs and research facilities).	First measurement to be conducted in September 2012.	Though no formal measure is available this year, progress toward the expected result is summarized below.
	2. Degree of match between workforce supplied and space community (industry and government) workforce requirements.	Methodology to be introduced in DPR 2013.	No formal measure is available this year.

**PERFORMANCE SUMMARY AND ANALYSIS OF PROGRAM ACTIVITY**

The Canadian space sector workforce increased by 692 new positions across the country in 2010. Of these new positions, 574 were classified as HQP. Total HQP has continuously increased since 2007 to reach 3100 in 2010 over a total of 8200 employees. R&D expenditures in space totaled \$72 million in 2010, with 50 organizations having undertaken space R&D projects. This represents an increase of 22% from the 2008 performance.

Eight academic institutions have integrated space science and technology in their programs and planning.

During 2011-2012, the CSA achieved progress in this program activity through initiatives in Space Expertise and Proficiency, Space Innovation and Market Access and Qualifying and Testing Services sub-activities. Although the first measurements of these performance indicators will take place in 2012-2013, a survey was conducted this year targeting principal investigators and organizations benefitting from CSA funding which provided information about the space community in Canada. According to this survey, their work resulted in a total of 829 publications and presentations combined (460 and 369), 631 Highly Qualified Personnel (HQP) were involved directly or indirectly across 115 organizations and, 293 important achievements under the Program activity of Future Canadian Space Capacity were identified. The subset of these results specifically related to the G&C Program is presented in the Annex on Details on Transfer Payment Programs (TPPs).

This year was marked by the successful implementation of new initiatives to support scientific and academic capacity development programs: the FAST (Flights for the Advancement of Science and

Technologies) and Academic Clusters initiatives. The CSA funded 10 Clusters in 8 priority areas of research following a competitive process initiated in 2010<sup>24</sup>. This initiative will continue for the next three years. In order to support the development of HQP, the CSA awarded the first 6 grants from the FAST Announcement of Opportunities with 5 more grants to be awarded in 2012-2013.

In order to ensure a full spectrum of sub-orbital platforms, the CSA initiated negotiations through an Implementing Arrangement with the *Centre National d'Études Spatiales* - France (CNES) for the use of CNES balloons by Canadian scientists and engineers. This suite of new initiatives will provide Canadian university students with frequent flight opportunities to develop and maintain Canadian expertise in supporting scientists and the next generation of scientists, engineers and technicians. In 2011-2012, the CSA counted 8 academic institutions having integrated space science and technology in their programs and planning (University of Montreal, U of Toronto, York, Western Ontario, Concordia, Calgary, Alberta and Laval).

The 2010 annual *State of the Canadian Space Sector* data revealed that 50 businesses out of 107 had generated export revenues from the sale of space-related goods and services, 100 out of the 107 companies surveyed reported having successfully obtained national / international space-related work orders. This indicates that significant progress is being made towards securing access to foreign space markets by Canadian industry and academia.

2011-2012 was also an exceptional year at the Canada's premier space qualification and testing facility, the David Florida Laboratory (DFL) where a thermal vacuum test campaign conducted in support of the Canadian contribution to the James Webb Space telescope became the longest test campaign ever conducted at the facility. DFL also supported an increased number of external client test campaigns. Loral Space Systems presented a supplier recognition award to the DFL in recognition of the exceptional professional support provided during four satellite test campaigns.

#### **LESSONS LEARNED**

The Clusters and the FAST programs have achieved their objectives in their first year of implementation but a formal post mortem will take place in 2012-2013 to ensure that their processes are efficient. When considering the implementation of new initiatives, one should not spare efforts in setting up the structure of the initiatives even before funds are available or confirmed. An early defined structure offers an alternative way to deliver on the mandate and outcomes the moment funds become available.

Similarly, the CSA will complete an analysis of the need and feasibility to implement a non-reimbursable contribution subset of the Space Technologies Development Program to support basic research by industry.

