Canadian Space Agency

2013–14

Departmental Performance Report

The Honorable James Moore, P.C., M.P.
Minister of Industry

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Foreword

Departmental Performance Reports are part of the Estimates family of documents. Estimates documents support appropriation acts, which specify the amounts and broad purposes for which funds can be spent by the government. The Estimates document family has three parts.

Part I (Government Expenditure Plan) provides an overview of federal spending.

Part II (Main Estimates) lists the financial resources required by individual departments, agencies and Crown corporations for the upcoming fiscal year.

Part III (Departmental Expenditure Plans) consists of two documents. Reports on Plans and Priorities (RPPs) are expenditure plans for each appropriated department and agency (excluding Crown corporations). They describe departmental priorities, strategic outcomes, programs, expected results and associated resource requirements, covering a three-year period beginning with the year indicated in the title of the report. Departmental Performance Reports (DPRs) are individual department and agency accounts of actual performance, for the most recently completed fiscal year, against the plans, priorities and expected results set out in their respective RPPs. DPRs inform parliamentarians and Canadians of the results achieved by government organizations for Canadians.

Additionally, Supplementary Estimates documents present information on spending requirements that were either not sufficiently developed in time for inclusion in the Main Estimates or were subsequently refined to account for developments in particular programs and services.

The financial information in DPRs is drawn directly from authorities presented in the Main Estimates and the planned spending information in RPPs. The financial information in DPRs is also consistent with information in the Public Accounts of Canada. The Public Accounts of Canada include the Government of Canada Consolidated Statement of Financial Position, the Consolidated Statement of Operations and Accumulated Deficit, the Consolidated Statement of Change in Net Debt, and the Consolidated Statement of Cash Flow, as well as details of financial operations segregated by ministerial portfolio for a given fiscal year. For the DPR, two types of financial information are drawn from the Public Accounts of Canada: authorities available for use by an appropriated organization for the fiscal year, and authorities used for that same fiscal year. The latter corresponds to actual spending as presented in the DPR.

The Treasury Board *Policy on Management, Resources and Results Structures* further strengthens the alignment of the performance information presented in DPRs, other Estimates documents and the Public Accounts of Canada. The policy establishes the Program Alignment

Architecture of appropriated organizations as the structure against which financial and non-financial performance information is provided for Estimates and parliamentary reporting. The same reporting structure applies irrespective of whether the organization is reporting in the Main Estimates, the RPP, the DPR or the Public Accounts of Canada.

A number of changes have been made to DPRs for 2013−14 to better support decisions on appropriations. Where applicable, DPRs now provide financial, human resources and performance information in Section II at the lowest level of the organization's Program Alignment Architecture.

In addition, the DPR's format and terminology have been revised to provide greater clarity, consistency and a strengthened emphasis on Estimates and Public Accounts information. As well, departmental reporting on the Federal Sustainable Development Strategy has been consolidated into a new supplementary information table posted on departmental websites. This new table brings together all of the components of the Departmental Sustainable Development Strategy formerly presented in DPRs and on departmental websites, including reporting on the Greening of Government Operations and Strategic Environmental Assessments. Section III of the report provides a link to the new table on the organization's website. Finally, definitions of terminology are now provided in an appendix.

Minister's Message

I am pleased to report on the Industry Portfolio's key activities in 2013–14.

During this period, facilitating support for business innovation, strengthening private sector investment in job creation, and creating lasting partnerships with the research community were among our most important achievements.

In February 2014, the government unveiled Canada's Space Policy Framework, which will guide Canada's strategic activities and future in space, ensure a strong and commercially competitive space industry, and lay the groundwork to inspire the next generation to pursue studies and careers in science and engineering. The Canadian Space Agency (CSA) will continue to align its operations with the core principles of the framework to support an ongoing commitment to space exploration, commercialization and development focused on delivering results for Canadians.

Working together, Industry Canada and our portfolio partners will continue to improve competitiveness, cost-efficiencies and job opportunities, bolstering the Canadian economy and furthering our government's commitment to create jobs and growth.

I am pleased to present the *2013–14 Departmental Performance Report* for the CSA.

James Moore
Minister of Industry

Section I: Organizational Expenditure Overview

Organizational Profile

Appropriate Minister: The Honourable James Moore, Minister of Industry

Institutional Head: General (Retired) Walter Natynczyk, President

Ministerial Portfolio: Industry

Enabling Instrument(s): *Canadian Space Agency Act*, S.C. 1990, c. 13

Year of Incorporation / Commencement: Established in March 1989

Organizational Context

Raison d'être

The mandate of the Canadian Space Agency[1] (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 carrying its mandate in collaboration with Canadian industry, academia, Government of Canada (GoC) organizations, and other international space agencies or organizations.

Responsibilities

The founding legislation that 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.

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

Strategic Outcome(s) and Program Alignment Architecture

1 **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.

- **1.1 Program:** Space Data, Information and Services
  - **1.1.1 Sub-Program:** Earth Orbit Satellite Missions and Technology
    - **1.1.1.1 Sub-Sub-Program:** Earth Observation Missions
    - **1.1.1.2 Sub-Sub-Program:** Communications Missions
    - **1.1.1.3 Sub-Sub-Program:** Scientific Missions
  - **1.1.2 Sub-Program:** Ground Infrastructure
    - **1.1.2.1 Sub-Sub-Program:** Satellite Operations
    - **1.1.2.2 Sub-Sub-Program:** Data Handling
  - **1.1.3 Sub-Program:** Space Data, Imagery and Services Utilization Development
    - **1.1.3.1 Sub-Sub-Program:** Earth Observation Data and Imagery Utilization
    - **1.1.3.2 Sub-Sub-Program:** Communications Services Utilization
    - **1.1.3.3 Sub-Sub-Program:** Scientific Data Utilization
- **1.2 Program:** Space Exploration
  - **1.2.1 Sub-Program:** International Space Station (ISS)
    - **1.2.1.1 Sub-Sub-Program:** International Space Station Assembly and Maintenance Operations
    - **1.2.1.2 Sub-Sub-Program:** International Space Station Utilization
  - **1.2.2 Sub-Program:** Exploration Missions and Technology
    - **1.2.2.1 Sub-Sub-Program:** Space Astronomy Missions
    - **1.2.2.2 Sub-Sub-Program:** Planetary Missions
    - **1.2.2.3 Sub-Sub-Program:** Advanced Exploration Technology Development
  - **1.2.3 Sub-Program:** Human Space Missions and Support
    - **1.2.3.1 Sub-Sub-Program:** Astronaut Training and Missions
    - **1.2.3.2 Sub-Sub-Program:** Operational Space Medicine
    - **1.2.3.3 Sub-Sub-Program:** Health and Life Sciences

1.3 Program: Future Canadian Space Capacity

1.3.1 Sub-Program: Space Expertise and Proficiency

1.3.2 Sub-Program: Space Innovation and Market Access

1.3.2.1 Sub-Sub-Program: International Market Access

1.3.2.2 Sub-Sub-Program: Enabling Technology Development

1.3.3 Sub-Program: Qualifying and Testing Services

1.4 Internal Services

Descriptions of Programs, Sub-Programs and Sub-Sub-Programs are in Section II.

Organizational Priorities

The CSA had identified eight priorities as presented in the 2013-14 Report on Plans and Priorities (RPP). Progress being made in each of these priorities is reflected below.

Priority	Type	Strategic Outcome(s) [and/or] Program(s)
Further the development of the RADARSAT Constellation Mission (RCM) in order to provide continuity and enhanced functionalities to the users of RADARSAT-1 and RADARSAT-2. Ground stations located in the Canadian Arctic are required to take full advantage of the RADARSAT Constellation Mission and to receive data from various Canadian and foreign satellites.	Ongoing	1.1 Space data, information and services 1.1.1 Earth orbit satellite missions and technology 1.1.2 Ground infrastructure
Summary of Progress		
Significant progress was accomplished in the manufacturing of the RCM satellites throughout 2013–14. Several satellite units are nearing completion and are to be delivered in 2014–15 for integration into the satellites. Work on the design of the RCM ground segment equipment also continued and is expected to be completed in 2015–16. As per current planning, the equipment will then be delivered and installed at the CSA headquarters in 2016–17. The launch currently remains scheduled for 2018–19. In the view of the investments by both Natural Resources Canada (NRCan) and the Department of National Defence (DND) to implement a network of ground stations across Canada, the scope of the CSA's Northern Ground Station (NGS) project has been limited to one ground station to be located in the Canadian Arctic. This will be used in conjunction with the DND and NRCan stations and will be capable of receiving data as well as controlling the RCM satellites, and other Canadian satellites. The NGS location will be selected to complement the coverage of the DND and NRCan stations. The CSA has initiated a consultation process with other Government of Canada (GoC) departments to finalize requirements.		
Priority	**Type**	**Strategic Outcome(s) [and/or] Program(s)**
Develop and integrate small satellite advanced technology to provide fast and cost-effective responses to government needs in specific areas such as safety and security, atmospheric monitoring, environment stewardship, water	New	1.1 Space data, information and services 1.1.1 Earth orbit satellite missions and technology 1.1.3 Space data, imagery and services utilization development

quality monitoring and precision farming.		

Summary of Progress

The CSA obtained confirmation of needs from other Government Departments through Letters of Interest for five mission concepts. Five different User and Science Teams have been set up for the five missions including participation from eight different GoC departments. The CSA conducted industrial competitions for a feasibility study for each mission concept and initiated the process to award contracts to industry in order to commence working stage at the beginning of 2014–15.

The CSA signed a Memorandum of Understanding (MOU) with the Swedish National Space Board to undertake a Concept Study for a scientific atmospheric limb sounding mission. The study began in December 2013 and will conclude in the summer of 2015.

Priority	Type	Strategic Outcome(s) [and/or] Program(s)
Canada will continue as an active partner and participant in the International Space Station (ISS), operating and upgrading Canadian robotic elements (Canadarm2 and Dextre), performing scientific experiments and technology demonstrations and having access to flight opportunities for Canadian astronauts.	Ongoing	1.2 Space exploration 1.2.1 International Space Station (ISS) 1.2.1.1 ISS assembly and maintenance operations 1.2.1.2 ISS utilization

Summary of Progress

Canada continued its role as an active partner on the International Space Station (ISS) Program. Canada's robotics elements, namely Candarm2 and Dextre, successfully carried out all planned ISS operations including the: Robotics Refuelling Mission operations, the US Orbital Cygnus-D1 capture and release, the Japanese HTV4 capture and release, and the US Pump Module Repair. A number of new ISS systems were also checked out by Canadarm2 and Dextre including the: Secondary Power Distribution Assemblies, Robot Micro Conical Tool, and the new Russian FGB Base location for Canadarm2. Six Canadian experiments operated on board the ISS.

Commander Chris Hadfield became the first Canadian Commander of the ISS during his five-month mission on the ISS.

Priority	Type	Strategic Outcome(s) [and/or] Program(s)
Foster the development of scientific instruments, advanced space robotics and other technologies capable of contributing to future international space exploration missions.	Ongoing	1.2 Space exploration 1.2.2 Exploration missions and technology 1.2.2.3 Advanced exploration technology development

Summary of Progress

Canada pursued its objective of advancing robotics and vision sensors in the field of Lunar and Martian rover mobility, as well as dexterous robotics development. Canada jointly worked with NASA on early studies of Moon and Mars science as well as prospecting missions in anticipation of their potential partnership in key robotics, vision sensor and scientific contributions to upcoming missions.

Canada continued to support the integration of its flight instruments on board the James Webb Space Telescope (JWST).

Canada also invested in medical monitoring and diagnostic technologies.

Priority	Type	Strategic Outcome(s) [and/or] Program(s)
Generate, maintain and improve the conditions that support the creation of Highly Qualified Personnel (HQP) in space and related fields in order to sustain and improve Canada's space capacity and capability.	Ongoing	1.3 Future Canadian space capacity 1.3.1 Space expertise and proficiency

Summary of Progress

A Stratospheric Balloon Base was built and qualified in Timmins, Ontario, in collaboration with the French '*Centre national d'études spatiales'* (CNES), the Northern Ontario Heritage Fund, the CSA and the City of Timmins. The balloon base is the Canadian contribution that will provide frequent flight opportunities on board French stratospheric balloons, thereby resulting in affordable yearly flights for Canadian users in a quasi-space environment. The first qualification campaign was successfully held in the summer of 2013, thus opening the base to regular scientific campaigns, starting as early as August 2014.

In addition, 40 reports on the various ongoing Grant and Contribution Agreements were received and accepted, attesting to the quality of space-related work being conducted by universities. Ten new Grant Agreements were signed with seven universities for new projects under the Flight for Advancement of Science and Technology (FAST) in 2013.

A group of students from three Canadian universities benefited from CSA funding and took part, with

Norwegian students, in a hands-on rocket course at the Andoya Rocket Range in Norway.

With *Canada's Space Policy Framework* and relevant CSA internal strategic reviews serving as background, new initiatives were explored with Granting Councils, as well as with industry and academia directly. The purpose is to facilitate knowledge and technology transfer through the promotion of closer links between universities and industry in priority areas.

Priority	Type	Strategic Outcome(s) [and/or] Program(s)
Generate, maintain and improve the conditions that support innovation in space technologies that will meet future needs and priorities.	Ongoing	1.3 Future Canadian space capacity 1.3.2 Space innovation and market access 1.3.2.2 Enabling technology development

Summary of Progress

Based on technology roadmaps of the CSA's future potential missions, the Space Technology Development Program (STDP) has issued 24 R&D contracts on priority technologies to major Canadian space companies as well as small and medium-sized enterprises (SME's). A pilot project of non-reimbursable contributions to the industry was also successfully conducted to support industrial innovative ideas in preparation for a larger Announcement of Opportunities to be conducted in FY 2014-15.

Priority	Type	Strategic Outcome(s) [and/or] Program(s)
Implement a new governance structure and strengthen corporate risk assessment and project management processes.	Ongoing	1.4 Internal services

Summary of Progress

In December 2013 as per the recommendations of the November 2012 Aerospace Review (Emerson Report), a Deputy Minister Governance Committee on Space (DMGCS) co-chaired by the CSA President was established. Made up of Deputy Ministers from stakeholder departments, the DMGCS's mandate is to coordinate government priorities for space and ensure efficient use of resources across government. In order to effectively maintain an integrated Whole of Government (WoG) and provide support to the DMGCS, two new committees have been created: the Space Program Integration Board at the Assistant Deputy Minister level (ADM-SPIB) and the Space Program Integration Board at the Director General level (DG-SPIB). These Boards were created to inform, advise and provide recommendations as required, to the DMGCS.

The Corporate Risk Profile was also updated in March 2014 and reflects the level of risks the Agency manages in order to meet its strategic objectives and expected results. This report is updated annually and

used in support of investment decisions and monitoring.

