CANADIAN SPACE AGENCY

Performance Report
For the period ending
March 31, 2005

David L. Emerson
Minister of Industry

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SECTION: 1 Message

1.1 Minister's Message

A key priority of the Government of Canada is building an economy that will meet the challenges of the 21st century; an economy that is knowledge-based, technology-driven, and globally oriented. In support of this goal, the Canadian Space Agency (CSA) and the 14 members of the Industry Portfolio encourage innovative basic and advanced research, promote the commercialization and the adoption of new technologies and support the diffusion of transformative ideas throughout our economy. We also work to forge new and improved relationships with international partners, including emerging markets, in science and specialized technical areas. Essential to this work is a framework of marketplace regulations and laws that encourages innovation and stable growth. Through our efforts, the Industry Portfolio is helping to build a world-leading economy driven by talent, ideas and initiative.

The organizational members of the Industry Portfolio are:

- Atlantic Canada Opportunities Agency [2]
- Business Development Bank of Canada [1]
- Economic Development Agency of Canada for Québec Regions [2]
- Canadian Space Agency
- Canadian Tourism Commission [1]
- Competition Tribunal
- Copyright Board Canada
- Enterprise Cape Breton Corporation [1] [2]
- Industry Canada
- National Research Council Canada
- Natural Sciences and Engineering Research Council of Canada
- Social Sciences and Humanities Research Council of Canada
- Standards Council of Canada [1]
- Statistics Canada
- Western Economic Diversification Canada [2]

[1] Not required to submit a Departmental Performance Report.
[2] Not a Portfolio member for the purposes of the Main Estimates.

The Industry Portfolio is composed of the Canadian Space Agency and 14 other federal departments, agencies, Crown corporations, and quasi-judicial bodies. These organizations collectively play a key role in advancing Canada's industrial and economic development as well as fostering progress in science and technology. Advancing these priorities improves the overall health of the Canadian economy, provides opportunities for all Canadians to participate in our economic development and prosperity, and contributes to the quality of life of all Canadians.

Many Industry Portfolio initiatives build upon our strategic investments in research and development and help to move publicly-funded scientific and technological advances into the marketplace. Other key activities and programs encourage business growth and help industrial sectors be more innovative. Collectively, Industry Portfolio initiatives — and more importantly the results of those initiatives — stimulate the necessary adaptive and transformative changes demanded by the global economy.

The Canadian Space Agency's *Departmental Performance Report* for the period ending March 31, 2005 describes the achievements and results of the Agency.

The mandate of the Canadian Space Agency is to promote the peaceful use and development of space, to advance the knowledge of space through science and to ensure that space science and technology provide social and economic benefits for Canadians. The CSA is achieving this mandate by implementing the Canadian Space Program (CSP) in co-operation with national and international partners and by providing strategic support to government departments and Canadian academic researchers.

As a member of the Industry Portfolio, the Canadian Space Agency has contributed to the industrial and economic development of our nation. The work and contributions of the department are part of the overall government effort to develop and foster opportunities that reflect Canada's economic and social character. Through these efforts, we are investing in our people, our enterprises, and our future — the result will be a stronger and more prosperous economy for all Canadians.

I am pleased to present the Canadian Space Agency's *Departmental Performance Report* for 2004-2005.

David L. Emerson
Minister of Industry

SECTION: 2 Management Representation Statement

Management Representation Statement

I submit, for tabling in Parliament, the 2004-2005 Departmental Performance Report (DPR) for the Canadian Space Agency.

This document has been prepared based on the reporting principles contained in the Treasury Board of Canada Secretariat's G*uide for the preparation of 2004-2005 Departmental Performance Reports.*

- It adheres to the specific reporting requirements.
- It uses an approved Business Line structure.
- It presents consistent, comprehensive, balanced and accurate information.
- It provides a basis of accountability for the results pursued or achieved with the resources and authorities entrusted to it.
- It reports finances based on approved numbers from the Estimates and the Public Accounts of Canada.

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Marc Garneau, President

Date: _____

SECTION: 3 Raison d'être

3.1 Mandate

The mandate of the Agency is "*to promote the peaceful use and development of space, to advance the knowledge of space through science and to ensure that space science and technology provide social and economic benefits for Canadians*."

The Canadian Space Agency (CSA) is achieving this mandate by implementing the Canadian Space Program (CSP) in co-operation with other government departments/agencies, industries, and universities, as well as international partners. In addition to delivering its own programs, the CSA is responsible for co-ordinating all federal and civil, space-related policies and programs pertaining to science and technology research, industrial development, and international co-operation.

In February 2005, the Government of Canada approved a new Canadian Space Strategy, which reaffirms the mandate and, since April 1, 2005, orients the activities of the CSA supporting the priorities of Canada, and delivering social and economic benefits to Canadians.

To learn more about the CSA's mandate, go to: http://www.space.gc.ca/asc/eng/about/mission.asp

3.2 National and Internationals Partnerships

The CSA works closely with several government departments and agencies, most notably the Canada Centre for Remote Sensing (CCRS) of Natural Resources Canada, which operates satellite data ground receiving stations, and the Communications Research Centre (CRC) of Industry Canada, which manages satellite communications programs on behalf of the Agency. The CSA has close co-operation links with the National Research Council (NRC), the Department of National Defence (DND), Foreign Affairs, International Trade, Industry Canada, Environment Canada, Fisheries and Oceans, and Natural Resources Canada. Canada's space industry and academic community have been and will remain the principal means through which the Government of Canada achieves its space objectives and derives ensuing benefits. For this reason, the CSA also works very closely with these communities in the planning and implementation of the CSP in a collaborative effort towards priority public policy objectives.

From the very beginning, international co-operation has been an essential element to the implementation of the CSP. Canada co-operates with a number of international partners and has ties to various space agencies. The United States (US) National Aeronautics and Space Administration (NASA) and the European Space Agency (ESA) remain Canada's principal international partners. As space science and technologies expand in other established and newly formed space-faring nations, so too are Canada's efforts to establish collaborative relationships.

To learn more about Canadian and international partners, go to:
http://www.space.gc.ca/asc/eng/industry/csd_search.asp
http://www.space.gc.ca/asc/eng/resources/links_agencies.asp

SECTION: 4 Strategic Context

Over the planning horizon of this Departmental Performance Report (DPR), the Canadian Space Agency (CSA) delivered the Canadian Space Program (CSP) in the context of a challenging international and national space sector.

4.1 International Environment

In the global context, space is recognised by industrialised nations as an essential and strategic tool to meet their social and economic objectives. Accordingly, many governments around the world are looking for increased consolidation and advancement of their space capabilities. Space activities are global in scope and thus favour co-operation between nations with common goals. Canada must therefore possess a space infrastructure to not only meet its specific national needs, but to also play a tangible and visible role in responding to the issues that interest the international community.

Canada is regarded as a reliable partner, that possesses unique technical and scientific capabilities, and as a nation that can meaningfully contribute to the initiatives of foreign space agencies. In particular, emerging space-faring countries in Asia and South America may offer high potential for future co-operation. Consequently, Canada maintains its efforts to establish a foothold in these emerging markets. It is of paramount importance for the CSA to continue to work with its stakeholders to ensure that our research community and industry remain active and competitive vis-à-vis world standards and markets.

The perception of Canada's space industry as being internationally competitive is confirmed by the results of the 2004 Annual Survey of the Canadian Space Sector. With exports representing 49% ($1.2B)[1] of the industry's total revenues, Canada has a higher percentage of exports than any other major space-faring nation. It is interesting to note that the destination of Canada space exports is balanced with 46% generally destined to the US, 36% to Europe, and 8% to Asia.[2]

4.2 National Environment

The Canadian Space Agency recognises that the best means of turning scientific and technological advancements into innovative products and services is through Canadian universities and industry. The CSA firmly believes that industry is the best vehicle for providing a broad range of technologies and expertise to diverse groups of users – from individuals to public and private organisations, both in Canada and abroad. With its highly skilled workforce, the space industry in Canada not only generates wealth in our economy, but also provides Canadians with competitive products and services that would otherwise have to be procured from foreign sources.

[1] Overall Revenues, Domestic v. Export Revenues, State of the Canadian Space Sector 2004
[2] Export Revenues, State of the Canadian Space Sector 2004

In 2004, Canada's space industry generated $2.4 billion in revenues[3]. Satellite Communications continued to generate the lion's share of the Canadian space sector's revenues with a total of $1.83 billion. A breakdown of the revenues by sectors of activity is as follows: Satellite Communications: 74.8% ($1.83 billion); Earth Observation: 8.6% ($211 million); Navigation: 8.7% ($212 million); Robotics 5.0% ($122 million); Space Science 2.5% ($61 million); and, all space-related activities in areas other than those mentioned above 0.4% ($9 million)[4]. While small in number of firms, the Canadian space sector is knowledge-intensive and at the forefront of research and innovation. Building on the strengths of 7,445 highly skilled workers[5], Canadian firms have acquired world-leading capabilities in niche areas such as Earth Observation, space Robotics and Satellite Communications.

Given that the national market is relatively small, it is critical that the Canadian industry is able to leverage foreign investments and generate export sales. Capitalising on export revenue depends on the industry's ability to commercialise highly competitive products and services, and establish local partnerships. The Government of Canada plays a critical role in helping to establish such partnerships, facilitate trade relations and export opportunities, and secure a strategic role for Canadian industry and academia on important international space initiatives.

4.3 CSA Business Planning and Management

In 2004-2005, the CSA finalised the development of the Canadian Space Strategy and pursued the implementation of the CSA Management Accountability Framework (MAF).

Canadian Space Strategy

In keeping with its objective of being an open and transparent organisation, CSA strategic planning was done in full consultation with its Canadian stakeholders, particularly through the use of Advisory Groups. This resulted in the development and approval of the Canadian Space Strategy by the Government of Canada in February 2005, along with a revision of the CSA's strategic outcomes and targeted results that define how the Canadian Space Program is managed since April 1, 2005. The Agency will, in future, focus it efforts, activities and investments to generate interest and drive scientific and technological excellence through the four strategic thrusts related to: Earth Observation; Space Science and Exploration; Satellite Communications; and, Space Awareness and Learning.

To learn more about the Canadian Space Strategy, go to:
http://www.espace.gc.ca/asc/pdf/strategy.pdf

[3] Overall Revenues, State of the Canadian Space Sector 2004
[4] Revenues by Sectors of Activity, State of the Canadian Space Sector 2004
[5] Space Sector Workforce, Workforce Groups, State of the Canadian Space Sector 2004

Management Accountability Framework

Since 2002, the CSA has made significant progress in improving its management practices. The CSA Audit, Evaluation and Review Directorate produced two progress reports in December 2002 and in February 2004; both indicating that the CSA was well on its way to achieving the goals set by the Management Modernization Action Plan. Through the transition from the Modern Comptrollership initiative to the implementation of the Management Accountability Framework (MAF) put forward by Treasury Board, the CSA pursued the improvement of its management practices by:

- approving a strategic plan for each of the four thrusts of the Canadian Space Strategy;
- approving a corporate risk profile;
- developing a Program Activity Architecture (PAA) linking the strategic outcomes to program activities;
- setting-up management planning and reporting structures supported by systems that integrate financial and performance information on a 3-year horizon;
- developing a training program for managers leading to the acquisition of modern management competencies;
- implementing targeted staffing initiatives under the Human Resources Strategic Plan; and,
- creating the positions of Chief Information Officer (CIO) and Director General, Policy, Planning and Relations (DG, PPR) to strengthen its corporate governance.

To learn more about the 2002 and 2004 CSA Management Modernization Action Plan progress reports, go to:
http://www.espace.gc.ca/asc/eng/resources/publications/comptrollership.asp
http://www.espace.gc.ca/asc/eng/resources/publications/comptrollership-dec2003.asp

To learn more about the CSA internal Management Accountability Framework (MAF) Capacity Assessment Report 2004-2005, go to: http://www.space.gc.ca/maf

To learn more about internal audit reports on the implementation of the Project Approval and Management Framework, go to: http://www.space.gc.ca/asc/eng/resources/publications/ar-0304-0104.asp; and on the follow-up to the Management Action Plans 2004, go to: http://www.space.gc.ca/asc/eng/resources/publications/management-2004.asp

SECTION: 5 Summary Information

5.1 Overview of the Canadian Space Agency

In order to grasp the full meaning of the CSA's performance for Canadians, it is important to link Canadian Space Agency programs and activities with the Government of Canada's main objectives, as outlined in its annual *Canada's Performance* report. Through the attainment of its strategic outcomes, the Canadian Space Agency has contributed in various degrees to two of the three key focus areas of the federal government, namely: "Sustainable Economy" and "Canada's Place in the World".

CSA contributions to Canada's Sustainable Economy

The CSA contributes to *Canada's Performance*, as measured against the following outcomes:

- sustainable economic growth;
- an innovative and knowledge-based economy;
- income security and employment for Canadians; and,
- a clean and healthy environment.

The space industry offers tremendous potential to contribute to Canada's economic well being and help achieve the highest possible standard of living and quality of life for all Canadians.

Through its R&D investments and the resulting transfers of applications to the private and public sectors, CSA programs and activities attract highly skilled labour that contributes to Canada's knowledge-based economy; help enhance the Canadian space industry's competitiveness by encouraging dynamic trade relationships with other nations; and, increase Canada's ability to compete in the global marketplace.

Earth Observation missions drive some of the changes that are improving our quality of life by helping our government deliver on priorities such as protection of the environment, sustainable development, management of natural resources, understanding climate change, and providing support for disaster management.

CSA contributions to Canada's Place in the World

The CSA contributes to *Canada's Performance*, as measured against the following outcomes:

- a strong and mutually beneficial North American partnership;
- a safe and secure world; and,
- increased development worldwide with a high quality of life.

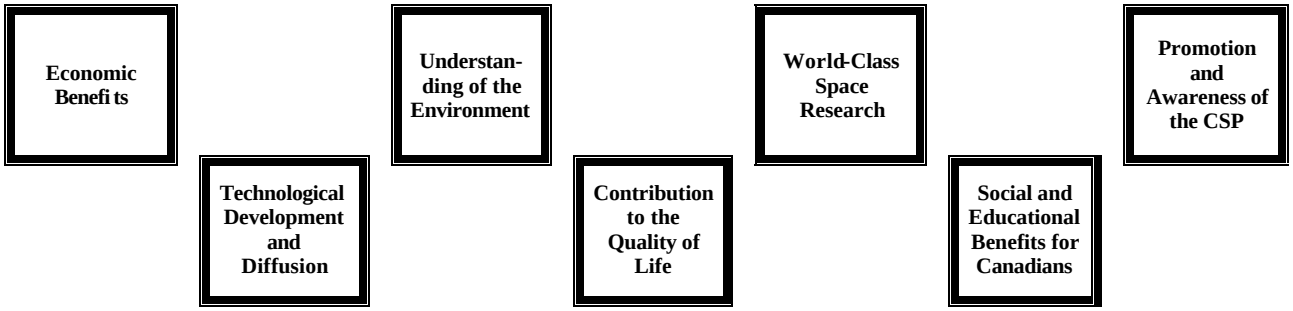
The global landscape has changed significantly over the past few years, thus tremendously increasing the need to bring peace, stability and development to many countries around the world.

With its space exploration, science and technology endeavours, which often involve international partners, the CSA plays a role of influence in building bridges between an increasing number of spare-faring countries. In striving to become one of the most advanced, connected, and innovative nations in the world, Canada offers and shares tremendous opportunities for the development and safety of the global community through the peaceful use of space.

