

Canadian Space Agency

2015–16

Report on Plans and Priorities

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

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Table of Contents

| | |
|--|----|
| Minister’s Message | 1 |
| Section I: Organizational Expenditure Overview | 3 |
| Organizational Profile | 3 |
| Organizational Context | 4 |
| Organizational Priorities | 7 |
| Risk Analysis | 10 |
| Planned Expenditures..... | 12 |
| Alignment of Spending With the Whole-of-Government Framework | 13 |
| Departmental Spending Trend..... | 14 |
| Estimates by Vote | 15 |
| Section II: Analysis of Programs by Strategic Outcome | 17 |
| Strategic Outcome: | 17 |
| Program 1.1: Space Data, Information and Services..... | 17 |
| Sub-Program 1.1.1: Earth Orbit Satellite Missions and Technology | 18 |
| Sub-Sub-Program 1.1.1.1: Earth Observation Missions | 20 |
| Sub-Sub-Program 1.1.1.2: Communications Missions | 21 |
| Sub-Sub-Program 1.1.1.3: Scientific Missions..... | 22 |
| Sub-Program 1.1.2: Ground Infrastructure | 24 |
| Sub-Sub-Program 1.1.2.1: Satellite Operations | 25 |
| Sub-Sub-Program 1.1.2.2: Data Handling | 26 |
| Sub-Program 1.1.3: Space Data, Imagery and Services Utilization Development | 28 |
| Sub-Sub-Program 1.1.3.1: Earth Observation Data and Imagery Utilization | 29 |
| Sub-Sub-Program 1.1.3.2: Communications Services Utilization | 31 |
| Sub-Sub-Program 1.1.3.3: Scientific Data Utilization | 32 |
| Program 1.2: Space Exploration | 34 |

| | |
|---|----|
| Sub-Program 1.2.1: International Space Station (ISS)..... | 36 |
| Sub-Sub-Program 1.2.1.1: International Space Station Assembly and Maintenance Operations | 37 |
| Sub-Sub-Program 1.2.1.2: International Space Station Utilization | 39 |
| Sub-Program 1.2.2: Exploration Missions and Technology | 40 |
| Sub-Sub-Program 1.2.2.1: Space Astronomy Missions..... | 42 |
| Sub-Sub-Program 1.2.2.2: Planetary Missions | 43 |
| Sub-Sub-Program 1.2.2.3: Advanced Exploration Technology Development | 44 |
| Sub-Program 1.2.3: Human Space Missions and Support | 45 |
| Sub-Sub-Program 1.2.3.1: Astronaut Training and Missions | 46 |
| Sub-Sub-Program 1.2.3.2: Operational Space Medicine | 47 |
| Sub-Sub-Program 1.2.3.3: Health and Life Sciences..... | 48 |
| Program 1.3: Future Canadian Space Capacity | 50 |
| Sub-Program 1.3.1: Space Expertise and Proficiency | 51 |
| Sub-Program 1.3.2: Space Innovation and Market Access | 52 |
| Sub-Sub-Program 1.3.2.1: International Market Access | 54 |
| Sub-Sub-Program 1.3.2.2: Enabling Technology Development..... | 55 |
| Sub-Program 1.3.3: Qualifying and Testing Services | 56 |
| Program 1.4: Internal Services..... | 58 |
| Section III: Supplementary Information..... | 61 |
| Future-Oriented Statement of Operations | 61 |
| Supplementary Information Tables | 62 |
| Tax Expenditures and Evaluations..... | 62 |
| Section IV: Organizational Contact Information..... | 63 |
| Appendix: Definitions | 65 |
| Endnotes | 69 |

Minister's Message

Canada will continue to benefit from responsible economic policies in 2015–16, including our low taxes, free trade opportunities and responsible investment regime.

The Industry Portfolio will help sustain job creation and economic growth by effectively managing programs and services that help Canadian companies compete and innovate. Canadians can depend on our government to invest in programs that benefit them the most. In 2015–16, the Industry Portfolio will continue to invest in world-class research and innovation that help companies compete at home and abroad.

A competitive and innovative space sector creates jobs and encourages economic growth by developing innovative technologies and infrastructure for domestic and global markets. In 2015–16, with Canada's Space Policy Framework now in place, the Canadian Space Agency will continue its commitment to space exploration and commercialization.

The Industry Portfolio will help deliver on our government's commitment to return to a balanced budget by managing programs and services effectively. I am confident that we will meet our objective and that the Canadian Space Agency will continue to contribute toward economic growth and prosperity that benefit all Canadians.



James Moore

Minister of Industry

Section I: Organizational Expenditure Overview

Organizational Profile

Appropriate Minister: The Honorable James Moore, Minister of Industry

Institutional Head: Luc Brûlé, Interim President

Ministerial Portfolio: Industry

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

Year of Incorporation / Commencement: Established in March 1989

The Canadian Space Agency was established in 1989. Approximately 90% of its employees are working at the headquarters located at the John H. Chapman Space Centre, in St-Hubert, Quebec. The remaining personnel serve the Agency at the Government Liaison Office and the David Florida Laboratory in Ottawa, or in Houston, Washington or Paris.

Organizational Context

Raison d’être

The objects of the Canadian Space Agency¹ (CSA) are “*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 delivering on 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 coordinating the space policies and programs of the Government of Canada;
- Planning and implementing programs and projects related to scientific or industrial space research and development, and the 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 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

This year's RPP differs from that of the previous year in the number of priorities. The CSA has singled out one strategic-level priority for each program in order to present a more focused view of its plans and priorities with regard to the Canada Space Policy Framework. Many of the 2014–15 ongoing operational priorities have been recast to align with each priority under the plans for meeting the priority section.

| Priority | Type ² | Program |
|---|-------------------|--|
| Ensure space-based Earth observation data, including that from the RADARSAT Constellation Mission (RCM), will efficiently meet the public sector's needs and requirements. | Ongoing | 1.1 Space Data, Information and Services |
| Description | | |
| <p>Why is this a priority?</p> <p>This priority serves Canada's national interest by ensuring the continuity of space-based Earth observation data and services that are essential to the delivery of key public sector mandates; in particular, maritime domain awareness, disaster management, ecosystem and resources management, and sovereignty. This priority responds to the principle of placing Canadian interests first while taking into consideration the other Canada Space Policy Framework (CSPF) principles. This priority is implemented in collaboration with other Government of Canada (GoC) organizations that have been consulted in the early planning of the initiatives listed below.</p> <p>What are the plans for meeting this priority?</p> <p>Over the three-year period covered by this RPP, the CSA will:</p> <ul style="list-style-type: none"> • Support Synthetic Aperture Radar (SAR) Data continuity by: <ul style="list-style-type: none"> - progressing with the implementation phase of RCM; - supporting the integration of new capabilities offered by RCM into government operations; - developing a SAR data policy under RCM data policy; - managing access to RADARSAT-2 data; and - initiating the development of options with GoC organizations for SAR Data continuity. • Support maritime domain awareness with access to Automatic Identification System (AIS) data. • Implement the Surface Water and Ocean Topography (SWOT) mission in partnership with NASA and the French Space Agency (CNES for <i>Centre national d'études spatiales</i>) which will enable the study of the Earth's surface water and sea surface topography. Through this participation, the CSA and user departments support the development of new tools for improved preservation and exploitation of the Earth's water resources; and | | |

² Type is defined as follows: **previously committed to**—committed to in the first or second fiscal year prior to the subject year of the report; **ongoing**—committed to at least three fiscal years prior to the subject year of the report; and **new**—newly committed to in the reporting year of the RPP or DPR.

