CANADIAN SPACE AGENCY

Performance Report
For the period ending
March 31, 2004

David L. Emerson
Minister of Industry

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SECTION: 1 Message

1.1 Minister's Portfolio Message

The Government of Canada has a crucial role to play in supporting a dynamic and innovative 21st century economy. Through prudent fiscal management, by creating an opportune environment for research, development and commercialization, and by promoting a climate that supports the entrepreneurial spirit, we are helping to create a solid foundation for Canada's future. It is a foundation that we can build on to meet the challenges of the global marketplace — one that is essential to generate the wealth that Canadians need to raise our standard of living and improve our quality of life.

The Industry Portfolio:

- Atlantic Canada Opportunities Agency [1]
- Business Development Bank of Canada [2]
- Economic Development Agency of Canada for Quebec Regions [1]
- Canadian Space Agency
- Canadian Tourism Commission [2]
- 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 [2]
- Statistics Canada
- Western Economic Diversification Canada [1]

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

The Industry Portfolio, comprising 15 departments and agencies, plays a significant role in improving Canada's innovation performance. By continuing to fund basic research through the granting councils, and by working with small and medium-sized businesses through initiatives such as the Industrial Research Assistance Program and Aboriginal Business Canada, we can continue to accelerate the innovation agenda and improve our commercialization capacity.

The progress we are making in the research and commercialization agenda will have a noticeable impact on Canada's ability to compete in the marketplace of tomorrow. We have seen positive results from our investments in universities and colleges. In order to transform this increased research capacity and these results into jobs for Canadians, we need to work in partnership with our stakeholders to encourage innovation and build our commercialization capacity.

To build on this, we must create a world-class business environment — one with sound marketplace frameworks that encourage entrepreneurial activity while removing obstacles to effective business growth. In today's global economy, we must ensure that our regulatory regime is one of the most efficient and effective in the world. This is why the Government of Canada has made regulatory reform a priority.

The many programs offered by the Industry Portfolio give our regions and communities the opportunity to expand their businesses so they can more effectively compete in the global economy. The expanded on-line delivery of key government services and information extends our reach into the remote areas of Canada even further.

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 other government departments and agencies, industries, universities, as well as international partners.

With these and other initiatives, the Canadian Space Agency is playing a key role in helping to secure the economic opportunities that are needed to compete in this fast changing world. The progress that we have made has benefited Canadians economically and socially in all areas of our country.

I invite you to review the Canadian Space Agency's Departmental Performance Report for more details on how it fosters a productive, innovative and competitive 21st century economy.

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David L. Emerson
Minister of Industry

SECTION: 2 Management Representation Statement

Management Representation Statement

I submit, for tabling in Parliament, the 2003-2004 Departmental Performance Report (DPR) for the Canadian Space Agency.

This report has been prepared based on the reporting principles and other requirements in the *2003-2004 Departmental Performance Reports Preparation Guide* and represents, to the best of my knowledge, a comprehensive, balanced, and transparent picture of the organisation's performance for the 2003-2004 fiscal year.

Name: _____

Marc Garneau, President

Date: _____

SECTION: 3 Raison d'être

3.1 Mandate

Canada is a vast country bordered by three oceans. The unique vantage point from space allows us to monitor our expansive landmass territories and waters. Canada is endowed with rich natural resources. Space-based technologies and applications help us to manage them properly. Canada is sparsely populated with many remote communities. Satellite communications efficiently link citizens wherever they work and live. Canada has an educated population. The space sector offers career opportunities contributing to a strong knowledge-based economy.

The mandate of the Canadian Space Agency (CSA) is to promote the peaceful use and development of space, to advance the knowledge of space through science and to ensure that space science and technology provide social and economic benefits for Canadians. The CSA is achieving this mandate by implementing the Canadian Space Program (CSP) in co-operation with other government departments and agencies, industries, 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. *To learn more about the mandate of the CSA, go to:* http://www.space.gc.ca/asc/eng/about.asp

3.2 Partnership

International co-operation is critical to the implementation of the Canadian Space Program. Canada co-operates with a number of international partners and has ties to various space agencies. Although the United States (U.S.) National Aeronautics and Space Administration (NASA) and the European Space Agency (ESA) remain Canada's main international partners, we are increasingly developing relationships with other foreign space organisations. *To learn more about Canada's international partners, go to:* http://www.space.gc.ca/asc/eng/resources/links_agencies.asp