CSA CONTRIBUTIONS TO GOVERNMENT OF CANADA OUTCOMES

GOVERNMENT OF CANADA OUTCOMES	
Sustainable Economy	**Canada's Place in the World**
1. Sustainable economic growth 2. An innovative and knowledge-based economy 3. Income security and employment for Canadians 4. A clean and healthy environment	1. A strong and mutually beneficial North American partnership 2. A safe and secure world 3. Increased development worldwide with a high quality of life

CSA STRATEGIC OUTCOMES



It is important to note that over the past two years, the Canadian Space Agency has carried out a vast consultation with representatives of the federal government, academia, science and research communities, and the space industry on the development of the new Canadian Space Strategy that was approved by the Government of Canada in February 2005. Subsequently, the CSA has substantially revised its strategic outcomes and added performance indicators through the implementation of a new Program Activity Architecture (PAA). In the 2005-2006 Departmental Performance Report (DPR), the display of information will be significantly improved in terms of results-based reporting that make explanations of the benefits for Canadians more obvious and pertinent.

To learn more about the Canadian Space Strategy and the CSA Program Activity Architecture, go to: Section 9: Supplementary Information

Summary of Main Accomplishments in relationship to CSA Departmental Strategic Outcomes and 2004-2005 Priorities

			$ in millions	
Strategic Outcomes	**2004-2005 Priorities**	**Main Accomplishments Highlights**	**Planned Spending**	**Actual Spending**
Economic Benefits	Implement the new CASSIOPE mission integrating the CASCADE telecommunication payload and the e-POP scientific instrument in a single Canadian small satellite bus. Complete the development of RADARSAT-2 Completion of the testing prior to launch of Dextre, the third element of the Mobile Servicing System.	In cooperation with Canadian industry and academia, the CASSIOPE mission successfully completed the preliminary design review. (See p.21) Assembly and testing of RADARSAT-2 main spacecraft sub-system elements progressed significantly. Completion of full satellite integration and test was delayed and the launch is now planned in FY 2006-2007. (See p.24) End-to-End testing is completed and Dextre is ready for launch. (See p.28)	167.6	128.6
Technological Development and Diffusion	Enhance competitiveness of the Canadian space industry	A total of 49 contracts were awarded out of 126 proposals received for a total sum of $17.3 million. (See p.34) Completion of the Intellectual Property Management Policy and of a Guide of space technologies available to Canadian industry for transfer and commercialisation. (See p.35)	43.2	49.8

			$ in millions	
Strategic Outcomes	**2004-2005 Priorities**	**Main Accomplishments Highlights**	**Planned Spending**	**Actual Spending**
Understanding of the Environment	Support the collection of data on the environment by developing and operating Canadian satellites	Several federal departments are benefiting from new Earth Observation applications in support of more effective approaches to delivering their mandate especially with regards to the protection of the environment and navigation safety. (See p. 40)	30.0	23.5
Contribution to the Quality of Life	Develop Canadian experiments in Space Life Sciences	Due to the loss of the Space Shuttle Columbia, the timetable of projects was delayed. Meanwhile, the CSA has been concentrating on developing new research concepts in anticipation of Return to Flight in July 2005. (See p. 44)	23.4	10.6
World-Class Space Research	Contribute to the understanding of the universe by developing and operating space scientific instruments	The development of a Fine Guidance Sensor for NASA's James Webb next generation space telescope. (See p. 47) MOST, Canada's first space telescope continues to perform flawlessly leading to the publication of landmark scientific results. (See p. 48) The provision of world-class and cost effective environmental space qualification services at the David Florida Laboratory. (See p. 48)	36.2	35.9

			$ in millions	
Strategic Outcomes	**2004-2005 Priorities**	**Main Accomplishments Highlights**	**Planned Spending**	**Actual Spending**
Social and Educational Benefits for Canadians	Improve scientific literacy among Canadian students and educators	An increase in educator and student participation in the space-centered learning initiatives. (See p.51) An expanded network of partnered initiatives in response to an increasing demand for educational materials and support. (See p.51) The implementation of the Grants and Contributions Programs, in partnership with other federal departments and agencies, to support awareness, research and training in space science and technology. (See p.54)	2.0	1.3
Promotion and Awareness of the CSP	Broaden public awareness of the Canadian Space Program	Proactive communications focused on major space achievements. (See p.56)	5.4	5.7

Total Financial Resources ($ in millions)

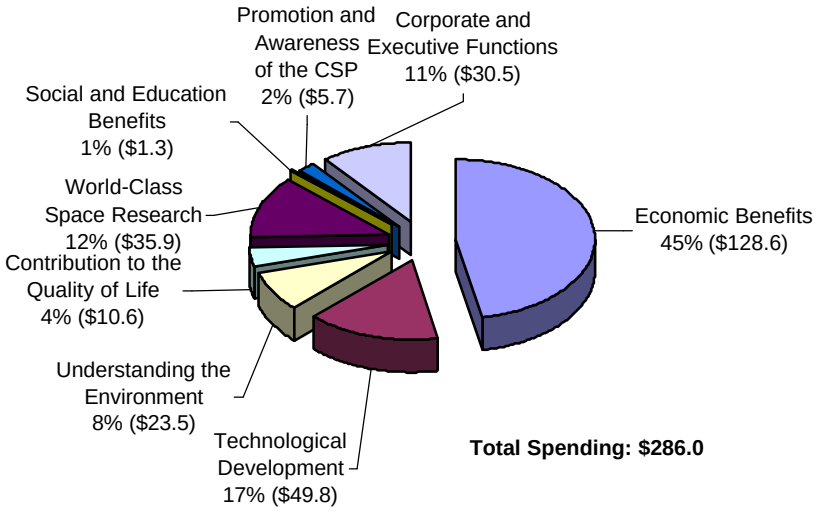
Planned	Authorities	Actual
334.3	327.4	286.0

Total Human Resources (FTE)

Planned	Authorities	Actual
614	614	573

Any significant variance reported against Planned Spending set in the 2004-2005 RPP is explained in Section 7 - Spending by Strategic Outcome.

FIGURE 1: Actual Spending by Strategic Outcomes for 2004-2005 (Percentage and Millions)



SECTION: 6 Performance by Strategic Outcome

Throughout the fiscal year, the CSA continued the development of the Canadian Space Strategy, approved by the Government of Canada in February 2005, along with a revision of its Strategic Outcomes for 2005-2006. At the same time, the CSA developed and refined its results-based performance measurement regime.

Therefore, this Departmental Performance Report is the last one to present the CSA performance according to the Strategic Outcomes established under the 1999 Planning and Reporting Accountability Structure (PRAS).

Strategic Outcome	**✧Economic Benefits**

STRATEGIC OUTCOME OBJECTIVES

The Strategic Outcome *Economic Benefits* has the following three objectives:

- develop space technologies and terrestrial applications to maintain Canada's world leadership in its traditional sectors (e.g., Satellite Communications, radar technology for Earth Observation, and space Robotics);
- leverage federal funding and transfer expertise to the private sector through partnerships with industry to facilitate the development of commercial applications of space technologies; and,
- encourage the participation of a growing number of firms in space-related activities, particularly small and medium-sized enterprises (SMEs), thereby pursuing sustainable industrial regional development.

KEY PARTNERS

The CSA recognises that the attainment of this Strategic Outcome requires the combined resources and sustained effort of several partners over a long period of time.

The CSA is working with a growing number of firms, especially SMEs, in space-related activities. By leveraging resources from international partnerships, the CSA and Canadian industry have expanded opportunities to develop or maintain expertise in core areas, to access new markets and to position themselves for follow-on activities leading to economic returns.

The CSA is also working alongside or carrying out ongoing consultations with other federal departments and agencies such as:

- Natural Resources Canada (NRCan), Canada Centre for Remote Sensing (CCRS)
- Department of Fisheries and Oceans Canada (DFO), Canadian Hydrographic Service (CHS)
- Department of National Defence (DND)
- Environment Canada (EC)
- Industry Canada, including the Communication Research Centre (CRC)
- National Research Council of Canada (NRC)
- Agriculture and Agri-Food Canada (AAFC)
- Department of International Trade (DIT)
- Foreign Affairs Canada (FAC)
- Canadian Commercial Corporation (CCC)
- Canadian Foundation for Innovation (CFI)
- Canadian Research Chair Program
- Economic Development Agency of Canada for the Regions of Québec (CED)
- Western Economic Diversification Canada (WED)
- Atlantic Canada Opportunities Agency (ACOA)

Spending for the Strategic Outcome Economic Benefits

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
167.6	149.4	128.6	134.0

This strategic outcome encompasses three main sectors: Satellite Communications, Earth Observation, and the Canadian Space Station Program (CSSP).

Satellite Communications

Emerging space technologies and broadband applications hold the promise of connecting urban, rural and remote communities, so that every citizen can have access to the information highway. Moreover, applications using Global Positioning System (GPS) satellites, have become integral to air and land navigation, vehicle tracking, and even in the prediction of earthquakes and volcanoes.

Satellite Communications is the largest space-sector activity in Canada with sales of more than $1.83 billion, representing 74.8% of total space industry revenues. In relation, Satellite Navigation, tracked separately from the aforementioned, generated revenues of $212 million and represents 8.7% of the total space revenues; therefore, making it the

second largest space-sector activity[6]. The North American global satellite navigation market alone has grown by nearly 90% between 2000 and 2003[7], with Canadian industry among the leading innovators and suppliers. The Canadian industry aims at responding to globalisation challenges by further securing its niche expertise in the fields of sub-systems, components and applications for the growing international space-based multi-media, mobile personal communications and navigation markets. This strategy demands important investment in research and development (R&D), as well as adequate CSA programs to help the industry develop advanced technologies and expertise. National priorities in this area are security and surveillance requirements, whereas initiatives of global importance are related to communications during natural disasters.

PROGRAMS

The **Canada/ESA Satellite Communications Programs** enhance the industry's technological base and provide access to European markets in advanced telecommunication areas such as Multi-Media, Optical Inter-Satellite and Mobile Communications.

Spending for the Canada/ESA Satellite Communications Programs

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
14.5	12.2	12.2	-

The **CASSIOPE Mission** is funded through a CSA contribution program to support the integration on a single Canadian small satellite bus of two payloads, the CASCADE telecommunications Ka-band component and the enhanced-Polar Outflow Probe (e-POP) scientific payload.

Spending for the CASSIOPE Mission Contribution Program

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
14.0	9.0	9.0	3.3

Any significant variance reported against Planned Spending set in the 2004-2005 RPP is explained in Section 7 - Spending by Strategic Outcome.

[6] Revenues by Sectors of Activity, State of the Canadian Space Sector 2004

[7] *Canadian GNSS Sector Study*; Canadian Space Agency, Natural Resources Canada, Department of National Defence and Industry Canada (2005)

MAIN ACCOMPLISHMENTS AGAINST
2004-2005 RPP PLANNED RESULTS
Economic Benefits: Satellite Communications

Planned Result: Integrate an advanced Ka-band multi-media payload on the Anik F2 satellite. By demonstrating the capability of this multi-media service throughout North America, this private/public sector partnership program will position Canadian industry on the international market both as a supplier of advanced components and as a service provider for the next generation of satellite communications systems.

Main Accomplishment: On July 17, 2004, at a remote outpost in French Guiana, the Anik F2 satellite was launched into orbit above the equator. The launch of the world's largest and heaviest commercial communications satellite followed a careful 4.5–year planning and production phase. After a successful two months of post-launch and in-orbit testing, Anik F2 went into commercial services in early October 2004. As of April 2005, Telesat Canada has been using the Ka-band payload to deliver multi-media services in Canada and, through WildBlue Communications Inc, in the United States. The Ka-band capacity available aboard Anik F2 is sufficient to support 150,000 users.

Through its support of the Anik F2, the Government of Canada has secured a Government Capacity Credit access worth $50 million over the next 11 years. The CSA has transferred this Capacity Credit to the National Satellite Initiative (NSI) to support the Government's connectivity agenda for the remote and underserved northern rural community.

The CSA has deployed a DVB-RCS hub in Telesat's Vancouver Facility to demonstrate Ka-band applications and services over Anik F2's four northern beams. A pilot project demonstration phase will be conducted over the next several months to encourage northern communities to utilise the capacity credit to deliver telehealth and tele-education services to their remote communities. NSI and relevant other government departments support will be critical to fund and deploy the required Ground Infrastructure facilities.

To learn more about the Anik F2 satellite, go to:
http://www.space.gc.ca/asc/eng/satellites/anikf2.asp

Planned Result: Canada’s participation in European Space Agency (ESA) programs allows our industry to: access forward-looking studies on new telecommunications services; develop new technologies, equipment and applications in multi-media, optical inter-satellite and mobile communications; and, demonstrate satellite-based communications services such as interactive communications services for remote communities and disaster management.

Main Accomplishment: Leading Canadian companies received contracts for: the development of a return link satellite system and low-cost broadband terminals following the new international DVB-RCS standard (EMS Technologies); optical inter-satellite links (COMDEV); satellite navigation high-precision Galileo receivers (NOVATEL);

and, the development of a telemedicine system to allow remote consultations and treatment monitoring for patients with mental health problems (Robotics Evaluation and Characterization - REACH, a consortium of companies lead by Telesat). On the disaster management side, the REMSAT project led by Telesat was successfully demonstrated in British Columbia, where satellite technologies were used to help fight forest fires. BC Forest Fires is now using the developed technology in their operations.

To learn more about Canada's participation in ESA programs and advanced research in telecommunications, go to: http://www.space.gc.ca/asc/eng/industry/esa.asp

Planned Result: In 2003-2004, as part of the CASSIOPE Mission Contribution Program, the CSA initiated the development and demonstration of the CASCADE telecommunications payload on a Canadian small satellite bus that will be fully designed and constructed by Canadian companies during the next three years (2004-2007). CASCADE is the precursor of communication satellite constellations that will help position Canadian industry on the international market both as a supplier of advanced components and as a service provider.

Main Accomplishment: The preliminary design phase of the CASCADE telecommunications payload was successfully completed in November 2004. The detailed design phase is now underway and on schedule for critical review by end of 2005-2006. Parts are now being procured and construction of the space and ground hardware will begin later this year.

Planned Result: As part of the Space Technologies Development Program, space manufacturing companies were awarded contracts worth $12 million in satellite communication and navigation R&D.

Main Accomplishment: Through this initiative, more than 20 contracts were awarded to the Canadian Space Industry. This led to the next critical step in the previously funded CSA Accelerated Satcom Technology Research and Development (CASTOR) initiative, which resulted in the awarding of $8 million worth of projects in the 2003-2004 timeframe. These initiatives were critical in sustaining the Canadian Space Industry during a period of economic downturn in the world market. Companies such as Novatel (Calgary) and EMS SatNet (Montréal) were able to gain market shares and impose their technologies in the very competitive international markets, thanks to support provided by the CSA in aid of innovation and economic development.

Earth Observation

Earth Observation (EO) is the third largest Canadian space-sector activity with annual revenues of $211 million, representing 8.6% of total space industry revenues[8]. It is an innovative, technologically advanced industry capable of developing products and services which contribute to natural resources management, environmental monitoring, and surveillance and security activities (such as response to natural disasters).

PROGRAMS

RADARSAT-1 is an advanced Earth Observation satellite system developed by Canada to monitor environmental change and to support resource sustainability. RADARSAT-1 has now greatly exceeded its 5-year nominal lifetime and is entering its 10th year of operation, delivering critical information to over 600 clients in 60 countries worldwide. Unless the satellite fails, operations are due to continue at least until the full commissioning of its successor, RADARSAT-2.

Spending for the RADARSAT-1 Program

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
12.6	10.4	10.4	19.8

The **RADARSAT-2 Development Program** incorporates advanced technologies such as higher resolution and polarimetric modes to ensure continuity in radar data supply, maintain Canadian leadership in this technology, and open up new international remote sensing markets for the value-added industry.