An evaluation of the Space Technology Development Program (STDP), which is part of sub-sub-activity Enabling Technology Development, was released in July 2011. The report concluded that

<sup>24</sup> Development and/or sustainability of Canadian expertise in the following **strategic areas**:

- Measurements of Earth and planetary atmospheres using space-borne Fourier transform infrared spectroscopy (FTIR);
- Carbon Cycle Science with space-borne data assimilation and modeling;
- Soil Moisture measurement and applications with space-borne data;
- Coupled GeoSpace - Atmosphere modeling and data assimilation;
- Development of lunar and planetary sciences;
- Analysis and curation of astromaterials;
- Development of training programs for the next generation of experimental space scientists; and,
- Space policy research (e.g. sustainability, international treaties and legal frameworks, planetary protection and defence, space security, socio-economic benefits, metrics innovation and/or management).

STDP has had a strong impact on Canadian space industry and contributed to advancing the Canadian Space Program by reducing risks associated with future missions, and or enabling potential new missions. However, the report also recommended that STDP prioritize and focus on the objectives of reducing risks associated with space missions, improving management processes and better communicating results to CSA clients. In response to these recommendations, tools were developed to clarify the major steps in the contract approval process, as well as the roles and responsibilities of each party involved. CSA also developed a prioritization process of the technical needs identified for futures missions of interest to Canada and issued technology development contracts in areas that were selected. This not only reduces the technical uncertainties of the missions but stimulates industrial competitiveness. A formal communication strategy was also developed.

## 2.2.4) Program Activity – Internal Services

**Program Activity Description:** In accordance with the Management Accountability Framework, this Program Activity serves to implement the Government’s commitment to modern Public Service management. Internal Services include only those activities and resources that apply across an organization in the areas of Governance and Management Support which includes Management and Oversight Services, Communications Services, and Legal Services; Resource Management which includes Human Resources Management Services, Financial Management Services, Information Management Services and Information Technology Services; and Asset Management which includes Real Property Services, Material Services, and Acquisition Services.

### 2011-2012 Financial Resources (\$ in millions)

Planned Spending	Total Authorities*	Actual Spending*
49.4	52.1	55.9
*Excludes amount deemed appropriated to Shared Services Canada (SSC).		

Any significant variance reported against Planned Spending set out in the 2011-2012 RPP is explained in [Section 4.2.1 – Spending by Program Activity](#).

### 2011-2012 Human Resources (FTEs)

Planned	Actual	Difference
295.9	291.7	4.2

INTERNAL SERVICES 2011-2012 PROGRAM ACTIVITY PERFORMANCE MEASUREMENT			
<u>EXPECTED RESULT #1</u>	<u>PERFORMANCE INDICATOR</u>	<u>TARGETS</u>	<u>ACTUAL RESULTS</u>
Internal Services provide an added value to CSA managers in the performance of their duties.	1. CSA's rating against MAF criteria based on Round 2011-12 assessment.	0 “Attention required” rating.	Out of 10 ratings: 2 “Strong”; 5 “Acceptable”; and, 3 “Opportunity for improvement”.
<u>EXPECTED RESULT #2</u>	<u>PERFORMANCE INDICATOR</u>	<u>TARGETS</u>	<u>ACTUAL RESULTS</u>
The highest priority risks identified in the CSA corporate risk profile are addressed and mitigated.	1. Mitigation action plans are implemented against the corporate risks identified as highest priorities.	“Acceptable “MAF rating for “Risk Management” Area of Management.	“Acceptable” rating obtained.

## **PERFORMANCE SUMMARY AND ANALYSIS OF PROGRAM ACTIVITY**

Overall, the Management Accountability Framework (MAF) revealed an improved performance for the Corporate Services with none of the Area of Management (AoM) under review were identified as having been rated “Attention required”. Despite these improvements, 3 of 10 MAF assessment ratings were flagged as an “opportunity for improvement”, namely the AoMs; Managing for results; Risk management; and, Investment planning and Project management. The CSA is taking action in a number of ways.

In 2011-2012, the CSA initiated a review of its governance structure. Considerable progress was made in defining the roles, responsibilities and interrelationships of government departments having a stake in the space sector, as well as the development of a framework to guide the deployment and use of space assets with multiple roles. In parallel, a series of guiding documents were produced: directives on the development of Business Cases for investments, a Project Management Methodology document, a draft renewed governance structure, a draft Policy for the Management of Projects, a draft Framework for the approval of mission requirements and scope changes, and a draft of Investment selection considerations and criteria.