- Collaborate with GoC organizations to develop a proposed consolidated ground infrastructure plan, in support of Canadian earth observation (EO) missions, including a business case for Northern Ground Stations (NGS).

| Priority | Type | Program |
|---|---------|-----------------------|
| Review of Canada’s Space Exploration Program, including future participation in the International Space Station (ISS) Program. | Ongoing | 1.2 Space Exploration |
| Description | | |
| <p>Why is this a priority?</p> <p>In reviewing its Space Exploration Program the CSA will be able to identify potential flexibility and opportunities for future space exploration missions consistent with Canada’s Space Policy Framework. This review will also allow for the identification of partnership opportunities with Canadian academia and industry, as well as with international partners, namely NASA, the European Space Agency (ESA) and other space agencies. This program review will prepare recommendations to government regarding possible continuation of Canada’s commitment to the ISS Program after 2020.</p> <p>What are the plans for meeting this priority?</p> <p>Over the three-year period covered by this RPP, the CSA will consult with Canadian industry, academia and our international partners to develop a roadmap of current and potential future space exploration missions.</p> | | |

| Priority | Type | Program |
|---|---------|------------------------------------|
| Consolidate both CSA’s technology development and capability demonstration activities. | Ongoing | 1.3 Future Canadian Space Capacity |
| Description | | |
| <p>Why is this a priority?</p> <p>Consistent with Canada’s Space Policy Framework, through this priority the CSA will position the private sector at the forefront of space activities; will ensure that Canada continues to play a vital role in space innovation; and that GoC continues to pursue excellence in niche areas of space science and technology.</p> <p>The CSA recognizes the gap between space research and development (R&D), innovation and commercialization opportunities. The consolidation of the technology development and capability demonstration activities will bridge all key components for success and reduce the lag time between theory and implementation of new or upgraded space-related technologies.</p> <p>What are the plans for meeting this priority?</p> <p>Over the three-year period covered by this RPP, the CSA will:</p> <ul style="list-style-type: none"> • Establish a formal internal and external consultation structure to support the development of a | | |

| |
|--|
| <p>coordinated space innovation roadmap.</p> <ul style="list-style-type: none"> • Start discussions to both leverage existing other government departments (OGD) expertise and programs to better support the space industry, and potentially establish Consortium for Aerospace Research and Innovation in Canada (CARIC) partnership. Investigate the possible coordination with the Built in Canada Innovation Program (BCIP). • Consolidate the CSA’s space technology development funds to industry and academia to further support future government missions in space (Government needs), industrial competitiveness and academic partnerships. • Consolidate the CSA’s space capability demonstration activities to further respond to government, industry and academia needs and address technological, scientific, and operational demonstration requirements using various space and non-space platforms. |
|--|

| Priority | Type | Program |
|--|---------|---|
| <p>Continue the implementation of Canada’s Space Policy Framework by:</p> <ul style="list-style-type: none"> • Aligning the CSA’s structure to better respond to Canada’s Space Policy Framework; • Generating a CSA Strategy that will drive the future updates to the CSA’s investment plan. | Ongoing | 1.4 Internal Services – Governance and Management Support |

Description

Why is this a priority?

In February 2014, the Government of Canada unveiled 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.

What are the plans for meeting this priority?

The CSA is currently establishing and implementing an organizational structure that is responsive to the strategic objectives of Canada’s Space Policy Framework and to the priorities of the Government. The CSA will also pursue the implementation of its new Project Management Framework and the development of a new project management methodology, thus enhancing the management and control processes already in place.

As a key enabler of the Canadian Space Program (CSP), it is critical that the CSA identify meaningful, long-term objectives that meet the intent of Canada’s Space Policy Framework. The development of the CSA Strategy is vital to the optimization of resources and excellence in the implementation, oversight and accountability of space-related initiatives that will be the core of the 2017–22 Investment Plan. The CSA is currently drafting the Strategy, which identifies a clear role for the CSA within the Canadian Space Program and a common vision with which to focus and drive sound investment decision making, all based on the current and future context defined by federal government strategies, plans and space sector reports. The CSA will utilize the Strategy to drive specific technology and mission development, and space capability demonstration, and to support the development of future policy options.

The CSA continues to work with space industry leaders and other stakeholders to identify ways in which they can play a stronger leadership role to ensure that the economic value of the government’s space investments are fully realized. A key announcement has been the establishment of a Space Advisory Board that will provide advice to the Minister of Industry on the CSA and the Canadian Space Program.

The Framework also calls for an increased focus on space cooperation with key international partners. The CSA is undertaking the development of a framework for international cooperation that will refine the principles and parameters for engaging with partners globally. Finally, the CSA 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

| Risk | Risk Response Strategy | Link to Program Alignment Architecture |
|---|---|--|
| <p><u>Gap between expectations and supply</u> Due to possible interruptions, infrastructure challenges, personnel availability, project implementation or changes in partners’ requirements and priorities, there may be a gap between partners’ expectations and services provided by the CSA.</p> | <ul style="list-style-type: none"> - Implementation of the Investment Plan in consultation with the Deputy Ministers Governance Committee on Space (DMGCS) and other external governance bodies to take into account strategic needs and operational requirements; - Ongoing monitoring and implementation of mechanisms to optimize the allocation of RADARSAT-2 data portion of the government’s credit; and - Monitoring of space objects and collision avoidance measures. | <p>1.1.1 Earth Orbit Satellite Missions and Technology</p> <p>1.2.1 International Space Station</p> <p>1.2.2 Exploration Mission and Technology</p> <p>1.3.3 Qualifying and Testing Services</p> |
| <p><u>Space capacity</u> New international competitors, fluctuating technological development and the uncertainty associated with technological development may impact the long-term priorities of the CSA.</p> | <ul style="list-style-type: none"> - Ongoing updating of the Canadian space technology requirements spectrum; - Promotion of partnerships between industry, the university community and the CSA; - Ongoing monitoring of Canadian space sector conditions; and - Partnerships with foreign space agencies to expand academic and industry opportunities to participate in the development of international missions. | <p>1.1.3 Space Data Imagery and Services Utilization Development</p> <p>1.2.2. Exploration Missions and Technology</p> <p>1.3.3 Qualifying and Testing Services</p> |

| | | |
|--|---|---|
| <p><u>Fiscal management</u></p> <p>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.</p> | <ul style="list-style-type: none"> - 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’ impacts 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. | <p>1.1.1 Earth Orbit Satellite Missions and Technology</p> <p>1.1.2 Ground Infrastructure</p> <p>1.2.2. Exploration Missions and Technology</p> <p>1.3.2 Space Innovation and Market Access</p> |
|--|---|---|

Risk Narrative

At the national level, space assets have been used increasingly to respond to national priorities. In a context where long-term timeframes are needed to develop assets and where spatial debris remains a constant threat to space assets, the CSA will continue to prioritize the implementation phase of RCM, ensure a sound management of the GoC RADARSAT-2 credit allocation and implement others measures to ensure that the needs for SAR data by operational government users are met in a sustainable way.

Canada has learned early on that it could leverage its technical and scientific expertise through opportunities with other countries, especially the United States and Europe, to gain global niche market advantage. This has become a hallmark of the Canadian space program. As the post-war domination by a few “great space powers” has given way to emerging players and strategic alliances, the CSA will continue to consolidate its technology development and capability demonstration activities to ensure the Canadian space sector keeps a foothold in the rapidly evolving international contexts. The CSA will also conduct a review of its Space Exploration Program to identify and develop future space exploration missions allowing our Canadian scientific and industrial partners to participate in international endeavours.

Finally, programmatic or technical difficulties associated with the development of cutting-edge technologies represent another important source of risks. Additional challenges can appear due to the long-term duration of space missions, their international dimension, and their uniqueness based on very stringent space hardware quality control requirements. Typically, those risks lead to cost increases and schedule slippages. In order to mitigate those risks, the CSA will pursue the implementation of its new Project Management Framework and the development of a new project management methodology, thus enhancing the management and control process already in place.

Planned Expenditures

Budgetary Financial Resources (Planned Spending—dollars)

| 2015–16 Main Estimates | 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|---------------------------|-----------------------------|-----------------------------|-----------------------------|
| 483,428,281 | 483,428,281 | 383,015,746 | 322,606,492 |

Refer to sub-sub-programs for details on significant planned spending variation.

Human Resources (Full-time equivalents—FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 613.3 | 613.3 | 613.3 |

Note: There is no correlation between the annual fluctuations of the budget and the number of full-time equivalents. The budget variations are mainly due to the projects' development cycle and their associated cash flow requirements (re-profiling + additional funds for RCM). Consequently, these do not entail any adjustment on the annual number of full-time equivalents under the CSA A-Base budget.

Note: Students are now included in the FTE calculation.

Budgetary Planning Summary for Strategic Outcome and Programs (dollars)

| Strategic Outcome, Programs and Internal Services | 2012–13 Expenditures | 2013–14 Expenditures | 2014–15 Forecast Spending | 2015–16 Main Estimates | 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|--|-------------------------|-------------------------|---------------------------------|------------------------------|--------------------------------|--------------------------------|--------------------------------|
| 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 | 130,830,203 | 207,544,469 | 176,857,047 | 259,609,001 | 259,609,001 | 174,805,520 | 122,152,515 |
| Space Exploration | 87,496,584 | 96,501,810 | 98,406,766 | 112,407,879 | 112,407,879 | 98,480,242 | 91,506,257 |
| Future Canadian Space Capacity | 52,480,907 | 55,453,614 | 60,771,349 | 66,268,193 | 66,268,193 | 66,630,064 | 66,079,416 |
| Subtotal | 270,807,694 | 359,499,893 | 336,035,161 | 438,285,073 | 438,285,073 | 339,915,826 | 279,738,188 |
| Internal Services | 49,437,721 | 49,215,347 | 42,683,613 | 45,143,208 | 45,143,208 | 43,099,920 | 42,868,304 |
| Total | 320,245,415 | 408,715,240 | 378,718,775 | 483,428,281 | 483,428,281 | 383,015,746 | 322,606,492 |

The CSA’s expenditure profile variation since FY 2012–13 is primarily the result of investments to develop the RADARSAT Constellation Mission (RCM) as announced in Budget 2010.