Spending for the RADARSAT-2 Development Program

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
32.0	29.4	10.9	4.9

[8] Revenues by Sectors of Activity, State of the Canadian Space Sector 2004

Earth Observation Support Programs aim to enhance Canada's ground receiving and data processing systems, to develop value-added commercial applications based on data from RADARSAT and other satellites, and to develop advanced imager technologies for the next generation of EO missions.

Spending for the Earth Observation Support Programs

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
27.8	19.3	18.5	8.2

Canada/ESA Earth Observation Programs enhance the industry's technological base and provide access to European markets for value-added products and services derived from satellite-based EO data in areas such as radar technologies, hyper-and multi-spectral application development, sensor instrument calibration facility, and sensor-data algorithm development.

Spending for the Canada/ESA Earth Observation Programs

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
9.8	15.6	15.6	-

Any significant variance reported against Planned Spending set in the 2004-2005 RPP is explained in Section 7 - Spending by Strategic Outcome.

MAIN ACCOMPLISHMENTS AGAINST 2004-2005 RPP PLANNED RESULTS

Economic Benefits: Earth Observation

Planned Result: The continuation of RADARSAT-1 operations with the same level of high performance for satellite reliability and image production, so as to ensure the supply of data until full commissioning of RADARSAT-2.

Main Accomplishment: RADARSAT-1 was successfully operated and managed for another year, meeting the data needs of: national and international clients, such as governments, Canadian Ice Services (CIS), NASA and, the US National Oceanic and Atmospheric Administration (NOAA); and, industry, such as RADARSAT International (RSI). This was done with a system performance rating of better than 95% and specified image quality. The global network of ground data receiving stations is still growing with 32 network stations around the globe now receiving RADARSAT-1 data directly. RADARSAT-1 also supported 13 natural disaster events in 11 different countries (including the December 2004 tsunami) under the "Space and Major Disasters" International Charter.

Furthermore, the Center for Southeastern Tropical Advanced Remote Sensing (CSTARS) of the University of Miami (UM) joined the Hurricane Watch project, a Canada-US initiative. RADARSAT-1 data has contributed to significantly improve their hurricane monitoring models as it pertains to the extraction of wind field vector information.

Planned Result: Once completed, RADARSAT-2 will ensure continuous all-weather, day and night radar coverage of the entire globe for the worldwide remote sensing data market. The main activity will be the spacecraft Assembly Integration & Test to be completed in August 2005. Launch is scheduled for September 2005 and full commissioning for early 2006.

Main Accomplishments: During the last year, the assembly and testing of the main spacecraft sub-systems elements progressed significantly: the Bus Thermal and Vacuum (TVAC) Test was performed at the David Florida Laboratory, one of the two Synthetic Aperture Radar (SAR) antenna wings was assembled and tested, the payload Sensor Electronics (SE) was partially integrated on the Bus +Y panel, and deployment tests on the Extendible Support Structure (ESS) were initiated. However, the technical challenges encountered on the Payload sub-system, particularly with the Transmit Receive Modules and the Sensor Electronics, have delayed the integration of the entire spacecraft and the testing schedule, which is now planned to be completed in the second quarter of 2006. The launch is planned for the third quarter of 2006 and commissioning will be completed in early 2007.

Planned Result: The upgrade of Canada's ground systems to receive and process data from RADARSAT-2 and other new sensors of strategic interest to Canada will be available by early 2004-2005.

Main Accomplishment: The upgrades to the ground systems in the Gatineau (GSS) and Prince Albert (PASS) satellite stations, in preparation for RADARSAT-2, were successfully completed in early 2005. The Canadian Earth Observation Satellite Acquisition Management (CEOSAM) system is now operational and interfaces with the upgraded PASS and GSS Data Acquisition Facility Control (DAFControl) systems.

An interdepartmental Steering Committee was created to examine a plan for future Canadian Reception infrastructure for Earth Observation data to ensure that Canadians have access to the data they need.

The CSA ensured that data from the European ERS-1, ERS-2 and ENVISAT Advanced Synthetic Aperture Radar (ASAR) missions continued to be received, archived, processed and distributed in Canada through arrangements with the European Space Agency, and by using the facilities and expertise at Canada Centre for Remote Sensing (CCRS).

Preparations continued for the utilisation of the Government of Canada allocation of RADARSAT-2 data including: the acquisition of airborne data simulating RADARSAT-2 for the development of new applications; the launch of the SOAR (Science and Operational Applications Research for RADARSAT-2) program aimed at supporting R&D on RADARSAT-2 data; and, the adaptation of RADARSAT-1 applications to the RADARSAT-2 capacities.

Planned Result: The implementation of a Preparatory Program for using and promoting RADARSAT-2 data, including Canadian Government data allocation valued at $445 million. This program will generate several Requests for Proposals from industry, pilot and demonstration projects within the government, as well as research opportunities within the university community, and international partnership opportunities.

Main Accomplishment: Polarimetric analysis software tools were developed and made available to users during polarimetric training workshops held across the country. Several applications were upgraded in view of the utilisation of the Canadian Government data allocation on RADARSAT-2. The Canadian value-added industry is also actively upgrading commercial products and services in preparation for RADARSAT-2. In support of the applications development, CSA acquired an important set of airborne data simulating RADARSAT-2 through Environment Canada's CONVAIR 580.

The Scientific and Operational Applications Research (SOAR) program was launched with a worldwide invitation to submit Letters of Interest for research based on RADARSAT-2 data. More than 240 applications were received and reviewed.

Planned Result: The continuation of satellite data application development, technology transfer and demonstration programs (e.g., Earth Observation and Applications Development Program (EOADP), the pre-competitive R&D programs) to support the growth of Canadian value-added industry.

Main Accomplishment: The announcement of the Canadian participation to the TIGER initiative was done in collaboration with the European Space Agency (ESA). The purpose of this initiative is to develop and deliver operational systems to support water resources management in Africa. Several industrial contracts were awarded to Canadian value-added companies. TIGER is supported by several international organisations to prove that space technology can be efficiently used in developing countries to help solve basic problems such as water management.

Under the Canada-Finland Memorandum of Understanding, a series of applications development contracts were awarded to Canadian companies. These contracts allow Canadian companies to work in collaboration with their Finnish counterparts on applications of mutual interest to the two countries or in aid of penetrating world markets.

To learn more about the RADARSAT 1, go to:
http://www.space.gc.ca/asc/eng/satellites/radarsat1/default.asp

To learn more about the RADARSAT-2, go to:
http://www.space.gc.ca/asc/eng/satellites/radarsat2/default.asp

Planned Result: The development of advanced space-borne instruments and user-oriented applications by Canadian companies through the participation of Canada in ESA Programs.

Main Accomplishment: Canadian organisations participated in all aspects of ESA EO programs, including scientific, technology and user-oriented application programs. Twenty-three projects from principal Canadian investigators are currently running which exploit the ENVISAT data. A major conference was held in September 2004, which was dedicated to the presentation of scientific outcomes resulting from ENVISAT data. Canadian scientists from Meteorological Services of Canada and York University are leading an international consortium for the development of coupled chemistry-dynamic data assimilation models. In technology (and advanced systems), Canada participated in the design and breadboarding of an Elevation Feed Network subsystem of L-band Synthetic Aperture Radar (SAR) antenna (EMS Technologies).

Canadian companies (Dynacon and MDA) are contributing to the Atmospheric Dynamics Mission in the areas of attitude/orbit control rate sensor (magnetometer) and ground segment data processor (level 1b processor). An advanced uncooled microbolometer technology has been developed (by INO) for space application, and is expected to play an important role in microsat based missions.

Many Canadian value-added companies participated in GMES, the Europe's next flagship program in space. An international consortium led by C-CORE (Newfoundland) successfully completed the first phase and is expected to continue to lead the project, which deals with monitoring of the Northern environment.

Many other Canadian companies received contracts for development of user-oriented application tools and commercial market development: Vexcel Canada – Atlantis Scientific for global wetland monitoring, AMEC for land subsidence problems, Hatfield for fisheries and aquaculture, and Dendron for forestry.

To learn more about the Earth Observation and applications development, technology transfer and demonstration programs, go to: http://www.space.gc.ca/asc/eng/industry/eoadp.asp

Canadian Space Station Program

With the development of the Mobile Servicing System (MSS), designed to assemble, service and maintain the International Space Station (ISS), Canada has established itself as a vital partner in international efforts to establish a permanent human presence in space.

Under the Canadian Space Station Program (CSSP), the CSA is also responsible for the training and qualification of all astronauts and cosmonauts operating the MSS, as well as the mission controllers mandated to support robotics operations on-orbit. The CSA provides an operational support capacity at the John H. Chapman Space Centre (St-Hubert, Québec) and at the Johnson Spaceflight Center (Houston, Texas), as well as sustaining engineering and logistical support of the MSS elements on-orbit. In exchange for this contribution, Canada has rights to use up to 2.3% of non-Russian laboratories and crew time aboard the ISS.

PROGRAMS

The **MSS Operations Program** allows Canada to maintain operational capabilities, as well as provide MSS training and real-time support to robotics operations for the flight and stage portion of every mission to the ISS over the life of the Station.

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
56.1	53.4	51.9	97.4

The **ISS Utilisation and Commercialisation Program** markets use of Canada's allocation of 2.3% of the non-Russian ISS research facilities.

Spending for ISS Utilisation

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
0.8	0.1	0.1	0.5

Any significant variance reported against Planned Spending set in the 2004-2005 RPP is explained in Section 7 - Spending by Strategic Outcome.

MAIN ACCOMPLISHMENTS AGAINST
2004-2005 RPP PLANNED RESULTS
Economic Benefits: Canadian Space Station Program

Planned Result: The completion of the MSS-4 software load destined for the integration of the Dextre software into the MSS integrated flight load to support the planned testing of the element prior to launch.

Main Accomplishment: The completion of MSS-4 software development to an engineering release marked the first point where the complete Mobile Servicing System software was fully integrated. All Dextre Computer Software Configuration Items (CSCIs) were added to the previous baseline of MSS software (MSS 3.1) and the Operational Control Software (OCS) was upgraded to allow control of the entire MSS, including Canadarm2 (Space Station Remote Manipulator System (SSRMS)), the Mobile Remote Servicer (MBS) and Dextre (Special Purpose Dexterous Manipulator (SPDM)). The completion of the MSS-4 software load led directly into the Dextre end-to-end testing.

Planned Result: The completion of the end-to-end testing of Dextre (SPDM), the third element of the MSS, for launch expected in early 2007, and the continuation of the design and development of the training material for Dextre.

Main Accomplishment: The completion of Dextre's end-to-end (ETE) testing, using the MSS-4 software, successfully culminated in the Test Results Review Board on March 30, 2005. The direct ETE testing consisted of approximately 190 tests performed using Dextre's hardware to ensure accurate integration of the MSS-4 software.

Planned Result: The fulfilment of responsibilities for MSS operations: maintaining MSS hardware and software, performing repair and overhaul work on the MSS, operating MSS training facilities in Canada, planning and supporting operations of MSS missions, and commissioning initial operations of the Remote-Multi-Purpose Support Room.

Main Accomplishment: The first of the two main accomplishments of this past fiscal year was the commissioning and certification by NASA of the CSA Remote Multi-Purpose Support Room (RMPSR) in May 2004. This facility is now fully operational supporting real-time robotics operations on the International Space Station. Between its certification and up to March 31, 2005, the RMPSR was scheduled by NASA to support MSS activities for a total of 4,476 hours of real-time robotic operations and 353 hours of simulation support. During this entire period, the system was available at least 99.47% of the time and with an average of 99.8% (exceeding the 99% requirement).

The second main accomplishment was the up-linking of an enhanced and accelerated Software Load, i.e. the MSS 3.1 Integrated Flight Load for the on-orbit system. Notably, this new software load provides the capability to perform the SSRMS "Ground Control", allowing robotics operations to be executed via ground initiated commands. The commissioning phase of Ground Control Capability, the second main accomplishment of this past year, was recently completed thanks to a Canadian-led operations planning, development, and execution campaign.

On the sustaining engineering side, an update to the MSS 3.1 software was also required to fix a timing error that could not be tested in the MSS ground facilities. Two hardware failures on-orbit affected the MBS Mast Camera and one light on a Canadarm2 Camera Light Pan-Tilt Assembly (CLPA). When the opportunity presents itself during a future space walk by ISS astronauts, spares are available on-orbit to replace both the camera and the light. Activity on the ground continues to ensure that the MSS spares inventory is capable of supporting the MSS in the long-term.

During this period, the Operations Engineering (OE) Training team used the CSA HQ MSS Training facilities to train and fully qualify 16 astronauts and cosmonauts (including 2 Canadian astronauts), 6 Capsule Communicators (CAPCOMs), 14 mission controllers and 12 CSA engineers. These facilities were also used to develop a crew proficiency flow applicable to the ongoing proficiency training of astronauts and cosmonauts – both at CSA and at Johnson Space Centre (JSC) – to start the development of the crew course for Dextre, and to conduct the validation and maintenance of the MSS Robotics Operator and Mission Controler courses.

Finally, on November 9, 2004, senior NASA HQ personnel travelled to the CSA Headquarters in St-Hubert to hold a Space Flight Awareness event, the highest recognition granted by NASA for Human Space Flight. The Canadian Space Station Program team was duly recognised and congratulated for their professionalism and unflagging support to the International Space Station mission and objectives.

Planned Result: The launch of Perceptual-Motor Deficits in Space/Test of Reaction and Adaptation Capabilities (PMDIS/TRAC), the first experiment to use the Canadian ISS allocation rights during Mission STS-121/ULF1.1 and STS-115/12A scheduled for late 2004 and early 2005.

Main Accomplishment: Work continued to prepare for this mission and the hardware is now ready for launch. However, NASA has delayed the launch of this experiment as the manifests for flights STS-121/ULF1.1 and STS-115/12A were adjusted to reflect the increased priorities for Shuttle inspection tasks resulting from the Columbia incident in 2003. The PMDIS-TRAC payload is now scheduled to be aboard STS-116/12A.1 in the spring of 2006.

Planned Result: The continued support of the Microgravity Vibration Isolation System (MVIS) delivered to ESA for integration into its Fluid Science Laboratory (FSL), which will be flown on their Columbus module. This will also allow Canadian researchers access to this state-of-the-art facility.

Main Accomplishment: The testing associated with MVIS was completed during the year. Preliminary acceptance was completed with ESA. Integration testing into the FSL was initiated using the engineering model. The final component delivery of the MVIS to ESA is scheduled for June 2005. Launch of the Columbus module, containing the FSL, is scheduled for early 2007.

Planned Result: The promotion and support of the use of the ISS Research Laboratory by the Canadian scientific community.

Main Accomplishment: The CSA has been actively working with Canadian communities in the life and physical sciences (the main scientific users of the ISS) in order to continuously develop the research capacity of and interest in utilising the ISS for scientific research once the program is re-established. This has been accomplished through a regular series of Announcements of Opportunity for new research ideas and through strong support to the various international forums that are held among ISS partners to discuss the way forward in relation to ISS utilisation. The CSA is also actively developing the program in order to interest more potential partners, including industries, in utilising this unique platform.

To learn more about the Canadian contribution to International Space Station, go to:
http://www.space.gc.ca/asc/eng/iss/default.asp
http://www.space.gc.ca/asc/eng/exploration/canadarm/default.asp

Strategic Outcome	✧Technological Development and Diffusion

STRATEGIC OUTCOME OBJECTIVES

The Strategic Outcome *Technological Development and Diffusion* has the following three objectives:

- strengthen the technological base of Canadian space firms;
- position Canadian space firms to seize international space mission opportunities; and,
- maintain a focus on the technologies needed to deliver existing and future Canadian space projects.