A new project management framework was approved in February 2014, and implemented early in the 2014–15 fiscal year: the Investment Governance and Monitoring Framework (IGMF). This new framework supports integrated project management, governance, and monitoring across the Agency, through the consistent application of gating processes appropriate for the risk and complexity of investments. The framework will strengthen informed investment decision-making and monitoring to optimize investment outcomes stemming from projects and non-projects initiatives.

Priority	Type	Strategic Outcome(s) [and/or] Program(s)
Implement the Five-Year Investment Plan in accordance with Treasury Board Secretariat policies.	Ongoing	1.4 Internal services

Summary of Progress

The 2014–2019 Investment Plan (IP) was finalized and approved by Treasury Board Ministers in June 2014. The IP has been developed in accordance with Treasury Board Secretariat's Policies. The IP will be updated and submitted to TBS in FY 2016-17.

Priority	Type	Strategic Outcome(s) [and/or] Program(s)
Adopt *Canada's Space Policy Framework.*	New	1.4 Internal services

Summary of Progress

In February 2014, the Government of Canada unveiled the new Canada's Space Policy Framework. The framework will serve as a guide for Canada's strategic activities and future in space, ensuring a strong and commercially competitive space industry that will continue to inspire Canadians for years to come. In the months following its release, the government has taken numerous steps to implement the core principles outlined in the document, including holding the first-ever Canadian Space Conference at the CSA's headquarters to engage key stakeholders from industry, academia and other government departments on how to implement the framework. The Agency continues to work with space industry leaders to identify ways in which the private sector can play a stronger leadership role to ensure that the economic value of the government's space investments is fully realized. The CSA is also transforming its structure and operations in order to ensure that the enabling role it plays on behalf of the Canadian government in space advances the strategic goals of jobs and growth, sovereignty, security and the advancement of knowledge. A key component to this work has been the development and implementation of a new governance structure that includes the new Deputy Minister Governance Committee on Space (DMGCS). The framework also called for increased focus on space cooperation with our key international partners, and through close collaboration with NASA and other partners on key projects like the James Webb Telescope, the Surface Water & Ocean Topography (SWOT) mission and the OSIRIS-REx asteroid mission, the government continues to work together globally on space. Finally, the government continues to actively support activities and programs aligned with the "Inspiring Canadians" principle of motivating young Canadians to pursue careers in science, technology, engineering and math, as outlined in the Framework.

Risk Analysis

Key Risks

Risks	Risk Response Strategy	Link to Program Alignment Architecture
Fiscal management The potential that costs may become greater than originally planned could reduce the amount of funds available to launch new initiatives. Increased costs could compel the CSA to reconsider priorities.	– Reduce technological uncertainty by implementing technology development activities at the design stage; – Assess projects' risks and allocate a financial risk margin based on the risks' impact and probability levels; – Monitor the implementation of a new project management policy; – Develop a new project management methodology; and – Where applicable, implement acquisition strategies based on risk sharing with industry partners.	1.1.1 Earth Orbit Satellite Missions and Technology 1.1.2 Ground Infrastructure 1.2.1 International Space Station (ISS) 1.2.2 Exploration Missions and Technology
Space capacity New international competitors, fluctuating technological development and the uncertainty associated with technological development, may impact the long-term priorities of the CSA.	– Ongoing updating of the Canadian space technology requirements spectrum; – Promotion of partnerships between the private industry, the university community and the CSA; – Ongoing monitoring of Canadian space sector conditions; and – Partnerships with foreign space agencies to expand academia and industry opportunities to participate in the development of international missions.	1.1.3 Space Data Imagery and Services Utilization Development 1.2.2 Exploration Missions and Technology 1.3.1 Space Expertise and Proficiency 1.3.2 Space Innovation and Market Access
Gap between expectations and supply Due to possible interruptions, infrastructure challenges, personnel availability, project implementation or changes in	– Ongoing consultations with GoC organizations and the university community regarding long-term requirements; – Ongoing consultations during the development phase about	1.1.1 Earth Orbit Satellite Missions and Technology 1.1.2 Ground Infrastructure 1.2.1 International Space Station (ISS)

partners' requirements and priorities, there may be a possible gap between partners' expectations and the data and services provided by the CSA.	operational requirements; – Produce cost-effectiveness analysis to determine if small satellite development could provide fast and efficient space solutions; – Ongoing monitoring and implementation of mechanisms to optimize the allocation of RADARSAT-2 data portion of the government's credit; – Monitoring of space objects and collision-avoidance measures; and – Annual updating of the Integrated Human Resources Plan.	1.3.3 Qualifying and Testing Services
Financial resource management The CSA needs to identify priorities in order to meet the Agency's requirements in space.	– Analysis of possible synergies between available resources and equipment, and new mission options; – Reassessment of operating costs; – Search for partnerships for operating cost sharing; – Continuous monitoring of project implementation; – Regular review of the project portfolio, activity plans and schedules; – Regular review of financial management strategies; and – Development of a guide to implement and monitor the investment planning policy.	1.1.1 Earth Orbit Satellite Missions and Technology 1.1.2 Ground Infrastructure 1.2.2 Exploration Missions and Technology 1.3.2 Space Innovation and Market Access

Risks Discussion

Space assets are increasingly used by GoC organizations to deliver their mandates. In a context where there is a large diversity of missions and partnership opportunities to choose from, there is a risk that gaps may emerge between users' needs and services provided. To mitigate that risk, the CSA continued to support the development of small satellite technology to provide fast and cost-effective responses to users' needs. Furthermore, the CSA continues the management and

optimization of the RADARSAT-2 data allocation, ensuring that operational users' needs are met in a sustainable manner until the launch of RADARSAT Constellation Mission (RCM) in 2018. The CSA has also implemented a new interdepartmental governance model which will facilitate identifying, mending and mitigating possible gaps between demand and supply while ensuring that adequate levels of financial resources will be devoted to space activities. The growth of small companies continues to represent a challenge due to their limited ability to market their products and services worldwide. While the traditional approach to concentrate Canada's efforts in a few strategic space fields has been successful, it has led to a highly concentrated industry. Consequently, the Canadian space industry, especially SMEs, remains reliant on continued R&D investments to overcome its growth challenges. To mitigate the risk of insufficient capacity needed to address future national needs and priorities, the CSA is pursuing the advancement of space robotics and other key technologies aimed at maintaining Canada's competitive edge. The CSA has also pursued the development of sub-orbital platforms to increase the pace of training and scientific discovery. The adoption of *Canada's Space Policy Framework* provides the policy blueprint for Canada to remain in the vanguard of space research and application.

Finally, programmatic and technical difficulties associated with space missions represent another important source of risks. Additional challenges can occur due to the international dimension of some projects. Realized risks may lead to cost increases and schedule slippages. In order to mitigate these risks, the CSA has pursued the implementation of its new Investment Governance and Monitoring Framework, therefore enhancing the management and control process already in place.

Actual Expenditures

Budgetary Financial Resources (dollars)

2013–14 Main Estimates	2013–14 Planned Spending	2013–14 Total Authorities Available for Use	2013–14 Actual Spending (authorities used)	Difference (actual minus planned)
488,680,928	488,680,928	510,357,747	408,715,240	(79,965,688)

Any significant variance reported in relation to Planned Spending in the 2013–14 RPP is explained in Section III: Spending by Program – Additional Information

Human Resources (Full-Time Equivalents [FTEs])

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
663.5	620.7	(42.8)

Budgetary Performance Summary for Strategic Outcome(s) and Program(s) (dollars)

Strategic Outcome(s), Program(s) and Internal Services	2013–14 Main Estimates	2013–14 Planned Spending	2014–15 Planned Spending	2015–16 Planned Spending	2013–14 Total Authorities Available for Use	2013–14 Actual Spending (authorities used)	2012–13 Actual Spending (authorities used)	2011–12 Actual Spending (authorities used)
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.								
Space Data, Information and services	288,783,916	288,783,916	256,908,528	192,301,464	303,969,896	207,544,469	130,830,203	137,297,150
Space Exploration	95,406,830	95,406,830	96,586,363	109,789,405	101,619,388	96,501,810	87,496,584	146,317,119
Future Canadian Space Capacity	58,528,146	58,528,146	62,772,518	64,627,670	58,280,568	55,453,614	52,480,907	69,563,250
Subtotal	442,718,892	442,718,892	416,267,409	366,718,539	463,869,852	359,499,893	270,807,694	353,177,519
Internal Services Subtotal	45,962,036	45,962,036	46,179,765	43,570,805	46,487,895	49,215,347	49,437,721	55,957,996
Total	488,680,928	488,680,928	462,447,174	410,289,344	510,357,747	408,715,240	320,245,415	409,135,515

Note: Due to rounding, amounts may not add up to totals shown.

Alignment of Spending With the Whole-of-Government Framework

The Government of Canada has adopted a whole-of-government framework for reporting to Parliament on progress made as a nation. The whole-of-government framework maps the financial and non-financial contributions of departments, agencies, and Crown corporations (http://www.tbs-sct.gc.ca/ppg-cpr/frame-cadre-eng.aspx). The framework consists of four spending areas: Economic Affairs, Social Affairs, International Affairs, and Government Affairs. The CSA's programs can be linked to the following spending areas and GoC outcomes:

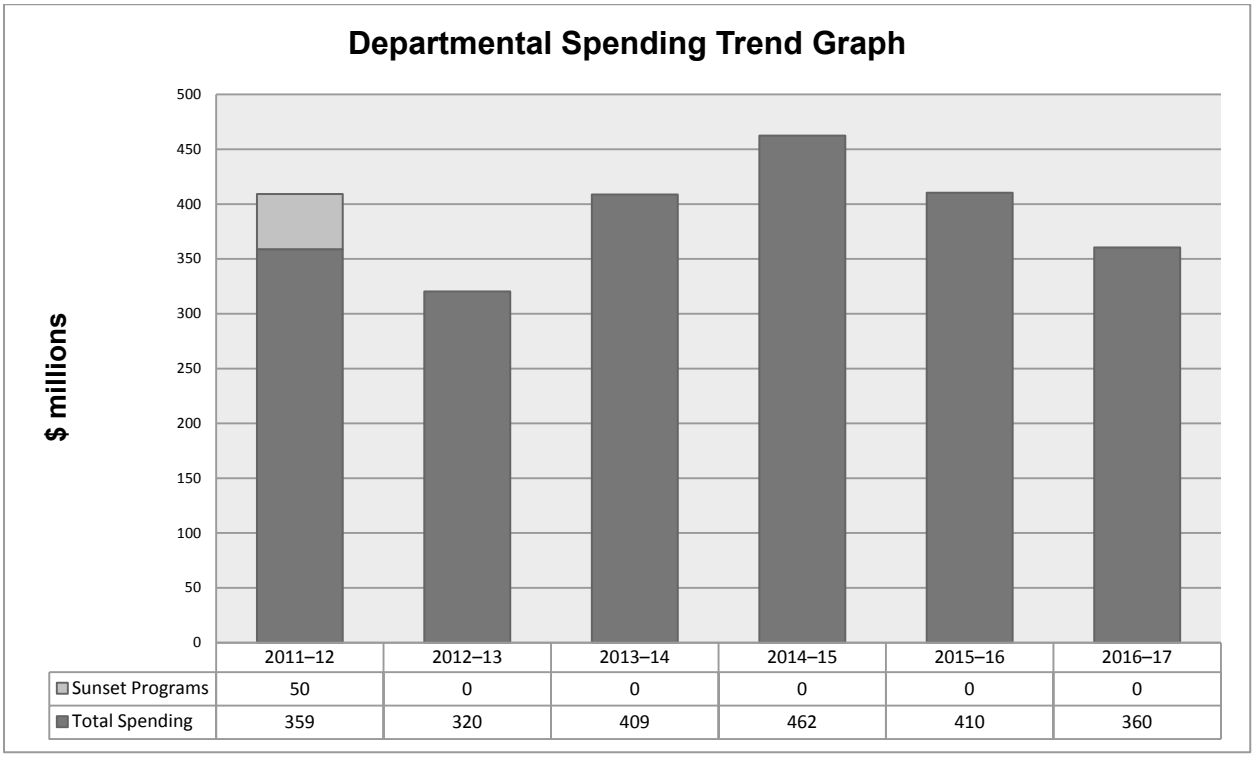
Alignment of 2013–14 Actual Spending With the Whole-of-Government Framework[i] (dollars)

Strategic Outcome	Program	Spending Area	Government of Canada Outcome	2013–14 Actual Spending
1 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.	1.1 Space Data, Information and Services	Government Affairs	Well-managed and efficient government operations	207,544,469
	1.2 Space Exploration	Economic Affairs	An innovative and knowledge-based economy	96,501,810
	1.3 Future Canadian Space Capacity	Economic Affairs	An innovative and knowledge-base economy	55,453,614

Total Spending by Spending Area (dollars)

Spending Area	Total Planned Spending	Total Actual Spending
Economic Affairs	153,934,976	151,955.424
Government Affairs	288,783,916	207,544,469

Departmental Spending Trend



	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17
Sunset Programs	50	0	0	0	0	0
Total Spending	359	320	409	462	410	360

The CSA's annual A-Base budget of $300 million was set in Budget 1999. The difference in the spending trend shown above is mainly attributable to the following factors:

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

- In Budget 2009, Canada’s Economic Action Plan (Action to Support Businesses and Communities) provided the CSA with $110 million over three years (2009–10 to 2011–12) so as to contribute to the development of terrestrial prototypes for space robotic vehicles, such as the Mars Lander and Lunar Rover, and for further development of other technologies and space robotics. The CSA has played an important role by working with the private sector to support advanced research, development and prototyping for new space-based technologies.

- In Budget 2010, the CSA was granted a sum of $397 million over five years (2010–11 to 2014–15) to develop the RADARSAT Constellation Mission. Furthermore, the CSA has received additional funding of $374 million over six years (2013–14 to 2018–19) and, of that amount, $234.2 million comes from transfers from other government departments.

- On August 4, 2011, an Order in Council established Shared Services Canada (SSC) as part of the Public Works and Government Services Canada portfolio to streamline and reduce duplication in the government's Information Technology services. SSC will consolidate the resources and personnel currently supporting email, data centres and networks, and associated internal services. In 2011–12, unexpended authorities related to functions transferred to SSC correspond to $3.5 million. Thus, at the beginning of 2012–13, the CSA transferred $7.2 million to SSC.

- The CSA's contribution to Budget 2012 Strategic Operating Review is $7.9 million for fiscal year 2012–13, $24.7 million for fiscal year 2013–14 and $29.5 million for fiscal year 2014–15.

Estimates by Vote

For information on the CSA's organizational votes and statutory expenditures, consult the *Public Accounts of Canada 2014* on the Public Works and Government Services Canada website.[ii]

Section II: Analysis of Program(s) by Strategic Outcome

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.

Program 1.1: Space Data, Information and Services

Description

This Program includes the provision of space-based solutions (data, information and services) and the progression of their utilization. It also serves to install and run ground infrastructure that processes the data and operates satellites. This Program 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 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.