The funding profiles of the CSA’s projects and missions vary from year to year and therefore have an impact on the Expenditures, the Forecast Spending as well as the Planned Spending by Program. These variations are presented in the table “Budgetary Planning Summary for Strategic Outcome and Programs (dollars)” shown above.

In line with the context described above, variations for Space Data, Information and Services are mainly due to project funding requirement variations for RADARSAT Constellation Mission (RCM), the M3MSat and the Surface Water & Ocean Topography (SWOT) projects. Planned ending of missions operations as well as funding and expenditure authority of \$8.0 million authorized only for 2015–16 in order to provide enhanced space-based Automatic Identification System (AIS) data services also account for the variance in the Space Data, Information and Services Program.

Alignment of Spending With the Whole-of-Government Framework

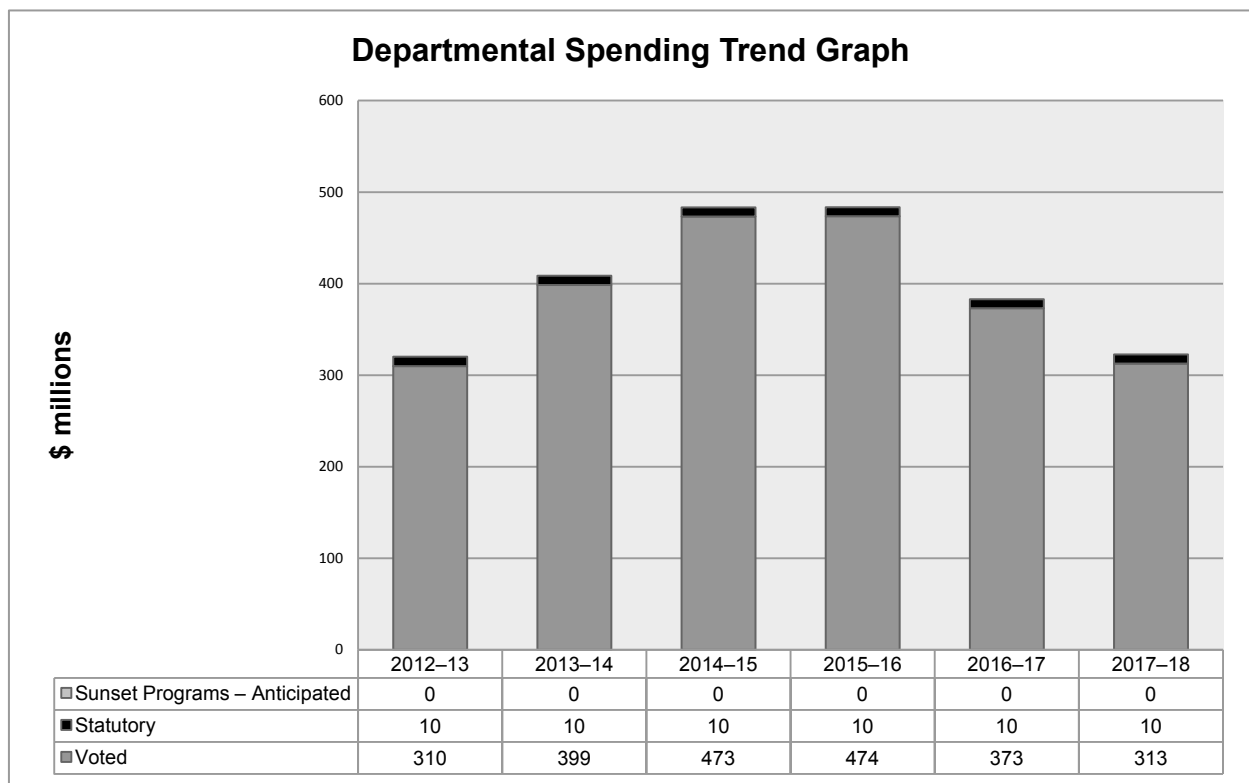
Alignment of 2015–16 Planned Spending With the [Whole-of-Government Framework](#)ⁱ (dollars)

| 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 | Spending Area | Government of Canada Outcome | 2015–16 Panned Spending |
| 1.1 Space Data, Information and Services | Government Affairs | Well-managed and efficient government operations | 259,609,001 |
| 1.2 Space Exploration | Economic Affairs | An innovative and knowledge-based economy | 112,407,879 |
| 1.3 Future Canadian Space Capacity | Economic Affairs | An innovative and knowledge-based economy | 66,268,193 |

Total Planned Spending by Spending Area (dollars)

| Spending Area | Total Planned Spending |
|-----------------------|------------------------|
| Economic Affairs | 178,676,072 |
| Social Affairs | 0 |
| International Affairs | 0 |
| Government Affairs | 259,609,001 |

Departmental Spending Trend



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

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

- Budget 2010 allocated \$397 million to the CSA over five years (FY 2010–11 to FY 2014–15) to develop the RADARSAT Constellation Mission (RCM). An additional \$374.2 million over six years (FY 2013–14 to FY 2018–19) was allocated for RCM. \$140.0 million of new funding from the Fiscal Framework and \$234.2 million was transferred from other government departments to the CSA.
- The CSA’s contribution to the Budget 2012 Strategic Operating Review was \$7.9 million for FY 2012–13, \$24.7 million for FY 2013–14 and \$29.5 million for FY 2014–15.
- Additional funding and expenditure authority of \$12.0 million was authorized during FY 2014–15 for two years (FY 2014–15 and 2015–16) in order to provide enhanced space-based Automatic Identification System (AIS) data services.

Estimates by Vote

For information on the CSA’s organizational appropriations, consult the [2015–16 Main Estimates](#) on the Treasury Board of Canada Secretariat website.ⁱⁱ

Section II: Analysis of Programs 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. This Program is also funded through the Class Grant and Contribution Program.

Budgetary Financial Resources (dollars)

| 2015–16 Main Estimates | 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|---------------------------|-----------------------------|-----------------------------|-----------------------------|
| 259,609,001 | 259,609,001 | 174,805,520 | 122,152,515 |

Refer to sub-sub-programs for details on significant planned spending variation.

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 108.2 | 108.2 | 108.2 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|--|---|--|
| 1. GoC organizations offer more diversified or cost-effective programs and services due to their utilization of space-based solutions. | 1. Number of new GoCs programs offering more diversified or efficient services. | Target to be established based on 2014–15 analysis of the use of space-based solutions by GoC. |

The CSA will continue to ensure continuity of the provision of space-based Synthetic Aperture Radar (SAR) data considered essential to public sector mandates by:

- Continuing the implementation phase of RADARSAT Constellation Mission (RCM);
- Supporting integration of new capabilities offered by the RCM into government operations;
- Leading the development of a policy governing access, sharing and use of RCM SAR data (i.e. an RCM Data Policy);
- Managing the Government of Canada RADARSAT-2 data allocation; and
- In collaboration with key federal departments, leading the development of a long term SAR continuity plan based on government needs in terms of services and enhanced capabilities.

Sub-Program 1.1.1: Earth Orbit Satellite Missions and Technology

Description

This Sub-Program encompasses the development of complete Canadian satellite systems or of sub-systems, payloads, instruments or other components provided to domestic and foreign satellites. This Sub-Program also includes the development of advanced technologies that could shape or determine the nature of potential new Earth orbit satellite missions. This Sub-Program is necessary because Government of Canada (GoC) organizations use satellite-generated data, information and services to deliver their mandate; and so do academia to perform their research.

This Sub-Program 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)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-----------------------------|-----------------------------|-----------------------------|
| 224,510,409 | 147,129,360 | 96,017,371 |

Difference in planned spending is due to project funding requirement variations for the RADARSAT Constellation Mission (RCM) and for the Surface Water & Ocean Topography (SWOT) projects.

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 76.9 | 76.9 | 77.0 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|---|---|---|
| 1. GoC organizations are using space-based data to deliver their mandate. | 1. Number of GoC's programs using space data or derived information to deliver their mandate. | Target to be based on analysis of the use of space-based solutions by GoC in 2014–15, validation of the methodology used and measure provided by results from 2013–14 and 2014–15 Departmental Performance Report (DPR) |
| | 2. Percentage of RADARSAT data used in program's delivery. | 40% R&D 60% Operations |

Major milestones that are expected to be achieved during 2015–16 include completion of the first of three satellite platforms and the first of three satellite payloads in anticipation of the planned launch in 2018. The RCM will enhance Canada's operational capability to use space-based solutions in the fields of maritime surveillance, disaster management and ecosystem monitoring as well as add a new series of applications enabled through the constellation approach.