KEY PARTNERS

The CSA has established partnerships with foreign space agencies and firms to exchange and acquire expertise, to demonstrate Canadian technologies as space-qualified products and services, and to improve access to international markets. In support of this mandate, the CSA is working with space-companies, particularly small and medium-sized enterprises, and universities and specialised research institutes, as well as performing R&D in its laboratories.

The CSA is also working alongside or carrying out ongoing consultations with other federal departments and agencies such as:

- National Research Council (NRC)
- Department of International Trade (DIT)
- Department of Foreign Affairs (DFA)
- Industry Canada (IC)
- Natural Resources Canada (NRCan)
- Natural Sciences and Engineering Research Council of Canada (NSERC)
- Canadian Foundation for Innovation (CFI)
- Canadian Research Chair Program
- Canada Economic Development for Québec Regions (CED)
- Western Economic Diversification Canada (WED)
- Atlantic Canada Opportunities Agency (ACOA)
- Department of National Defence (DND)

Spending for the Strategic Outcome Technological Development and Diffusion

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
43.2	51.3	49.8	108.4

In response to the challenges raised by globalisation, the CSA has strategically focused its programs on strengthening the technological base of space firms and positioning them to seize international space mission opportunities, while maintaining a focus on the technologies needed to deliver existing and future Canadian space projects. Considering the modest level of internal resources dedicated to technology development, the CSA is leveraging partnerships with foreign space agencies and firms to acquire expertise, demonstrate Canadian technologies as space-qualified products and services, and improve access to international markets.

PROGRAMS

Through a competitive contracting-out process, the **Space Technology Development Program** co-funds with industry, the development of high-risk technologies required for future space missions and offering a high potential for world leadership in specific areas of space technology.

Spending for the Space Technology Development Program

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
16.4	19.5	19.2	11.2

The **Technology Demonstration Program** provides flight opportunities to space-qualify technologies developed by industry.

Spending for the Technology Demonstration Program

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
2.5	1.1	1.0	2.0

The **Commercialisation Office** supports the transfer of proven space technologies to the market-place and their application in non-space products and services.

Spending for the Commercialisation Office

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
1.8	1.7	1.4	4.9

In-house Research and Development maintains a base of expertise within the Agency focusing on high-risk and innovative technology development activities to support the implementation of the Canadian Space Program, the acquisition of knowledge of worldwide technology trends, and the exploration, along with industry, of potential emerging technologies.

Spending for In-house Research and Development

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
13.5	19.5	18.7	89.6

The **CASSIOPE Mission** is a funded through CSA contribution program to support the integration on a single Canadian small satellite bus of two payloads, the CASCADE telecommunications Ka-band component and the enhanced-Polar Outflow Probe (e-POP) scientific payload.

Spending for the CASSIOPE Mission Contribution Program

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
9.0	9.5	9.5	0.7

Any significant variance reported against Planned Spending set in the 2004-2005 RPP is explained in Section 7 - Spending by Strategic Outcome.

MAIN ACCOMPLISHMENTS AGAINST 2004-2005 RPP PLANNED RESULTS

Technological Development and Diffusion

Planned Result: The enhancement of the Canadian space industry's competitiveness by awarding 30 new projects to companies through an annual Request for Proposal process under the Space Technology Development Program. Priority technologies are defined in consultation with industry, which contributes up to 35% of total project costs based on the level of maturity of technologies.

Main Accomplishment: A total of 49 contracts were awarded out of 126 proposals received for a total sum of $17.3 million. The industry's contribution on most of these projects represents 40% of the total project costs and is based on the level of technological maturity.

A few examples of technological achievements: the newly developed NASA spacesuit battery developed by Electrovaya; novel spacecraft solar panels developed by Routes; and, Neptec's 3-D laser camera technology allowing for in-orbit space shuttle inspection.

To learn more about the Space technology Development Program, go to:
http://www.space.gc.ca/asc/eng/industry/stdp.asp

Planned Result: The CASSIOPE Mission Contribution Program will pioneer world-leading technologies, systems and associated ground segments using an innovative approach that will allow telecommunications payload and the enhanced-Polar Outflow Probe (e-POP) scientific research instruments to be integrated on a single Canadian small satellite bus for future Canadian missions.

Main Accomplishment: The program has successfully completed the preliminary design of the Canadian small satellite bus. The program has advanced to the next phase, which will see the completion of the detailed design and begin the manufacture of the spacecraft structure and associated payload components.

Planned Result: The development of advanced concepts for future space missions, innovative space technologies, and involvement in international projects by Canadian companies through participation in the ESA General Support and Technology Program.

Main Accomplishment: Canadian companies are participating in PROBA, a small satellite mission that is part of an ESA technology demonstration program. PROBA has a goal to develop enabling technologies for future high demanding Earth Observation, telecom and scientific missions based on small LEO (Low Earth Orbit) satellites. Canadian companies will be supplying flight essential hardware elements such as microwheels from Dynacon (Toronto, ON) and basic spacecraft platform software elements for Attitude and On-Orbit Control (AOCS) of the spacecraft from NGC Aerospace (North Hatley, QC). In addition, ESA is pursuing the development of a fibre optic sensor scheme for monitoring spacecraft propulsion systems with MPB Technologies (Pointe-Claire, QC) that will "fly" on PROBA as a flight demonstration

payload. Another Canadian involvement includes Gain Microwave (Ottawa, ON) studying means of achieving high reliability of Solid State Power Amplifier for space application.

Planned Result: The maintenance of in-house technical capabilities by conducting advanced R&D projects that meet the criteria of excellence and relevance in support of the implementation of the Canadian Space Program.

Main Accomplishment: In 2004-2005, the in-house R&D activities resulted in 11 invention declarations and the issue of 3 patents. In addition, 4 patent applications and 1 provisional patent were filed. Six licences were issued for technologies developed at the CSA.

Planned Result: The transfer and commercialisation of space technologies and their applications to other sectors of the economy to enhance Canadian industrial competitiveness. This is being achieved by managing the CSA portfolio of patents and intellectual property licenses, by conducting commercialisation assessments and marketing plans for technologies developed in-house and through contracts to industry with the Technology Diffusion Program, which supports potential licensees in assessing business opportunities associated with their space technologies.

Main Accomplishment: A new policy was adopted and implemented to govern the writing and publication of scientific and technology papers by CSA authors; this completes the previous Intellectual Property Management Policy and the Inventor and Innovator Awards Program. A technology guide was published to provide information on CSA technologies available for transfer. The CSA Intellectual Property Technical Committee reviewed invention declarations by employees made during the year. The Technology Diffusion Program held a Request for Proposal and awarded 4 contracts to industry to develop commercialisation plans based on CSA technologies. The Inventors and Innovator Award program held its second award ceremony; 20 awards were given to engineers and scientists who contributed to the creation of new knowledge and technologies.

Strategic Outcome	✧Understanding of the Environment

STRATEGIC OUTCOME OBJECTIVES

The Strategic Outcome *Understanding of the Environment* has the following three objectives:

- to better understand the dynamics of the atmosphere;
- monitor atmospheric pollution; and,
- enhance the prediction capabilities of global climate change.

KEY PARTNERS

The CSA has collaborated with foreign space agencies on projects addressing global atmospheric pollution and climate change issues. The CSA is working with universities, specialised research institutes, and firms in space-related activities, particularly small and medium-sized enterprises.

The CSA is also working alongside or carrying out ongoing consultations with other federal departments and agencies such as:

- Environment Canada (EC)
- Natural Resources Canada (NRCan)
- National Research Council (NRC)
- Department of Fisheries and Oceans Canada (DFO)
- Agriculture and Agri-Food Canada (AAFC)
- Natural Sciences and Engineering Research Council of Canada (NSERC)

Spending for the Strategic Outcome Understanding of the Environment

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
30.0	32.7	23.5	11.9

The unique scientific data provided by space-based instruments and Earth Observation satellites contributes to the understanding, monitoring and prediction of the Earth’s environment and climate change, the formulation of policies for emission control of atmospheric pollutants with respect to Canada's international commitments, natural resources enhancement and natural disasters management.

Building on the Canadian scientists' international reputation of excellence, the CSA is pursuing a two-pronged strategy focused on participation in international missions dedicated to better understanding of the dynamics of the atmosphere, monitoring atmospheric pollution and enhancing the prediction capabilities of global climate change; and, on Canadian-led small satellite missions addressing specific domestic needs. The scientific instruments are usually conceived by Canadian universities and are built by Canadian industry.

PROGRAMS

The **Atmospheric Environment Programs** study the dynamics of the atmosphere, the ozone layer, greenhouse gases, and other global climate change phenomena.

Spending for the Atmospheric Environment Programs

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
16.2	17.8	8.7	5.4

The **Space Environment Programs** develop small payload missions for in-studies of space plasma and Earth's electromagnetic field.

Spending for the Space Environment Programs

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
2.9	3.4	3.4	2.0

The **Government Related Initiatives Program (GRIP),** as the name suggests, aims to work with other federal government departments to develop and demonstrate the application of space-borne technologies in ongoing activities related to natural resources, disaster management, and environmental protection.

Spending for the Government Related Initiatives Program

2004-2005			FTEs
Planned Spending	Authorities Received	Actual Spending	
7.4	8.0	8.0	4.4

The **CASSIOPE Mission** is funded through a CSA contribution program to support the integration on a single Canadian small satellite bus of two payloads, the CASCADE telecommunications Ka-band component and the enhanced-Polar Outflow Probe (e-POP) scientific payload.

Spending for the CASSIOPE Mission Contribution Program

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
3.5	3.4	3.4	-

Any significant variance reported against Planned Spending set in the 2004-2005 RPP is explained in Section 7 - Spending by Strategic Outcome.

MAIN ACCOMPLISHMENTS AGAINST 2004-2005 RPP PLANNED RESULTS

Understanding the Environment

Planned Result: Acquire science data from Canada's SCISAT-1 Atmospheric Chemistry Experiment. Launched in August 2003, the satellite measures numerous trace gases, thin clouds and aerosols in the stratosphere, thereby enabling a more comprehensive understanding of the several chemical processes that play a role in stratospheric ozone depletion.

Main Accomplishment: SCISAT-1 was successfully operated and managed, and scientific data were provided to the science team. The capacity to receive science data was augmented from 1.1 gigabytes per day to 2.39 gigabytes per day by employing two Canadian stations and those of US and European partners as well.

Intensive data analysis by the scientific teams has produced a number of new results that have been disseminated at international scientific conferences and through the publication of peer-reviewed scientific papers. By virtue of the success of the mission, international partners (NASA and ESA) have joined the program and have provided additional ground stations in order to retrieve more data from the mission. This mission has significantly enhanced Canadian leadership in stratospheric ozone studies and is leading to improved understanding of the complex chemistry surrounding ozone production and destruction in the Earth's middle atmosphere, especially at high Northern latitudes.

Planned Result: The study of stratospheric composition and ozone depletion processes at mid-latitudes, through the launch of high-altitude balloon experiments in August 2004, as part of validation campaigns for Canada's OSIRIS instrument onboard Sweden's Odin satellite and SCISAT-1.

Main Accomplishment: Twenty-four high-altitude balloons were launched from Vanscoy, Saskatchewan during August and September 2004 as part of the MANTRA (Middle Atmosphere Nitrogen TRend Assessment) campaign. These flights were supported by a number of ground-based observations. While the majority of the flights were successful, the two large multi-instrumented balloons were only partially successful due to mechanical and telemetry malfunctions. Overall, the campaign produced a valuable dataset that is being analysed in-depth by the various scientific investigators. Validation of ozone profiles in relation to the OSIRIS and SCISAT-1 satellite missions was successfully accomplished.

Planned Result: The execution of final preparatory activities for the launch of the NASA CLOUDSAT mission in Spring 2005 with key hardware components from Canada. This mission will allow Canadian scientists to participate in the study of global climate processes.

Main Accomplishment: Activities in relation to CLOUDSAT were successfully completed, including final reviews. The satellite is now ready for expected launch in September 2005. The CSA signed an agreement with the Meteorological Service of Canada (MSC) at Environment Canada to support a comprehensive CLOUDSAT field validation campaign in the Great Lakes region that will take place during the cold season. MSC is investing significantly in this mission through in-kind scientific expertise, data analysis, application of operational and research observation networks, and strategic capital investment.

Planned Result: The continued development, in collaboration with ESA, of an instrument called SWIFT (Stratospheric Wind Interferometer for Transport) to better understand the global atmospheric circulation and thereby provide means to validate complex climate and weather models.

Main Accomplishment: After ESA notified the CSA in December 2003 that Japan's National Space Development Agency GOSAT mission would no longer fly SWIFT, the CSA decided to define a new mission, called Chinook, and to fly the SWIFT instrument on a Canadian small satellite bus. In order to maintain the momentum with the instrument development initiated during the GOSAT mission, the CSA decided to maintain the original schedule and awarded a preliminary design contract to EMS Technologies in July 2004. Proceeding with the SWIFT instrument preliminary design phase offered benefits in technical risk reduction and eventual mission schedule relief, as well as in acquiring data to assist in definition of the Canadian mission. The SWIFT system requirements have been established and the preliminary design review is scheduled for July 2005. The Chinook mission concept development phase was approved in September 2004. A number of potential partnership opportunities were explored and a secondary experiment was selected.

Planned Result: The continued development of the Canadian scientific mission e-POP (enhanced-Polar Outflow Probe) and six Canadian scientific payloads.

Main Accomplishment: All six Canadian instruments successfully progressed through the preliminary design phase of the e-POP mission. Three of these instruments have subsequently passed the critical review milestone of the design process while the remaining three are expected to achieve that important milestone by mid-summer 2005. Launch is currently scheduled for December 2007.

Planned Result: The continuation of satellite data application development and technology transfer through the Government-Related Initiatives Program (GRIP).

Main Accomplishment and Supported Projects: Through GRIP, several federal departments are completing projects that will lead to the implementation of new Earth Observation (EO) applications within their day-to-day operations in support of new and more effective approaches to delivering their mandate. GRIP reviews departmental proposals once a year and co-funds the space segment of department-led initiatives aimed at a variety of national priorities. For example:

- The Integrated Satellite Tracking of Polluters (ISTOP) seeks to reduce illegal pollution in Canadian waters by the development and implementation of an operational procedure using RADARSAT data to monitor Canadian waters for the detection of illegal pollution activities.

- The Monitoring Ecosystem Integrity and Climate Change impacts the use of EO satellite for monitoring and assessing the ecosystem integrity of Canada's parks from stresses created by climate change effects, the pressure of human development and unpredictable or unexpected environmental conditions. This project stems from the Government of Canada's willingness to use objective indicators based on EO satellite and to look for innovative solution in addressing Global issues.

- Canadian Wildland Fire Information System (CWFIS) aims at developing a new framework that integrates fire management systems with satellite monitoring and mapping technologies. The CWFIS supports Canada’s policy and decision strategy with respect to the UN Framework Convention on Climate Change and the reporting obligations of the Montréal and Kyoto protocols. The carbon emission savings from the use of the EO monitoring technique are estimated to be around $200 million per year.

Planned Result: The modernisation and upgrade, completed by 2004-2005, of a Canada-wide array of ground-based instruments (known as Geospace Monitoring) to complement and validate a large fleet of international space missions which will be launched between 2005 and 2015 under the co-ordinated International Living With a Star (ILWS) Program.