Budgetary Financial Resources (dollars)

2013–14 Main Estimates	2013–14 Planned Spending	2013–14 Total Authorities Available for Use	2013–14 Actual Spending (authorities used)	2013–14 Difference (actual minus planned)
288,783,916	288,783,916	303,969,896	207,544,469	(81,239,447)

Any significant variance reported in relation to Planned Spending in the 2013–14 RPP is explained in Section III: Spending by Program – Additional Information

Human Resources (Full-Time Equivalents [FTEs])

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
102.3	104.0	1.7

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1 GoC organizations offer more diversified or cost–effective programs and services due to their utilization of space-based solutions.	1 Number of new GoC's programs offering more diversified or efficient services.	Benchmark to be established.	Benchmark not yet established.*

Performance Analysis and Lessons Learned

This indicator is used to determine the impact of space-based solutions on the effectiveness of government programs and services. Enumeration of GoC programs benefiting from Earth Observation applications and other satellite services continues to be a target for measuring the success of CSA programs. Currently however, this data is incomplete, mostly limited to the operational applications of the main user departments (e.g. EC, DND).

*The CSA intends to develop an accurate and comprehensive indicator that will allow measuring the improvements in effectiveness and efficiency of other GoC departments that are attributable to the use of space-based solutions in 2014–15.

Sub-Program 1.1.1: Earth Orbit Satellite Missions and Technology

Description

This Sub-Program (SP) encompasses the development of complete Canadian satellite systems or of sub-systems, payloads, instruments or other components provided to domestic and foreign satellites. The SP also includes the development of advanced technologies that could shape or determine the nature of potential new Earth orbit satellite missions. This SP is necessary because GoC use satellite-generated data, information and services to deliver their mandate; and so do academia to perform their research. This SP is delivered in collaboration with GoC organizations, along with the participation of Canadian industry, academia and foreign space agencies. This collaborative effort is formalized under contracts, grants, contributions and partnership agreements with national, public/private and international organizations.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
261,780,766	185,179,694	(76,601,072)

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
64.3	67.9	3.6

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. GoC organizations are using space-based data to deliver their mandate.	1. Number of GoC's programs using space data or services to deliver their mandate.	Benchmark to be established.	46 GoC programs
	2. Percentage of RADARSAT data used in program's delivery.	Benchmark to be established.	69% operational 31% Research and Development
2. Academia is using space data or services to conduct their research.	1. Number of research projects using space data or services.	[2]SOAR: 100 [3]SESS: 35	SOAR: 211 SESS: 41

Performance Analysis and Lessons Learned

The GoC programs using space data or services to deliver their mandate include 32 programs that have acquired RADARSAT-2 data for the year 2013–14. This is in addition to the 11 programs making use of Automatic Identification System (AIS) data, one program for SCISAT-1 and two programs for the SMOS mission. Information collection for allowing identification of government programs using space solutions continues to be improved.

The following progress has been achieved in improving space solutions services to be offered in the coming years:

[2] SOAR: Science and Operational Applications Research

[3] SESS: Sun-Earth System Science

- The manufacturing of RCM satellites proceed through 2013–14. Several sub-systems will be delivered in 2014–15 for integration into the satellites. Issues with some sub-systems are being addressed and are not expected to have any impact on the launch date planned for 2018–19. The CSA continues to identify potential synergies between RCM and the European Space Agency's (ESA) Sentinel-1 mission launched in April 2014.
- The CSA is also pursuing the development of promising mission concepts for operational space services, technology demonstrations or to meet scientific objectives. Various modes of implementation are considered, including the use of micro and small satellites, and/or integrating Canadian instruments on foreign satellites.
- The CASSIOPE satellite was successfully launched in September 2013. It carries a science payload consisting of a suite of instruments designed to help understand space weather. It also has a high bandwidth communication technology demonstration payload that has commercial potential.

Moreover, 69% of the total data consumed was used for Government programs that were considered operational and 31% were used for research and development programs.

The research projects using space data or services consist of reported activities for the 211 Science and Operational Applications Research for RADARSAT-2 (SOAR) projects in the context of Earth Observation (1.1.3.1) data usage, and the 41 Sun-Earth projects utilizing data from science missions (1.1.3.3).

For additional Highlights of Expected Accomplishments for the Sub-Program – Earth Orbit Satellite Missions and Technology, go to: http://www.asc-csa.gc.ca/eng/publications/rp.asp

Sub-Sub-Program 1.1.1.1: Earth Observation Missions

Description

This Sub-Sub-Program (SSP) encompasses the definition, design, technology development, and implementation of Earth orbit satellites dedicated to producing data, information or imagery of Earth and its atmosphere, ranging from its sub-surface to its upper atmospheric layers, including space surveillance for asteroids, earth orbiting objects and space debris. This SSP serves continuous operations and is necessary to produce pertinent Earth observation data and imagery that assist with the mandate delivery of Government of Canada (GoC) organizations that deal especially with key national priorities, such as environment, climate change, weather, natural resources, sovereignty, defence, safety and security. It also provides academia with data required for its research. This SSP is delivered in collaboration with GoC organizations, along with the participation of Canadian industry, academia and foreign space agencies. This collaborative

effort is formalized under contracts, grants, contributions and partnership agreements with national, public/private and international organizations.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
255,760,238	178,422,246	(77,337,992)

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
47.2	50.1	2.9

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. Earth Observation (EO) missions provide GoC organizations and academia with data and information.	1. Number of GoC programs provided with data and images from EO missions.	Benchmark to be established.	26 GoC programs (in line with departmental PAAs) using EO data supplied under GRIP.
	2. Number of academia provided with data and images from EO missions.	15	22 Canadian universities
	3. Number of users of EO data.	300	298 authorized users of RADARSAT-2 data.

Performance Analysis and Lessons Learned

Earth-Observation (EO) missions continue to supply data and information to GoC departments and agencies, and the scientific community.

After 17 years, RADARSAT-1 became inoperable on March 29, 2013, exceeding its expected life by more than 12 years. However, the RADARSAT-2 program continues to provide data and image information to 298 users authorized by the GoC.

The RADARSAT-2 image credit use increased rapidly in the early years but will stabilize at approximately 30,000 scenes per year. The departments of Environment Canada (EC), the

Department of National Defence (DND) and Natural Resources Canada (NRCan) consume 70% of the data.

The CSA will continue the implementation phase of the RADARSAT Constellation Mission (RCM), which began at the end of FY 2012–13. This phase will last approximately six years and will end with the launch of three satellites during FY 2018–19. RCM will ensure the continuity of data from its predecessors RADARSAT-1 and RADARSAT-2 for all user departments. It will strengthen Canada's capacity to use space-based solutions to support activities pertaining to sovereignty, defence, safety and security, resource management and environmental monitoring, especially in the Arctic.

The 26 GoC programs using EO data relate to information requested from departments under projects supported through the CSA's Government Related Initiatives Program (GRIP) but do not cover other programs or activities of the CSA. GRIP supports the development of the GoC capacity to use EO data and RADARSAT-2 data in particular. It accelerates the integration of data into department's operations and promotes new innovative space-based solutions in support of their mandates.

The 22 Canadian universities using data and images from EO missions relate to those that received RADARSAT-2 images under the SOAR program. This excludes other activities under different CSA programs.

The 298 users of EO data, as reported for this indicator, is the number of RADARSAT-2 authorized users from Canadian and provincial governments, who used RADARSAT-2 data in 2013-14. Information on the number of users of all available data from Earth-Observation sensors is not available.

Sub-Sub-Program 1.1.1.2: Communications Missions

Description

This SSP encompasses the definition, design, technology development, and implementation of Earth orbit satellites dedicated to delivering continuous communications, including Navigation, Positioning and Timing (NPT) services. This SSP serves continuous operations and is necessary to provide pertinent communications and NPT to provide services that assist GoC organizations in the delivery of their mandate, particularly those locating and monitoring vehicle or ship signals, those dealing with remote communities or those managing other key national priorities, such as sovereignty, defence, safety and security. This SSP is delivered in collaboration with GoC organizations, along with the participation of Canadian industry, academia and foreign

space agencies. This collaborative effort is formalized under contracts, grants, contributions and partnership agreements with national, public/private and international organizations.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
1,301,258	4,381,870	3,080,612*

*The variance is mainly due (61%) to cash flow for M3MSat project and to internal surplus reallocations to other initiatives of SSP 1.1.1.2

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
9.4	14.0	4.6

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. Satellites provide communications services that respond to the expressed needs of GoC organizations	1. Number of Satellite Communication missions/instruments in operation.	3	2 in operation (Anik F2 and CASSIOPE). 1 not yet in operations due to postponed launch (M3MSat)
	2. Number of GoC organizations requesting data from Satellite Communication missions.	1	1 (DND)

Performance Analysis and Lessons Learned

The CASSIOPE Mission (Cascade Demonstrator, Smallsat Bus and Ionospheric Polar Explorer, part of the Enhanced Polar Outflow Probe [ePOP]) was successfully launched on September 29, 2013. Funded by the CSA through contribution agreements, this mission will allow the demonstration by industry of the capabilities of a Canadian-built small satellite bus and a space-based store-and-forward system that can handle large volumes of data at high transmission rates. Scientific breakthroughs are also expected with the ePOP payload (applicable to PAA 1.1.1.3). The design life of the satellite is two years.

Telesat's Anik F2 satellite is presently in its operation phase. It carries a CSA demonstration payload to address GoC's commitment to delivering cost-effective, two-way broadband, Internet, tele-health, tele-learning and e-government services to clients in any part of the country. It currently supports a total of 11 telemedicine, tele-education and R&D services at multiple sites in northern Canada

Finally, the CSA is finalizing the implementation of the M3MSat satellite (Maritime Monitoring and Messaging Microsatellite). This project, conducted jointly by the CSA and DND, will demonstrate the usefulness of a space-borne AIS (Automatic Identification System). The system will relay signals from vessels operating in Canadian waters in order to facilitate the management and monitoring of marine transport.

Lessons Learned

An action plan was implemented in response to the recommendations of an evaluation of the CASSIOPE Project released in February 2014. The evaluation concluded that efforts should be made to track impacts of its projects on industrial capacity. Also, in line with *Canada's Space Policy Framework* and the Aerospace Review, the CSA should explore ways to better ensure that the Canadian space industry has the technological capacity to undertake space projects sponsored by the Agency. Concrete steps are being taken to address these issues.

Sub-Sub-Program 1.1.1.3: Scientific Missions

Description

This SSP encompasses the definition, design, technology development, and implementation of Earth orbit satellites dedicated to producing scientific data and information for research performed by GoC organizations or academia. Examples of this research are those pertaining to climate processes and space weather (solar winds and their interaction with the Earth's magnetic field). This SSP is necessary to produce pertinent scientific data and information that allow GoC organizations to mitigate damage or avoid the disabling of critical ground and space infrastructure, such as pipelines, electricity networks and satellites that can sustain damage from the effects of solar winds. In addition, with their enhanced understanding of climate processes and the improved models made possible through this SSP, GoC organizations are better able to provide weather and climate forecasting. Academia also uses the data and information produced through this SSP to perform its own research. This SSP is delivered in collaboration with GoC organizations, along with the participation of Canadian industry, academia and foreign space agencies. This collaborative effort is formalized under contracts, grants, contributions and partnership agreements with national, public/private and international organizations.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
4,719,270	2,375,579	(2,343,691)

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
7.8	3.8	(4.0)

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. Sun-Earth System scientific space missions reflect GoC organizations and academia priorities	1. Number of Sun-Earth System missions/instruments in operation.	25	27
	2. Number of Canadian and international partners participating in CSA's Sun-Earth System science missions.	130	143

Performance Analysis and Lessons Learned

For the last 10 years, the Canadian satellite SCISAT-1 has generated, high-quality data that are used in climate studies, and monitor weather and pollution conditions in the polar zone, including greenhouse gases. It is the only satellite providing vertical resolution data on the chemical composition of the atmosphere.

Successfully launched on September 29, 2013, the ePOP payload on the CASSIOPE satellite contributes to the study of space weather. The suite of eight scientific instruments collects data on solar storms and more specifically, their harmful effects on radio communications, satellite navigation and other space and terrestrial systems.

The Swarm mission satellites, launched by ESA on November 22, 2013, carry a full range of new generation instruments utilizing European and Canadian technological expertise. These instruments gather highly accurate data and will expand the knowledge of the Earth’s magnetic field. One of them, the Canadian Electrical Field Instrument (EFI), was built by the Canadian

company COM DEV, under a European Space Agency (ESA) contract. With financial support from the CSA, researchers from the University of Calgary worked closely with engineers from COM DEV to design the Thermal Ion Imagers for the EFI instruments. The Canadian EFI will collect information about the interaction of Earth's magnetic field with the solar wind and electric currents, and their effects on Earth.

The CSA continues to work with Environment Canada and Agriculture and Agri-Food Canada to support the Canadian scientific plan to develop applications and utilize data from NASA's Soil Moisture Active Passive (SMAP) mission scheduled for launch in 2014.

The 27 Sun-Earth System missions and instruments in operation includes the SCISAT mission as well as Canadian participation in NASA's CloudSat mission and the instruments NIRST, CEFI (3x), MAESTRO, OSIRIS and MOPITT. Also included are the eight instruments of ePOP, and ten instrument networks of the geospatial observatory (GO Canada).

The number of partners participating in the CSA's Sun-Earth System science missions comes from an annual survey which enumerated 143 Canadian and international institutions associated with Sun-Earth system science. As in previous years, participation in the survey, while considered representative, is not exhaustive.

Sub-Program 1.1.2: Ground Infrastructure

Description

This SP includes the development, installation and use of an integrated and coordinated national system of ground infrastructure to receive data from domestic or foreign satellites. In addition, the ground infrastructure houses and uses the equipment required for satellite operations. This SP is necessary to operate satellites as well as to process and make available space-based data received by the Canadian Space Agency to assist GoC organizations in delivering their mandate. Finally, this SP capitalizes on Canada's geographical advantage by capturing space data from the increasing number of satellites flying over the Arctic and by installing ground stations in this strategic location. This SP is delivered with the participation of industry, GoC organizations and foreign space agencies. This collaborative effort is formalized under contracts, grants, contributions and partnership agreements with national, public/private and international organizations.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
14,977,174	12,760,497	(2,216,677)

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
21.3	28.4	7.1

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. Expressed Canadian and foreign data needs are fulfilled by ground infrastructure.	1. Percentage of acquisitions request fulfilled.	80%	RADARSAT-1, N/A RADARSAT-2, 82% SCISAT-1, 96% NEOSSat, N/A
	2. Ratio of acquisitions request fulfilled to missions acquisition requirements.	RSAT-1 70% RSAT-2 60% SCISAT 80%	RADARSAT-1, N/A RADARSAT-2, 75% SCISAT-1, 100%
2. National ground infrastructure is reliable.	1. Percentage of successful satellites contacts.	80 %	95 %

Performance Analysis and Lessons Learned

The RADARSAT-1 mission, initially planned for five years of operations, lasted seventeen years, until the loss of contact with the satellite in March 2013. The Near-Earth Object Surveillance Satellite (NEOSSat) is still undergoing commissioning.