The CSA will continue to support maritime domain awareness with the operations of Maritime Monitoring and Messaging Micro-Satellite (M3MSat), in partnership with the Department of National Defence (DND). This joint micro-satellite project will demonstrate and further develop a multi-mission bus capability, allow optimization of the Automatic Identification System (AIS) payload in maritime traffic identification, and significantly support Canadian industry's business

development strategies. The data from this satellite will complement that provided by both RCM and DND's Polar Epsilon mission.

The CSA will continue to support the monitoring of the world's oceans and continental surface waters through Canadian participation in the Surface Water and Ocean Topography (SWOT) demonstration mission led by NASA and CNES (French space agency), which is scheduled for launch in 2020. The SWOT mission objective is to measure water heights (and their space-time variations) of rivers, lakes and flooded zones as well as features of oceans circulation. SWOT data will be of great utility to Environment Canada for hydrological and meteorological monitoring and forecasting, and to Fisheries and Oceans Canada for ocean science and forecasting.

For Additional Planning Highlights go to: <http://www.asc-csa.gc.ca/fra/publications/rp.asp#rp>

Sub-Sub-Program 1.1.1.1: Earth Observation Missions

Description

This Sub-Sub-Program 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 Sub-Sub-Program 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 Sub-Sub-Program 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 and partnership agreements with national, public/private and international organizations. This Sub-Sub-Program is also funded through the Class Grant and Contribution Program to Support Research, Awareness and Learning.

Budgetary Financial Resources (dollars)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-----------------------------|-----------------------------|-----------------------------|
| 214,221,097 | 137,945,648 | 90,340,731 |

Difference in planned spending is due to project funding requirement variations for the RADARSAT Constellation Mission (RCM) project.

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 65.2 | 67.7 | 66.0 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|---|--|--|
| 1. Earth Observation missions provide GoC organizations and academia with data and information. | 1. Number of GoC programs provided with data and images from Earth Observation missions. | First set of data collected in DPR 2013–14 to be validated based on 2014–15 analysis of the use of space-based solutions by GoC validation of the methodology used and numbers provided. |
| | 2. Number of academia provided with data and images from Earth Observation missions. | 19 |
| | 3. Number of users of Earth Observation data. | 250 |

Sub-Sub-Program 1.1.1.2: Communications Missions

Description

This Sub-Sub-Program 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 Sub-Sub-Program serves continuous operations and is necessary to provide pertinent communications and NPT services that assist Government of Canada (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 Sub-Sub-Program 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 and partnership agreements with national, public/private and international organizations. This Sub-Sub-Program is also funded through the Class Grant and Contribution Program to Support Research, Awareness and Learning.

Budgetary Financial Resources (dollars)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-----------------------------|-----------------------------|-----------------------------|
| 4,380,384 | 5,823,256 | 1,135,256 |

Difference in planned spending is due to project funding requirement variations for the M3MSat project.

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 8.5 | 6.4 | 7.7 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|---|--|--|
| 1. Satellites provide communications services that respond to the expressed needs of GoC organizations. | 1. Number of Satellite Communication missions/instruments in operation. | 1 |
| | 2. Number of GoC organizations using data from Satellite Communication missions. | 1 |

Sub-Sub-Program 1.1.1.3: Scientific Missions

Description

This Sub-Sub-Program encompasses the definition, design, technology development, and implementation of Earth orbit satellites dedicated to producing scientific data and information for research performed by Government of Canada (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 Sub-Sub-Program 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 Sub-Sub-Program, GoC organizations are better able to provide weather and climate forecasting. Academia also uses the data and information produced through this Sub-Sub-Program to perform its own research.

This Sub-Sub-Program 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 and partnership agreements with national, public/private and international organizations. This Sub-Sub-Program is also funded through the Class Grant and Contribution Program to Support Research, Awareness and Learning.

Budgetary Financial Resources (dollars)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-------------------------------------|-------------------------------------|-------------------------------------|
| 5,908,928 | 3,360,456 | 4,541,384 |

Difference in planned spending is due to project funding requirement variations for the Surface Water & Ocean Topography (SWOT) project.

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|----------------|----------------|----------------|
| 3.2 | 2.8 | 3.4 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|--|---|---|
| 1. Solar and Earth System scientific space missions reflect GoC organizations and academia priorities. | 1. Number of Solar and Earth System missions/instruments in operation. | 25 |
| | 2. Number of Canadian and international organizations participating in CSA’s Solar and Earth System science missions. | 130 |

Sub-Program 1.1.2: Ground Infrastructure

Description

This Sub-Program 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 Sub-Program is necessary to operate satellites as well as to process and make available space-based data received by the Canadian Space Agency to assist Government of Canada (GoC) organizations in delivering their mandate. Finally, this Sub-Program 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 Sub-Program 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)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-----------------------------|-----------------------------|-----------------------------|
| 16,575,512 | 17,687,080 | 16,146,064 |

Planned spending variation is mainly due to planned ending of missions operations.

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 24.5 | 24.5 | 24.4 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|--|--|---|
| 1. Expressed Canadian and foreign data needs are fulfilled by ground infrastructure. | 1. Percentage of acquisitions request fulfilled. | RADARSAT-2 – 85% SCISAT – 85% NEOSSat – 70% |
| | 2. Ratio of acquisitions request fulfilled to missions acquisition requirements. | RADARSAT-2 – 50% SCISAT – 80% NEOSSat – 65% |
| 2. National ground infrastructure is reliable. | 1. Percentage of successful satellites contacts. | 90% |

The CSA will continue to operate the Near Earth Object Surveillance Satellite (NEOSSat) launched in February 2013. The NEOSSat is a micro-satellite jointly funded by the CSA and Defence Research and Development Canada (DRDC) to acquire useful metric (position/time) data on objects orbiting near Earth (asteroids) and man-made objects (spacecraft and space debris).

Canada is the preferred location for studying space weather processes due to its proximity to the magnetic North Pole and its large landmass under the auroral oval. In order to better understand the processes that lead to geomagnetic storms and auroral intensification, the CSA will continue funding operations of the 16 Canadian ground-based observatories for the Time History of Events and Macroscale Interactions during Substorms (THEMIS) mission, complementing the observations from four Alaska-based observatories and multiple NASA spacecraft.

The CSA will ensure that RADARSAT-1 data archives will be maintained to continue supplying radar imagery data to the existing client base in Canada and abroad. RADARSAT-1 data archives were accumulated over the satellite's 17 years of operations and constitute an important asset for the future. They are currently a source of unique reference data for operational and research purposes, and, when combined with the successor RADARSAT-2 and future RCM data, will constitute an important time series of Earth observation.

The CSA will continue to help scientists to monitor the atmosphere as it responds to natural and anthropogenic changes, and to improve climate and weather models by operating SCISAT and supporting data production, validation and analysis. SCISAT makes climate-quality, vertical-profile measurements of atmospheric composition (over 35 gas species).

For Additional Planning Highlights go to: <http://www.asc-csa.gc.ca/eng/publications/rp.asp#rp>

Sub-Sub-Program 1.1.2.1: Satellite Operations

Description

This Sub-Sub-Program 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 Sub-Sub-Program is necessary to render orbiting satellites functional.

The operations of Canadian Space Agency (CSA) satellites are mostly conducted with CSA equipment located in Canada. In some instances, formal arrangements can be concluded between CSA, Canadian industry, Government of Canada (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)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-----------------------------|-----------------------------|-----------------------------|
| 11,275,576 | 12,893,128 | 12,093,544 |

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 19.9 | 19.9 | 20.5 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|--|--|---|
| 1. CSA's satellites are functioning as per operational requirements. | 1. Percentage of system availability. | SCISAT – 90% NEOSSat – 80% |
| | 2. Number of Canadian satellites operated by CSA, as per operational requirements. | 2: SCISAT and NEOSSat |
| 2. Foreign Satellite Missions are supported. | 1. Number of foreign satellites supported. | 2 |

Sub-Sub-Program 1.1.2.2: Data Handling

Description

This Sub-Sub-Program includes a coordinated national approach to determine optimal station locations and space data handling. This Sub-Sub-Program 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 Government of Canada (GoC) organizations in delivering their mandate.

Data handling operations are mostly conducted with Canadian Space Agency (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 Sub-Sub-Program is delivered with the participation of Canadian industry, foreign space agencies and GoC organizations. This collaborative effort is

formalized under contracts and partnership agreements with national, public/private and international organizations. This Sub-Sub-Program is also funded through the Class Grant and Contribution Program to Support Research, Awareness and Learning.