A draft version of the CSA’s Five-Year Investment Plan was shared with TBS but the formal submission was delayed until after the conclusion, announcement and analysis of the impact of Budget 2012. Additional precisions requested by TBS related to project management have been addressed in parallel with progress being made with the governance structure review.

In February 2012, the CSA’s Executive committee approved a revamped Integrated Risk Management Policy which contributed to the “acceptable” MAF rating obtained for AoM “Risk management”. This policy paved the way for the development of new procedures supporting the annual revision of the CSA’s corporate risk profile. Benchmarks were established for the new CSA PMF. As a result of this initial experience with the new PMF structure, some indicators, sources and methodologies will be modified and captured in subsequent PMF evaluations.

The five-year Evaluation Plan progressed as planned, with the completion of two evaluation reports in 2011-2012: the Evaluation of the Space Technology Development Program (STDP) for the period of 2002-2003 to 2007-2008, and the Evaluation of the Earth Observation Data and Imagery Utilization Program. In terms of Performance Measurement Strategies, 8 of 14 were initiated and 1 has been completed. The development of the Performance Measurement Strategies will continue in 2012-2013.

The revised Policy on the Management of Intellectual Property and Technology Transfer was approved by the Executive Committee and fully implemented.

In 2011-2012, to ensure compliance with TBS’s Record Keeping Directive, the CSA drafted the Framework for the Management of Space Data to formalize and standardize information regarding the capture, processing, archiving and distribution of space data. Internal directives were drafted to ensure the protection and integrity of the information created within the Space Agency, including the management of e-mails and development of information systems.

As part of the government wide Open Data initiative, the CSA published the CARISMA magnetometer database on the Open Data portal. This essential international resource for magnetospheric physics data is now available to the general public.

During 2011-2012 the Canadian Space Agency, along with other government departments, undertook the evaluation of its IT resources, systems and structure in anticipation of their transfer to the newly created Shared Services Canada. In its planning and execution of the transfer of personnel, fiscal and IT resources, the CSA was cited as a model organization and was subsequently selected to participate, amongst six larger departments, in the drafting of the new Business Arrangement document that would be signed by all 43 departments affected by the transition.

**LESSONS LEARNED**

Overall, the CSA has enhanced its collaborative relationships with government partners through the renewal work on its governance structure, strengthened its coordination and consultation with central agencies. The CSA created a departmental committee to coordinate and integrate all Government management cycle planning and accountability exercises.

While significant effort has been invested in the development of a “Security Plan”, at year-end only 75% of this activity has been achieved. The CSA is committed to completing and implementing its Security Plan in the second quarter of fiscal year 2012-2013. Similarly, the CSA also progressed significantly in the development of its “Business Continuity Plan (BCP)”. This departmental initiative involved consultations and input from all core and corporate sectors, and once completed, will be reviewed and updated annually.

The Agency is generating operational efficiencies by using the same team to produce the Performance Measurement Strategies together with the development of the Performance Measurement Framework.