75% of RADARSAT-2 acquisition requests were fulfilled, including low-priority acquisitions for the background mission. Excluding the background mission, 81.8% of acquisition requests were fulfilled. The unfilled requests are mainly due to conflicting requests. A whole-of-government approach for de-conflicting requests was adopted in 2013–14 and a new mechanism was implemented in March 2014, aiming to optimize the use of ground stations. Promising results are already emerging and the CSA expects to be able to increase the percentage of fulfilled requests in the future.

The excellent performance is dependent on two important factors:

- The availability of a skilled and highly qualified workforce. A combination of public and private sector organizations involved in satellite operations maintain high operating standards.

- The robustness of the ground infrastructure. Maintenance and modernization of the infrastructure has to be carefully planned in order to accommodate the growing requirements linked with satellite data.

SCISAT-1, planned for a two-year lifespan, is still performing nominally after 11 years. Space debris monitoring and mitigation and system anomaly management are examples of actions taken to strengthen its performance.

For additional Highlights of Expected Accomplishments for the Sub-Program –Ground Infrastructure, go to: http://www.asc-csa.gc.ca/eng/publications/rp.asp

Sub-Sub-Program 1.1.2.1: Satellite Operations

Description

This SSP encompasses the Telemetry, Tracking and Command (TT&C) of Canadian satellites or of foreign satellites when such services are required from Canadian stations. It also includes the development, installation and use of ground infrastructure that processes the data and operates satellites. This SSP is necessary to render orbiting satellites functional. The operations of CSA satellites are mostly conducted with CSA equipment located in Canada. In some instances, formal arrangements can be concluded between CSA, Canadian industry, GoC organizations or international partners to operate one party's satellites using another party's equipment. Those arrangements can also provide for the location of one party's equipment in another party's facilities.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
10,508,804	7,676,697	(2,832,107)

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
18.7	25.0	6.3

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. CSA's satellites are functioning as per operational requirements.	1. Percentage of system availability.	80 %	SCISAT-1: 96%, target exceeded RADARSAT-1: not applicable NEOSSat: not applicable
	2. Number of Canadian satellites operated by CSA.	3 RADARSAT-1, SCISAT, NEOSSat.	1 RADARSAT-1 ceased operation; SCISAT-1 operational; NEOSSat under commissioning
2. Foreign Satellite Missions are supported.	1. Number of foreign satellites supported.	2	3

Performance Analysis and Lessons Learned

The CSA continues to operate SCISAT and to support data production, validation and analysis. October 2013 marked 10 years of operation. SCISAT makes measurements of atmospheric composition that help scientists assess the atmosphere's response to natural and anthropogenic changes, and improve climate and weather models. The outstanding performance of the SCISAT-1 mission, exceeding five times the planned operating life, creates pressure on the CSA's operating budgets. An external review held in 2013 showed that the impact indicators of the mission are well above the average in the field. A strategic review of SCISAT activities was initiated with partners and stakeholders to decide whether to continue satellite operations and data analysis. A decision on continuation will be made during fiscal year 2014-15.

NEOSSat, launched in February 2013, is undergoing commissioning. All the critical functions of the spacecraft have been demonstrated except for those requiring fine pointing mode. A plan to resolve performance issues is in place and is being closely monitored. Considerable progress has been achieved and the user community is kept appraised of such progress.

The CSA continues to safeguard CSA satellites in orbit against space debris by taking operational actions as required. In addition, the CSA collaborates operationally with DND and foreign agencies to ensure the latest tools and information are available to protect satellites from the impact of debris in space. The CSA continues to participate in international fora concerned with space debris while offering its operational expertise in avoiding space debris to Canadian operators of satellites.

The CSA was also requested to support foreign satellites. It is part of the CSA's engagement strategy for an exchange of operations of services with international partners.

The CSA has supported the following international satellites: Terrasar-X, Tandem-X and TET-1 from DLR (the German Space Agency).

Sub-Sub-Program 1.1.2.2: Data Handling

Description

This SSP includes a coordinated national approach to determine optimal station locations and space data handling. This SSP is necessary for the planning and tasking of data acquisition, as well as the capture, calibration, cataloguing, archiving and availability of space data received from domestic or foreign satellites to assist GoC organizations in delivering their mandate. Data handling operations are mostly conducted with CSA equipment, located in its ground facilities. In some instances, formal arrangements can be concluded between CSA, GoC organizations or international partners to use another party's equipment located within its facilities. This SSP is delivered with the participation of Canadian industry, foreign space agencies and GoC organizations. This collaborative effort is formalized under contracts, grants, contributions and partnership agreements with national, public/private and international organizations.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
4,468,370	5,083,800	615,430

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
2.5	3.4	0.9

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. Satellite data provided to GoC organizations and academia.	1. Number of RADARSAT-1 images delivered to GoC organizations and other customers.	12,000 minutes	263 minutes delivered to GoC organization and commercial clients from archives.
	2. Number of RADARSAT-2 images delivered to GoC organizations and other customers.	25,000 images delivered	35,779 images delivered to GoC clients.
	3. Number of SCISAT observations delivered to GoC organizations and other customers.	12,000 observations	13,240 observations

Performance Analysis and Lessons Learned

Although RADARSAT-1 ceased functioning on March 29, 2013, the CSA continued to provide to user communities satellite imagery data through archives. RADARSAT-1 data continues to provide data complementarity with data from the successor RADARSAT-2 Mission. The CSA is reviewing options to enhance the use of RADARSAT-1 and possibly RADARSAT-2 archive data in line with the Government's Open Data Policy. Government organizations continue to request and receive RADARSAT-2 data. Measures have been taken to optimize the use of the RADARSAT-2 data allocation until the RADARSAT Constellation Mission is launched. A whole-of-government approach and other enhancements in data order handling were adopted in 2013–14, resulting in a significant reduction in conflicts and service charges. This resulted in a saving of about $410K in service charges in FY 2013–14 compared to FY 2012–13. Furthermore, the implementation of a new procedure optimizing the use of ground stations in March 2014, provided an additional saving of about $100K in credit utilization in just one month.

The CSA continues to actively participate in the International Charter – Space and Major Disasters by providing Earth Observation data, mostly from RADARSAT-2. Data provided in

response to activation of the Charter contributed to minimize the impact of disasters on the loss of human lives and property. In 2013–14, RADARSAT data was provided for 46 activations of the Charter around the world.

The CSA continues to support the implementation of key international initiatives under the leadership of the intergovernmental Group on Earth Observations (GEO), such as JECAM (Joint Experiment for Crop Assessment and Monitoring) to monitor crops from space; SDCG (Space Data Coordination Group) to monitor forest carbon; and GFOI (Global Forest Observation Initiative). The CSA also provides RADARSAT data for the third phase of the CSDP (Caribbean Flood Pilot Project) project whose aim is to demonstrate the effectiveness of satellite imagery for mitigation, management and coordinated response to natural disasters.

The delivery of SCISAT observations has been constant in the last years, showing an extremely sound and reliable system.

Sub-Program 1.1.3: Space Data, Imagery and Services Utilization Development

Description

This SP develops utilization of space–based data, imagery and information, and of communications services available on space assets for the benefit of the user community, primarily GoC organizations and academia. This SP is necessary to foster the development of a Canadian value–added industry that turns space data and information into readily useable products, as well as to increase the ability of GoC organizations to use space–based solutions (data, information and services) for the delivery of their mandate and to increase the ability of academia to perform their research. This SP engages the participation of the Canadian space industry and academia and is formalized under contracts, grants, contributions and partnership agreements with national, public/private and international organizations.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
12,025,976	9,604,277	(2,421,699)

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
16.7	7.7	(9.0)

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. GoC organizations are using space-based solutions to deliver their mandate.	1. Number of GoC's programs using developed applications.	Benchmark to be established.	Benchmark not yet established*
	2. Average number of programs using each developed applications.	Benchmark to be established.	Benchmark not yet established*
2. The Canadian scientific community use space-based data to conduct their research.	1. Number of peer-reviewed papers related to data utilization produced in academia and R&D community in Canada.	SOAR: 5 SESS: 200	SOAR: 37 SESS: 258

Performance Analysis and Lessons Learned

To support government departments and agencies in improving efficiency by using space solutions, the CSA invests in external resources, such as contractors and university students, to support the development of applications that bridge the gap between space data and government services.

*Inventorying Government of Canada programs benefiting from Earth Observation applications and satellite services continues to be a target for measuring the success of CSA programs. Currently however, this data is incomplete, largely limited to the operational applications of the main user departments (e.g. EC, DND). A performance measurement strategy is being developed in 2014–15 to determine the best approach for the assessment and measurement of these indicators.

Fourteen departments are taking advantage of RADARSAT's many capabilities and making long-term investments to develop new capabilities to better fulfill their mandates. Many of these also benefit from the CSA's co-investment in application development. The Department of National Defence's Polar Epsilon Project has become one of the largest users of SAR data in Canada along with Environment Canada's Ice Service. Other examples include Environment

Canada's Integrated Satellite Tracking of Pollution (ISTOP) program which uses satellite imagery to monitor the pollution in coastal waters; the SARWind project, a joint project with industry that allows Environment Canada's Meteorological Service to improve the analysis of winds and short-term forecasts in large marine areas, especially in coastal areas; the ecological monitoring of national parks by Parks Canada; the mapping of northern regions by Natural Resources Canada; and flood mapping by Public Safety Canada.

The SOAR program is aimed at increasing the use of space data in scientific research. Under the SOAR program, 37 R&D proposals from Canadian organizations were evaluated in 2013–14 including 25 proposals from academia, six from industry and six from federal departments.

The Sun-Earth System Science program demonstrated, once again this year, solid scientific productivity with 128 publications in solar-terrestrial sciences, 102 in atmospheric sciences and 28 in Earth system science. In total, with support from the CSA, 258 peer-reviewed publications were produced in this area.

For additional Highlights of Expected Accomplishments for the Sub-Program –Space Data, Imagery and Services Utilization Development, go to: http://www.asc-csa.gc.ca/eng/publications/rp.asp

Sub-Sub-Program 1.1.3.1: Earth Observation Data and Imagery Utilization

Description

This SSP develops the utilization of Earth Observation imagery and atmospheric data acquired from Canadian and foreign space assets, ranging from its sub-surface to its upper atmospheric layers. This also applies to weather and climate imagery. This SSP is necessary to broaden the applicability of currently available Earth Observation space products and services (optimization) or to create new ones (innovation) for the user community (GoC organizations and academia). This SSP engages the participation of the Canadian space industry and academia and is formalized under contracts, grants, contributions and partnership agreements with national, public/private and international organizations.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
9,518,192	7,801,577	(1,716,615)

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
7.9	6.7	(1.2)

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. Enhanced GoC organizations ability to turn space data into products and services.	1. Number of EO data utilization activities supported.	GRIP: 15 GRIP: Government Related Initiatives Program	22 projects
2. Canadian industry ability to turn space data into products and services.	1. Number of EO data utilization activities supported.	EOADP: 25 EOADP: Earth Observation Application Development Program	28 projects
3. The scientific community produces new ideas to turn space data into products and services.	1. Number of EO data utilization activities supported.	SOAR: 100 SOAR: Science and Operational Applications Research for RADARSAT-2	211 projects

Performance Analysis and Lessons Learned

In its mandate to support the development of EO applications, the CSA acts on three levels. It supports application development by GoC departments, innovation in the private sector, and research within the academic community.

The CSA continues its collaboration with and support to other GoC departments by developing new applications using Earth Observation data that meet both their mandates and the priorities of the Government of Canada with respect to ecosystems, water management and the North. A total of 22 GRIP projects were initiated in partnership with GoC departments.

Of the 28 EOADP projects in support of industry, 10 are new applications. They were initiated to further optimize the utilization of RADARSAT data with the development of new technological advancements in support of the GoC priorities in its various roles nationally and in the international community.

The Science and Operational Applications Research (SOAR) activity has 136 active projects and 75 inactive projects for a total of 211 projects distributed over several areas of investigation, including supporting education. International initiatives include collaboration with the Italian

Space Agency (ASI) in the exchange of Cosmo-SkyMed data for RADARSAT-2 data, collaboration with the German Space Agency (DLR) and collaboration with Joint Experiment for Crop Assessment and Monitoring (JECAM), an initiative of the Group on Earth Observations (GEO). In total, more than 3,000 SAR data scenes have been provided to the scientific community to support the development of applications.

Sub-Sub-Program 1.1.3.2: Communications Services Utilization

Description

This SSP develops the utilization of space communications, including Navigation, Positioning and Timing (NPT) services available through Canadian and foreign satellites. This SSP fosters the applicability of currently available communications services (optimization) to broaden or to create new ones (innovation) for GoC organizations. This SSP engages the participation of the Canadian space industry and is formalized under contracts, grants, contributions and partnership agreements with national, public/private and international organizations.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
2,334,304	1,686,876	(647,428)

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
8.7	0.9	(7.8)

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. Enhanced GoC organizations ability to use communications space assets.	1. Number of communications application development activities supported.	4	5 activities/projects were completed and one activity in progress.

Performance Analysis and Lessons Learned

The telecommunications data use by GoC departments, particularly Automatic Identification System (AIS) space data, has significantly increased over the past three years. In addition, the number of departments using AIS-S data has increased from two departments to more than ten. This has created a need for the development of applications to maximize the utility of AIS-S data. There are currently two AIS-S applications development activities to meet the needs specified by data user departments.

Regarding the use of the demonstration payload on Anik-F2 satellite capacity, there has been a constant increase in the installation of terminals and capacity utilization in the last two years by northern communities. There are 11 projects to develop new applications ranging from tele-medicine, tele-education, and response to remote emergency situations.

Sub-Sub-Program 1.1.3.3: Scientific Data Utilization

Description

This SSP develops the utilization and validates the quality of Canadian and foreign space-based scientific data and derived information that address science questions, such as those related to our understanding of the Earth's climate system and magnetic field (magnetosphere). This SSP involves the collaboration of Canadian scientists from GoC organizations and academia. This SSP is necessary to broaden the applicability of currently available space scientific data (optimization) or to create new ones (innovation) for GoC organizations and academia, especially in weather forecasts, climate change and space weather. This SSP engages the participation of the Canadian space industry, academia and GoC organizations scientists, and is formalized under contracts, grants, contributions and partnership agreements with national, public/private and international organizations.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
173,480	115,825	(57,655)

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
0.2	0.2	0.0

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. Enhanced scientific community ability to use scientific data.	1. Number of Solar and Earth System scientific operations and research activities supported.	35	41
	2. Number of Solar and Earth System scientific instruments that are validated and used.	27	27

Performance Analysis and Lessons Learned

A total of 41 projects supported scientific activities in the field of Sun-Earth system science. They can be grouped into three main scientific fields:

- 15 activities supported atmospheric sciences: three for greenhouse gases (APOCC-GHG); two for OSIRIS; three for SCISAT; and one for each of the following: MOPITT, C-IAM, WINDII, CASS, SHOW, SPARC and ALISS;
- 19 activities supported the geospatial environment: 14 for the geospatial observatory (GO Canada); two for THEMIS; two for SWARM; and one for ePOP;
- 7 activities supported surface sciences: six for the Canadian SMAP Mission and one for the NIRST payload aboard the SAC-D/Aquarius Mission.