Budgetary Financial Resources (dollars)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-------------------------------------|-------------------------------------|-------------------------------------|
| 5,299,936 | 4,793,952 | 4,052,520 |

Planned spending variation is mainly due to planned ending of missions operations.

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|----------------|----------------|----------------|
| 4.5 | 4.6 | 3.9 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|---|--|---|
| 1. Satellite data provided to GoC organizations and academia. | 1. Number of RADARSAT-2 images delivered to GoC organizations and other customers. | 25,000 |
| | 2. Number of validated and used instruments in Sun-Earth system sciences. | 26 |

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

Description

This Sub-Program 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 Government of Canada (GoC) organizations and academia. This Sub-Program 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 Sub-Program engages the participation of the Canadian space industry and academia and is formalized under contracts and partnership agreements with national, public/private and international organizations.

Budgetary Financial Resources (dollars)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-----------------------------|-----------------------------|-----------------------------|
| 18,523,080 | 9,989,080 | 9,989,080 |

Planned spending variation is mainly due to additional funding and expenditure authority of \$8.0 million authorized only for 2015–16 in order to provide enhanced data services.

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 6.9 | 6.9 | 6.9 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|--|---|---|
| 1. GoC organizations are using space-based solutions to deliver their mandate. | 1. Number of GoCs programs using developed applications or derived information. | Benchmark to be established based on 2014–15 analysis of the use of space-based solutions by GoC. |

| | | |
|---|---|---|
| | 2. Average number of programs using each developed applications. | Benchmark to be established based on 2014–15 analysis of the use of space-based solutions by GoC. |
| 2. The Canadian scientific community uses 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. | ³ SOAR: 10 ⁴ SESS: 220 |

The CSA will continue managing and optimizing RADARSAT-2 data allocation to ensure that the needs for Synthetic Aperture Radar (SAR) data by operational Government users are met in a sustainable way. As of October 2014, the Canadian Government had used \$225 million worth of a total \$445 million worth of prepaid RADARSAT-2 data. In order to better fulfill their mandates 14 departments are using the many capabilities of RADARSAT-2 and making long-term investments to develop new capabilities by either bringing applications closer to an operational status or finding ways to improve the use of the data.

The CSA supports Canadian universities and post-secondary educational institutions, by supporting four projects oriented predominantly towards fundamental and applied research in the development of EO applications that utilize the new capabilities provided by RADARSAT-2. By supporting these projects the CSA fosters the development of a critical mass of researchers and highly qualified people in Canada in the field of SAR Earth observation.

The CSA will continue to leverage international efforts to better serve Canadians by partnering with international organizations such as the International Charter on Space and Major Disasters, the Committee on Earth Observation Satellites (CEOS) and the Polar Space Task Group.

For Additional Planning Highlights go to: <http://www.asc-csa.gc.ca/eng/publications/rp.asp#rp>

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

Description

This Sub-Sub-Program develops the utilization of Earth observation imagery and atmospheric data acquired from Canadian and foreign space assets, ranging from its subsurface to its upper

³ SOAR: Science and Operational Applications Research

⁴ SESS: Sun-Earth System Science

atmospheric layers. This also applies to weather and climate imagery. This Sub-Sub-Program 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 (Government of Canada (GoC) organizations and academia).

This Sub-Sub-Program engages the participation of the Canadian space industry and academia and is formalized under contracts and partnership agreements with national, public/private and international organizations. This Sub-Sub-Program is also funded through the Class Grant and Contribution Program to Support Research, Awareness and Learning.

Budgetary Financial Resources (dollars)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-----------------------------|-----------------------------|-----------------------------|
| 10,186,176 | 9,652,176 | 9,652,176 |

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 6.3 | 6.3 | 6.3 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|--|---|---|
| 1. Enhanced GoC organizations ability to turn Earth Observation data into products and services. | 1. Number of Earth Observation data utilization activities supported. | ⁵ GRIP: 17 |
| 2. Enhanced Canadian industry ability to turn Earth observation data into products and services. | 1. Number of Earth Observation data utilization activities supported. | ⁶ EOADP: 28 |
| 3. The scientific community produces new ideas to turn Space data into products and services. | 1. Number of Earth Observation data utilization activities supported. | ⁷ SOAR: 168 |

⁵ GRIP: Government Related Initiatives Program

⁶ EOADP: Earth Observation Application Development Program

⁷ SOAR: Science and Operational Applications Research

Sub-Sub-Program 1.1.3.2: Communications Services Utilization

Description

This Sub-Sub-Program develops the utilization of space communications, including Navigation, Positioning and Timing (NPT) services available through Canadian and foreign satellites. This Sub-Sub-Program is necessary to broaden the applicability of currently available communications services (optimization) or to create new ones (innovation) for Government of Canada (GoC) organizations.

This Sub-Sub-Program engages the participation of the Canadian space industry and is formalized under contracts and partnership agreements with national, public/private and international organizations. This Sub-Sub-Program is also funded through the Class Grant and Contribution Program to Support Research, Awareness and Learning.

Budgetary Financial Resources (dollars)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-----------------------------|-----------------------------|-----------------------------|
| 8,336,904 | 336,904 | 336,904 |

Planned spending variation is due to additional funding and expenditure authority of \$8.0 million authorized only for 2015–16 in order to provide enhanced data services.

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 0.5 | 0.5 | 0.5 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|---|---|---|
| 1. Enhanced GoC organizations ability to use communications space assets. | 1. Number of communications application development activities supported. | 0 |

Sub-Sub-Program 1.1.3.3: Scientific Data Utilization

Description

This Sub-Sub-Program 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 Sub-Sub-Program involves the collaboration of Canadian scientists from Government of Canada (GoC) organizations and academia. This Sub-Sub-Program 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 Sub-Sub-Program engages the participation of the Canadian space industry, academia and GoC organizations scientists, and is formalized under contracts and partnership agreements with national, public/private and international organizations. This Sub-Sub- Program is also funded through the Class Grant and Contribution Program to support Research, Awareness and Learning.

Budgetary Financial Resources (dollars)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-----------------------------|-----------------------------|-----------------------------|
| 0 | 0 | 0 |

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 0 | 0 | 0 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|--|---|--|
| 1. Enhanced scientific community ability to use scientific data. | 1. Number of Solar and Earth System scientific data utilization activities supported. | 8 |

Target is based on 2014–15 grants and contracts awarded in January 2015 for Geospace Monitoring.

Planning and Reporting Continuity

RPP 2014–15 and DPR 2013–14:

<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 to 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 Government of Canada (GoC) organizations. This collaborative effort is formalized under international partnership agreement, contracts, grants or contributions.

Budgetary Financial Resources (dollars)

| 2015–16 Main Estimates | 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|---------------------------|-----------------------------|-----------------------------|-----------------------------|
| 112,407,879 | 112,407,879 | 98,480,242 | 91,506,257 |

Refer to sub-sub-programs for details on significant planned spending variation.

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 168.5 | 168.5 | 168.5 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016* |
|---|---|---|
| 1. Expansion of advanced scientific knowledge acquired through space exploration endeavours. | 1. Number of peer-reviewed scientific publications, reports and conference proceedings using space exploration information and produced by researchers (sciences and technology) in Canada. | 200 |
| 2. Multiple use and applications of knowledge and know-how acquired through space exploration endeavours. | 1. Number of terrestrial applications of knowledge and know-how acquired through space exploration endeavours. | 2 |
| | 2. Number of space re-utilization of knowledge and know-how acquired through space exploration endeavours. | 1 |

As mentioned previously in the organizational priorities section, the CSA will consult with Canadian industry, academia and our international partners to develop a roadmap of current and potential future space exploration missions. Mission scenario roadmaps will be developed and prioritized, and funding requirements identified in order to ensure that Canada continues to have a balanced Space Exploration Program capable of responding to stakeholders needs and delivering on its expected results.

The CSA will continue to fulfill its International Space Station (ISS) obligations by operating the Mobile Servicing System (MSS) until 2020. This involves providing operational and technical support for MSS hardware and software; replacing obsolete sub-systems; providing MSS training for astronauts, cosmonauts and ground support personnel; planning and providing real-time support for MSS operations; and conducting operations in conjunction with the NASA Houston flight control room from the Remote Multi-Purpose Support Room located in Longueuil, Quebec.

Consistent with its agreement with NASA, the CSA will continue to provide technologies and services to the ISS Program as part of its commitment to share the ISS Common System Operations Costs to 2020. The CSA will negotiate additional content in service of this agreement and continue to not only meet NASA's needs but to provide further Canadian industrial benefits and opportunities for investments.

Along with NASA and the European Space Agency, Canada is a partner in the James Webb Space Telescope, a major space observatory scheduled for launch in 2018. The James Webb Space Telescope is a successor to the highly successful Hubble Space Telescope. By virtue of the CSA's contribution, Canadian astronomers will have guaranteed access to 5% of the observing time of the James Webb Space Telescope.