The CSA works closely with several government departments and agencies, most notably with 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, and the Departments of National Defence, Foreign Affairs, International Trade, Industry Canada, Environment Canada, Fisheries and Oceans and others. The CSA also works very closely with the Canadian space industry and the academic sector in the planning and implementation of the Canadian Space Program.
To learn more about Canadian space-related organisations, go to:
http://www.space.gc.ca/asc/app/csd/search.asp?Item=Resultat

SECTION: 4 Strategic Context

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

4.1 International Environment

Space is now recognised by most industrialised nations as an essential and strategic tool to meet their social and economic objectives. Accordingly, many governments around the world are now looking for increased consolidation, nurturing and protection of their space capabilities. Space activities are global in scope and this characteristic favours co-operation between nations seeking 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 strived to maintain strong international partnerships even though the worldwide thrust towards increased integration in the space industry, as well as the preservation of national autonomy, often supported by domestic procurement policies and restrictive export regulatory regimes, made it increasingly challenging.

This situation, along with the severe global downturn in the telecommunications sector, has already had a negative impact on the Canadian space industry, which, historically, has generated almost half its revenue in foreign markets. Moreover, events such as the Columbia Space Shuttle and Ariane-5 incidents have generated uncertainties worldwide, resulting in delayed major ventures and the review of priorities by major space agencies.

Still, several international opportunities remain and Canada is regarded as a non-threatening and reliable partner that possesses unique technical and scientific capabilities, and that can meaningfully contribute to the initiatives of foreign space agencies. In particular, emerging space-faring countries in Asia and South America offer high potential for future co-operation. These markets, while limited in the short-term, are likely to be subject to intense competition in the long-term. Consequently, Canada maintained its efforts to establish a foothold in these emerging markets. Therefore it was of paramount importance for the CSA to continue to work with its stakeholders to ensure that both our research community and industry remain active and competitive vis-à-vis world standards and markets.

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 industry. Industry is also the best vehicle for providing a broad range of services to diverse groups of users – from individuals to public and private organisations. 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 be obtained from foreign sources.

In addition to being able to respond directly to the needs of Canadians without constraint, this industrial capability should be of sufficient size and quality to make Canada an attractive partner for nations with whom it wishes to co-operate in order to meet common objectives. Given that the Canadian market is relatively small, it is critical that industry be able to leverage foreign investments and generate export sales. Capitalizing on export revenue depends on industry's ability to commercialise highly competitive products and services, as well as the Government of Canada's ability to establish open trade regulations with its closest international partners.

Canada's overall space revenues reflected the downturn in the global space sector, showing very marginal growth in 2003. Once again, telecommunications activities remained the core workhorse for the space sector.

To foster growth of the space industry during strenuous economic conditions, the CSA adjusted its priorities in order to accelerate the development of telecommunication in research and development (R&D) initiatives with a greater involvement of Canadian firms. The CSA also nurtured the conditions needed to expand the domestic market as well as the utilisation of space products and services in Canada. This was done through the Canadian Space Program, which is centred on: the advancement of knowledge through leading-edge science; the development of next generation technologies driven by Canadian needs; the introduction and use of advanced technologies to provide Canadians with new or more effective products and services at an affordable cost; and the commercialisation of these products and services by Canadian industry, particularly in foreign markets.

To learn more about the state of the Canadian space sector, go to:
http://www.space.gc.ca/asc/eng/science_industry/state.asp

4.3 Government Environment

In 2003-2004, the CSA finalised the development of its Canadian Space Strategy and pursued the implementation of its Management Modernisation Action Plan, while still maintaining efficient management of initiatives already approved under the Canadian Space Program. 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 the CSA Advisory Council and several Advisory Groups. This resulted in the final development of the CSA Canadian Space Strategy, which will define how the Canadian Space Program will be managed starting in 2005-2006.

Participants in the government-wide Modern Comptrollership initiative, the CSA conducted an agency-wide evaluation to assess its current management practices, which led to the approval of the Management Modernisation Action Plan (MMAP) in September 2002. Meanwhile, the Office of the Auditor General conducted its first audit

of the CSA and tabled its report in December 2002. The objective of the audit was to assess CSA capacity to deliver the Canadian Space Program with due regard to economy, efficiency, and effectiveness. The Report of the Auditor General of Canada and the MMAP have dovetailed in a joint initiative to improve CSA management over the following issues:

- develop a strategy for the CSA;
- consult with stakeholders in the formulation of long-term strategies;
- implement the remaining components of the Canadian Space Program Management Framework;
- balance financial capacities and obligations;
- refine the Project Approval and Management Framework;
- improve the performance measurement process and reporting; and,
- develop a strategic human resources plan.