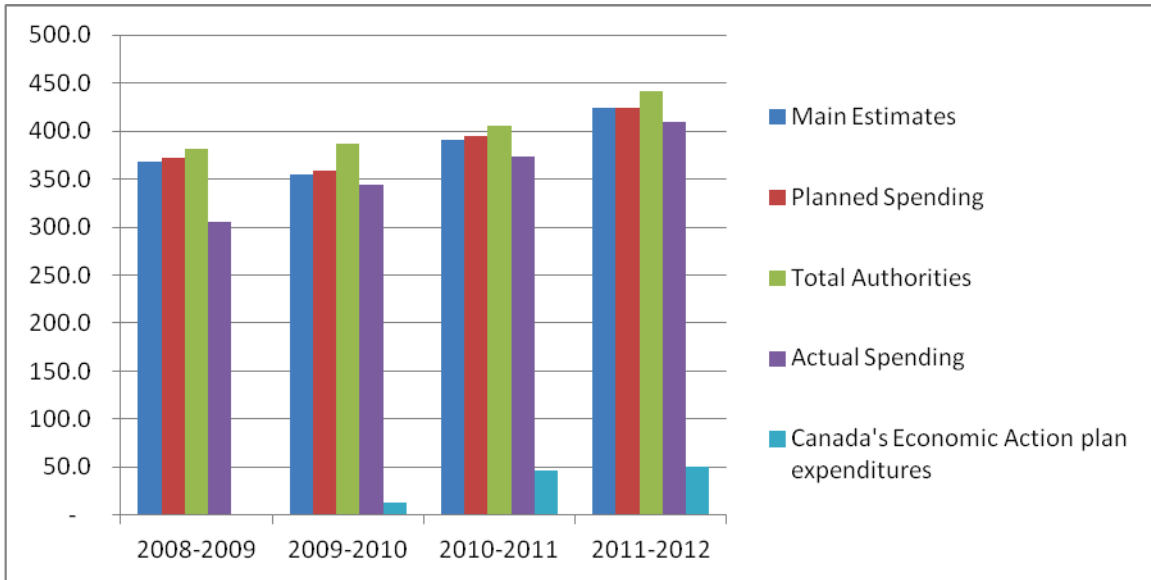
**Changes to Government Structure**

*Shared Services Canada*

Impacts on Financial and Human Resources resulting from the Establishment of Shared Services Canada (SSC)

<b>2011-2012 Financial Resources (\$ in millions)</b>		
	<b>Planned Spending</b>	<b>Total Authorities*</b>
Net transfer post Orders in Council (OIC)** to Shared Services Canada (SSC)	3.4	3.4
<b>2011-2012 Human Resources</b>		
	<b>Planned</b>	<b>Actual</b>
Deemed to SSC	10.9	10.9
<p>* Pursuant to section 31.1 of the Financial Administration Act and Orders in Council P.C. 2011-0881, P.C. 2011-0877 and P.C. 2011-1297, this amount was deemed to have been appropriated to SSC, which resulted in a reduction in the appropriation for the CSA.</p> <p>** Total Authorities, as presented in the “2011-2012 Financial Resources” table (and other relevant tables) in the “Summary of Performance” section, is the net of any transfers to SSC. Actual spending does not include expenditures incurred on behalf of SSC as of the OIC date.</p>		

### 2.2.5) Canada's Economic Action Plan



In Budget 2009, Canada's Economic Action Plan (EAP) provided the CSA with an additional \$110 million over three years for the development of prototypes of a lunar exploration rover, a Mars science rover, and next-generation space robotics systems and technologies for on-orbit servicing. The two main objectives of this initiative were the preservation of Canadian expertise and leadership in space robotics, and the increase of Canada's readiness and credibility as a partner for future space robotics and space exploration projects.

In 2011-2012, Canadian firms and universities continued the development of terrestrial prototypes of the next generation Canadarm and prototypes of three different rovers and their associated technologies for future international Moon and Mars exploration missions. The CSA continued supervising the contracts awarded for the development of science instruments and support for analogue mission deployments. No new contracts were awarded for this EAP work.

Expected Result	
Maturing science, technology and operational solutions for planning and strategic positioning purposes.	
Indicator	Performance
Number of science, technology and operational solutions that are under development in conformity with the orientations and conclusions of the Canadian Space Exploration strategic plan.	47 solutions are ongoing as a result of 8 prototyping and analogue missions, and 7 concept studies <sup>25</sup> .

<sup>25</sup> 2011-2012 RPP: <http://www.asc-csa.gc.ca/pdf/rpp-2011-details-eng.pdf>



## SECTION 3: SUPPLEMENTARY INFORMATION

### 3.1 FINANCIAL HIGHLIGHTS

#### 3.1.1) Condensed Statement of Financial Position

<b>Condensed Statement of Financial Position (Unaudited)</b>			
<b>As at March 31, 2012</b>			
<b>(\$ in millions)</b>			
	<b>Change %</b>	<b>2011-2012</b>	<b>2010-2011</b>
<b>Total net liabilities</b>	-11	122	137
<b>Total net financial assets</b>	-9	86	95
<b>Departmental net debt</b>	-14	36	42
<b>Total non-financial assets</b>	-4	1,256	1,306
<b>Departmental net financial position</b>	-3	1,220	1,264