The CSA will maintain its human space flight expertise to meet the requirements of its Space Exploration program. The two newest Canadian astronauts are eligible for long-duration space flight assignments to the ISS. They are training on various ISS Partners' segments while assuming collateral duties in support of the ISS Program and CSA priorities.

Sub-Program 1.2.1: International Space Station (ISS)

Description

This Sub-Program 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 Sub-Program is necessary to generate specific understanding and technological advances to prepare for the challenges of space exploration and for terrestrial benefits. This Sub-Program provides Canadian industry and academia privileged access to the ISS.

This Sub-Program is performed in collaboration with Government of Canada (GoC) organizations and foreign space agencies. This collaborative effort is captured under contracts, contributions, grants and/or international partnership agreements.

Budgetary Financial Resources (dollars)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-----------------------------|-----------------------------|-----------------------------|
| 83,310,375 | 78,204,266 | 73,683,673 |

Difference in planned spending is due to funding requirement variations for the ongoing commitment to the international partnership to maintain the ISS.

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 100.1 | 100.7 | 101.9 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|---|---|--|
| 1. Development of operational and technological know-how related to long-duration space missions (with potential Earth application) acquired through participation in the International Space Station (ISS) operations and laboratory missions. | 1. Number of Canadian missions /solutions / instruments flown on ISS. | 10 |
| | 2. Percentage of Canadian missions /solutions / instruments flown on ISS that met their mission requirements. | 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 |
|---|--|----|

The CSA will continue to maintain MSS operational preparedness to carry out ISS maintenance and operations. This will entail the development and certification of new flight software products and operational procedures to support MSS operations. The CSA will also continue to monitor the MSS health, perform engineering analysis, and put in place mitigation activities to maximize the MSS life.

The CSA will enable Canadians to utilize the ISS through the development and implementation of state-of-the-art scientific research and innovative technology activities such as:

- A cardiovascular study (BP Reg) to validate a simple in-flight method to test the risk of fainting on return to Earth after long-duration space flight.
- Implementation of radiation dosimeter technology to measure neutron radiation levels aboard the ISS through the Radi-N2 payload.
- An educational activity, Tomatosphere, aimed at stimulating the interest of students in science by planting tomato seeds exposed to the space environment.

For Additional Planning Highlights go to: <http://www.asc-csa.gc.ca/eng/publications/rp.asp#rp>

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

Description

This Sub-Sub-Program 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 Canadian Space Agency (CSA) and the National Aeronautics and Space Administration (NASA) - Johnson Space Center. This Sub-Sub-Program 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 Sub-Sub-Program 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. This Sub-Sub-Program is

funded through the Class Grant and Contribution Program to Support Research, Awareness and Learning.

Budgetary Financial Resources (dollars)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-------------------------------------|-------------------------------------|-------------------------------------|
| 71,544,759 | 67,041,114 | 61,756,001 |

Difference in planned spending is due to funding requirement variations for the ongoing commitment to the international partnership to maintain the ISS.

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|----------------|----------------|----------------|
| 82.0 | 81.2 | 80.0 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|--|--|---|
| 1. The Canadian contribution (Mobile Servicing 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 Memorandum of Understanding (MOU). | 1. Percentage of operational requirements fulfilled. | 100% |

Sub-Sub-Program 1.2.1.2: International Space Station Utilization

Description

This Sub-Sub-Program 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 International Space Station (ISS) by Government of Canada (GoC) organizations, academia or the private sector. The ISS offers said organizations the advantages of an orbiting platform with human presence and prolonged microgravity exposure. This Sub-Sub-Program 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 Sub-Sub-Program is performed in collaboration with GoC organizations and foreign space agencies. This collaborative effort is captured under contracts and/or international partnership agreements. This Sub-Sub-Program is also funded through the Class Grant and Contribution Program to Support Research, Awareness and Learning.

Budgetary Financial Resources (dollars)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-----------------------------|-----------------------------|-----------------------------|
| 11,765,616 | 11,163,152 | 11,927,672 |

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 18.1 | 19.5 | 22.0 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|--|--|---|
| 1. Optimal utilization of the International Space Station (ISS). | 1. Percentage of programmatic objectives achieved through ISS utilization. | 80% |
| | 2. Number of Canadian stakeholders involved in activities on the ISS. | 9 |
| | 3. Proportion of ISS resources used. | 95% |

Sub-Program 1.2.2: Exploration Missions and Technology

Description

This Sub-Program encompasses the development and use of astronomy and planetary missions as well as the development of advanced exploration technologies. This Sub-Program is necessary as it contributes 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 Sub-Program provides Canadian industry and academia with unique opportunities through their participation in international space exploration initiatives.

This Sub-Program is performed in collaboration with foreign space agencies, Government of Canada (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)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-----------------------------|-----------------------------|-----------------------------|
| 24,666,216 | 15,791,688 | 13,337,296 |

Difference in planned spending is due to project funding requirement variations for the James Webb Space Telescope and the OSIRIS-REx projects, to planned ending of mission operations and to additional feasibility studies.

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 54.8 | 54.1 | 52.9 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|---|---|--|
| 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. | 1/1 |

| | | |
|--|---|----|
| 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. | 10 |
| 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 space astronomy and planetary missions providing data to Canadian scientific community. | 4 |

Canada is responsible for the design and construction of a critical element of the James Webb Space Telescope: the Fine Guidance Sensor (FGS). The FGS ensures a very precise pointing of the telescope. Canada is also responsible for the design and construction of the Near Infrared Imager and Slitless Spectrograph (NIRISS) science instrument. In 2015–16, NASA will finalize the integration of those two instruments with two others provided by NASA and ESA in the Integrated Science Instrument Module (ISIM) and undertake the third cryogenic test campaign of the ISIM. By virtue of the CSA's contribution, Canadian astronomers will have guaranteed access to 5% of the observing time of the James Webb Space Telescope.

The CSA will support the integration of an optical metrology system on the Japan Aerospace Exploration Agency (JAXA) ASTRO-H X-ray space astronomy telescope. This mission includes participation from Europe and NASA. The CSA's participation will foster Canadian industrial capabilities in optics and will enable Canadian scientists, members of the JAXA Science Working Group, to submit proposals for observations on the telescope.

The CSA will support operations of the Near Earth Object Surveillance Satellite (NEOSSat) which was launched in February 2013. NEOSSat is a micro-satellite jointly sponsored by the CSA and Defence Research and Development Canada (DRDC) to acquire useful position and time data on known near-Earth asteroids and man-made objects (spacecraft and space debris).

The CSA will complete the development of the OSIRIS-REx Laser Altimeter (OLA), an advanced scanning Light Detection and Ranging (LIDAR) that will provide global topographic mapping of the target asteroid's surface. The mission is part of the NASA New Frontiers program and will launch in 2016. It will be the first U.S. mission to return samples from an asteroid, and it will constitute Canada's first participation in a sample return mission.

For Additional Planning Highlights go to: <http://www.asc-csa.gc.ca/eng/publications/rp.asp#rp>

Sub-Sub-Program 1.2.2.1: Space Astronomy Missions

Description

This Sub-Sub-Program 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 Sub-Sub-Program is necessary to perform space astronomy investigations and generate data and new knowledge about the universe.

This Sub-Sub-Program is performed in collaboration with foreign space agencies, Government of Canada (GoC) organizations and through consultations with the Canadian astronomical community. This collaborative effort takes shape under contracts and/or international partnership agreements. This Sub-Sub-Program is also funded through the Class Grant and Contribution Program to Support Research, Awareness and Learning.

Budgetary Financial Resources (dollars)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-----------------------------|-----------------------------|-----------------------------|
| 6,089,504 | 3,850,160 | 3,487,096 |

Difference in planned spending is due to project funding requirement variations for the James Webb Space Telescope project and planned ending of mission operations.

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 8.1 | 6.2 | 6.0 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|---|--|--|
| 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. | 1 |

Sub-Sub-Program 1.2.2.2: Planetary Missions

Description

This Sub-Sub-Program encompasses the definition, design, technology development, implementation and use of Canadian scientific instruments and signature technologies made available to international exploration missions. The Sub-Sub-Program 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 Sub-Sub-Program is performed in collaboration with the international space exploration community, Government of Canada (GoC) organizations and foreign space agencies. This collaborative effort takes shape under contracts and/or international partnership agreements. This Sub-Sub-Program is also funded through the Class Grant and Contribution Program to Support Research, Awareness and Learning.

Budgetary Financial Resources (dollars)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-----------------------------|-----------------------------|-----------------------------|
| 6,046,952 | 3,635,432 | 1,797,256 |

Difference in planned spending is due to project funding requirement variations for the OSIRIS-REx project.