In December 2003, the Audit, Evaluation and Review Directorate produced an evaluation report of CSA's management capacity using the Treasury Board Secretariat (TBS) modern comptrollership capacity methodology. The report indicated that the CSA has made significant progress in improving management practices in the last two fiscal years and is well on its way to achieving the goals set by the MMAP. With the transition from the Modern Comptrollership initiative to the implementation of the Management Accountability Framework put forward by TBS, the CSA pursues the improvement of its management practices by:

- fully integrating financial and non-financial performance information;
- developing an integrated corporate information management system;
- fostering the acquisition of modern management competencies; and,
- promoting public service values and ethics throughout the CSA.

To learn more about the CSA Management Modernisation Action Plan, go to: http://www.space.gc.ca/asc/eng/about/comptrollership.asp *and for more about the MMAP progress report*, go to*:* http://www.space.gc.ca/asc/eng/resources/publications/comptrollership-dec2003.asp

To learn more about the Office of the Auditor General Audit Report, go to: http://www.oag-bvg.gc.ca/domino/reports.nsf/html/20021207ce.html

SECTION: 5 Summary of Performance

The CSA has established seven Strategic Outcomes, which are not mutually exclusive. Hence, a single program, project or activity may contribute to more than one strategic outcome. The main priorities for each Strategic Outcome were the following:

Strategic Outcome	Main Accomplishment Highlights Against 2003-2004 Priorities
Economic Benefits	The development of RADARSAT-2 progressed steadily to be ready for launch in December 2005. RADARSAT-1 entered its 9th year of operation, 4 years beyond its design lifetime, and continues its reliable delivery of valuable data and images. Successful launch of Anik-F2 communication satellite that will start delivering Ka-band commercial services in 2004. Canada's last contribution to the International Space Station, the Special Purpose Dextrous Manipulator progressed on schedule for launch in 2007.
Technological Development and Diffusion	Demonstration of the world's first all-optical fine tracking mechanism for high data (Optical Inter Satellite Links) under the auspice of a Canada-Japan Space Panel. Implementation of an improved CSA Intellectual Property Management Policy to facilitate technology exploitation, transfer and commercialisation.
Understanding of the Environment	Launch of SCISAT-1 providing a wealth of data on stratospheric ozone depletion, on track with mission objectives identified by the science community. The CSA co-invested in 22 Earth Observation projects with other Government of Canada departments to collect space-borne data with a capacity to address Government priority areas.
Contributions to the Quality of Life	The System for Monitoring and Maintaining Robotic Operators Performance was flown to the Russian segment of the International Space Station.
World-Class Space Research	Canada was chosen to build a Meteorological Station to study Mars' polar climate for the Phoenix Mission, scheduled for launch in August 2007. MOST, Canada's first telescope and science satellite since 1971, was launched and is contributing to understanding the makeup of stars such as our Sun and limits on the age of the universe. Canada's premier space qualification facility, the David Florida Laboratory, highly met its clients' expectations with a 95% surveyed level of satisfaction.

Strategic Outcome	Main Accomplishment Highlights Against 2003-2004 Priorities
Social and Educational Benefits	The interest of educators throughout the country for CSA's space science and technology learning and information materials increased by 275% over the past two years. Canadian Astronauts toured the country eight times to reach stakeholders at the primary, secondary and university level.
Promotion and Awareness of the CSP	The CSA's Speakers' Bureau addressed 14,000 Canadians gathered at 78 events in 7 provinces. Numerous consultations on the overall direction of the CSA's Canadian Space Strategy were held with representatives from the government, space industry, scientific research and academia stakeholders.

SECTION: 6 Performance by Strategic Outcome

The following section presents CSA performance for each of the Strategic Outcomes. The CSA will continue the development of the Canadian Space Strategy in 2004-2005, along with a revision of its targeted results and strategic outcomes for 2005-2006. At the same time, the CSA will develop and refine its results-based performance measurement regime in order to improve its capability to report on Strategic Outcomes.