There are a total of 27 Solar and Earth System Scientific instruments that are validated and used:

- In atmospheric science: SCISAT-FTS, MAESTRO, OSIRIS, MOPITT, CloudSat;
- In the geospatial environment: SWARM (3), ePOP (8), GO Canada (10);
- In surface sciences: NIRST.

Planning and Reporting Continuity

RPP 2013–14 and DPR 2012–13:
http://www.asc-csa.gc.ca/eng/publications/rp.asp

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

Program 1.2: Space Exploration

Description

This Program provides valuable Canadian science, signature technologies and qualified astronauts for international space exploration endeavours. This Program 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 appeals to the science and technology communities. It is targeted mostly towards Canadian academia and international space exploration partnerships. Canadian industry also benefits from the work generated within this Program. This Program 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.

Budgetary Financial Resources (dollars)

2013–14 Main Estimates	2013–14 Planned Spending	2013–14 Total Authorities Available for Use	2013–14 Actual Spending (authorities used)	2013–14 Difference (actual minus planned)
95,406,830	95,406,830	101,619,388	96,501,810	1,094,980

Any significant variance reported in relation to Planned Spending in the 2013–14 RPP is explained in Section III: Spending by Program – Additional Information.

Human Resources (Full-Time Equivalents [FTEs])

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
186.0	171.9	(14.0)

Due to rounding, decimal points may not add up to difference shown.

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. Expansion of scientific knowledge acquired through space exploration endeavors.	1. Number of peer-reviewed scientific publications, reports and conference proceedings based on space exploration data produced by researchers (sciences and	75	242

	technologies) in Canada.		
2. Multiple use and applications of knowledge and know-how acquired through space exploration endeavors	1. Number of terrestrial applications of knowledge and know-how acquired through space exploration endeavors.	3	3
	2. Number of space re-utilization of knowledge and know-how acquired through space exploration endeavours.	1	6

Performance Analysis and Lessons Learned

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 expertise. In order for Canada's space program to generate knowledge and economic returns and to be sustainable, a variety of elements are required: a competitive industry producing advanced technologies; highly qualified scientists contributing to leading-edge research; terrestrial applications and spinoffs 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. Per example, Canada's APXS instrument on board the Curiosity Rover has been providing scientific data from the surface of Mars since 2012.

The Canadian Space Program has achieved notable international successes through Canadian scientists' contributions to space life sciences, space astronomy and planetary sciences. A total of 242 peer-reviewed scientific publications were produced using information made available by the CSA's funded space exploration instruments. This is comparable to the 246 publications produced last year. While the CSA is pleased to report such success, one has to compare the results with the target of 75. This target was set in 2011, after the CSA implemented its new Program Activity Architecture. Since then, a tool has been developed internally to measure some indicators (CSA annual Performance Result – Integrated Survey). The number of peer-reviewed publications has been measured with that tool for the last 2 years. The target will be adjusted in light of those results.

In 2013–14, space exploration missions and programs generated three terrestrial applications for use in commercial markets: J5 Mobility Platform, derived from the CSA's planetary rover prototypes; Astroskin, a biometric shirt whose terrestrial counterpart can monitor sleep, physical training and basic health parameters and the Canadian Microflow Cytometer that has been spun off into a portable, robust bio-analytical tool for use on Earth. In addition, space exploration missions and programs generated six space re-utilization-of-knowledge applications for use in

space exploration endeavours. They range from optics, robotics to the creation of new companies. More details may be found in the following public links: Opal-360, LiDAR, Nuvu Cameras, Sitelle, Xiphos Technologies, NORCAT, Key Mars Rover Elements.

Sub-Program 1.2.1: International Space Station (ISS)

Description

This SP uses the International Space Station (ISS)—a unique Earth-orbiting laboratory—to learn to live and work in space while conducting scientific, medical and engineering studies. It includes the assembly and maintenance of the ISS through the use of the Canadian Mobile Servicing System (MSS) and the design, development and operations of payloads and technological demonstrations aboard the ISS. This SP is necessary to generate specific understanding and technological advances to prepare for the challenges of space exploration and for terrestrial benefits. This SP provides Canadian industry and academia privileged access to the ISS. This SP is performed in collaboration with GoC organizations and foreign space agencies. This collaborative effort is captured under contracts, contributions, grants and/or international partnership agreements.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
54,537,830	52,430,958	(2,106,872)

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
106.4	94.4	(11.9)

Due to rounding, decimal points may not add up to difference shown.

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. Development of operational and technological know-how related to long-duration	1. Number of Canadian missions/solutions/instruments flown on ISS.	10	10 ISS operations 6 ISS utilization Total = 16

space missions (with potential Earth application) acquired through participation in the ISS operations and laboratory missions.	2. Percentage of Canadian missions/solutions/instruments flown on ISS that met their mission requirements.	100 %	100 %
2. Canada, a well-positioned partner, influences the ISS program direction.	1. Number of CSA's participation in ISS program boards and panels.	67	126

Performance Analysis and Lessons Learned

The CSA activities on the ISS in 2013–14 included both operations and utilization missions. The operation missions included, amongst other things, the capture and release of space vehicles delivering cargo to the ISS (the Japanese HTV and US SpaceX Dragon, both vehicles capable of delivering external cargo to the ISS, and the US Cygnus Orbital, an unmanned resupply spacecraft). The CSA also supported advanced robotic refuelling mission operations, and Extravehicular Activities (EVA). Regarding ISS utilization, a number of life sciences missions were conducted. For more details, refer to SP 1.2.3.

100% (16 of 16) of all mission activities satisfied their planned requirements and met their success criteria.

Through the International Space Life Sciences Working Group (ISLSWG), which is one of the ISS boards and panels, the CSA continued to work with the European Space Agency (ESA), the Japan Aerospace and Exploration Agency, NASA, the German Space Agency (DLR), the French Space Agency (CNES) and the Italian Space Agency (ASI) to coordinate space life sciences and multinational world-class scientific research on the ISS. Participation in this international working group generates efficiencies through collective peer review, and space hardware and data sharing. A new international Announcement of Opportunity (the International Life Sciences Research Announcement 2014) was launched in February 2014 for selection of new ISS experiments.

Participation in ISS boards and panels create synergies by sharing data, processes, or other information to streamline operations, utilization or decision making. The CSA supported the ISS multilateral program boards and panels throughout the year, mostly through videoconference participation. A more robust methodology was developed during the past two years. Results show that this specific indicator is not the most appropriate one to measure the performance of this sub-program, and it will be changed when the window for the indicator changes is available. Through the development of its new performance measurement strategy, the Space Exploration Program and its sub-programs are reviewing indicators and targets.

For additional Highlights of Expected Accomplishments for the Sub-Program - International Space Station (ISS), go to: http://www.asc-csa.gc.ca/eng/publications/rp.asp

Sub-Sub-Program 1.2.1.1: International Space Station Assembly and Maintenance Operations

Description

This SSP includes the provision and operation of the Canadian Mobile Servicing System (MSS), composed of three Canadian robots – Canadarm2, Dextre and the Mobile Base System. MSS operations and maintenance services are conducted by Canadian or foreign astronauts on board the International Space Station (ISS) and by ground controllers and engineers located in established facilities at the CSA and the National Aeronautics and Space Administration (NASA) – Johnson Space Center. This SSP also includes the provision of specialized MSS training, systems engineering and software services, flight procedures development as well as the facility infrastructure necessary to operate the MSS through its life cycle. This SSP is necessary to fulfill Canada's ongoing commitment to the international partnership to assemble and maintain the ISS, a legally binding obligation under the Canadian *Civil International Space Station Agreement Implementation Act.*

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
49,799,568	47,161,635	(2,637,933)

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
91.4	80.3	(11.1)

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. The Canadian contribution (Mobile Services System) meets the planned operational requirements identified in the ISS Increment Definition Requirements Document (IDRD) in accordance with the Intergovernmental Agreement (IGA) and the NASA/CSA MOU.	1. Percentage of operational requirements fulfilled.	100 %	100% The MSS supported all planned operations.

Performance Analysis and Lessons Learned

The CSA continued to fulfill 100% of its International Space Station obligations by operating the Mobile Servicing System (MSS) throughout the year. This involved maintaining and providing technical support for the MSS hardware and software, continuing the repair and overhaul of failed hardware, providing MSS related training and qualification for astronauts and ground support personnel, planning and supporting MSS operations, and conducting operations in conjunction with the NASA Houston flight control room from the Remote Multi-Purpose Support Room in St-Hubert, Québec. The CSA continued the development of a plan for the procurement of new MSS cameras to replace existing equipment.

The CSA proceeded into maintaining MSS operational preparedness to carry out ISS maintenance and operations. This entailed the development and certification of new flight products and procedures to support planned MSS operations. The CSA also expanded the use of ground control operations to free up on-orbit crew time.

The CSA completed its assessment of extending the operating life of the Mobile Servicing System to 2020. As a result, the CSA informed the National Aeronautics and Space Administration (NASA) and the ISS Program that the MSS is now certified to operate until 2020.

The CSA began a process to negotiate an agreement with NASA to provide technologies and services that will offset Canada’s share of the ISS Common System Operation Costs to 2020 with the aim of leveraging this obligation to prepare Canada for future space exploration cooperation.

The CSA continued to update MSS software, which will provide further capabilities to reduce the amount of analysis required during mission preparation while providing more autonomy to the operators of the MSS.

The CSA also supported the unplanned removal and replacement of a failed critical pump module used to cool the ISS.

Sub-Sub-Program 1.2.1.2: International Space Station Utilization

Description

This SSP encompasses the implementation of scientific, operational, medical and technological studies in specific areas, such as life sciences, radiation, material or fluid sciences, to be conducted aboard the ISS by GoC organizations, academia or the private sector. The ISS offers them the advantages of an orbiting platform with human presence and prolonged microgravity exposure. This SSP is necessary for testing novel technologies and conducting scientific studies in the unique environment of the ISS, leading to a better understanding of long-duration space missions and to potential terrestrial benefits. This SSP is performed in collaboration with GoC organizations and foreign space agencies. This collaborative effort is captured under contracts, contributions, grants and/or international partnership agreements.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
4,738,262	5,269,322	531,060

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
15.0	14.1	(0.8)

Due to rounding, decimal points may not add up to difference shown.

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. Optimal utilization of the ISS.	1. Percentage of programmatic objectives achieved through ISS utilization.	100%	100%

	2. Number of Canadian stakeholders involved in activities on the ISS.	4	7
	3. Proportion of ISS resources used.	50%	136%

Performance Analysis and Lessons Learned

In 2013–14, 100% of the programmatic objectives as listed below were achieved: Scientific objective (BCAT-C1 and BP-Reg.Vascular); Outreach objective (C2); Education objective (Tomatosphere IV); Technical objective (Microflow); and Medical objective (Radi-N2).

The following seven Canadian stakeholders were involved in activities on the ISS: University of Waterloo, Simon Fraser University, University of Guelph, and University of Ontario Institute of Technology, *Institut National d'Optique*, Bubble Technology Industries, and Ryerson University.

From March to September 2013, CSA payloads used 136% of the crew time allocated to the CSA. The over-achievement resulted from additional crew time being made available by re-arrangement of events on-board the ISS. As crew-time is currently the most constrained ISS resource, resource use is reported against crew-time.

Sub-Program 1.2.2: Exploration Missions and Technology

Description

This SP encompasses the development and use of astronomy and planetary missions as well as the development of advanced exploration technologies. This SP is necessary as it contributes to valued Canadian signature technologies to international space exploration endeavours and generates a better understanding of the universe, the solar system and our home planet. It could also lead to technology transfers for terrestrial benefits. This SP provides Canadian industry and academia with unique opportunities through their participation in international space exploration initiatives. This SP is performed in collaboration with foreign space agencies, GoC organizations and through CSA participation in international groups, such as the International Space Exploration Coordination Group. This collaborative effort takes shape under contracts, grants, contributions and/or international partnership agreements.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
35,935,466	40,211,851	4,276,385

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
60.0	61.2	1.2

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. Technological know-how acquired through Space Exploration endeavours (Astronomy and Planetary).	1. Proportion of CSA's missions/solutions/instruments that met their mission performance requirements at acceptance review and/or at commissioning.	0	0 No mission planned in 2013–14.
2. Canada maintains a strategic positioning which supports its capacity to influence space exploration missions and decision making process in key international space exploration forums.	1. Number of CSA's sponsored Highly Qualified Personnel (HQP) nominated on International Space Exploration decision bodies.	8	18
3. CSA's participation in space exploration missions provides access to scientific data about the Solar system and the Universe.	1. Number of CSA's sponsored astronomy and planetary missions' providing data to Canadian scientific community	3	5

Performance Analysis and Lessons Learned

All five missions identified below provide astronomy and planetary data to the Canadian and international scientific community. Through the CSA's Space Exploration endeavours Canada developed the technological know-how to:

- Analyze Plank Space Telescope data;
- Understand the behaviour of stars through their micro variability and oscillation (MOST). This mission has been running successfully for 10 years;
- Determine the chemical composition of various soil, dust and rock samples on Mars by developing and using the Alpha Particle X-ray Spectrometer (APXS, a Canadian instrument on board the Curiosity Rover that is part of the Mars Science Laboratory);
- Analyze data from the space telescope Hershel, containing Canada's Heterodyne Instrument for the Far Infrared (HIFI) and Spectral and Photometric Imaging Receiver (SPIRE) instruments.

In addition to the above, NEOSSat was launched in 2013 but is still in commissioning. It will observe and track the position and timing of near-Earth orbiting asteroids and man-made objects.

More so, a total of 18 Highly Qualified Personnel (HQP), sponsored by the CSA, took part of strategic international space exploration bodies.