Main Accomplishment: The CSA transferred the ground-based array of geophysical instruments (CANOPUS) that had been operating since 1989, to the larger Canadian national space science initiative known as Canadian Geospace Monitoring (CGSM). This included the transfer of the data distribution function to the Space Science Data Portal as well as the implementation of a new real-time data collection system. The enhanced CGSM instrument array will provide higher temporal and spatial resolution synoptic data specifying the ionospheric electrodynamics over a larger geographical region than is currently available. The new instrumentation will allow scientists to address strategically important questions in near-Earth space plasma physics. The instrument configuration takes full advantage of Canada's unique geographical advantage for ground-based geospace studies. The large international utilisation of the data allows Canadian scientists to access all major space science missions and the project has benefited from large co-funding provided by the Canada Foundation for Innovation (CFI) and the Natural Sciences and Engineering Research Council (NSERC). During this period, Canada also assumed the chairmanship of the International Living With a Star (ILWS) Program.

Planned Result: The development and delivery of new and improved forecasts of space weather conditions affecting power-grids, telecommunications, and Low Earth Orbit satellite. This work is performed in collaboration with Natural Resources Canada, the National Research Council of Canada and the University of Alberta.

Main Accomplishment: A Space Weather Canada Web site has been created. It is a Regional Warning Centre (RWC) of the International Space Environment Service (ISES) that monitors a variety of parameters that help to characterize the conditions on the Sun, in space between the Sun and Earth, and on the Earth. The data are used to develop Space Weather warnings and alerts. As part of this initiative, the CSA is supporting the University of Alberta in developing three-dimensional global Magnetohydrodynamic (MHD) modeling of the solar wind interaction with Earth's magnetosphere in order to provide improved forecasts of space weather conditions.

To learn more about Atmospheric and Space Environment Programs, go to:
http://www.space.gc.ca/asc/eng/sciences/atmosphere.asp
http://www.space.gc.ca/asc/eng/sciences/relation.asp

Strategic Outcome	✧Contributions to the Quality of Life

STRATEGIC OUTCOME OBJECTIVE

The Strategic Outcome *Contributions to the Quality of Life* has the following objective:

- improve public health by advancing life sciences and biotechnologies through experiments using the effects of microgravity, and by advancing the understanding of basic physical and chemical processes in the weightless environment.

KEY PARTNERS

The CSA is working with universities, specialised research institutes, and firms in space-related activities, particularly small and medium-sized enterprises.

The CSA is also working alongside or carrying out ongoing consultations with other federal departments and agencies such as:

- National Research Council (NRC)
- Natural Resources of Canada (NRCan)
- Natural Sciences and Engineering Research Council of Canada (NSERC)
- Canadian Institutes of Health Research (CIHR)
- Agriculture Canada

Spending for the Strategic Outcome Contributions to the Quality of Life

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
23.4	14.2	10.6	23.7

Space-based sciences and technologies are increasingly contributing to making our lives better on Earth, while addressing issues of concern to Canadians. In the near future, Canadians will reap scientific benefits arising from Canada's investments in maintaining a human presence in space, in the training of Canadian astronauts for participation in the construction and operation of the ISS, and in the exploitation of the microgravity environment.

PROGRAMS

The **Space Life Sciences Program** enables the Canadian scientific community and industry to advance our knowledge of changes to the cardiovascular, bone and nervous systems, as well as the adaptation of humans and other life forms in a weightless environment. The ultimate aim of these studies is to make space travel safer and improve life on Earth.

Spending for the Space Life Sciences Program

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
6.6	4.2	2.9	2.8

The **Microgravity Sciences Program** enables the Canadian scientific community and industry to advance our knowledge of basic physical and chemical processes in the weightless environment and address the effect of gravity on systems with the ultimate aim of making space travel safer and improving life on Earth.

Spending for the Microgravity Sciences Program

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
10.3	3.8	2.7	3.8

The **Canadian Astronaut Office** was created to: develop and maintain human spaceflight expertise to meet the needs of the Canadian Space Program (CSP); participate in CSP activities that rely upon or benefit from the knowledge, skills, and attitudes of trained astronauts; increase public awareness of the CSP and its social and economic benefits for Canada; and, advocate a Canadian economy based upon innovation and advanced education.

Spending for the Canadian Astronaut Office

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
6.5	6.2	5.1	17.1

Any significant variance reported against Planned Spending set in the 2004-2005 RPP is explained in Section 7 - Spending by Strategic Outcome.

MAIN ACCOMPLISHMENTS AGAINST 2004-2005 RPP PLANNED RESULTS

Contributions to the Quality of Life

Due to the interruption of the ISS and the Space Station Programs, incurred by the loss of the Space Shuttle Columbia, the CSA has had to reconsider the opportunity or the time frame of projects identified in the 2004-2005 RPP. In addition, changes in the availability of the Shuttle and its concentrated use in final ISS construction means it may be necessary to modify future plans and projects.

Planned Result: Continue research into mechanisms of bone loss density onboard the Space Shuttle and the ISS. It is clear that bone research in microgravity will also provide insights into osteoporosis, a disease affecting millions of Canadians.

Main Accomplishment: Following the success of the Osteoporosis Experiments in Orbit (OSTEO) mission on the space shuttle in 1998, a second experiment was flown on the ill-fated Space Shuttle Columbia mission in January 2003. Notwithstanding this loss, the CSA, working with the CIHR Institute of Musculo-skeletal Health and Arthiritis (IMHA), is continuing to develop follow-on experiments and is currently building the enhanced OSTEO (e-OSTEO) to fly with the European Space Agency on an unmanned Russian recoverable satellite mission in 2007.

Planned Result: The advancement in the understanding of basic physical, chemical and biotechnology processes in the weightless environment and the improvement of material processing techniques (including proteins, fluid and combustion processes) through the use of the Space Shuttle and eventually, the ISS.

Main Accomplishment: The Soret Coefficient in Crude Oil (SCCO) experiment, to be used to validate mathematical models to improve oil-prospecting techniques and facilitate oil extraction, will be flown on a Russian recoverable satellite in June 2005.

Planned Result: Improve human performance in space.

Main Accomplishment: The Perceptual Motor Deficit in Space (PMDIS) experiment is designed to determine whether the loss in hand-eye co-ordination often seen in astronauts early in missions is due to neurological adaptation, psychological stress or postural instability. The determination of the underlying cause will define the appropriate countermeasure. At the request of NASA, hardware adjustments were made and the experiment has been manifested on a shuttle flight to take place in the coming year.

Planned Result: Conduct basic biological research in the environment of weightlessness.

Main Accomplishment: High school students worked with one of our researchers to fly experiments looking at how serpents and lizards respond to weightlessness experienced in a parabolic aircraft. Not only did the group of students participate in the design and

execution of a complex experiment, the interesting results have now been peer-review and published in the scientific journal, *Zoology*.

In the 2004 International Life Sciences Research Announcement supported by NASA, ESA, CSA, JAXA (Japan), CNES (France), DLR (Germany) and NSAU (Ukraine), fully half of the Canadian research proposals passed the rigorous, international peer-review process. This places Canadian researchers alongside Americans as the most successful of safer human and robotic exploration of space.

To learn more about Life and Microgravity Science, go to:
http://www.space.gc.ca/asc/eng/sciences/life.asp
http://www.space.gc.ca/asc/eng/sciences/weightlessness.asp

Strategic Outcome	✧World-Class Space Research

STRATEGIC OUTCOME OBJECTIVE

The Strategic Outcome *World-Class Space Research* has the following objective:

- enhance Canada's tradition of excellence and our capacity and capability to co-operate with international partners in the worldwide exploration of space.

KEY PARTNERS

Since the very beginning of the Canadian Space Program, Canada's space science programs have been founded on international co-operation. This has provided the scientific community and industry with exciting opportunities to contribute to the global knowledge base and enhance Canada's technological base with the development of unique scientific instruments.

The CSA is working with universities, specialised research institutes, and firms in space-related activities, particularly small and medium-sized enterprises.

The CSA is also working alongside or carrying out ongoing consultations with other federal departments and agencies such as the National Research Council (NRC) and Natural Resources Canada (NRCan).

Spending for the Strategic Outcome World-Class Space Research

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
36.2	41.1	35.9	60.7

Over the years, Canada’s space science programs have been founded on international co-operation. This strategy has offered exciting opportunities to the scientific community for participating in international space missions, as well as to Canadian industry for enhancing its technological base. The development of unique scientific instruments has contributed to the formation of Canada's tradition of excellence, to the human quest for knowledge about space and to the growing interest in planetary exploration.

PROGRAMS

The **Astronomy and Space Exploration Programs** enable our scientific community to participate in international efforts aimed at understanding the universe, its origin, and predicting its evolution.

Spending for the Astronomy and Space Exploration Programs

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
26.4	31.5	26.9	14.7

The **David Florida Laboratory** (DFL), a world-class laboratory providing environmental testing and assembly facilities for space hardware, contributes to the recognition of Canada's leadership in space research. The CSA operates DFL facilities for domestic and foreign clients on a fee-for-service basis.

Spending for the David Florida Laboratory

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
9.8	9.6	9.0	46.1

Any significant variance reported against Planned Spending set in the 2004-2005 RPP is explained in Section 7 - Spending by Strategic Outcome.

MAIN ACCOMPLISHMENTS AGAINST 2004-2005 RPP PLANNED RESULTS

World-Class Space Research

Planned Result: The development of a Fine Guidance Sensor (FGS) and Tuneable Filter Instrument (TFI) for NASA's James Webb Space Telescope (replacement of the Hubble Telescope) and participation in the design and manufacturing of a sub-system for the Heterodyne Instrument in the Far-Infrared (HIFI) for the Herschel/Planck missions led by ESA.

Main Accomplishment: The James Webb Space Telescope (JWST) is one of the most prestigious programs in international Space Astronomy. The Canadian Space Agency is responsible for supplying the complete JWST Fine Guidance System (FGS). The requirements phase of the project was completed in September 2004. A Preliminary Design Review is scheduled for early fiscal year 2005-2006. This project provides international exposure of Canadian Industry and provides Canadian scientists with access to the most advanced astronomical data through participation in the JWST mission.

The HIFI will provide Canadian scientists with the opportunity to acquire data on interstellar chemistry, the early stages of star formation and the cosmic microwave background radiation. The CSA is providing the Local Oscillator Source Unit (LSU) for the HIFI. The detailed design, manufacturing and assembling of the LSU Development Model continued during the year. Due to requirement changes and late delivery of parts from the Space Research Organisation Netherlands (SRON), the project has suffered an approximate 12-month delay.

Planned Result: Continued operations of the Microvariability and Oscillations of Stars (MOST) micro-satellite space telescope, launched in June 2003, expected to lead to significant scientific results.

Main Accomplishment: The MOST space telescope, Canada's first space telescope and first microsatellite mission, continues to perform flawlessly and has yielded impressive scientific results. Many scientific results have been announced including a landmark paper published in the journal Nature. The mission and its results have generated significant international and media attention.

Planned Result: The production of a meteorological station for the NASA PHOENIX Scout mission is a key project for potential international partners to collaborate on upcoming robotic missions as part of a Canadian strategy to explore the Moon and Mars.

Main Accomplishment: PHOENIX is a fixed lander using a robotic arm to dig through the ice layer and analyze Mars soil samples with a suite of sophisticated on-deck scientific instruments. The Canadian-built Meteorological Station (MET) will record daily weather on the Martian northern plains using temperature and pressure sensors, as well as a light detection and ranging (LIDAR) instrument, the first to be landed on another planet. During this period, the detailed design of the Canadian instrument was completed in preparation for the Critical Design Review planned for May 2005.

To learn more about the Astronomy and Space Exploration Programs, go to: http://www.space.gc.ca/asc/eng/sciences/astronomy.asp

Planned Result: The provision of world-class and cost effective environmental space qualification services for the assembly, integration and testing of spacecraft systems and sub-systems in support of CSA and Canadian space industry projects, as well as those of other government departments.

Main Accomplishment: This reporting period included the initiation of significant activity on the environmental test campaign for RADARSAT-2. Following the receipt of the spacecraft BUS module at the David Florida Laboratory (DFL) from Alenia Spazio, (Italy), the unit was subjected to a comprehensive thermal vacuum test. In addition, thermal vacuum and vibration testing was completed on the RADARSAT-2 SAR panel assembly. Other programs and projects benefiting from DFL support included the Orbital Boom Sensor System (OBSS), a critical element of the US Space Shuttle return to flight,

CLOUDSAT, Skynet V, INMARSAT, Space Vision System, CANADARM-1, MVIS, ANIK F1, OSTEO, and Hotbird 8.

Planned Result: Increased efforts to market DFL services internationally, which involves the conclusive negotiation of a generic Facilities Use Agreement to satisfy US technology transfer concerns regarding commercial satellite programs, and hence, facilitate arrangements with prime US contractors for conducting environmental tests at the DFL.

Main Accomplishment: Negotiations and discussions with American primes for DFL support continue, although strictly on a case-by-case basis. US technology transfer policy (ITARS) remains an issue for the DFL. Off-shore contract negotiations were completed for Orbital Sciences on Telekom 2, and with EADS Space, a global space industry leader, on Skynet V.

Planned Result: To undertake facility preparations and test technology development to respond to the qualification requirements of future missions and maintain the DFL's ISO-9001:2000 certification.

Main Accomplishment: Test technology development activities in support of the DFL's continuous improvement program included upgrades or procurement of testing facilities for the CASSIOPE Mission, ISS payloads/instrument, and Mars environment simulators. DFL successfully passed the surveillance audit by the firm QMI of its Quality Management System, as per the ISO 9000:2000 standard.

To learn more about the David Florida Laboratory, go to:
http://www.space.gc.ca/asc/eng/dfl/default.asp

Strategic Outcome	✧Social and Educational Benefits for Canadians

STRATEGIC OUTCOME OBJECTIVES

The Strategic Outcome *Social and Educational Benefits for Canadians* takes advantage of the unique appeal of space to fulfil the following three objectives:

- improve scientific literacy among students and educators;
- encourage youth to pursue careers in science and engineering; and,
- promote awareness of the importance of science and technology in Canada's future.

KEY PARTNERS

Canadian astronauts, space scientists, engineers and researchers are excellent role models who significantly contribute to enhancing awareness of Canada's role and achievements in space and our leading contributions to the development of space science knowledge, exploration and technological innovation. The CSA leverages the strengths of its partners (science museums, schools, universities, specialised research institutes and youth organisations) to broaden public awareness about Canada's leadership in space, while inspiring youth and driving interest in the pursuit of careers in science, engineering and technology.

The CSA is also working alongside or carrying out ongoing consultations with other federal departments and agencies such as the Natural Sciences and Engineering Research Council of Canada (NSERC) and the Public Service Commission of Canada, as well as representatives of the Inter-departmental Workgroup on Education.

Spending for the Strategic Outcome Social and Educational Benefits for Canadians

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
2.0	1.6	1.3	4.8

PROGRAMS

The **Space Awareness and Learning Program** encourages youth to undertake careers in Science and Technology (S&T) through reward and recognition activities, the distribution of space-related information and teaching materials, interactive distance learning classrooms and proactive public information campaigns across Canada.

Spending for the Space Awareness and Learning Program

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
1.2	1.1	0.9	4.0

The **Training of Qualified Canadian Scientists, Engineers and Technicians** for high technology and space-related industries is conducted through a series of programs jointly delivered with the Natural Sciences and Engineering Research Council of Canada (NSERC) and/or the Public Service Commission, as well as through new training initiatives with industry and universities.

Spending for the Training of Qualified Canadian Scientists, Engineers and Technicians

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
0.8	0.5	0.4	0.8

Any significant variance reported against Planned Spending set in the 2004-2005 RPP is explained in Section 7 - Spending by Strategic Outcome.