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 small- and medium-sized enterprises, 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 Quebec (DEC)
- Western Economic Diversification Canada (WED)
- Atlantic Canada Opportunities Agency (ACOA)

Spending for the Strategic Outcome Economic Benefits:

2003-2004			
Planned Spending	**Authorities Received**	**Actual Spending**	**FTEs**
172.7	170.4	145.5	142.0

This strategic outcome covers three main sectors: Satellite Communications, Earth Observation, and the Canadian Space Station Program.

Satellite Communications

Emerging space technologies and broadband applications hold the promise of connecting urban, rural and remote communities, so that every citizen will have access to the information highway.

Satellite Communications is the largest space-sector activity in Canada with sales of more than $1.128 billion, representing 63% of total space industry revenues[1]. The Canadian industry aims at responding to globalisation challenges by re-deploying itself as a supplier of sub-systems and components for the growing international space-based multi-media and mobile personal communications market. This strategy demands important investment in research and development (R&D), as well as CSA programs that will help industry develop advanced components and sub-systems, join international consortia as suppliers and maintain its competitiveness in its traditional market niches.

[1] Characteristics of the Canadian Space Sector, Canadian Space Agency Survey 2002
State of the Canadian Space Sector:
http://www.space.gc.ca/asc/pdf/state_of_the_canadian_space_sector_2002.pdf

PROGRAMS

The **Payload Flight Demonstration Program,** a private/public sector partnership, develops a Ka-band payload on the Anik-F2 satellite demonstrating the capability of a broadband multi-media service throughout North America.

Spending for the Payload Flight Demonstration Program:

2003-2004		
Planned Spending	**Authorities Received**	**Actual Spending**
21.4	21.3	21.2

The **Canada/ESA Satellite Communications Programs** enhance the industry's technological base and provide access to European markets in advanced telecommunication areas.

Spending for the Canada/ESA Satellite Communications Programs:

2003-2004		
Planned Spending	**Authorities Received**	**Actual Spending**
11.6	15.1	15.0

Approved in October 2003, the new **CASSIOPE Contribution Program** supports the integration of two payloads, the Cascade telecommunications Ka-band component and the enhanced Polar Outflow Probe (e-POP) scientific instrument, on a single small satellite bus designed and constructed by Canadian companies.

Spending for the CASSIOPE Contribution Program:

2003-2004		
Planned Spending	**Authorities Received**	**Actual Spending**
0	6.4	6.3

Any significant variance reported against Planned Spending set in the 2003-2004 RPP is explained in Section 7 - Spending by Strategic Outcome.

MAIN ACCOMPLISHMENTS AGAINST 2003-2004 RPP PLANNED RESULTS

Economic Benefits: Satellite Communications

Planned Result: The development and space-qualification of an advanced Ka-band multi-media payload scheduled for launch on Anik-F2 in October 2003. Eventually, this 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 Accomplishments: All payload components for the Payload Flight Demonstration Program were successfully built by Canadian suppliers and were integrated into the Anik-F2 satellite bus. Due to delays with other subsystems on the satellite, the successful launch finally took place on July 17, 2004 onboard an Ariane-5 launch.

The implementation of the Government Credit for Anik-F2 Utilisation was negotiated with Telesat and an Agreement was signed with the CSA on November 26, 2003. A subsequent Memoranda of Understanding (MOU) between CSA, CRC and Industry Canada was signed on June 25, 2004, to distribute this capacity over a 10-year period in accordance with the Government's new National Satellite Initiative (NSI) Program that was announced by the Minister of Industry in October 2003.

Final preparation for the launch of Anik-F2: Telesat will conduct in-orbit testing throughout the summer, and the Ka-band commercial services are expected to begin later in 2004.

To learn more about the use of Ka-band services on Anik-F2, go to: http://www.espace.gc.ca/asc/eng/satellites/commercial.asp

Started in the Fall of 2003, preliminary work for the CASSIOPE mission progressed rapidly with the preparation of the Cascade Ka-band payload mission requirements and the preliminary design of the (e-POP) scientific instrument.

Planned Result: By participating in European Space Agency (ESA) programs, the CSA allows our industry to access forward-looking studies on new telecommunications services; to develop new technologies, equipment and applications in multi-media, optical inter-satellite and mobile communications; and to demonstrate satellite-based communications services.

Main Accomplishments: Canada participated in the Advanced Research in Telecommunications R&D program ARTES-1, 3, 5 and 9; in the ARTEMIS operational data-relay satellite and in the development of the Galileo satellite navigation program.