For additional Highlights of Expected Accomplishments for the Sub-Program –Exploration Missions and Technology, go to: http://www.asc-csa.gc.ca/eng/publications/rp.asp

Sub-Sub-Program 1.2.2.1: Space Astronomy Missions

Description

This SSP encompasses the definition, design, technology development, implementation and use of Canadian scientific instruments and signature technologies made available to Canadian and international space astronomy missions. This SSP is necessary to perform space astronomy investigations and generate data and new knowledge about the universe. This SSP is performed in collaboration with foreign space agencies, GoC organizations and through consultation with the Canadian Astronomical Society. This collaborative effort takes shape under contracts, grants, contributions and/or international partnership agreements.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
9,625,406	11,989,225	2,363,819

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
12.1	12.0	(0.1)

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. Canadian know-how and expertise allow Canada to lead or participate in international space astronomy missions.	1. Number of technological and scientific solutions being developed by the CSA in the context of astronomy missions.	2	3 JWST, CAMS, NEOSSat

Performance Analysis and Lessons Learned

The CSA is developing three astronomy missions:

- Participation in the James Webb Space Telescope (JWST), a major facility-class space observatory that will be launched in 2018. The JWST is a successor to the highly successful Hubble Space Telescope. Canada is responsible for the Fine Guidance Sensor (FGS), a critical element of the mission, which ensures the very precise pointing of the telescope, and a science instrument named NIRISS (Near Infrared Imager and Slitless Spectrograph). Both instruments were delivered in July 2012. The CSA continued to support the integration of the flight instruments on board JWST. Through the CSA's contribution, Canadian astronomers will have guaranteed access to 5% of the observing time of the James Webb Space Telescope.
- Design of a metrology system (Canadian ASTRO-H Metrology System (CAMS)) for participation in JAXA's lead ASTRO-H mission, an X-ray space astronomy telescope, scheduled for launch in 2015. This mission also includes participation from Europe and NASA. The CSA's participation will enable Canadian scientists to apply for observation time on the telescope.
- NEOSSat is a microsatellite jointly sponsored by the CSA and Defence Research and Development Canada (DRDC). Through NEOSSat, Canada is contributing to the international effort to both acquire useful metric (position/time) data on the near-Earth orbiting objects (asteroids) and man-made objects (spacecraft and space debris), and catalogue them to maintain the safety of Canadian and international assets, both civilian and military. NEOSSat, launched on February 25, 2013, on an Indian PSLV launch vehicle was

not commissioned during the fiscal year 2013–14 hence creating delays in meeting mission objectives as planned and was eventually resolved. Efforts towards achieving operational status as soon as possible continued.

Lessons Learned

An action plan was implemented in response to the recommendations of an evaluation of the NEOSSat Project released in February 2014. The evaluation concluded that efforts should be made to establish a process to address risk factors in cases where deficiencies are observed regarding the financial, technical and/or project management of contractor performance during contract execution. The new Investment Governance and Monitoring Framework includes processes to strengthen the Agency's project performance, including the continuous monitoring of contractors' performance. Other conclusions pertained to ensuring industrial capacity in "niche" areas, in line with the *Space Policy Framework* and the Aerospace Review Report.

Sub-Sub-Program 1.2.2.2: Planetary Missions

Description

This SSP encompasses the definition, design, technology development, implementation and use of Canadian scientific instruments and signature technologies made available to international exploration missions. The SSP is necessary to reach exploration destinations such as planets and asteroids or new exploration platforms to conduct planetary science investigations, to generate data and new knowledge and to conduct engineering and/or planetary resource management activities. This SSP is performed in collaboration with the international space exploration community, GoC organizations and foreign space agencies. This collaborative effort takes shape under contracts, grants, contributions and/or international partnership agreements.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
17,184,330	19,004,364	1,820,034

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
11.5	10.6	(0.8)

Due to rounding, decimal points may not add up to difference shown.

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. Canadian know-how and expertise allow Canada to participate in planetary exploration missions.	1. Number of technological and scientific solutions being developed by the CSA in the context of planetary missions.	1	1 OSIRIS-REX (OLA)

Performance Analysis and Lessons Learned

NASA's OSIRIS-REx spacecraft will be launched to an asteroid named Bennu (1999 RQ36) in 2016. OSIRIS-REx will execute precise spacecraft navigation to the surface of this carbonaceous primitive asteroid, thoroughly characterize the asteroid, retrieve sample of pristine regolith and return these samples to Earth for detailed study and analyses that will contribute to a better understanding of the solar system's formation and the origins of life. The Canadian contribution to the OSIRIS-REx mission is the OLA instrument, an advanced scanning Light Detection and Ranging (LIDAR) system that will be an important navigation aid providing high resolution topographic mapping of the asteroid surface. OLA's will map the dimensions of the asteroid from a distance of between 7 km and 225 m, resulting in a highly accurate 3-dimensional model of the targeted asteroid.

On February 14, 2013, Treasury Board provided the Expenditure Authority (EA) for the second definition phase of the OLA project. This phase focused on completing the preliminary design of the instrument. The detailed design started shortly after a successful Preliminary Design Review conducted in April 2013. The detailed design will be considered completed with a successful OLA Critical Design Review and the completion of the Engineering Model testing.

Lessons Learned

The CSA has assessed the overall risk level for the OLA implementation phase as being high due to the stringent schedule. The launch window is inflexible and is constrained by the Bennu-Earth close approaches. Bennu has an orbital period that results in a close pass with the Earth every six years and the next launch window opportunity is September 2016. The OLA definition phase began later than all other instruments on the mission. Although some of the schedule deficit has

been recuperated, the OLA instrument will still be the last one to complete its Critical Design Review. To mitigate this risk, reviews of the instrument-spacecraft interface have been successfully conducted and long lead items have already been procured. However, any delay in the implementation contract award could have resulted in a shortening of the OLA implementation phase. Treasury Board consideration for the implementation phase was sought as early as possible.

Sub-Sub-Program 1.2.2.3: Advanced Exploration Technology Development

Description

This SSP includes the development of advanced Canadian signature technologies to be used in potential astronomy and planetary missions that could be destined for the Moon, Mars, asteroids or other celestial bodies. This SSP is necessary to shape or determine the nature of Canada's contribution to potential international exploration and astronomy missions and could lead to spinoffs. In addition, the SSP includes terrestrial deployments in analogue sites that offer geological similarities with Martian or Lunar surfaces, where this technology and its operational aspects are being tested and where exploration-related science is conducted for proof of concepts. This SSP is performed in collaboration with foreign space agencies and GoC organizations and through the Canadian Space Agency participation in international groups, such as the International Space Exploration Coordination Group. This collaborative effort takes shape under contracts and/or international partnership agreements.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
9,125,730	9,218,262	92,532

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
36.5	38.6	2.1

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. Maturing science, technology and operational solutions for planning and strategic positioning purposes.	1. 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.	12	27

Performance Analysis and Lessons Learned

Consistent with the Canadian Space Exploration Plan the Exploration Core Program prepares Canadian industry and research organizations for future exploration missions. The CSA continued the development of concepts for planetary, astronomy and space robotic servicing missions. The CSA deployed terrestrial rover prototypes in its planetary analogue terrain and to external locations. Through the Advanced Astronaut Medical Support activities, the CSA continued the development of medical Concepts of Operations as well as medical technologies and procedures for human space flight. The CSA also initiated prototyping activities and supported multiple analogue mission deployments, working in collaboration with industrial and academic partners.

Sciences, technology and operational solutions under development include ten concept studies, nine prototype developments, six analogue missions and two initial (Phase 0) studies, for a total of 27. This sub-sub-program continued to see a higher than expected actual result mostly because many concept studies were started in 2012–13 and were reported in 2013–14.

Lessons Learned

An action plan was implemented in response to the recommendations of an evaluation of the Advanced Exploration Technology Development (AETD) Program released in February 2014. Several of the recommendations related to the need for better communication of objectives and overall intent to stakeholders.

Sub-Program 1.2.3: Human Space Missions and Support

Description

This SP encompasses all activities required to recruit, develop, train and maintain a healthy and highly qualified Canadian astronaut corps capable of participating in space exploration missions.

It also includes all activities directed at mitigating health risks associated with those missions, such as the development of advanced technologies to be used in support of human space missions. This SP is necessary to generate specialized knowledge in fields that sustain human space flights, such as life sciences and space medicine. Furthermore, by exploring technological solutions to the various challenges of human space flight, this SP could contribute to alternate healthcare delivery mechanisms for terrestrial applications. This SP is performed with GoC organizations and foreign space agencies. This collaborative effort is formalized under contracts, grants, contributions or international partnership agreements.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
4,933,534	3,859,002	(1,074,532)*

*Refer to sub-sub-programs for significant difference details.

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
19.6	16.3	(3.3)

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. Human space flight generates “unique” health and life sciences knowledge, and technological know-how to sustain life and mitigate health risk during long-duration space flight.	1. Number of activities that lead to health risk mitigation strategies, technologies and/or countermeasures.	6	7

Performance Analysis and Lessons Learned

The CSA undertook and/or participated in more than seven activities related to mitigating health risks in human space flight, including those briefly summarized below:

1. BP Reg: to assess the reliability of a simple test for cardiovascular deconditioning;

2. VASCULAR: ongoing experiment, led by scientists at the University of Waterloo, to examine the impact of long-duration space flight on inflammation of the blood vessels of astronauts (ISS science – 2 studies on cardio vascular risk);
3. Radi-N2: with international partners on the ISS, using the Canadian-made radiation dosimeter (Bubble Detector) to enable the collection of neutron radiation exposure data;
4. Microflow-1: to enable scientists and physicians to quantify molecules and cells in blood or other body fluids as a first step in providing future capacity to provide real-time medical care for crewmembers;
5. SHARE: the CSA co-hosted a national Space Health and Ageing Research workshop looking at parallels between changes impacting astronauts in space and those associated with ageing. Based on the results of the workshop, 4 reviews summarizing the research in ageing and space parallels in the areas of psychosocial issues, neuroscience, cardiovascular system, and musculo-skeletal system were produced;
6. Bed-rest study: analog science aimed at gene expression during bed-rest-linked muscle atrophy; and
7. Hypersole: activity that explored sudden changes in skin sensitivity experienced by some astronauts in space. Post-flight data were analyzed for development of countermeasures.

For additional Highlights of Expected Accomplishments for the Sub-Program –Human Space Missions and Support, go to: http://www.asc-csa.gc.ca/eng/publications/rp.asp

Sub-Sub-Program 1.2.3.1: Astronaut Training and Missions

Description

This SSP encompasses activities associated with all phases of an astronaut career from recruitment to retirement, including space missions. This SSP includes the management of National Astronaut Recruitment Campaigns; the implementation of individualized astronaut career management plan; the implementation of basic, advanced and mission-specific training; collateral duties assignment; space mission negotiations and assignment; as well as all the logistical, administrative and operational support activities in the pre-flight, in-flight and post-flight periods. This SSP is necessary to live and work in a space environment and in order to further our understanding of human behaviour and health in space, and to conduct experiments and collect space-based scientific data useful to the science community. This SSP is performed with GoC organizations and foreign space agencies. This collaborative effort is formalized under contracts or international partnership agreements.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
2,855,194	2,613,536	(241,658)*

*The difference between planned and actual spending for sub-sub-program 1.2.3.1 is due to the reduction of activities related to C2 Mission post-flight activities and changing spending priorities within the Astronaut, Life Sciences and Space Medicine directorate.

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
10.3	11.4	1.1

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. Canadian astronauts Corps is ready to assume any responsibilities on an expedition to the International Space Station (ISS).	1. Number of astronaut activities undertaken in preparation for eventual ISS missions' assignments.	4	6

Performance Analysis and Lessons Learned

Six major activities were undertaken by Canadian Astronauts to prepare them for Mission assignment including: Robotics Training; Field Geology Training; ISS Systems Training; Russian Language Training; Flight Training and Collateral Duties such as Lead Capcom as well as new training activity development for NASA's latest Astronaut Candidate (ASCAN) class.

Canadian astronaut Chris Hadfield completed a 5-month stay aboard the International Space Station (ISS) in May 2013, where he assumed commandership, a first for a Canadian astronaut. During Chris Hadfield's mission, over 100 scientific experiments were conducted, all while bringing to Earth, through social media, the wonders of living and working in space.

Through the efforts of the CSA mission team, combined with Hadfield's tireless work, this mission has inspired a future generation of Canadians interested in pursuing a career in space and its related disciplines.

Sub-Sub-Program 1.2.3.2: Operational Space Medicine

Description

This SSP delivers operational and clinical healthcare activities during all phases of basic, advanced and mission-specific training as well as during the pre-flight, in-flight and post-flight periods. It also promotes and ensures the physical, mental, social well–being and safety of Canadian astronauts. This SSP is necessary to ascertain the overall health of Canadian astronauts to ascertain and to monitor long-term health status.

This SSP is performed with GoC organizations and foreign space agencies. This collaborative effort is formalized under contracts, grants, contributions or international partnership agreements.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
1,193,390	611,213	(582,177)*

*The significant difference between planned and actual spending for sub-sub-program 1.2.3.2 is due to the transfer of Radi-N2 project and the reallocation of its funds to SSP 1.2.1.2 (Radi-N2 measures the neutron radiation environment on ISS).

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
5.1	2.2	(2.9)

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. Astronauts' health is optimized to meet mission requirements.	1. Number of active astronauts medically certified for ISS assignment and duties.	3	3
2. Astronauts' long-term health is monitored following their active careers.	1. Percentage of eligible astronauts participating in their long-term health monitoring.	14%	57%

Performance Analysis and Lessons Learned

The two newest Canadian astronauts continue to be eligible for long-duration space flight assignments to the ISS. They trained while assuming collateral duties in support to the ISS

Program and CSA priorities. The CSA continued to provide medical support for Canada's second long-duration mission to the ISS and implemented a comprehensive rehabilitation program for Chris Hadfield upon his return to Earth. The CSA also continued the monitoring and coordination of medical support with international partners and actively supported the ISS Medical committees.

The participation of retired astronauts to health monitoring studies is voluntary. In 2013–14, 7 astronauts were eligible to participate. The target was set at one astronaut/year for participation to the study. In 2013–14, 4 of 7 astronauts chose to participate. Since it is a voluntary program it is difficult to set realistic and achievable yearly targets as there are many variables over which the CSA has little control.

Sub-Sub-Program 1.2.3.3: Health and Life Sciences

Description

This SSP encompasses space medicine and life sciences activities that explore health care delivery and life sustainability solutions on future long-duration exploration missions. These benefits are targeted at the space exploration community, mainly academia and partnering agencies. This SSP develops collaborative projects with academia and industry. It uses analog sites that offer relevant similarities with the harsh environment of space, and where exploration-related medical and life science studies are conducted. This SSP is necessary to identify, understand, mitigate or eliminate health risks associated with human space flights, and to understand and address the needs of humans during those missions. The solutions could also be offered as alternative healthcare delivery mechanisms for terrestrial benefits through the transfer of space technology. This SSP is performed with GoC organizations and foreign space agencies. This collaborative effort is formalized under contracts, grants, contributions or international partnership agreements.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
884,950	634,253	(250,697)*

*The difference between planned and actual spending for sub-sub-program 1.2.3.3 is due to to the postponement of a Life Sciences workshop and delays in staffing actions.

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
4.1	2.7	(1.4)

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. Performance of space life sciences studies with potential benefits for Canadians and to enable human exploration of space.	1. Number of studies aiming at the development of countermeasures and enhanced human performance and life support.	4	4
	2. Number of partnerships addressing potential terrestrial healthcare solutions.	1	1

Performance Analysis and Lessons Learned

The Bed-rest study aimed at gene expression during bed-rest-linked muscle atrophy was completed. VASCULAR and BP Reg, studies of the cardiovascular risks of human space flight are in progress on the ISS. Hypersole closed out successfully with completion of data analysis and submission of recommendations for countermeasure development.