MAIN ACCOMPLISHMENTS AGAINST 2004-2005 RPP PLANNED RESULTS

Social and Educational Benefits for Canadians

Planned Result: An increase in educator and student participation in the space-centered learning initiatives of the Space Awareness and Learning Program, which contributes to encouraging youth to pursue careers in the field of science and engineering.

Main Accomplishment: The Distance Learning Program experienced a 360% increase in the number of students reached, going from 250 students in 4 provinces to engaging 1,149 students in 6 provinces (including both coasts) and 1 territory.

There was also a 5% increase in the number of individual educator and student participants in the Tomatosphere program. Since its debut in 2000, the program has reached a total of 378,728 students across the nation.

Planned Result: The enhanced use of targeted and educational space-based materials by not-for-profit and educational institutions, and increased requests for youth-oriented public information campaigns across Canada.

Main Accomplishment: There was a 128% increase in the number of educators enrolled in the CSA Educator Database. More than 3,000 educators from all provinces receive information about the space program and its educational initiatives on an on-going basis.

There has also been a 73% increase in the number of visits to the educator resource section of the Web site, rising from 111,260 to 192,835. Furthermore, 45% of the visits retrieved resources provided in French, while 55% of visits retrieved resources provided in English.

The number of visits to the career section of the CSA Web site increased by more than 50%.

The CSA also developed and distributed 2 new learning modules, which reached approximately 98,000 students in all provinces and territories.

In addition, some 21,054 secondary and post-secondary students, including Aboriginal students in Northern Ontario, benefited from career-focused speaking opportunities, presentations and Web content.

Planned Result: The promotion of professional development workshops and the creation of validated teaching materials such as Web-based assisted learning opportunities, to respond to the needs of educators while expanding interest and inspiring Canadian youth.

Main Accomplishment: There was 1% overall increase in the total number of educators engaged in CSA Space Educator Professional Development.

There were 36% of Space Educator Conference participants from 8 provinces proactively sought guidance, input or information from our Education staff throughout the year. Science consultants from three boards of education in Québec and Alberta arranged to have groups of educators from their respective boards engaged in professional development workshops conducted on-site at the CSA and via video-conference.

For the first time, the CSA was also engaged, in pre-service educator training in collaboration with the Faculty of Education at Memorial University in Newfoundland.

Planned Result: An expanded network of leveraged expertise and partnered initiatives in response to an increasing demand for educational materials and support.

Main Accomplishment: The signature of two learning partnerships with boards of education in Alberta and New Brunswick expanded the CSA relationships with various levels of the education community, ranging from the Minister of Education to classroom educators in both provinces.

The partnerships provide the CSA with an expanded pool of primary and secondary educators who are encouraged by their boards of education to focus test CSA pedagogical materials, integrate the CSA science and engineering expertise into courses through tele-learning and emerging Internet technologies, and engage in space–focused curricular development.

Planned Result: Regional tours and partnered initiatives with Canadian Space and Science Museums, schools and youth organisations, to expand student and educator access to the space science and technology community.

Main Accomplishment: Development of an opportunity for the CSA to meet and discuss potential collaboration with the Council of Ministers of Education to jointly address the issue of scientific literacy among Canadian youth and educators in Canada.

Signature of Memorandum of Understanding with Scouts Canada ensuring the promotion of CSA learning content among scouts troops across the nation.

The signature of a Letter of Understanding resulted in a proactive partnership between the CSA and international space agencies (ESA, NASA and JAXA) to develop the International Student Zone and associated post-secondary student programming at the 2004 International Astronautical Congress (IAC), in Vancouver, British Columbia. The CSA provided financial support through its new grants program, which allowed 41 students to attend this international conference. The CSA developed the first-ever Heads of Agency panel session, which garnered the participation of some 350 students from 41 countries. Canadian students also participated, in a breakfast meeting and briefing session, with senior representatives of Canada's space industry.

As a result of CSA efforts, one student received a job offer, while another has engaged in a collaborative research project with a leading space research and development firm. Four students studying in three different disciplines at different universities in three provinces also came together to develop an experiment, which was subsequently accepted by ESA as part of their student parabolic flight program.

All 41 Canadian participants provided very positive feedback with regard to their learning experiences at IAC 2004. International partners have since requested CSA participation and partnership for IAC 2005.

All 7 proposals received from 5 provinces with a value of $1.1 million of funding were considered. Of those, 3 proposals from Québec, Ontario and Alberta received funding. Projects completed in this fiscal year resulted in the participation of 66,400 primary, secondary and rural students in Alberta, Ontario, Québec, New Brunswick and PEI in space-focused learning.

To learn more about the Awareness and Learning Program, go to:
http://www.space.gc.ca/asc/eng/educators/default.asp

Planned Result: The implementation of the Grants and Contributions Programs, in partnership with other federal departments and agencies, to support awareness, research and training in space science and technology.

Main Accomplishment: Twenty new grants were awarded through the 2004 Competition under the Supplements Programs of the NSERC Scholarships and Fellowships in Space Science and Space Technologies Program. Support continued for eligible 2003 Competition winners.

Two continuing university-industry projects received second year funding increments under the 2003 CSA Support Program for the NSERC Research Partnerships Program.

The new CSA program, in support of NSERC's Partnerships Program, was approved in 2004 and increases the number of opportunities for the CSA and NSERC to collaborate in supporting University-Industry Partnerships in Space Science and Space Technologies.

An announcement was released in relation to Space Science Fellowships. Eight applications were received that underwent full peer-review with an expectation of results to be announced in mid-2005.

Three continuing awards were supported with respect to CSA Support to NSERC Industrial Research Chairs in Space Sciences.

Three competitions were held in relation to CSA Support to Space Science Conferences. Ten awards were provided.

To learn more about Space Science and Technology Grants and Contributions Programs, go to: http://www.space.gc.ca/asc/eng/industry/nserc.asp

Strategic Outcome	✧Promotion and Awareness of the Canadian Space Program

STRATEGIC OUTCOME OBJECTIVES

The Strategic Outcome *Promotion and Awareness of the Canadian Space Program* has the three following objectives:

- build national pride through public awareness of Canadian achievements in space;
- help Canadians to better understand the importance of space programs in Canada's future; and,
- promote partnership with international and domestic stakeholders in the successful delivery of the Canadian Space Program.

KEY PARTNERS

The CSA is working with Government of Canada departments and agencies, universities, specialised research institutes, and firms in space-related activities, particularly small and medium-sized enterprises. At the regional level, the Canadian Space Agency relies considerably on the regional agencies like the Atlantic Canada Opportunities Agency, whose network of officials help to promote the awareness of the Canadian Space Program and of potential opportunities.

Spending for the Strategic Outcome Promotions and Awareness of the Canadian Space Program

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
5.4	6.2	5.7	37.5

PROGRAMS

The **Promotion and Awareness of the Canadian Space Program** is done through a proactive and balanced communications strategy focusing on important space achievements and by managing the strategic relationships between the CSA and its domestic and international partners.

Communications and outreach activities targeting Parliament, key stakeholders and the public will continue to broaden understanding of the benefits of the Canadian Space Program and highlight the value of leveraged partnerships that are contributing to driving

collaboration between government, industry, the research community and other space agencies. The awareness activities aim to underline the importance of maintaining Canada's international reputation as an innovative space science and technology leader, with beneficial returns outweighing the longstanding investments into the nation's space program, space industry and specialised scientific community.

Spending for the Promotion and Awareness of the Canadian Space Program

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
5.4	6.2	5.7	37.5

Any significant variance reported against Planned Spending set in the 2004-2005 RPP is explained in Section 7 - Spending by Strategic Outcome.

MAIN ACCOMPLISHMENTS AGAINST 2004-2005 RPP PLANNED RESULTS

Promotion and Awareness of the Canadian Space Program

Planned Result: Scientific implementation of SCISAT-1, Canada's first science satellite in 30 years.

Main Accomplishment: SCISAT was featured at the Montréal Biosphere during Environment Week in June 2004, an event that attracted 6,000 visitors. A SCISAT info card was produced for the event and over 10,000 copies have been distributed since then. SCISAT was featured at the International Astronautical Congress (IAC) 2004 in Vancouver.

Planned Result: Scientific use of MOST, Canada's micro-satellite space telescope.

Main Accomplishment: MOST was featured at the CASCA (Canadian Astronomical Society) Conference in Winnipeg in June 2004. A scientific paper published in the journal *NATURE* and written by Dr. Jaymie Matthews, principal investigator of the MOST science team, generated extensive press coverage in Canada. A MOST info card was produced and over 10,000 copies have been distributed since then. MOST was featured at both IAC 2004 in Vancouver and at the Federal Departments' ScienceFest in Ottawa in October 2004 (over 4,000 visitors). A second 1:1 scale model of the MOST satellite was produced in March 2005 for use in conferences, press events and exhibitions.

Planned Result: Celebration of 20 years of Canadian Human Space Flight.

Main Accomplishment: A travelling exhibit was created and opened in Vancouver on October 6, during IAC 2004. This interactive exhibit, highlighting 20 years of Canadian Human Space Flight, will travel across the country through June 2006 to reach Canadians visiting 12 space and science centres. A video chronicling the flights of Canada's astronaut corps, a greeting from the Expedition crew aboard the International Space Station and a poster commemorating this historic milestone were unveiled at Space and Science Centres in communities across Canada. A limited edition learning resource sticker book was distributed to 7,930 students through 13 science centres in 8 provinces. Extensive media coverage blanketed the nation on the 20th anniversary of Marc Garneau's maiden voyage into space.

Planned Result: Recognition of 25 years of collaboration between Canada and the ESA.

Main Accomplishment: Bilateral meetings between the CSA and ESA and a presentation to space industry personnel assembled at IAC 2004 evaluated the progress and highlighted the evolution of scientific and technological expertise, as well as celebrated a partnership that has spanned the Atlantic over the past 25 years. Production of a targeted brochure supported by extensive coverage by Canadian and international journalists focused on collaboration and achievements over the past 25 years. It also emphasised their shared vision for enhancing the use of space, delivering benefits for humanity and plans to partner on future space exploration missions.

Planned Result: Staging of the SpaceOps 2004 conference in Montréal and support for the IAC 2004 conference in Vancouver.

Main Accomplishment: SpaceOps 2004 took place from May 17-21, 2004 in Montréal and was hosted by the CSA, in partnership with NRC and Telesat Canada with more than 530 attendees from 27 countries. It drew a high-level of delegates from around the world and leaders in the operation, use and control of international satellites. The CSA used this high profile international gathering to promote Canada's renowned global expertise in satellite communications, especially the launch of Telesat Canada's Anik F2. Industry partners, international representatives and interested participants were also introduced to Canada's RADARSAT-2, the next-generation Earth Observation satellite being readied for launch in 2006.

The CSA helped organise and support IAC 2004, the premier global space policy, science, technology and industrial conference that brought more than 2,500 delegates to Vancouver. Working with MDA, Canada's leading space company, the MacMillan Space Center and the City of Vancouver, the CSA promoted a week-long SpaceFest and invited the residents of Vancouver to meet astronauts, visit the CSA exhibit, take in a public lecture and see the ISS at the IMAX theatre as part of the integrated public outreach program supporting IAC 2004.

Planned Result: Further co-operation with traditional and new international partners, maintain effective relations with domestic stakeholders in the delivery of the Canadian Space Program, and help the positioning of Canadian space companies to seize global market opportunities.

Main Accomplishment: Memoranda of Understanding were signed with India and Israel during industrial mission and discussions are underway with China, a rising space-faring nation.

More than 50 opportunities for the CSA and Canadian firms were identified within the US and specific initiatives were signed with the NASA and NOAA.

The CSA elaborates strategies and plans for international and domestic partnerships under over 100 Collaborative Arrangements signed between the CSA and external partners, including other Canadian government departments.

The CSA held consultations on the overall direction of its Canadian Space Strategy with the Interdepartmental Committee on Space and several advisory groups, all of which draw their membership from government, space industry, scientific research and academia stakeholders

The CSA carries out key ongoing intelligence projects such as:

- distributing daily space news briefs to 300 users;
- producing the "Annual State of the Canadian Space Sector" review;
- updating "The Directory of the Canadian Space Sector"; and,
- monitoring the regional distribution of CSA contracts.

To learn more about promotion of national and international co-operation, go to:
http://www.space.gc.ca/asc/eng/industry/nsts.asp
http://www.space.gc.ca/asc/eng/industry/external.asp

SECTION: 7 Spending by Strategic Outcome

Strategic Outcome	Planned Spending ($ in millions)	Actual ($ in millions)	Variance ($ in millions)	Comments
Economic Benefits – Satellite Communications	28.5	21.2	7.3	The net surplus of $2.3 million resulted from a decrease of Canada's contribution to the ESA's Advanced Research in Telecommunications Systems Program. A surplus of $5.0 million was generated by the complexity of the CASCADE Ka-band comm-unications technologies, difficulties in establishing contracts with key national and international space companies, unforecasted personnel issues and underestimated efforts to ramp up the project and complete a satisfactory preliminary design; all of these issues contributed and dictated the need to amend the CASSIOPE program schedule and associated costs projection.
Economic Benefits – Earth Observation	82.2	55.5	26.7	A surplus of $21.1 million was generated by delays encountered by the RADARSAT-2 Major Crown Project's with the development of cutting-edge technology for the SAR imaging payload. This difficulty prevented the completion of some spacecraft construction milestones and caused further deferment of payments to the launch services provider. The launch is now scheduled for the third quarter of 2006. Another surplus of $1.7 million was due to changes in the NASA schedule for the Hydros mission. Radarsat-1 royalty revenue actually amounted to $3.1 million, which is $1.0 million less than originally forecasted. Part of the surplus was reallocated to the CSA's $3.0 million contribution to the Government-wide $1billion

				reallocation exercise. The CSA cancelled a considered increase of its participation to technology development programs under the Canada/European Space Agency (ESA) Cooperation Agreement.
Economic Benefits – Canadian Space Station Program	57.0	52.0	5.0	The CSA supports the operation and maintenance of the Mobile Service System on the International Space Station (ISS). The reduction in operational tempo, in the aftermath of the Columbia accident, has decreased the risk exposure for Canadian operations. This under-spending in risk funding combined with a transfer of ISS commercialization activities to a different CSA cost account explained most of the $5.0 million surplus.
Technological Development	43.2	49.8	(6.6)	Additional funding allocated to the Space Technology Development Program in order to respond to industry's requirement for technology development in the satellite communication sectors as well as emerging technologies for future space missions.
Understanding the Environment	30.0	23.5	6.5	Surplus of $6.5 million was due to delays in initiating Capital projects, more specifically Swift.
Contribution to the Quality of Life	23.4	10.6	12.7	The surplus of $12.7 million was mainly caused by a significant slow-down of activities relating to flying life and micro-gravity experiments in space since the Columbia accident.
World-Class Space Research	36.2	35.9	0.3	None
Social and Educational Benefits	2.0	1.3	0.7	None
Promotion and Awareness of the Canadian Space Program (CSP)	5.4	5.7	(0.3)	None
Corporate and Executive Functions	26.5	30.5	(4.0)	Additional funds were reallocated in order to pay compensations to a plaintiff on an intellectual property court case ($0.9 million), make the CSA computer infrastructure more efficient and secure ($1.2 million), support a major upgrade of the financial system ($1.1 million), and cover infrastructure work ($0.8 million).