#### 3.1.2) Condensed Statement of Operations and Departmental Net Financial Position

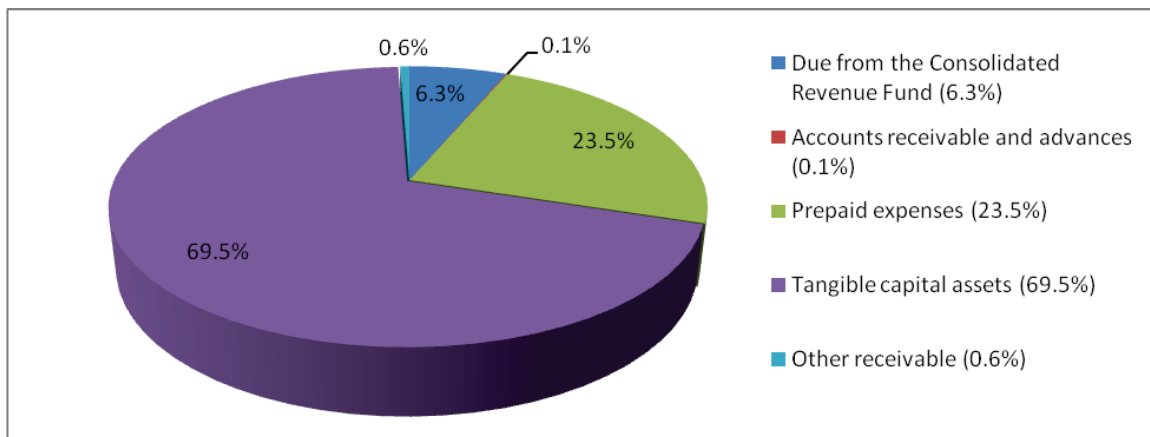
<b>Condensed Statement of Operations and Departmental Net Financial Position (Unaudited)</b>			
<b>For the year ended March 31, 2012</b>			
<b>(\$ in millions)</b>			
	<b>Change %</b>	<b>2011-2012</b>	<b>2010-2011</b>
<b>Total expenses</b>	+7	468	435
<b>Total revenues</b>	+2000	21	1
<b>Net cost of operations before government funding and transfers</b>	+2	450	441
<b>Departmental net financial position</b>	-3	1,220	1,264

### 3.2 FINANCIAL HIGHLIGHTS GRAPH

The financial highlights presented are intended to serve as a general overview of the Agency's financial position and operations. Below are explanations for the variances, in each major grouping, based on the most significant factors that affected each grouping during the fiscal year.

#### Assets by Type

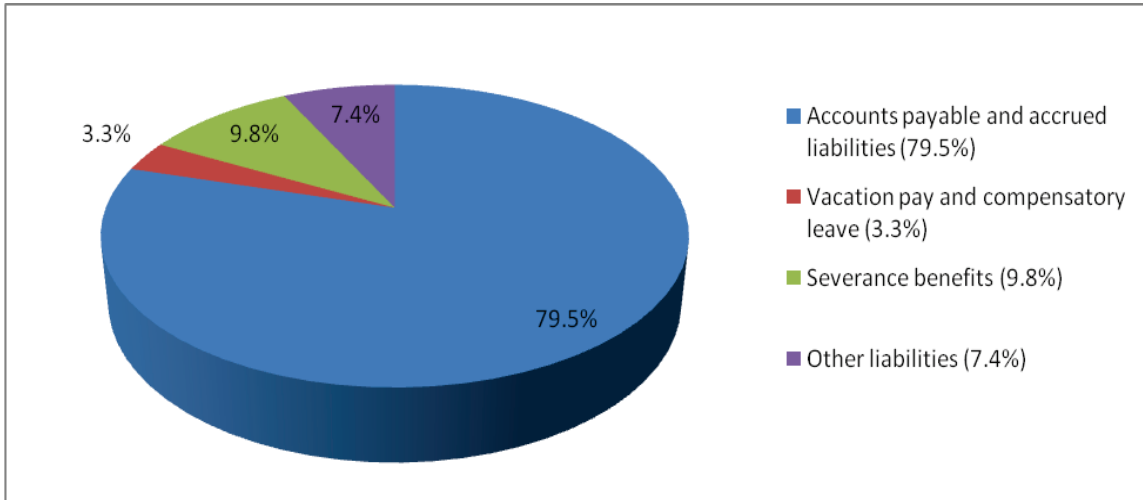
Assets held by the Agency for use in its activities consist primarily of Tangible Capital Assets, which are composed of 91.6% of space related assets.