The CSA continued to collaborate with ESA on planning the next program of bed-rest campaigns. An Announcement of Opportunity (AO) on Bed-rest and Isolation as part of the European Life and Physical Sciences (ELIPS) program was published on October 1, 2013. This AO is expected to clarify the mechanisms of bedrest-induced muscle atrophy, cardiovascular dysfunction and anaemia. The results of these studies will be applied to analyze of the risks of

human space flight, and are also applicable to rehabilitation therapy and other important medical fields.

A partnership with the Canadian Institute of Health Research (CIHR) is in effect through the Regenerative Medicine and Nano-medicine Initiative. A second partnership is being developed under the SHARE initiative, with the CIHR Institute of Aging. Both have specific and dramatic applications for health care on Earth and in space.

Planning and Reporting Continuity

RPP 2013–14 and DPR 2012–13:
http://www.asc-csa.gc.ca/eng/publications/rp.asp

To learn more about space science and exploration, go to:
http://www.asc-csa.gc.ca/eng/activities.asp

Program 1.3: Future Canadian Space Capacity

Description

This Program 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 secures the nation's strategic and ongoing presence in space in the future and to preserve Canada's capability to deliver internationally renowned space assets for future generations. It is targeted at Canadian academia, industry and youth, as well as users of Canadian space solutions (GoC organizations) and international partners. This Program 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.

Budgetary Financial Resources (dollars)

2013–14 Main Estimates	2013–14 Planned Spending	2013–14 Total Authorities Available for Use	2013–14 Actual Spending (authorities used)	2013–14 Difference (actual minus planned)
58,528,146	58,528,146	58,280,568	55,453,614	(3,074,532)

Any significant variance reported in relation to Planned Spending in the 2013–14 RPP is explained in Section III: Spending by Program – Additional Information.

Human Resources (Full-Time Equivalents [FTEs])

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
108.0	94.9	(13.1)

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. Canada holds a space community (academia, industry and government) able to contribute to the sustained and strategic Canadian use of space.	1. Number of FTE in the Canadian space sector.	3,500 HQP	4,434 HQP
	2. Monetary value of the Canadian space sector R&D investments.	$60 millions	$165 millions

	3. Degree of match between workforce supplied and industry workforce requirements.	Benchmark to be established.	*Benchmark not established.

Performance Analysis and Lessons Learned

The Canadian space sector recorded an increase in employment of 7% compared to the previous year, resulting in the addition of 499 positions across the country, for a total of 7,993 employees in the space sector. Most of the additional jobs were in positions of highly qualified personnel (HQP), such as scientists, engineers and technicians. Growth in HQP positions drove overall Canadian space workforce numbers, with an increase of 14.5% and 4,434 total positions.

Total spending on research and development (R&D) amounted to $ 165 million in 2012, with 51 organizations working on space research and development. This result includes all investments in R&D, whether from sources internal or external to a given organization. In previous years only investments in R&D from external sources were considered. The methodology of the survey, from which the investment in R&D is derived, was changed last year. The survey no longer distinguishes between internal and external investment sources. This explains the result for this year which is much higher than that of last year and almost three times higher than the target.

Source: These data comes from the most recent report on the *State of the Canadian space sector* (2012).

*Although a study is underway to determine the degree of match between the labor available and the needs of industry (HQP study), it is planned to withdraw this annual performance indicator since it is unlikely that it can be satisfactorily measured on an annual basis.

Sub-Program 1.3.1: Space Expertise and Proficiency

Description

This SP includes the development and enhancement of Canada's space capacity. This SP supports research in private or public organizations and sustains the development of Highly Qualified Personnel (HQP) in science and engineering. We encourage scientists and engineers to perform relevant development activities in space science and technology, and to develop their know-how by offering them financial support to sustain their research project and access to infrastructure devoted to world-class research and training, among which fast execution and small size missions offer frequent flight opportunity. This SP is necessary to create and sustain a pool of space expertise and proficiency that will form the next generation of space professionals

and workers and to provide solutions for future Canadian space endeavours. This SP is delivered with the participation of funding agencies, GoC organizations, foreign space agencies and not-for-profit organizations. This collaborative effort is formalized under grants, contributions or national and international partnership.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
14,826,572	13,998,977	(827,595)

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
47.5	46.3	(1.2)

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. A pool of space experts and professionals is sustained and enhanced.	1. Number of scientists and engineers involved through opportunities provided by the program.	Benchmark to be established.	615
2. Research is conducted in priority areas.	1. Number of research projects conducted through opportunities provided by the program.	Benchmark to be established.	32
3. Advancement of S&T solutions for future space initiative.	1. Number of peer-reviewed papers, reports and conference proceedings acknowledging CSA support.	Benchmark to be established.	310

Performance Analysis and Lessons Learned

The program was adjusted this year and allowed 615 scientists and engineers to be involved in space-related activities through 32 different projects. Projects were identified through AOs, although two resulted from unsolicited proposals. The funding mechanism used was essentially Grants, directed mainly to universities. The activities fall under four groups: Academic Development Activities (ADA), aimed at clusters of three or more Principal Investigators from

three or more organizations; Collaborative Research targeting Industrial Research Chairs, Flight for the Advancement of Science & Technology (FAST), for suborbital missions, in part under a stratospheric balloon collaboration with the French space agency CNES at the Timmins Base (see below) and; Research Infrastructure Activities (RIA) in the form of interdepartmental collaboration and providing scientists with access to specialized research facilities.

The advancement of Science & Technology (S&T) solutions for future space initiatives represent a sustained effort over the years which, in 2013, resulted in 310 peer-reviewed papers, reports and conference proceedings, all acknowledging CSA support.

The newly built stratospheric Balloon Base, located in Timmins, Ontario, was completed in the summer of 2013. This marks the beginning of affordable and frequent flight opportunities for Canadian space scientists. The first two flights were successfully launched and carried two Canadian instruments with the aim of conducting research & development in space technology priority areas. These generic technologies advance S&T solutions for future Canadian space initiatives, thereby limiting the overall risk to space missions, while maintaining a pool of space experts at the forefront of their field.

For additional Highlights of Expected Accomplishments for the Sub-Program –Space Expertise and Proficiency, go to: http://www.asc-csa.gc.ca/eng/publications/rp.asp

Sub-Sub-Program 1.3.2: Space Innovation and Market Access

Description

This SP includes the development and enhancement of Canada's space capacity through innovation and market positioning. Through leading-edge technology and facilities, and international arrangements, the SP improves Canadian industrial competitiveness so that space users are continuously well served through constantly improving optimal and cost-effective space solutions. This SP is necessary to foster entrepreneurship that enhances Canadian industry's international positioning on commercial and government markets.

This SP is performed with industry and is formalized under contracts or contributions. Foreign space agencies are partners in this endeavour, so that Canadian industry can access foreign markets through innovation or international arrangements.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
37,376,826	36,088,345	(1,288,481)

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
22.3	14.0	(8.3)

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. Through innovation and international arrangements, Canadian industry is well positioned on international commercial and government markets.	1. Number of Canadian companies exporting space-related goods and services.	50	44
	2. Value of Canadian space-related goods and services exported.	$1.7 billion	$1.6 billion
2. Enhanced Canadian industry competitiveness.	1. Number of Canadian companies successfully obtaining national/international work orders.	100	83

Performance Analysis and Lessons Learned

Forty-four of the companies that responded to the survey on the *State of the Canadian Space Sector* reported combined revenues of $1.6 billion from exports of goods and services. This is down slightly from the previous year, with 51 companies reporting $1.66 billion in combined export revenues.

Eighty three of the companies reported successfully obtaining national or international work orders. Similarly, this figure demonstrates a decrease from the 90 companies who reported the previous year.

The CSA has continued to support space innovation and access to markets through its partnership with the European Space Agency (ESA) in several areas:

1. ARTES (Advanced Research in Telecommunications Systems) program, which allows Canadian industry to participate in ground-breaking studies on new telecommunications services and to develop new satellite, technologies, equipment and applications, in partnership with the European industry, focusing in the area of satellite-based Automatic Identification Systems (AIS) for improved maritime domain awareness;
2. Earth Observation programs, which enable Canadian companies to participate in the development of space-borne instruments and cutting-edge technology subsystems; and
3. The Aurora European planetary exploration program, the lunar lander mission and the European Life and Physical Science Program (ELIPS) which favorably position the Canadian industry for future space exploration missions. More specifically, several Canadian companies have been awarded contracts to deliver key components of the Exomars missions scheduled to be launched in 2016 and 2018. Also, Canada's contribution the ELIPS Program has provided opportunities to Canadians in Europe.

The CSA awarded 24 new contracts to industry and research organizations to address identified priority areas to mitigate the risks associated with future missions of interest to Canada, while contributing to strengthening Canadian capabilities.

In addition, technological intellectual property at the CSA continued to be managed very rigorously and responsibly, in order to maximize the growth and economic benefits to industry.

Source: These data comes from the most recent report on the *State of the Canadian Space Sector (2012)*.

For Additional Highlights of Expected Accomplishments for the Sub-Program –Space Innovation and Market Access, go to: http://www.asc-csa.gc.ca/eng/publications/rp.asp

Sub-Sub-Program 1.3.2.1: International Market Access

Description

This SSP consists in facilitating foreign market access by the Canadian space industry through negotiating, implementing and managing special international arrangements. For example, in return for CSA monetary contributions to the ESA under the long-lasting ESA–Canada Agreement, Canadian industry obtains some of the contracts awarded by ESA; thus penetrating a market that would otherwise be limited to Europeans. This SSP is necessary as it results in increased access to foreign government market share for Canadian industry.

This SSP is delivered through concluding international agreements, trade measures, or other mutually beneficial arrangements that create a favourable political or trade environment that facilitates access to global markets.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
25,443,762	25,136,804	(306,958)

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
2.4	3.4	1.0

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. Canadian investments through the ESA Agreement allow Canadian industry to access the institutional European market	1. Canadian industrial return coefficient (Ratio between the actual value of contracts awarded by ESA to Canadian organizations and the ideal value of contracts awarded by ESA to Canadian organizations).	96% or higher	Overall Canadian industrial return of 98%
2. The Canadian industry has access to flight opportunities for its space technologies/components.	1. Number of technologies or components developed by Canadian industry which have been space qualified and/or have acquired flight heritage through Canada's participation in ESA programs.	5 opportunities over the duration of the agreement (2012–19)	4 Canadian component/technologies flew on ESA missions in 2013–14.

Performance Analysis and Lessons Learned

The reported industrial return on CSA contributions to ESA is cumulative and covers the period from January 1, 2000, to December 31, 2013. The return coefficient is currently 98%, slightly above the target. This coefficient is the ratio of the value of Canadian industrial contracts

awarded by ESA to the CSA's contribution to ESA programs. For several years it has been above 100% which leads to an expectation by ESA of additional contributions to compensate for the over-return. Therefore 98% is a more desirable value. Nevertheless, discussions with ESA are ongoing in order to ensure that Canada's return does not go below 96%.

Canadian components or technologies flown on ESA missions in 2013–14 were:

On Alphasat, launched on July 25, 2013:
- Advanced antenna feed for L-Band supplied by MDA, Ste-Anne-de-Bellevue; and
- Advanced Pilot Tone Injection Unit (PTIU) and L-Band Test Interface Unit (LTIU) supplied by COMDEV.

On Proba 2, launched on May 7, 2013:
- Navigation, guidance and control algorithms developed by NGC Aerospace.

On SWARM, launched on November 22, 2013:
- Electric Field Instrument (EFI), based on research done at the University of Calgary, and built by COMDEV (3 units for the 3 satellites in the constellation).

Sub-Sub-Program 1.3.2.2: Enabling Technology Development

Description

This SSP consists of technology development and demonstration activities that contribute to maintaining or developing a technological edge in promising fields, such as switches, batteries, launchers, antennas, solar panels, etc. This SSP is necessary as the enabling (generic) technology developed reduces costs and technological risks on multiple mission types, enhances the efficiency or performance of already established space solutions, and facilitates the commercialization of new products through innovation.

This SSP is performed with industry and is formalized under contracts or contributions.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
11,933,064	10,951,541	(981,523)

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
19.9	10.6	(9.3)

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. Increased technological capability of Canadian industry.	1. Number of different technologies addressed.	40	43

Performance Analysis and Lessons Learned

Through this Sub-Sub-Program, the CSA continues to funnel work on identified priority technologies to industry and research organizations in order to reduce the technical uncertainties related to potential future missions of Canadian interest. This work also contributes to the enhancement of Canadian industrial capabilities through the development of new concepts, products and know-how. The aim is to strengthen industry's core capabilities with particular focus on developing its people, knowledge and competitive advantage. These activities are conducted mainly by awarding non-refundable contributions.

Following a prioritization process that took into account the CSA's long-term mission roadmaps, 12 R&D contracts for Mission Enabling Technologies were awarded as well as 12 R&D contracts for Generic Technologies. Examples of technology development activities are:

- Critical technologies to reduce risks and enable implementation of the Polar Communication and Weather (PCW) and similar HEO missions;
- New generation of imaging sensors operating in the visible and near infrared region for the purpose of improving astronomical instruments;
- "Lab-on-a-chip" technology for in-situ cellular or molecular analysis required for long-duration space missions;
- Digital beam forming antenna prototype for multi-satellite acquisition; and
- Thermo-mechanical detector for the spatial heterodyne observation of water.

The Space Technologies Development Program's first Announcement of Opportunity (AO) resulted in eight non-reimbursable contribution agreements in the area of spacecraft platforms totalling a little less than $800,000. This AO served as the pilot project for a major AO of non-reimbursable contributions (total of $10 million) for innovative and promising technologies that was issued at the beginning of June 2014.

Sub-Sub-Program 1.3.3: Qualifying and Testing Services

Description

This SP consists of specialized activities and services for the assembly, integration, and testing of space hardware and involves space qualifying technology, sub-units, units or entire spacecraft developed by Canadian academic institutions, government organizations, and industry, as well as international partners and clients. This SP is necessary to ensure that mission-assigned technology and entire systems can safely ensure and reliably meet the rigors of space and to demonstrate the suitability and effectiveness of new Canadian space technology for providing valuable contributions to space missions. This provides an effective base for increasing Canada's capability to participate in future space programs. This SP is delivered by the CSA's David Florida Laboratory on a fee-for-service basis.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
6,324,748	5,366,292	(958,456)

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
38.2	34.6	(3.6)

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. Test results of space hardware prove to be reliable in demonstrating suitability for launch and space environment.	1. Percentage of client satisfaction towards the quality of the services provided.	95 %	95 %

Performance Analysis and Lessons Learned

The David Florida Laboratory (DFL) continued to provide environmental space qualification services for the assembly, integration and testing of spacecraft systems to the CSA's programs, as well as national and international clients. Following the completion of significant infrastructure modifications and equipment updates required to support the CSA's RADARSAT

Constellation Mission (RCM) and other projects foreseen for 2014 and beyond, testing activity is set to recommence.