SECTION: 8 Annexes

8.1 Financial Tables

8.1.1 Comparison of Total Planned Spending to Actual Spending (including FTEs)

($ in millions)	Actual 2002-2003	Actual 2003-2004	2004–2005			
			Main Estimates	Planned Spending	Total Authorities	Actual
Space Knowledge, Applications and Industrial Development	328.9	280.6	322.9	334.3	327.4	286.0
Total	**328.9**	**280.6**	**322.9**	**334.3**	**327.4**	**286.0**
Less: Non-respendable Revenue	(3.7)	(4.0)	(5.0)*	(5.0)*	(4.2)	(4.2)
Plus: Cost of services received without charge	3.6	4.1	4.1	4.1	4.3	4.3
Net cost of Department	**328.8**	**280.7**	**322.1**	**333.5**	**327.5**	**286.2**
Full Time Equivalents	**524**	**550**	**614**	**614**	**614**	**573**

Notes:

- Due to rounding, figures may not add to totals shown.
- Total Authorities are Main Estimates plus Supplementary Estimates and other Authorities.
- Difference between Total Authorities and Actual Spending is mainly due to re-profiling of funds from 2004-2005 to 2005-2006 and 2006-2007 associated with the management of Capital Projects.
- Planned Spending corresponds to Net Planned Spending in 2004-2005 RPP.

* In order to provide consistent figures on Non-respendable Revenue, RADARSAT-1 royalty revenues amounting at $4.1 million have been added to the Main Estimates and Planned Spending shown in the 2004-2005 DPR although the 2004-2005 RPP did not show these revenues.

8.1.2 Use of Resources by Business Line

2004-2005								
	Budgetary						Non-budgetary	
Space Knowledge, Applications and Industrial Development ($ in millions)	**Operating**	**Capital**	**Grants and Contribution**	**Gross**	**Revenue**	**Net**	**Loans, Investments and Advances**	**Total**
Main Estimates	134.8	141.6	46.6	**322.9**	-	**322.9**	-	**322.9**
Planned Spending	134.8	153.0	46.6	**334.3**	-	**334.3**	-	**334.3**
Total Authorities	140.8	137.5	49.1	**327.4**	-	**327.4**	-	**327.4**
Actual Spending	132.8	104.3	49.0	**286.0**	-	**286.0**	-	**286.0**

Notes:

- Due to rounding, figures may not add to totals shown.
- Total Authorities are Main Estimates plus Supplementary Estimates and other Authorities.
- Operating and Capital Expenditures include Employee Benefit Plans.
- Difference between Total Authorities and Actual Spending is mainly due to re-profiling of funds from 2004-2005 to 2005-2006 and 2006-2007 associated with the management of Capital Projects.
- Planned Spending corresponds to Net Planned Spending in 2004-2005 RPP.

8.1.3 Voted and Statutory Items

Voted or Statutory Item	Truncated Vote or Statutory Wording	2004-2005 ($ in millions)			
		Main Estimates	Planned Spending	Total Authorities	Actual
25	Operating Expenditures	125.4	125.4	133.2	125.1
30	Capital Expenditures	141.0	152.4	136.9	103.8
35	Grants and Contributions	46.6	46.6	49.1	49.0
(S)	Contributions to Employee Benefit Plans	10.0	10.0	8.2	8.2
	Total	**322.9**	**334.3**	**327.4**	**286.0**

Notes:

- Due to rounding, figures may not add to totals shown.
- Total Authorities are Main Estimates plus Supplementary Estimates and other Authorities.
- Difference between Total Authorities and Actual Spending is mainly due to re-profiling of funds from 2004-2005 to 2005-2006 and 2006-2007 associated with the management of Capital Projects.
- Planned Spending corresponds to Net Planned Spending in 2004-2005 RPP.

8.1.4 Net Cost of Department

($ in millions)	**2004–2005**
Total Actual Spending	**286.0**
Plus: Services received without charge	
Accommodation provided by Public Works and Government Services Canada (PWGSC)	0.1
Contributions covering employers' share of employees' insurance premiums and expenditures paid by TBS (excluding revolving funds)	3.9
Worker's compensation coverage provided by Social Development Canada	-
Salary and associated expenditures for legal services provided by Justice Canada	0.3
	4.3
Less: Non-respendable Revenue	(4.2)
2004–2005 Net cost of Department	**286.2**

Note:

- Due to rounding, figures may not add to totals shown.

8.1.5 Contingent Liabilities

Contingent Liabilities	($ in millions)	
	March 31, 2004	March 31, 2005
Claims, Pending and Threatened Litigation	--	--
CS500-05-042325-983[1]	14.4	--
CS500-17023-875-050[2]	--	4.9
Total	**14.4**	**4.9**

Note:

[1] On October 13, 2004 the Québec Superior Court issued its decision in this case, ordering the CSA to pay the sum of $553,500 in damages to the plaintiff, along with interest at the legal rate and with the additional indemnity provided for under section 1619 of the Civil Code of Québec. The total amount is $859,285.97, to which must be added an amount of $14,366.35 for the plaintiff's bill of costs. The Minister of Justice decided not to appeal this decision, as the CSA paid the above-mentioned amount.

[2] A lawsuit in damages in the amount of $4.9 has been instituted against the CSA on January 7, 2005.

8.1.6 Sources of Respendable and Non-respendable Revenue

Non-respendable Revenue

Business Line: Space Knowledge, Applications and Industrial Development ($ in millions)	Actual 2002-2003	Actual 2003-2004	2004-2005			
			Main Estimates	Planned Revenue	Total Authorities	Actual
Revenues from royalties	2.6	3.3	4.1	4.1	3.1	3.1
Services of a non-regulatory nature	0.9	0.7	0.9	0.9	1.1	1.1
Miscellaneous Revenues	0.2	0.0	0.0	0.0	0.0	0.0
Total Non-respendable Revenue	**3.7**	**4.0**	**5.0**	**5.0**	**4.2**	**4.2**

8.1.7 Resource Requirements by Branch/Sector Level

2004-2005				
Business Line: Space Knowledge, Applications and Industrial Development ($ in millions)	**Main Estimates**	**Planned Spending**	**Total Authorities**	**Actual Spending**
Space Programs	62.8	74.2	85.8	53.9
Space Technologies	114.2	114.2	96.8	95.2
Space Science	33.7	33.7	27.6	24.5
Canadian Astronaut Office	6.6	6.6	6.2	5.1
Space Operations	72.9	72.9	72.5	70.6
Corporate and Executive Functions	32.7	32.7	38.5	36.7
TOTAL	**322.9**	**334.3**	**327.4**	**286.0**

Notes:

- Due to rounding, figures may not add to totals shown.
- Total Authorities are Main Estimates plus Supplementary Estimates and other Authorities.
- Difference between Total Authorities and Actual Spending is mainly due to re-profiling of funds from 2004-2005 to 2005-2006 and 2006-2007 associated with the management of Capital Projects.
- Planned Spending corresponds to Net Planned Spending in 2004-2005 RPP.

8.1.8 2004-2005 User Fee Reporting – *User Fees Act*

A. User Fee	Fee Type	Fee Setting Authority	Date Last Modified	2004-2005					Planning Years		
				Forecast Revenue ($000)	Actual Revenue ($000)	Full Cost ($000)	Performance Standard	Performance Results	Fiscal Year	Forecast Revenue ($000)	Estimated Full Cost ($000)
Fees charged for the processing of access requests filed under the *Access to Information Act*	O	*Access to Information Act and Privacy Act*	1992	0.5	0.1	60.0 (incl. Salaries and O&M)	Framework under development by TBS. More info: http://lois.justice.gc.ca/en/a-1/8.html	Statutory deadlines met 94% of the time.	2005-2006 2006-2007 2007-2008	0.5 0.5 0.5	60.0 60.0 60.0
				Sub-Total (R) Sub-total (O) Total 0.5	Sub-Total (R) Sub-total (O) Total 0.1	Sub-Total (R) Sub-total (O) Total 60.0			Sub-total Sub-total Sub-total	2005-2006 2006-2007 2007-2008 Total 1.5	2005-2006 2006-2007 2007-2008 Total 180.0

B. Date Last Modified

n/a

C. Other Information

To access the 2004-2005 Annual Report to Parliament on the Administration of the Access to Information Act and Privacy Act, go to:
http://www.space.gc.ca/asc/eng/resources/publications/aiapa-2004.asp

8.1.9 Details on Project Spending

($ in millions)	Current Estimated Total Cost	Actual 2002-2003	Actual 2003-2004	2004-2005			
				Main Estimates	Planned Spending	Total Authorities	Actual
Space Knowledge, Applications and Industrial Development							
(Q) RADARSAT-1 (MCP)	686.9	12.8	11.3	8.5	12.6	10.4	10.4
(BC-Q) RADARSAT-2 (MCP)	421.6	51.1	7.4	24.7	32.0	29.4	10.9
(O) Insect Habitat (EPA)	10.1	2.4	1.4	0.1	0.1	0.1	0.1
(O) CLOUDSAT (EPA)	15.3	5.3	1.1	0.8	0.8	0.5	0.5
(Q-M) MIM Base Unit (MIMBU) (EPA)	6.3	2.7	-	1.3	1.3	-	-
(Q-M) MVIS (EPA)	10.0	2.0	3.8	0.4	0.4	0.6	0.6
(O) Herschel HIFI (PPA)	10.5	-	2.0	3.6	3.6	4.8	3.5
(O-Q) SWIFT (PPA)	42.8	-	0.4	12.5	12.5	11.8	2.6
(O-Q) HYDROS (PPA)	11.7	0.3	0.4	0.4	0.4	0.4	0.3
(O) JWST (S)	66.0	-	-	4.2	4.2	4.0	3.4
(O) MARS PHOENIX (S)	23.9	-	-	10.1	10.1	10.3	8.4
TOTAL	**1305.2**	**76.5**	**27.8**	**66.6**	**78.0**	**72.3**	**40.8**

Notes:
- Due to rounding, figures may not add to totals shown.
- Total Authorities are Main Estimates plus Supplementary Estimates and other Authorities.

Province where the capital project will be carried out:
O = Ontario
Q = Québec
BC = British Columbia
M = Manitoba

Class of Project:
MCP = Major Crown Project
EPA = Effective Project Approval
PPA = Preliminary Project Approval
S = Substantive Estimate

8.1.10 Details on Transfer Payments Programs (TPPs)

Contribution to European Space Agency (ESA)		
Start Date: January 1, 2000	**End Date:** December 31, 2009	**Total Funding as of March 31, 2009:** $350 million

Purpose of Transfer Payment Program (TPP):

Enhance Canadian industry's technological base and provide access to European markets for value added products and services in the field of Earth Observation and Satellite Communications; allow the participation of Canadian academia; and, make possible the demonstration of Canadian space technologies in European science and exploration missions.

Expected Results:

Successful development and demonstration of advanced technologies, systems, components, or studies provided for in the contracts awarded by ESA to Canadian firms under the following ESA EO programs: ENVISAT, EOEP/EOPP, Earth Watch GMES and TerraSar.

Successful development and demonstration of advanced technologies, systems, components, or studies provided for in the contracts awarded by ESA to Canadian firms under the following ESA Telecommunications programs: ARTES 1, 3, 5 and 9, Artemis and GalileoSat (navigation).

Growing utilisation of data obtained from ESA on markets and Earth Observation/ telecommunications technologies as strategic information for government departments, agencies and industries in Canada.

Demonstration of space-qualified technologies and products developed by Canadian firms for the space exploration markets (via the Aurora program).

Development of new alliances and/or strengthening of established alliances between Canadian and European companies, to diversify Canada's international space partnerships and complement its long-standing relationship with the US.

Main Accomplishments:

Several technologies and skills have been developed and improved through the participation of Canadian companies in ESA programs. Some businesses have integrated these technologies into products, allowing them to sell these products in markets other than European ones. The economic spin-offs totalled $128.3 million, a return of 1.27 times the amount invested. In addition to generating revenues, the development and improvement of space technologies also created or maintained specialised jobs; an average of 100 person-years throughout the terms of the direct contracts were generated. In addition, specialised skills were created in the areas of space hardware, ground segment, and space technology applications.

Also the program served to boost the visibility of Canada in European markets. Canadian contractors see the ESA Contribution program as a means of cultivating business relationships. The program also fosters regional development and access to other markets by virtue of the successes of companies in Europe. Furthermore, Canada expanded its knowledge and technology in fields such as weather and ice movement forecasting, Earth Observation data, satellite communications technologies, environmental monitoring and security.

Business Line: Space Knowledge, Applications and Industrial Development ($ in millions)	Actual Spending 2002-2003	Actual Spending 2003-2004	Planned Spending	Total Authorities 2004-2005	Actual Spending 2004-2005	Variance between Planned vs. Actual
Total Grants	-	-	-	-	-	-
Total Contributions	29.6	29.3	26.6	30.0	30.0	(3.4)
Total Transfer Payment Program	**29.6**	**29.3**	**26.6**	**30.0**	**30.0**	**(3.4)**

Comments on Variance:

The additional contributions to ESA will serve to increase Canada's participation in the following programs: the preparatory phase of the European space exploration program, Aurora ($1 million), the ESA Earth Observation Envelope Program (EOEP) ($1 million) for the development of a Canadian instrument in support of ESA EO mission, and ARTES ($1.4 million) for the development of new satellite communication systems. These increases in existing optional programs are made in conformity with the objectives and terms & conditions of the 2000-2009 Canada/ESA Cooperation Agreement. Canadian industry (similarly for other Member States) is awarded contracts for the implementation of ESA optional programs in direct proportion to Canada's financial contributions to ESA.

Significant Evaluation Findings:

Canada has a good reputation with the Europeans, as the 25 years of cooperation between ESA and Canada clearly demonstrate. Canadian companies have made a significant contribution to the many technologies developed in the areas of Earth Observation and Satellite Communications.

Several businesses have developed business relationships with Europe thanks to the Agreement, and all stakeholders in the program agree that these relations could continue, provided that Canada maintains its financial contribution to ESA. Canadian businesses have cultivated alliances with each other to benefit from or facilitate access to European markets through ESA programs under the Agreement.

The program helps diversify and open markets and aids in the achievement of objectives under the Canadian Space Strategy respecting Earth Observation and Satellite Communications. However, it does not lead to the transfer of technologies but more to the exchange of information on technologies.

The economic spin-offs totalled $128.3 million and created an average of 100 person-years throughout the terms of the direct contracts for a period of 6 years.

Small and medium-sized companies have difficulty taking part in ESA programs and require greater support, not only to access these markets, but also to develop expertise so that they can continue doing business in these markets after their initial participation in ESA programs.

To learn more about the Evaluation of the Canada/ESA Cooperation Agreement, go to: http://www.espace.gc.ca/asc/pdf/er-0405-0202.pdf

To learn more about the Audit of the Management Framework of the Canada/ESA Cooperation Agreement, go to: http://www.space.gc.ca/asc/eng/resources/publications/ar-0405-0101.asp

Notes:

- Due to rounding, figures may not add to totals shown.
- This table details contribution programs with funding in excess of $5 million per annum.

CASSIOPE Mission		
Start Date: November 1, 2003	**End Date:** October 31, 2008	**Total Funding as of March 31, 2005:** $23.5 million

Purpose of Transfer Payment Program (TPP):

Support the integration of two payloads, the CASCADE telecommunications Ka-band component and the enhanced-Polar Outflow Probe (e-POP) scientific instrument, on a single generic Canadian small satellite bus.

Expected Results:

Development and demonstration of the CASCADE Ka-band telecommunications payload that will be designed and constructed by Canadian companies. CASCADE is the precursor of communication satellite constellations that will help position Canadian industry on the international market both as a supplier of advanced components and as a service provider.

Development and demonstration of the enhanced-Polar Outflow Probe (e-POP) payload, which will probe the upper atmosphere and ionosphere region where solar variability influences global change in various time scales.

Development of a generic Canadian small satellite bus that could also be used for future Canadian missions.