Total assets were \$1,342 million at the end of 2011-2012, a decrease of \$59 million (4.2%) over the previous year's total assets of \$1,401 million. This decrease can be mostly attributed to the change in prepaid expenses related to the RADARSAT-2 satellite. In 2010, the Agency received credit for the supply of data (imagery) following its participation in the construction and launch of the satellite. Each year, the credit is decreased by the value of imagery received. In 2011-2012, the Agency received imagery valued at \$49 million.

## Liabilities by Type

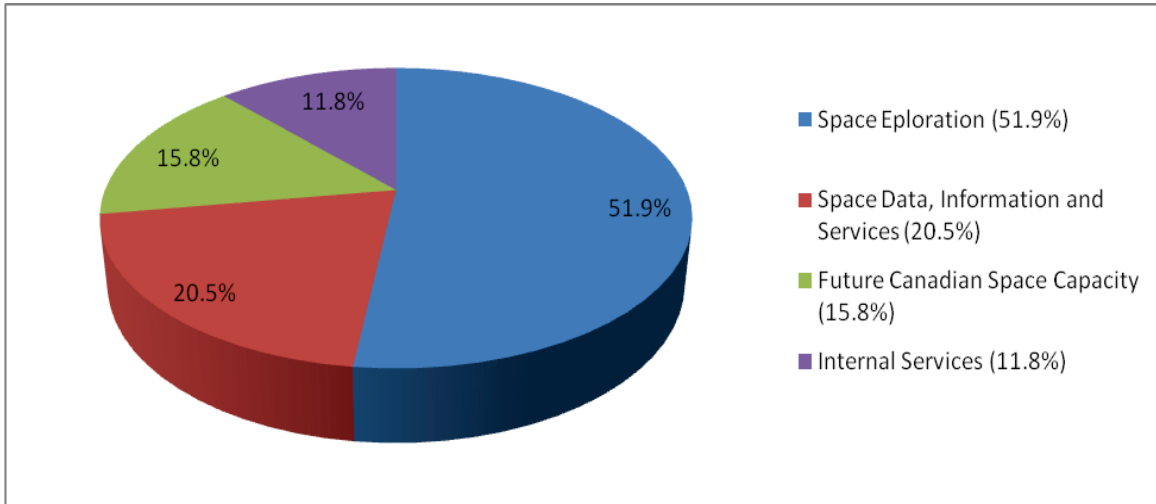
Liabilities arising from the Agency's activities consist primarily of accounts payable and accrued liabilities, the majority of which are related to accruals in support of programs such as Space Utilization and Space Exploration.



Total liabilities were \$122 million at the end of 2011-2012, a decrease of \$15 million (10.9%) over the previous year's total liabilities of \$137 million. This decrease can be mostly attributed to the change in other liabilities related to the non-monetary exchange with NASA. The balance of the non-monetary exchange at the beginning of the year amounted to \$13 million. In 2012, services pursuant to the agreement were provided to NASA which offset the liability balance.

## Expenses

Expenses incurred to support the Agency's programs were mostly grouped under Professional and Special Services (\$151 million or 32%), Amortization of tangible capital assets (\$98 million or 21%) and Salaries and employee benefits (\$85 million or 18%).



Total expenses were \$468 million in 2011-2012, an increase of \$33 million over previous year's total of \$435 million. This increase can be mostly attributed to the following items: increase in the RADARSAT-2 imagery received in 2012 compared to 2011, write-downs of tangible capital assets under Space Exploration and Space Data, Information and Services, an increase in expenditures in the Professional and Special Services associated with the Economic Action Plan, an initiative announced in the 2009 and 2010 budgets and an increase in severance benefits paid to employees following changes made to collective agreements.

### 3.3 FINANCIAL STATEMENTS

Information on CSA's Financial Statements is at the following address:

<http://www.asc-csa.gc.ca/eng/publications/rp.asp#rr>

### 3.4 LIST OF SUPPLEMENTARY INFORMATION TABLES

Electronic supplementary information tables listed in the 2011–12 Departmental Performance Report can be found on the [Canadian Space Agency's Website](#)<sup>26</sup>.