During 2013–14, satisfaction surveys were sent to 32 client organizations. The average satisfaction of respondents met our target of 95%. Performance issues, related to lack of available qualified resources, were identified in supporting client test programs. The Client Satisfaction survey is sent automatically with each test summary as part of our continued approach to increased and targeted client satisfaction.

For additional Highlights of Expected Accomplishments for the Sub-Program –Qualifying and Testing Services go to: http://www.asc-csa.gc.ca/eng/publications/rp.asp

Planning and Reporting Continuity

RPP 2013–14 and DPR 2012–13:
http://www.asc-csa.gc.ca/eng/publications/rp.asp

To learn more about enabling technology development, go to:
http://www.asc-csa.gc.ca/eng/programs/default.asp

To learn more about qualifying and testing services go to:
http://www.asc-csa.gc.ca/eng/dfl/default.asp

Program 1.4: Internal Services

Description

Internal Services are groups of related activities and resources that are administered to support the needs of programs and other corporate obligations of an organization. These groups are: Management and Oversight Services; Communications Services; Legal Services; Human Resources Management Services; Financial Management Services; Information Management Services; Information Technology Services; Real Property Services; Materiel Services; Acquisition Services; and Other Administrative Services. Internal Services include only those activities and resources that apply across an organization and not to those provided specifically to a program.

Budgetary Financial Resources (dollars)

2013–14 Main Estimates	2013–14 Planned Spending	2013–14 Total Authorities Available for Use	2013–14 Actual Spending (authorities used)	2013–14 Difference (actual minus planned)
45,962,036	45,962,036	46,487,895	49,215,347	3,253,311

Any significant variance reported in relation to Planned Spending in the 2013–14 RPP is explained in Section III: Spending by Program – Additional Information.

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
267.3	249.9	(17.4)

Performance Results

Expected Results	Performance Indicators	Targets	Actual Results
1. 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 2012–13 assessment.	Acceptable ratings are reached or maintained.	Acceptable ratings were reached or maintained

Performance Analysis and Lessons Learned

In 2013–14, the CSA has maintained acceptable ratings for Values and Ethics, People Management, Financial Management, Integrated Risk Management, and Evaluation Areas of Management while enhancing its rating for Internal Audit. Note that in 2013–14, because of past

satisfactory ratings the Treasury Board Secretariat (TBS) did not require the evaluation of the Area of Management (AoM) on Information Management and Information Technology (IM/IT). Acceptable Management Accountability Management (MAF) ratings were thus obtained by the CSA in 2013–14.

In order for the CSA to have its management practices meet the standards set by the Government-wide policies, and based on lessons learned from the MAF assessments, the results of the Public Service Employee Survey, and Internal Audit recommendations, the following actions were undertaken in 2013–14:

- A new project management framework was approved in February 2014 and was implemented early in the 2014–15 fiscal year. The Investment Governance and Monitoring Framework (IGMF) supports integrated project management, governance, and monitoring across the Agency, through the consistent application of gating processes appropriate for the risk and complexity of investments. The framework will strengthen informed investment decision-making and monitoring, to maximize investment outcomes stemming from projects and non-projects initiatives.

- The CSA completed the development of its first Investment Plan (IP) in 2013–14. The Plan was approved by Treasury Board in June 2014.

- The Corporate Risk Profile was also updated in March 2014 and reflects the level of risks the Agency manages in order to meet its strategic objectives and expected results. This profile is updated annually and used in support of investment decisions and monitoring.

- The CSA's Departmental Security Plan was implemented as required in the Policy on Government Security.

- The CSA's Strategic Emergency Management Plan was developed and implemented as required by the *Emergency Management Act*.

- The ongoing implementation of a five-year Evaluation Plan applicable to the CSA's 2013–14 Program Alignment Architecture (PAA) as well as the development of Performance Measurement Strategies for all programs.

- The ongoing implementation of the three-year (2013–16) Risk-Based Audit Plan.

Planning and Reporting Continuity

RPP 2013–14 and DPR 2012–13:

http://www.asc-csa.gc.ca/eng/publications/rp.asp

Section III: Supplementary Information

Financial Statements Highlights

The financial highlights presented are intended to serve as a general overview of the Agency's financial position and operations. More detailed information is provided in the Agency's financial statements available at section *Quarterly Financial Reports*, which are prepared using an accrual accounting basis. Below are explanations for the variances in each major grouping based on the most significant factors that affected each grouping during the fiscal year.

Canadian Space Agency
Condensed Statement of Operations and Departmental Net Financial Position
(unaudited)
For the Year Ended March 31, 2014
(dollars)

	2013–14 Planned Results	2013–14 Actual	2012–13 Actual	Difference (2013–14 actual minus 2013–14 planned)	Difference (2013–14 actual minus 2012–13 actual)
Total expenses	381,981,641	300,984,415	334,543,248	(80,997,226)	(33,558,833)
Total revenues	823,790	554,778	963,013	(269,012)	(408,235)
Net cost of operations before government funding and transfers	381,157,851	300,429,637	333,580,235	(80,728,214)	(33,150,598)
Departmental net financial position	1,315,254,861	1,326,776,263	1,208,944,730	11,521,402	117,831,533

Total planned expenses for 2013–14 were $382.0 million, an overstatement of $81 million compared to the actual results of $301.0 million. The variance between the planned and the actual expenses is mainly explained by the following:

- $35.9 million less Radarsat-2 data (imagery) was purchased than what was planned;
- $29.3 million less amortization expenses as assets under construction planned to be capitalized to tangible capital assets in 2013–14 were lower than projected.

Total 2013–14 expenses were $301.0 million, a decrease of $33.5 million over the previous year's total expenses of $334.5 million. The decrease is mainly explained by the following items:

- A $23.7 million decrease over the previous year in the acquisition of machinery and material expense category as less Radarsat-2 data (imagery) was purchased under the Space Data, Information and Services Program;
- A $4.5 million decrease over the previous year in loss on disposal and write downs of capital assets as no significant activities occurred in 2013–14 whereas in 2012–13, there was a $3.2 million write-down of a space related capital asset under the Space Exploration Program;
- A $3.2 million decrease in salaries stemming from the implementation of the decisions announced in Budget 2012 relating to the Deficit Reduction Action Plan (DRAP).

The most significant expenses are for the Space Station Program under the Space Exploration Program.

The Agency's total revenues were $0.6 million in 2013–14 ($1 million in 2012–13) comprised of generated revenues of $2.9 million of which $2.3 million were earned on behalf of the GoC (non-respendable revenues for the Agency). 66.6% of revenues generated are registered under the sale of goods and services and are for services provided by the David Florida Laboratory to private businesses or other government departments. There were no significant changes between the two fiscal years.

Canadian Space Agency
Condensed Statement of Financial Position (unaudited)
As at March 31, 2014
(dollars)

	2013–14	2012–13	Difference (2013–14 minus 2012–13)
Total net liabilities	102,127,337	117,139,448	(15,012,111)
Total net financial assets	78,079,190	84,444,841	(6,365,651)
Departmental net debt	24,048,147	32,694,607	(8,646,460)
Total non-financial assets	1,350,824,410	1,241,639,337	109,185,073
Departmental net financial position	1,326,776,263	1,208,944,730	117,831,533

Total liabilities were $102.1 million at the end of 2013–14, a decrease of $15 million compared to $117.1 million for 2012–13. The decrease in mainly explained by the following:

- A $5.3 million decrease in accrued liabilities for services rendered to the Agency but for which an invoice was not received at year-end;
- A $3.4 million decrease in accounts payable for invoices received at the end of 2013–14 but paid in fiscal year 2014–15;
- A $1.9 million decrease in Contractor's holdbacks.

Accounts payable and accrued liabilities representing $94 million are for goods and services that have been received at year-end but have not been paid by the CSA. Some of the most significant liabilities recorded at year-end are for the Space Station Program under the Space Exploration Program and for the RADARSAT Constellation Mission under the Space Data, Information and Services Program.

Total assets were $1,429 million at the end of 2013–14, ($78.1 million of financial assets and $1,350.8 million of non-financial assets), an increase of $103 million (7.8 %) from the previous year's total assets of $1,326 million. The increase in mainly related to the $132 million increase in tangible capital assets which is composed of the following:

- An increase of $205.6 million in space related assets under construction such as, the RADARSAT Constellation Mission;
- Amortization expenses of $73.8 million.

Tangible capital assets represent 76.9% of total CSA assets and are mainly composed of space related assets under construction ($663 million).

Financial Statements

Information on the CSA's Financial Statements is at the following address:
http://www.asc-csa.gc.ca/eng/publications/rp.asp#rr

Supplementary Information Tables

The supplementary information tables listed in the 2013–14 Departmental Performance Report can be found on the *Canadian Space Agency's* website.

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

Tax Expenditures and Evaluations

The tax system can be used to achieve public policy objectives through the application of special measures such as low tax rates, exemptions, deductions, deferrals and credits. The Department of Finance Canada publishes cost estimates and projections for these measures annually in the *Tax Expenditures and Evaluations*[iii] publication. The tax measures presented in the *Tax Expenditures and Evaluations* publication are the sole responsibility of the Minister of Finance.

Additional Information – Spending by Program (dollars)

Description	2013–14 Planned Spending	2013–14 Actual Spending	Difference (actual minus planned)
Space Data, Information and Services	288,783,916	207,544,469	(81,239,447)

Comments

The variance of $81.2 million was mainly due to the re-profiling of $83.2 million of capital funds on the RADARSAT Constellation Mission (RCM) project to meet a revised milestones payment schedule under the firm fix price contract between the crown (PWGSC-CSA) and the prime contractor. The expenditure for the year on the RCM project was much lower than originally planned at the beginning of the calendar year when the contract was signed.

Description	2013–14 Planned Spending	2013–14 Actual Spending	Difference (actual minus planned)
Space Exploration	95,406,830	96,501,810	1,094,980

Comments

No significant variance between Planned Spending and Actual for Space Exploration Program.

Description	2013–14 Planned Spending	2013–14 Actual Spending	Difference (actual minus planned)
Future Canadian Space Capacity	58,528,146	55,453,614	(3,074,532)

Comments

The variance of $3.1 million was mainly due to the following factors:

- Lower spending of $1.3 million related to the evolution in ESA's implementation of various programs in which Canada participates and to the Space technology development program (STDP).
- During 2013-14 the David Florida Laboratory was partially closed to conduct renovations. Due to this closure, tests and expenses connected therewith have been lower than expected by $0.9 million.

Description	2013–14 Planned Spending	2013–14 Actual Spending	Difference (actual minus planned)
Internal Services	45,962,036	49,215,347	3,253,311
Comments The variance is mainly due to paylist expenditures of $4.0 million eligible for reimbursement by the Treasury Board.			

Section IV: Organizational Contact Information

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Appendix: Definitions

appropriation: Any authority of Parliament to pay money out of the Consolidated Revenue Fund.

budgetary expenditures: Include operating and capital expenditures; transfer payments to other levels of government, organizations or individuals; and payments to Crown corporations.

Departmental Performance Report: Reports on an appropriated organization's actual accomplishments against the plans, priorities and expected results set out in the corresponding Reports on Plans and Priorities. These reports are tabled in Parliament in the fall.

full-time equivalent: Is a measure of the extent to which an employee represents a full person-year charge against a departmental budget. Full-time equivalents are calculated as a ratio of assigned hours of work to scheduled hours of work. Scheduled hours of work are set out in collective agreements.

Government of Canada outcomes: A set of 16 high-level objectives defined for the government as a whole, grouped in four spending areas: economic affairs, social affairs, international affairs and government affairs.

Management, Resources and Results Structure: A comprehensive framework that consists of an organization's inventory of programs, resources, results, performance indicators and governance information. Programs and results are depicted in their hierarchical relationship to each other and to the Strategic Outcome(s) to which they contribute. The Management, Resources and Results Structure is developed from the Program Alignment Architecture.

non-budgetary expenditures: Include net outlays and receipts related to loans, investments and advances, which change the composition of the financial assets of the Government of Canada.

performance: What an organization did with its resources to achieve its results, how well those results compare to what the organization intended to achieve and how well lessons learned have been identified.

performance indicator: A qualitative or quantitative means of measuring an output or outcome, with the intention of gauging the performance of an organization, program, policy or initiative respecting expected results.

performance reporting: The process of communicating evidence-based performance information. Performance reporting supports decision making, accountability and transparency.

planned spending: For Reports on Plans and Priorities (RPPs) and Departmental Performance Reports (DPRs), planned spending refers to those amounts that receive Treasury Board approval by February 1. Therefore, planned spending may include amounts incremental to planned expenditures presented in the Main Estimates.

A department is expected to be aware of the authorities that it has sought and received. The determination of planned spending is a departmental responsibility, and departments must be able to defend the expenditure and accrual numbers presented in their RPPs and DPRs.

plans: The articulation of strategic choices, which provides information on how an organization intends to achieve its priorities and associated results. Generally a plan will explain the logic behind the strategies chosen and tend to focus on actions that lead up to the expected result.

priorities: Plans or projects that an organization has chosen to focus and report on during the planning period. Priorities represent the things that are most important or what must be done first to support the achievement of the desired Strategic Outcome(s).

program: A group of related resource inputs and activities that are managed to meet specific needs and to achieve intended results and that are treated as a budgetary unit.

results: An external consequence attributed, in part, to an organization, policy, program or initiative. Results are not within the control of a single organization, policy, program or initiative; instead they are within the area of the organization's influence.

Program Alignment Architecture: A structured inventory of an organization's programs depicting the hierarchical relationship between programs and the Strategic Outcome(s) to which they contribute.

Report on Plans and Priorities: Provides information on the plans and expected performance of appropriated organizations over a three-year period. These reports are tabled in Parliament each spring.

Strategic Outcome: A long-term and enduring benefit to Canadians that is linked to the organization's mandate, vision and core functions.

sunset program: A time-limited program that does not have an ongoing funding and policy authority. When the program is set to expire, a decision must be made whether to continue the program. In the case of a renewal, the decision specifies the scope, funding level and duration.

target: A measurable performance or success level that an organization, program or initiative plans to achieve within a specified time period. Targets can be either quantitative or qualitative.

whole-of-government framework: Maps the financial contributions of federal organizations receiving appropriations by aligning their Programs to a set of 16 government-wide, high-level outcome areas, grouped under four spending areas.

Endnotes

i. Whole-of-government framework, http://www.tbs-sct.gc.ca/ppg-cpr/frame-cadre-eng.aspx

ii. *Public Accounts of Canada 2014*, http://www.tpsgc-pwgsc.gc.ca/recgen/cpc-pac/index-eng.html

iii. *Tax Expenditures and Evaluations* publication, http://www.fin.gc.ca/purl/taxexp-eng.asp