Main Accomplishments:

The preliminary design of the science instruments, the telecommunications payload and the Canadian small satellite Bus, have been successfully completed. The mission has moved to the detail design phase and four of the science instruments have already passed the critical design review stage. Several subsystems and major components have been ordered or procured. The University of Calgary and its subcontractors have begun the manufacturing of four of the scientific instruments.

Business Line: Space Knowledge, Applications and Industrial Development ($ in millions)	**Actual Spending 2002-2003**	**Actual Spending 2003-2004**	**Planned Spending**	**Total Authorities 2004-2005**	**Actual Spending 2004-2005**	**Variance between Planned vs Actual**
Total Grants	-	-	-	-	-	-
Total Contributions	-	6.1	17.5	17.5	17.5	0.1
Total Transfer Payment Program	**-**	**6.1**	**17.5**	**17.5**	**17.5**	**0.1**

Notes:

- Due to rounding, figures may not add to totals shown.
- This table details contribution programs with funding in excess of $5 million per annum.

8.2 Other than Financial Tables

8.2.1 Comparison to the TBS Special Travel Authorities

Travel Policy Name of the Canadian Space Agency:
"The Canadian Space Agency follows the TBS Special Travel Authorities".
Authority: n/a
Coverage: n/a
Principal difference(s) in policy provisions: n/a
Principal financial implications of the difference(s): n/a

8.2.2 Comparison to the TBS Travel Directive, Rates and Allowances

Travel Policy Name of the Canadian Space Agency:
"The Canadian Space Agency follows the TBS Travel Directive, Rates and Allowances".
Authority: n/a
Coverage: n/a
Principal difference(s) in policy provisions: n/a
Principal financial implications of the difference(s): n/a

8.2.3 Fuel Storage Tanks

The Canadian Space Agency (CSA) operates from two distinct sites: St-Hubert, Québec and Nepean, Ontario. The Fuel Storage tanks of those locations fall under different management therefore two separate tables are presented below.

Status of Fuel Storage Tanks located in St-Hubert, Québec; CSA is the building custodian.

Annual Report for April 30, 2005

As required under the CEPA, Part IV, *Registration of Storage Tank Systems for Petroleum Products and Allied Petroleum Products on Federal Lands Regulations,* this report provides the information set out in Schedule II of the aforementioned regulation, updated to December 31, 2004.

The following number of *above-ground* storage tank systems: Zero tank with storage capacity greater than 4000 litres.
- Are registered: n/a .
- Comply with the *Federal Aboveground Storage Tank Technical Guidelines*: n/a .
- Do not comply with the *Federal Aboveground Storage Tank Technical Guidelines*: n/a .

The following number of *underground* storage tank systems: Two tanks: one with a 15,000 litres capacity and the other with a 20,000 litres capacity.
- Are registered: Both tanks are currently registered with the department of Natural Resources Quebec and Public Works and Government Services Canada which managed the St-Hubert facility from 1992 to December 2000.
- Comply with the *Federal Underground Storage Tank Technical Guidelines*: Both tanks are fully compliant with all provincial and federal guidelines.

Status of Fuel Storage Tanks located in Nepean, Ontario at the David Florida Laboratory (DFL); CSA is the building custodian.

Annual Report for April 30, 2005

As required under the CEPA, Part IV, *Registration of Storage Tank Systems for Petroleum Products and Allied Petroleum Products on Federal Lands Regulations,* this report provides the information set out in Schedule II of the aforementioned regulation, updated to December 31, 2004.

The following number of *above-ground* storage tank systems: One 9,000 litres diesel fuel tank surrounded by a concrete containment basin.
- Are registered: Environment Canada is aware of the tank but does not require a formal registration of it.
- Comply with the *Federal Aboveground Storage Tank Technical Guidelines*: Yes, the tank is fully compliant with all federal technical guidelines.
- Do not comply with the *Federal Aboveground Storage Tank Technical Guidelines*: n/a .

The following number of *underground* storage tank systems: Zero tank.
- Are registered: n/a .
- Comply with the *Federal Underground Storage Tank Technical Guidelines*: n/a .

8.2.4 Response to Parliamentary Committees, Audits and Evaluations for Fiscal-Year 2005-2006

Response to Parliamentary Committees
No recommendation was received during the period covered by this report.
Response to the Auditor General
No recommendation was received during the period covered by this report. However, a Status Update for 2004-2005 on the 2002 recommendations was produced. To learn more about the Status Update, go to: http://www.space.gc.ca/asc/eng/resources/publications/pr-2005_response.asp
External Audits (note: these refer to other external audits conducted by the Public Service Commission or the Office of the Commissioner of the Official Languages or the Official Languages Branch of the Public Service Human Resources Management Agency).
No external audits were conducted during the period covered by this report.
Internal Audits or Evaluations
Here is the list of all internal audits and evaluations conducted at the CSA during fiscal-year 2004-2005: March 2004 – Audit Report on the Implementation of the Project Approval and Management Framework: http://www.space.gc.ca/asc/eng/resources/publications/ar-0304-0104.asp March 2004 – Audit Report on the follow-up to the Management Action Plans 2004: http://www.space.gc.ca/asc/eng/resources/publications/management-2004.asp July 2004 – Audit Report on Service Contracts for the provision of specialized services in connection with Canada's contribution to the International Space Station: http://www.space.gc.ca/asc/eng/resources/publications/ar-0405-0402.asp November 2004 – Audit Report on the Management Framework of the Canada/ESA Cooperation Agreement: http://www.space.gc.ca/asc/eng/resources/publications/ar-0405-0101.asp November 2004 – Evaluation Report on the Canada/ESA Cooperation Agreement: http://www.space.gc.ca/asc/pdf/er-0405-0202.pdf

8.3 Status Summary of Major Crown Projects

Information on RADARSAT-1 and RADARSAT-2 Major Crown Projects is reported on the CSA Web site at the following address:
http://www.space.gc.ca/asc/eng/resources/publications/report_mcp.asp

8.4 Procurement and Contracting

Procurement and contracting is at the core of the CSA program delivery. Most program objectives are achieved through the procurement of space hardware and services from Canadian industry, often implemented under international arrangements. In 2004-2005, the CSA awarded all of its contracts in accordance with *Government Contracts Regulations*.

SECTION: 9 Supplementary Information

In 2004-2005, the CSA has developed a Program Activity Architecture (PAA) for the management of the Canadian Space Program in line with the Canadian Space Strategy, and has reorganized the corporate support services.

Canadian Space Strategy and the CSA Program Activity Architecture (PAA)

Since April 1, 2005, the Canadian Space Strategy (CSS) replaces the Long-Term Space Plan as the framework that guides the Canadian Space Agency in leading Canada's national Space Program.

The Canadian Space Strategy is a concise overview that serves as a tool for planning purposes, and provides our stakeholders and partners with insight on Canada's strategic directions regarding space. In keeping with its objective of being an open and transparent organisation, the CSA strategic planning was done in full consultation with Government of Canada organisations and with its Canadian stakeholders, particularly through the use of several Advisory Groups. The Canadian Space Strategy will be reviewed regularly, and will evolve with the environment that characterises and influences Canada's space activities.

The CSA also carries out ongoing consultations with Government of Canada organisations to identify where and how space technologies could be used to enhance the delivery of their mandates and provide new or more efficient services to Canadians. More specifically, the CSA is constantly seeking ways to significantly contribute to the effective and efficient delivery of government programs and services in the fields of: communications, environment and sustainable development, security, intelligence, emergency preparedness, industry development and space science.

Further to the approval of the Canadian Space Strategy by the Government of Canada, the CSA has substantially revised its strategic outcomes.

PREVIOUS STRATEGIC OUTCOMES 2004-2005	NEW STRATEGIC OUTCOMES 2005-2006	GOVERNMENT OF CANADA OUTCOMES
- **Economic Benefits** - **Technological Development and Diffusion** - **Understanding of the Environment** - **Contribution to the Quality of Life** - **World-Class Space Research** - **Social and Educational Benefits for Canadians** - **Promotion and Awareness of the CSP**	**Knowledge, Innovation and Economy:** A Space Program that generates knowledge and pushes innovation, while leading (where appropriate) to increased productivity and economic growth through commercialisation.	**Sustainable Economy**
- **Economic Benefits** - **Understanding of the Environment** - **World-Class Space Research**	**Sovereignty and Security:** A Space Program that supports recognition of Canada's sovereignty and the security of its communities.	**Canada's Place in the World**
- **Economic Benefits** - **Understanding of the Environment** - **Technological Development and Diffusion**	**Environment and Sustainable Development:** A Space Program that helps Canada understand and protect the environment, and develop its resources in a sustainable manner.	

The CSS will greatly influence decision-making at the CSA as it streamlines its Strategic Outcomes and sets the long-term priorities for all activities under the new Program Activity Architecture (PAA). For each of the four Program Activities (also referred as Core Thrusts in the CSS), a strategic plan was developed that sets a road map of important milestones that will be reached over the next ten years. The Program Activity priorities are:

Space Based Earth Observation: Develop and operationalise the use of Space Based Earth Observation for the benefits of Canadians.

Space Science and Exploration: Understand the Solar System and the Universe, seek extraterrestrial habitats for life, and prepare for a permanent human presence on other planets.

Satellite Communications: Provide all Canadians with the means to participate and fully benefit from the global information age.

Space Awareness and Learning: Further public understanding and engagement with regards to space-related issues, ultimately leading to improving the scientific literacy of Canadians.

By elaborating a logical chain of results, the PAA illustrates how each program activity produces expected effects, ultimately contributing to the Strategic Outcomes, and how the performance measurement regime supports the CSA's accountability and reporting activities.

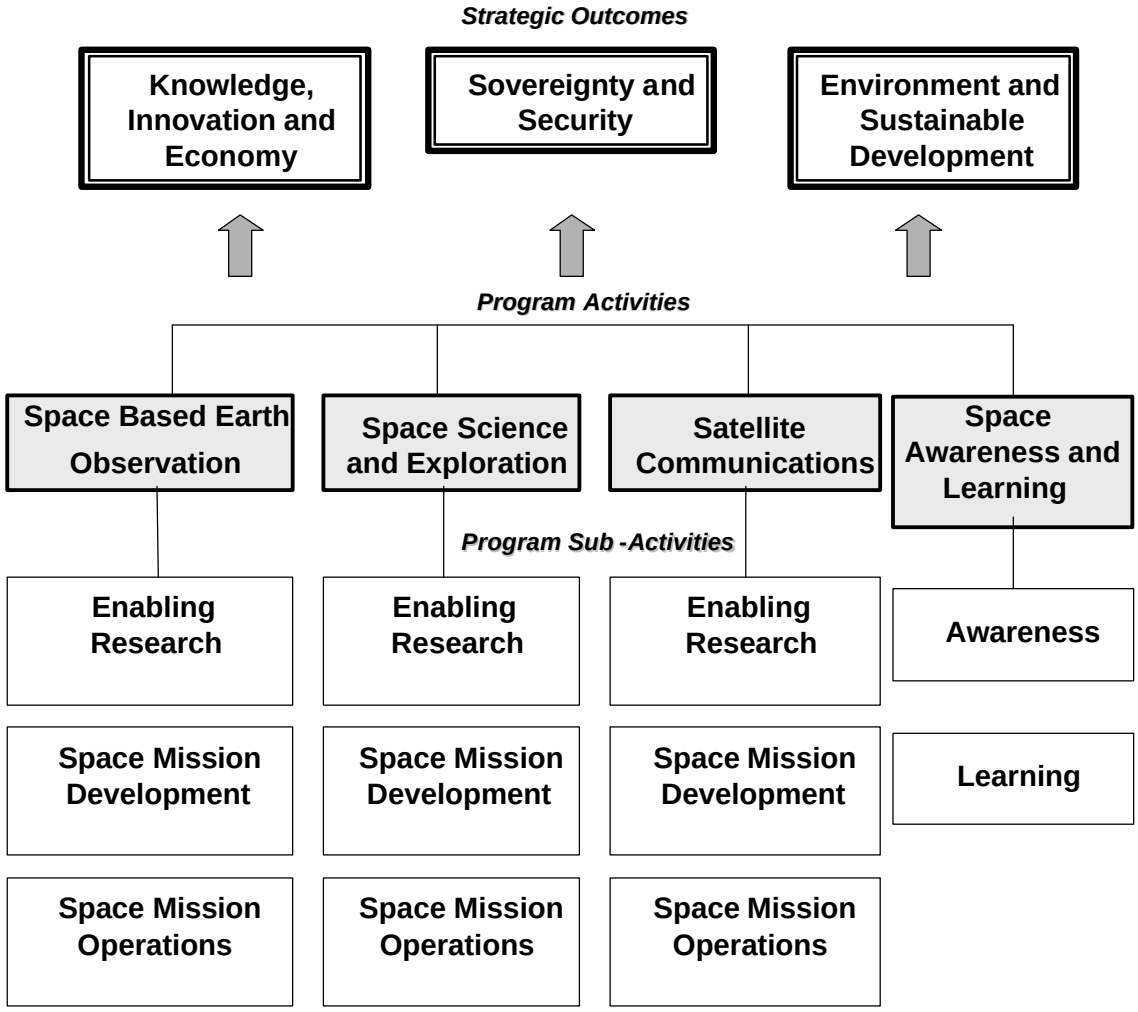
The CSA manages its Program Activities by organising its scientific and engineering programs into three large clusters: Enabling Research, Space Mission Development, and Space Mission Operations. Each cluster carries out a specific objective in line with the CSA priorities and stakeholders' expectations:

- Through Enabling Research, the CSA provides leadership, co-ordination or support to applied research and experimental development in order to increase the knowledge base, devise new applications through space missions, and allow the transfer of intellectual property and proven technologies to Canadian industry, academia, and government organisations.

- Through Space Mission Development, the CSA provides co-ordination or support to the development of space missions through the definition, critical design, manufacturing, integration, testing and delivery phases leading to launch and operations of space systems.

- Through Space Mission Operations, the CSA operates space missions through on-orbit ground control operations, system maintenance and logistic support, as well as data handling and delivery.

The synergy between the clusters described above can also be referred to as Matrix Management. The CSA is committed to Matrix Management in order to optimise the effectiveness and expertise of employees coming from different core functions and promote an integrated team and multi-functional approach to projects and services. The long-term objective of Matrix Management is to constitute a heritage within the core functions by acquiring and accumulating knowledge and experience within identified skill sets through the various matrix assignments. The CSA co-ordinates its activities from the initial research phases to final operational phases with this comprehensive end-to-end approach in order to strengthen and deepen its specialised human resources, while delivering social and economic benefits to all Canadians.



This new Program Activity Architecture (PAA) was first used in the CSA 2005-2006 Report on Plans and Priorities (RPP). To learn more about the 2005-2006 RPP and the Canadian Space Strategy, go to:
http://www.espace.gc.ca/asc/eng/resources/publications/default.asp#parliament
http://www.espace.gc.ca/asc/eng/resources/publications/default.asp#strategy

Reorganisation of Corporate Support Services

Since April 1, 2005, corporate services supporting the CSA's activities are regrouped under one Program Activity, which includes: Information Management and Information Technology, Audit, Evaluation and Review, Finance, Human Resources, Legal Services, Policy, Planning and Relations, President's Office, Communications, and Security and Facilities. All of these services have a common overarching objective: to implement the government's commitment to modern public service management in support of the implementation of the Canadian Space Program through the Management Accountability Framework (MAF).

Spending for the Corporate Support Services

2004-2005 ($ in millions)			FTEs
Planned Spending	Authorities Received	Actual Spending	
26.5	30.9	30.5	191.6

FIGURE 2: CSA Organisational Chart