Fifteen contracts awarded during the fiscal year are worth $9.35 million. Canada (through EMS Technologies SatNet Division) continued to be particularly active in the development of the DVD-RCS technology and systems, which are generating an important volume of business abroad. This contributed to Canada's overall contract to industry return coefficient of 1.27 (as of March 31, 2004), which is considered an outstanding performance.

To learn more about Satellite Communications, go to:
http://www.espace.gc.ca/asc/eng/satellites/satellites.asp

Earth Observation

Earth Observation (EO) is the second largest Canadian space-sector activity with annual revenues of $232 million, representing 12.9% of total space industry revenues[2]. 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. Operations are due to continue until the full commissioning of its successor, RADARSAT-2.

Spending for the RADARSAT-1 Program:

2003-2004		
Planned Spending	**Authorities Received**	**Actual Spending**
8.4	11.8	11.3

The **RADARSAT-2 Development Program** incorporates advanced technologies such as higher resolution and polari-metric 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.

[2] Characteristics of the Canadian Space Sector, Canadian Space Agency Survey 2002
State of the Canadian Space Sector:
http://www.space.gc.ca/asc/pdf/state_of_the_canadian_space_sector_2002.pdf

Spending for the RADARSAT-2 Development Program:

2003-2004		
Planned Spending	**Authorities Received**	**Actual Spending**
50.2	28.1	7.4

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:

2003-2004		
Planned Spending	**Authorities Received**	**Actual Spending**
20.3	18.6	15.2

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.

2003-2004		
Planned Spending	**Authorities Received**	**Actual Spending**
9.0	11.3	11.3

Any significant variance reported against Planned Spending set in the 2003-2004 RPP is explained in Section 7 - Spending by Strategic Outcome.

MAIN ACCOMPLISHMENTS AGAINST 2003-2004 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 at least until RADARSAT-2 is launched and commissioned.

Main Accomplishments: Due to delays in the construction and the launch of its successor RADARSAT-2, the RADARSAT-1 satellite was in its ninth year of operation; a full four years beyond its design lifetime. RADARSAT-1 continued to operate with the same level of high performance for reliability and image production to ensure data supply to clients.

Ongoing operation of RADARSAT-1 provides useful information to both commercial and scientific users in such fields as disaster management, interferometry, agriculture, cartography, hydrology, forestry, oceanography, ice studies and coastal monitoring. The CSA received positive feedback from NASA, the U.S. National Oceanographic and Atmospheric Agency (NOAA) and Radarsat-1's commercial data distribution services (RSI) at international meetings and through bilateral communications, as well as from end user clients as measured by client/stakeholder responses.

To learn more about RADARSAT-1, go to:
http://www.space.gc.ca/asc/eng/csa_sectors/earth/radarsat1/radarsat1.asp

Planned Result: The completion of RADARSAT-2 development to ensure continuous, all-weather, day and night radar coverage of the entire globe for the worldwide remote sensing data market.

Main Accomplishments: The development of the RADARSAT-2 satellite has progressed, albeit at a slower pace than planned. Delays encountered by the main contractor and subcontractors in the production of some of the satellite components have resulted in a significant delay in the assembly, integration and testing of the spacecraft. Launch is rescheduled for December 2005. Any additional costs to complete the construction and launch of RADARSAT-2 will be at the main contractor's expense. However, these additional delays will require that the CSA RADARSAT-2 project office remains operational beyond the time for which available funding was allocated.

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

To learn more about RADARSAT-1 and RADARSAT-2 Major Crown Projects, go to:
http://www.space.gc.ca/asc/eng/resources/publications/report_mcp.asp

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 the end of 2003-2004.

Main Accomplishments: The upgrade of Canada's ground systems for RADARSAT-2 will be available by early 2004-2005 and will be used to accelerate processing of RADARSAT-1 data.

The upgrade of Canada's ground systems moved at a slower pace than planned due to technical complexities associated with developments of this nature, as well as delays associated with the contracting process. On Site Acceptance Tests are scheduled for completion in September 2004, way ahead of the RADARSAT-2 launch date.

Planned Result: The continuation of satellite data application development, technology transfer and demonstration programs to support the growth of Canada's value-added industry, and the use of data produced by RADARSAT and other satellites.