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 10.0 | 7.8 | 6.8 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|---|--|--|
| 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 |

Sub-Sub-Program 1.2.2.3: Advanced Exploration Technology Development

Description

This Sub-Sub-Program 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 Sub-Sub-Program is necessary to shape or determine the nature of Canada's contribution to potential international exploration and astronomy missions and could lead to spin-offs. In addition, the Sub-Sub-Program 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 Sub-Sub-Program is performed in collaboration with foreign space agencies and Government of Canada (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)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-----------------------------|-----------------------------|-----------------------------|
| 12,529,760 | 8,306,096 | 8,052,944 |

Planned spending variation is due to additional feasibility studies to be performed in 2015–16.

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 36.7 | 40.1 | 40.1 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|--|---|--|
| 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 plan. | 7 |

Sub-Program 1.2.3: Human Space Missions and Support

Description

This Sub-Program 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 Sub-Program 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 Sub-Program could contribute to alternate healthcare delivery mechanisms for terrestrial applications.

This Sub-Program is performed with Government of Canada (GoC) organizations and foreign space agencies. This collaborative effort is formalized under contracts, grants, contributions or international partnership agreements.

Budgetary Financial Resources (dollars)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-----------------------------|-----------------------------|-----------------------------|
| 4,431,288 | 4,484,288 | 4,485,288 |

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 13.7 | 13.7 | 13.7 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|---|--|--|
| 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. | 13 |

The CSA will continue to actively support the ISS Operational and Medical panels and working groups that are mandated by international agreements.

The Health and Life Science Program managed by the CSA will support and initiate several activities including:

- The CSA and the Canadian Institutes of Health Research will continue their collaboration to support research on the effects of exposure to the space environment that are relevant to the aging process.
- The CSA will continue to collaborate in the European Program for Life and Physical Sciences (ELIPS). Recently, through this collaboration, Canadian researchers were eligible to apply to a European competition for bed rest and isolation studies relevant to space.
- The CSA will continue to work with the ESA, JAXA (Japan Aerospace Exploration Agency), NASA, the German Space Agency (DLR), the French Space Agency (CNES) and the Italian Space Agency (ASI) to support Canadian science experiments through coordinating space life sciences and multinational world-class scientific research.

For Additional Planning Highlights go to: <http://www.asc-csa.gc.ca/eng/publications/rp.asp#rp>

Sub-Sub-Program 1.2.3.1: Astronaut Training and Missions

Description

This Sub-Sub-Program encompasses activities associated with all phases of an astronaut career from recruitment to retirement, including space missions. This Sub-Sub-Program 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 Sub-Sub-Program 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 Sub-Sub-Program is performed with Government of Canada (GoC) organizations and foreign space agencies. This collaborative effort is formalized under contracts or international partnership agreements.

Budgetary Financial Resources (dollars)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-----------------------------|-----------------------------|-----------------------------|
| 2,179,328 | 2,213,328 | 2,213,328 |

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 8.1 | 8.1 | 8.1 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|--|---|--|
| 1. Canadian astronaut 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 mission assignments. | 4 |

Sub-Sub-Program 1.2.3.2: Operational Space Medicine

Description

This Sub-Sub-Program 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 Sub-Sub-Program is necessary to ascertain the overall health of Canadian astronauts and to monitor long-term health status.

This Sub-Sub-Program is performed with Government of Canada (GoC) organizations and foreign space agencies. This collaborative effort is formalized under contracts or international partnership agreements. This Sub-Sub-Program is also funded through the Class Grant and Contribution Program to Support Research, Awareness and Learning.

Budgetary Financial Resources (dollars)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-----------------------------|-----------------------------|-----------------------------|
| 1,033,080 | 1,053,080 | 1,053,080 |

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 2.9 | 2.9 | 2.9 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|--|--|--|
| 1. Astronauts' health is optimized to meet mission requirements. | 1. Number of active astronauts medically certified for ISS assignment and duties. | 2 |
| 2. Astronauts' long-term health is monitored following their active careers. | 1. Percentage of eligible astronauts participating in their long-term health monitoring. | 25% |

The participation of retired astronauts in health monitoring studies is voluntary. Hence, not all the same astronauts participate year after year. By targeting a minimum of 25% of participation annually the CSA can adequately monitor the health of retired astronauts over the years

Sub-Sub-Program 1.2.3.3: Health and Life Sciences

Description

This Sub-Sub-Program 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 Sub-Sub-Program develops collaborative projects with academia and industry. It uses analogue sites that offer relevant similarities with the harsh environment of space, and where exploration-related medical and life science studies are conducted. This Sub-Sub-Program 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 Sub-Sub-Program is performed with Government of Canada (GoC) organizations and foreign space agencies. This collaborative effort is formalized under contracts or international partnership agreements. This Sub-Sub-Program is also funded through the Class Grant and Contribution Program to Support Research, Awareness and Learning.

Budgetary Financial Resources (dollars)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-----------------------------|-----------------------------|-----------------------------|
| 1,218,880 | 1,217,880 | 1,218,880 |

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 2.7 | 2.7 | 2.7 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|---|--|--|
| 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. | 9 |
| | 2. Number of partnerships addressing potential terrestrial healthcare solutions. | 2 |

Planning and Reporting Continuity

RPP 2014–15 and DPR 2013–14:

<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 (Government of Canada (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)

| 2015–16 Main Estimates | 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|---------------------------|-----------------------------|-----------------------------|-----------------------------|
| 66,268,193 | 66,268,193 | 66,630,064 | 66,079,416 |

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 101.0 | 101.0 | 101.0 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|--|---|---|
| 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 |
| | 2. Monetary value of the Canadian space sector R&D investments. | \$60 million |

The CSA will establish governance for Space Innovation with formalized internal and external consultation structures. This will allow for a more strategic and prioritized approach yielding a better return on investment of public funds in space innovation activities. In conjunction with

this governance, the CSA will pursue an Innovation to Flight strategy, addressing technology development, capability demonstration, academic partnership, and funding leveraging.

In order to align its activities with its Innovation-to-Flight strategy, the CSA will develop a program aimed at demonstrating space capabilities in relevant environmental and operational conditions, striving for effective and timely flight opportunities. The latter will include orbital (rocket launches), sub-orbital (parabolic flights, stratospheric balloons), and ground-based (analogue deployment) platforms to address technological, scientific and operational demonstration needs. This will also facilitate the qualification of new space technologies and the training of Canada’s next generation of scientists and engineers.

Sub-Program 1.3.1: Space Expertise and Proficiency

Description

This Sub-Program includes the development and enhancement of Canada’s space capacity. This Sub-Program supports research in private or public organizations and sustains the development of highly qualified personnel 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 Sub-Program 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 Sub-Program is delivered with the participation of funding agencies, Government of Canada (GoC) organizations, foreign space agencies and not-for-profit organizations. This collaborative effort is formalized under national and international partnership or contracts. This Sub-Program is also funded through the Class Grant and Contribution Program to Support Research, Awareness and Learning.

Budgetary Financial Resources (dollars)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-----------------------------|-----------------------------|-----------------------------|
| 10,015,744 | 10,066,488 | 9,968,000 |

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 40.7 | 40.7 | 40.7 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|---|--|--|
| 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. | 615 |
| 2. Research is conducted in priority areas. | 1. Number of research projects conducted through opportunities provided by the program. | 32 |
| 3. Advancement of S&T solutions for future space initiative. | 1. Number of peer-reviewed papers, reports and conference proceedings acknowledging CSA support. | 310 |

Following the successful completion of the STRATO-SCIENCE 2014 stratospheric balloon campaign, the CSA will work to further increase the efficiency of the STRATOS program to support the next scientific balloon campaign to be held in August–September 2015. Instruments from several Canadian universities and organizations will benefit from these flight opportunities.

The CSA will continue the Flights for the Advancement of Science and Technology (FAST) activities which contribute to the development of Highly Qualified Personnel (HQP), including hands-on experience on sub-orbital platform flights. For the FAST 2013 grantees, the CSA will continue to support their work with a view to providing access to stratospheric balloons and parabolic flight aircraft. The CSA will also initiate a new FAST 2015 Announcement of Opportunity and fund new grantees accordingly.

For Additional Planning Highlights go to: <http://www.asc-csa.gc.ca/eng/publications/rp.asp#rp>

Sub-Program 1.3.2: Space Innovation and Market Access

Description

This Sub-Program 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 Sub-Program improves Canadian industrial competitiveness so that space users are continuously well served through constantly improving optimal and cost-

effective space solutions. This Sub-Program is necessary to foster entrepreneurship that enhances Canadian industry's international positioning on commercial and government markets.