- Details on Transfer Payment Programs (TPPs)
- Internal Audits and Evaluations
- Response to Parliamentary Committees and External Audits
- Sources of Respendable and Non-Respendable Revenue
- Status Report on Major Crown and Transformational Projects
- Status Report on Projects Operating with Specific Treasury Board Approval
- User Fees Reporting

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<sup>26</sup> The Canadian Space Agency's Website: <http://www.asc-csa.gc.ca/eng/publications/rp.asp>

## SECTION 4: OTHER ITEMS OF INTEREST

### 4.1 ORGANIZATIONAL CONTACT INFORMATION

Canadian Space Agency  
 Communications and Public Affairs  
 Telephone: 450-926-4370  
 Fax: 450-926-4352  
 E-mail: [media@asc-csa.gc.ca](mailto:media@asc-csa.gc.ca)

### 4.2 ADDITIONAL INFORMATION

#### 4.2.1) Spending by Program Activity

Description	Planned Spending (\$ in millions)	Actual* (\$ in millions)	Variance (\$ in millions)
<b>Space Data, Information and Services</b>	136.6	137.3	(0.7)
<u>Comments:</u>			
<ul style="list-style-type: none"> <li>- No significant variance between Planned Spending and Actual for Space Data, Information and Services.</li> </ul>			
Description	Planned Spending (\$ in millions)	Actual* (\$ in millions)	Variance (\$ in millions)
<b>Space Exploration</b>	152.4	146.3	6.1
<u>Comments:</u>			
The variance of \$6.1 million was mainly due to the following factor: <ul style="list-style-type: none"> <li>- A carry forward of \$5.9 million (from 2011-2012 to 2012-2013) to adjust cash-flow as a results of delays encountered in NEOSSat mission and James Webb Space Telescope (JWST) project.</li> </ul>			

<b>Description</b>	<b>Planned Spending (\$ in millions)</b>	<b>Actual (\$ in millions)</b>	<b>Variance (\$ in millions)</b>
<b>Future Canadian Space Capacity</b>	86.1	69.6	16.5
<u>Comments:</u>			
The variance of \$16.5 million was mainly due to the following factors:			
<ul style="list-style-type: none"> <li>- For the ESA program, the variance of \$12.2 million is mainly due to: the budgetary cycle of ESA differs from the one of Canada, the slippage in the planned disbursements of ESA programs and the non realization of some budgeted risks such as potential cost increases in ESA programs, inflation, exchange rate fluctuations and additional payments for industrial over-returns. A reprofiling from 2011-2012 to future fiscal years will be requested.</li> <li>- For the Space Technology Development Program (STDP), spending reduction of \$4.7 million is due to the cancellation of Request for proposals (RFPs) for Highly Elliptical Orbit &amp; Geostationary Earth Orbit Future Missions that is related to Communication Technologies (following a thorough review of CSA's financial pressures, priorities and opportunities) and a spending reduction of \$1.1 million due to the difficulty to put contracts in place and for some companies to deliver products on time, in line with the initial STDP calendar.</li> </ul>			

<b>Description</b>	<b>Planned Spending (\$ in millions)</b>	<b>Actual* (\$ in millions)</b>	<b>Variance (\$ in millions)</b>
<b>Internal Services</b>	49.4	55.9	(6.5)
<u>Comments:</u>			
The variance of (\$6.5) million was mainly due to the following factors:			
<ul style="list-style-type: none"> <li>- Spending increase of (\$2.0) million taken from other Program Activities to cover costs for IM/IT systems acquisitions and upgrades, maintenance renewals and hardware purchases.</li> <li>- Spending increase of (\$1.6) million realized from reallocations from other Program Activities to cover costs for infrastructure at St-Hubert and David Florida Laboratory.</li> <li>- Spending increase of (\$4.1) million due to the reimbursable eligible pay list expenditures.</li> <li>- Spending reduction of \$3.0 million due to activities transferred to Shared Services Canada.</li> </ul>			

\*Excludes amount deemed appropriated to Shared Services Canada.

#### **4.2.2) FTEs Variance (Full-Time Equivalent)**

In 2011-2012, the difference between planned and actual FTEs is 10.5. This variance is due to 10.9 FTEs transferred from the CSA to the new organization Shared Services Canada. This small variance shows a significant improvement in planning FTE requirements and the implementation of a corporate integrated staffing action plan.