Main Accomplishments: A total of 30 contracts were awarded: 18 for RADARSAT-2 applications, 10 for disaster management applications and 2 for Outreach and Diffusion. An International Implementation Arrangement was concluded with Finland, which led to the first Request for Proposal for joint applications development between Canadian and Finnish companies. The CSA started an evaluation study to assess the performance and responsiveness of the Earth Observation Application Development Program (EOADP), a major component of Earth Observation Support Programs.

The pre-competitive R&D, commercial and operational potential of new sensors was systematically explored through pre-competitive research and development in priority areas of the economy. Research reports were made available to Canadian industry and the research community.

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 Accomplishments: Contracts awarded (39) in EO during the fiscal year 2003-2004 are worth 5.939 euros (or approx. $9.8 million). Canada has been receiving contracts for the majority of Phase Studies for candidate ESA Earth Explorer Core and Opportunity missions (6), consequently positioning our industry for follow-on B/C/D phases when ESA selects the approved mission(s).

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; the mission controllers mandated to support robotics operations on orbit; the provision of an operational support capacity at the John H. Chapman Space Centre in St. Hubert, Quebec; and, the provision of sustaining engineering and logistical support of the MSS elements on orbit.

In exchange for this contribution, Canada has gained the rights to use up to 2.3% of non-Russian laboratories and crew time aboard the ISS. The CSSP has generated a robotics industry with revenues of $146 million[3] per year.

PROGRAMS

The **Development of the Mobile Servicing System** (MSS) is Canada's contribution to the International Space Station (ISS). The MSS includes Canadarm2, or the Space Station Remote Manipulator System (SSRMS), which is mounted on the Mobile Base System (MBS). Both components are now installed on the ISS and are designed to handle large loads onboard the Station. The third MSS component, Dextre, or the Special Purpose Dextrous Manipulator (SPDM), is the second specialised robot designed to perform more delicate tasks and its launch to the ISS is expected in 2007.

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 next 15 years.

The **ISS Utilisation Program** promotes the utilisation of Canada's allocation of 2.3% of the non-Russian ISS research facilities.

[3] Characteristics of the Canadian Space Sector, Canadian Space Agency Survey 2002

State of the Canadian Space Sector:
http://www.space.gc.ca/asc/pdf/state_of_the_canadian_space_sector_2002.pdf

Spending for the Development of the Mobile Servicing System, the MSS Operations Program, and the ISS Utilisation Program:

2003-2004			
Programs	**Planned Spending**	**Authorities Received**	**Actual Spending**
Development of MSS:	3.4	0.2	0.2
MSS Operations:	47.5	56.8	56.7
ISS Utilisation:	0.9	0.9	0.8
TOTAL	51.7	57.9	57.7

Any significant variance reported against Planned Spending set in the 2003-2004 RPP is explained in Section 7 - Spending by Strategic Outcome.

MAIN ACCOMPLISHMENTS AGAINST 2003-2004 RPP PLANNED RESULTS

Economic Benefits: Canadian Space Station Program

Planned Result: The completion of the ground test equipment and beginning testing of the SPDM in preparation for its launch.

Main Accomplishments: SPDM testing and integration work is proceeding well and the element is expected to be ready in 2005; well in advance of its launch date, which is currently expected to occur no earlier than May 2007. This delay is due to the Space Shuttle launch delays following the Columbia accident.

As a result of the completion of the SPDM, CSA and Treasury Board officially closed the Canadian Space Station Program Major Crown Project, for the acquisition of the Mobile Servicing System in March 2004, and an evaluation report was produced.

To learn more about the Canadian Space Station Program Major Crown Project, go to: http://www.space.gc.ca/asc/eng/resources/publications/report_mcp.asp, *and about the Evaluation Report, go to:* http://www.espace.gc.ca/asc/eng/resources/publications/report_mcp-2003.asp

Planned Result: Ongoing fulfilment of responsibilities for MSS Operations.

Main Accomplishments: Effective teams of sustaining engineers and private contractors, together with specialised engineering facilities, supported on-orbit operations of Canadarm2 and the Mobile Base System. Since 1998, training has been provided at CSA headquarters for 256 people, including cosmonauts/astronauts, mission controllers and other ground support personnel from ISS partners, to enable them to meet all MSS operations mission requirements and simulations. Four Canadian astronauts have now completed the MSS Robotics Operator certification program at CSA. The CSA's Mobile Servicing System Operations group continues to support mission planning and mission

execution for every robotic activity conducted on ISS; both when a Space Shuttle is present and during the stage periods between Space Shuttle visits. Logistics and sustaining engineering activities have ensured the continued performance of the MSS system, especially in 2002 when one Canadarm2 joint had to be replaced on orbit. Software changes have been performed to successively add new MSS functionalities and to remain synchronised with the evolution of the ISS software.