This Sub-Program 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)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-----------------------------|-----------------------------|-----------------------------|
| 50,543,049 | 50,855,176 | 50,403,016 |

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 25.4 | 25.4 | 25.4 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|--|---|---|
| 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 |
| | 2. Value of Canadian space-related goods and services exported. | \$1.6 billion |
| 2. Enhanced Canadian industry competitiveness. | 1. Number of Canadian companies successfully obtaining national /international work orders. | 100 |

The CSA will consolidate space technology development funds to industry and academia to further support future government mission in space (Government needs), industrial competitiveness and academic partnerships.

The CSA will develop a strategic framework to use grants and contributions in order to support industrial competitiveness. This will allow better reporting and long-term performance.

For Additional Planning Highlights go to: <http://www.asc-csa.gc.ca/eng/publications/rp.asp#rp>

Sub-Sub-Program 1.3.2.1: International Market Access

Description

This Sub-Sub-Program consists in facilitating foreign market access by the Canadian space industry through negotiating, implementing and managing special international arrangements. For example, in return for Canadian Space Agency (CSA) monetary contributions to the European Space Agency (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 Sub-Sub-Program is necessary as it results in increased access to foreign government market share for Canadian industry.

This Sub-Sub-Program is delivered through concluding international agreements, trade measures, or other mutually beneficial arrangements that create a favorable political or trade environment that facilitates access to global markets. This Sub-Sub Program is funded through the European Space Agency Contributions program.

Budgetary Financial Resources (dollars)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-----------------------------|-----------------------------|-----------------------------|
| 26,720,216 | 27,525,216 | 27,068,216 |

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 2.5 | 2.5 | 2.5 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|--|---|--|
| 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 |

| | | |
|--|---|--|
| 2. The Canadian industry has access to flight opportunities for its space technologies and 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) |
|--|---|--|

Sub-Sub-Program 1.3.2.2: Enabling Technology Development

Description

This Sub-Sub-Program 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 Sub-Sub-Program 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 Sub-Sub-Program is performed with industry and is formalized under contracts. This Sub-Sub-Program is also funded through the Class Grant and Contribution Program to Support Research, Awareness and Learning.

Budgetary Financial Resources (dollars)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-----------------------------|-----------------------------|-----------------------------|
| 23,822,833 | 23,329,960 | 23,334,800 |

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 23.0 | 23.0 | 23.0 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|---|--|--|
| 1. Increased technological capability of Canadian industry. | 1. Number of different technologies addressed. | 60 |

Sub-Program 1.3.3: Qualifying and Testing Services

Description

This Sub-Program 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 of Canada (GoC) organizations, and industry, as well as international partners and clients. This Sub-Program is necessary to ensure that mission-assigned technology and entire systems can safely 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 Sub-Program is delivered by the CSA's David Florida Laboratory on a fee-for-service basis.

Budgetary Financial Resources (dollars)

| 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|-----------------------------|-----------------------------|-----------------------------|
| 5,709,400 | 5,708,400 | 5,708,400 |

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 34.9 | 34.9 | 34.9 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|---|--|---|
| 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% or more |

The David Florida Laboratory (DFL) will continue to provide cost-effective 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. The CSA will continue to make its test, research and qualification facilities more accessible and available to academia and the Canadian space industry.

The CSA is reviewing and developing options to ensure long-term viability of this world-class facility.

For Additional Planning Highlights for the Sub-Programs go to:

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

Planning and Reporting Continuity:

RPP 2014–15 and DPR 2013–14:

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

To learn more about the Space Technology Development Program go to:

<http://www.asc-csa.gc.ca/eng/programs/stdp/default.asp>

To learn more about a model of international cooperation with European Space Agency (ESA) go to: <http://www.asc-csa.gc.ca/eng/programs/esa/default.asp>

To learn more about David Florida Laboratory (DFL) – Qualifying and testing services go to:

<http://www.asc-csa.gc.ca/eng/dfl/facilities.asp>

To learn more about Stratospheric balloons (Stratos) go to:

<http://www.asc-csa.gc.ca/eng/sciences/balloons/default.asp>

To learn more about the Flights for the Advancement of Science and Technology (FAST 2013) go to: <http://www.asc-csa.gc.ca/eng/ao/2013-fast.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)

| 2015–16 Main Estimates | 2015–16 Planned Spending | 2016–17 Planned Spending | 2017–18 Planned Spending |
|---------------------------|-----------------------------|-----------------------------|-----------------------------|
| 45,143,208 | 45,143,208 | 43,099,920 | 42,868,304 |

Human Resources (FTEs)

| 2015–16 | 2016–17 | 2017–18 |
|---------|---------|---------|
| 235.6 | 235.6 | 235.6 |

Performance Measurement

| Expected Results | Performance Indicators | Targets to be achieved by March 31, 2016 |
|--|---|---|
| 1. Demonstration of CSA's good management. | 1. CSA's result against MAF criteria according to assessment of last round. | CSA comparison to OGDs is acceptable. |

As mentioned previously in the organizational priorities section, the CSA will continue to support the Minister of Industry.

The CSA is currently drafting a CSA Strategy that identifies a clear role for the CSA within the Canadian Space Program and a common vision with which to focus and drive sound investment decision making, all based on the current and future context defined by federal government strategies, plans and space sector reports.

The CSA will continue 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 are fully realized.

The CSA 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.

The CSA will continue to implement its people effective management strategy, an integrated three-year strategy that focuses on improving working conditions, ensuring healthy and empowering work environments, establishing a productive and skilled workforce, and delivering internal services that are modern, efficient and relevant to customers.

The CSA will implement its three-year information management and information technology strategy. This strategy aims to manage effectively and efficiently all operational information assets, and the organization’s IT applications, according to their life cycle, to support all employees as part of their duties.

The CSA will continue the implementation of a five-year Evaluation Plan as well as Performance Measurement Strategies.

The CSA will continue the monitoring of management action plans developed in response to audits and evaluations as well as third party recommendations.

Section III: Supplementary Information

Future-Oriented Statement of Operations

The future-oriented condensed statement of operations provides a general overview of the CSA's operations. The forecast of financial information on expenses and revenues is prepared on an accrual accounting basis to strengthen accountability and to improve transparency and financial management.

Because the future-oriented condensed statement of operations is prepared on an accrual accounting basis, and the forecast and planned spending amounts presented in other sections of the Report on Plans and Priorities are prepared on an expenditure basis, amounts differ.

A more detailed future-oriented statement of operations and associated notes, including a reconciliation of the net cost of operations to the requested authorities, can be found on the CSA's websiteⁱⁱⁱ.

Future-Oriented Condensed Statement of Operations For the Year Ended March 31 (dollars)

| Financial information | 2014–15 Estimated Results | 2015–16 Planned Results | Difference |
|------------------------------|--------------------------------------|------------------------------------|-------------------|
| Total expenses | 340,905,491 | 357,243,570 | 16,338,079 |
| Total revenues | - | - | - |
| Net cost of operations | 340,905,491 | 357,243,570 | 16,338,079 |

Expenses

Total expenses, estimated on an accrual accounting basis, are projected to be \$357,243,570 in 2015–16 and are substantially the same level as estimated in 2014–15 (\$340,905,491), an increase of \$16,338,079. A significant portion of these expenses is broken down as follows: \$102,367,455 in professional and special services, \$77,042,309 in amortization and \$70,929,207 in salaries and fringe benefits. These expenses include planned spending presented in this RPP as well as expenses such as amortization, services provided without charge by other government departments, and severance benefits and vacation pay liability adjustments.

Revenues

Total revenues in 2015–16 are projected to be \$3,189,335, most of which are constituted of sales of goods and services. The Agency’s spendable revenues will be nil since the Agency has no authority regarding their disposition.

Supplementary Information Tables

The supplementary information tables listed in the 2015–16 Report on Plans and Priorities^{iv} can be found on the CSA’s website.

Details on Transfer Payment Programs of \$5 Million or More;
Status Report on Transformational and Major Crown Projects;
Upcoming Internal Audits and Evaluations over the next three fiscal years; and
Greening Government Operations.

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 publishes cost estimates and projections for these measures annually in the [*Tax Expenditures and Evaluations*](#)^v publication. The tax measures presented in the Tax Expenditures and Evaluations publication are the sole responsibility of the Minister of Finance.

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.

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.

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.

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. 2015–16 Main Estimates, <http://publiservice.tbs-sct.gc.ca/ems-sgd/esp-pbc/me-bpd-eng.asp>
- iii. Detailed future-oriented statement of operations, <http://www.asc-csa.gc.ca/eng/publications/rp.asp#rp>
- iv. 2015–16 Report on Plans and Priorities, <http://www.asc-csa.gc.ca/eng/publications/rp.asp#rp>
- v. Tax Expenditures and Evaluations publication, <http://www.fin.gc.ca/purl/taxexp-eng.asp>