Planned Result: The promotion of the use of the ISS research laboratory and the proper brand management of the ISS.

Main Accomplishments: A comprehensive strategy was developed to promote the use of Canada's share of ISS facilities and resources, and has led to the drafting of several Memorandums of Understanding for ISS utilisation on a cost recovery basis. The Columbia accident has put a halt to the assembly of the ISS and minimised the role of the MSS during this period of stage operations only. Every opportunity is taken by the CSA Communications directorate to showcase the MSS and the ISS.

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 prioritised partnerships with foreign space agencies and firms to acquire expertise, to demonstrate Canadian technologies as space-qualified products and services, and to improve access to international markets. The CSA is working with firms in space-related activities, particularly small- and medium-sized enterprises, and universities and specialised research institutes.

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)

Spending for the Strategic Outcome Technological Development and Diffusion:

2003-2004			
Planned Spending	**Authorities Received**	**Actual Spending**	**FTEs**
27.1	40.1	38.7	91.0

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 has prioritised 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 international market potential.

Spending for the Space Technology Development Program:

2003-2004		
Planned Spending	**Authorities Received**	**Actual Spending**
9.4	21.2	20.6

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

Spending for the Technology Demonstration Program:

2003-2004		
Planned Spending	**Authorities Received**	**Actual Spending**
2.3	0.9	0.7

The **Commercialisation Office** supports the transfer of proven space technologies to the marketplace and their application in non-space products and services. The Technology Diffusion Programs allow companies to develop business and commercialisation plans for technologies developed under the Canadian Space Program.

Spending for the Commercialisation Office:

2003-2004		
Planned Spending	**Authorities Received**	**Actual Spending**
1.8	1.8	1.3

The Space Technology Research Program 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 space technology trends; the exploration, along with industry and universities, of potential emerging technologies; and, the transfer of in-house developed technologies to the Canadian space industry.

Spending for the Space Technology Research Program:

2003-2004		
Planned Spending	**Authorities Received**	**Actual Spending**
13.7	16.3	16.0

Any significant variance reported against Planned Spending set in the 2003-2004 RPP is explained in Section 7 - Spending by Strategic Outcome.

Main Accomplishments against 2003-2004 RPP Planned Results

Technological Development and Diffusion

Planned Result: The enhancement of the Canadian space industry's capabilities by awarding new technology development contracts to companies following an annual Request for Proposal process.

Main Accomplishments: More than 70 contracts were active at the end of 2003-2004, providing opportunities for the development of high-risk technologies critical to penetrating emerging international markets and meeting the requirements of future Canadian and international space missions.

A total of 49 contracts, worth of $16.3 million, were awarded to develop innovative technologies in priority areas for the CSA and industry. The industry's contribution to some of these projects represents up to 35% of the total project costs (based on the level of maturity of technologies).

Under the CSA's Accelerated Satcom Technology Research and Development (CASTOR) initiative, five activities (two activities with ComDev, two with EMS, and one with Telesat) were completed to reinforce the industry's market share during the current slowdown with product enhancements and new customer development.

A first contract was awarded to Bristol in February 2004 for the preliminary design of a standardised multi-mission small satellite bus that will provide low-cost access for science and technology demonstration missions. This contract will thus contribute to and maintain bus design, manufacturing and integration capabilities.

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 Accomplishments: Seven contracts were awarded during the first three quarters of 2003-2004. During that period, the very successful Harsh Environment Initiative was concluded with the award of one last contract (C-CORE, Newfoundland). Canada's participation in the PROBA-2 technology demonstration satellite was confirmed with the participation of Dynacon, NGC Aerospace and MPB Technology. This contributed to Canada's overall contract to industry return coefficient of 1.11 (as of December 2003), which is considered an outstanding performance.

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 Accomplishments: Scientific, engineering expertise and technical capabilities were acquired in the fields of: advanced robotics and automation, space optics, ground systems and software development, interplanetary mission planning, attitude control systems, radar and hyperspectral sensors, advanced materials and thermal technologies.

CSA scientific authorities supported more than 50 contracts, and 12 new high-risk technologies were demonstrated in laboratories in 2003-2004.

Examples of research and development activities performed under this program include the development of technologies for planetary exploration such as micro-robotics and autonomous navigation of mobile robots. Technologies were also developed to support future satellite servicing missions such as the Hubble rescue mission being considered by NASA. As formation flying of spacecraft will play an important role in future space exploration, research is underway on the control of spacecraft formation.

Autonomy in satellite operations is a growing technological trend for large communication satellites, as well as earth observation and space science and exploration missions based on small satellites and future micro and nano-satellites. In this context, innovative research on autonomous smart thermal radiators and failure detection, and identification and recovery techniques of spacecraft is underway. These technologies have good spin-off potential for earth-based terrestrial applications such as increased energy efficiency in the building sector. The associated reduction in greenhouse gas emissions will also contribute to the Kyoto Protocol.

The CSA is actively developing Microwave Monolithic Integrated Circuit (MMIC) chipsets for the Next Generation Transmit/Receive Modules for use on future Synthetic Aperture Radar (SAR) Earth Observation missions. This will reduce Canada's dependence on foreign suppliers. Transfer of this R&D effort to Canadian industry has begun and a proof of concept T/R Module breadboard has been delivered and hardware specifications drafted. The Next Generation T/R Module program should conclude with a T/R Module elegant breadboard by 2007.

The world's first all-optical fine tracking mechanism for high data rate Optical Inter Satellite Links (OISL) has been successfully demonstrated at the CSA and submission for patent has been made. Under the auspice of the 2004 Japan-Canada Space Panel, held at St. Hubert in late May 2004, a mutual demonstration was conducted of both the electro-mechanical system designed by the National Institute of Information and Communication Technology (NICT, formerly the Communication Research Laboratory) of Tokyo, Japan and the all-optical mechanism designed at the CSA. This collaboration will lead to the demonstration of data communications between Japanese and CSA terminals.

Over 38 papers and formal presentations were published at various conferences around the world, 8 inventions were declared and 54 patent applications were submitted. The Inventor and Innovator Awards Program was implemented to officially recognise and reward CSA researchers.

Planned Result: The transfer and commercialisation of space technologies and their applications to other sectors of the economy to enhance Canada's industrial competitiveness.

Main Accomplishments: The CSA managed a portfolio of more than 100 active patents and intellectual property licenses resulting from government R&D investments, and conducted several commercialisation assessments and marketing plans for technologies developed in-house and through contracts to industry. Also, 14 Arrangements were concluded regarding technology exploitation, transfer and commercialisation. The CSA implemented a new Intellectual Property Management policy and provided related information and training to its employees.

To learn more about Technological Development and Diffusion, go to:
http://www.space.gc.ca/asc/eng/csa_sectors/technology/technology.asp

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:

2003-2004			
Planned Spending	**Authorities Received**	**Actual Spending**	**FTEs**
30.5	23.7	21.7	11.3

The unique scientific data provided by space-based instruments and Earth Observation (EO) 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: (i) participation in international missions dedicated to understanding the dynamics of the atmosphere better, monitoring atmospheric pollution and enhancing the prediction capabilities of global climate change, and (ii) 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:

2003-2004		
Planned Spending	**Authorities Received**	**Actual Spending**
17.8	12.8	11.6

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

Spending for the Space Environment Programs:

2003-2004		
Planned Spending	**Authorities Received**	**Actual Spending**
5.5	4.1	3.5

The **Government Related Initiatives Program (GRIP)** fosters the use of Canada's space resources such as space-based earth-ocean-atmosphere observation systems and services by Canadian federal government departments. GRIP supports the analysis of EO data and the integration of EO data and derived environmental parameters into the geospatial information products and predictive models of all components of the environmental system for use by Canadian government decision makers and by the Canadian public.

Spending for the Government Related Initiatives Program (GRIP):

2003-2004		
Planned Spending	**Authorities Received**	**Actual Spending**
7.2	6.9	6.6

Any significant variance reported against Planned Spending set in the 2003-2004 RPP is explained in Section 7 - Spending by Strategic Outcome.

Main Accomplishments against 2003-2004 RPP Planned Results

Understanding the Environment

Planned Result: Launch and operation of SCISAT-1, the first Canadian-led mission since the early 1970s, to enhance Canada's leadership in stratospheric ozone studies.

Main Accomplishments: SCISAT was launched in August 2003 and is now acquiring a wealth of data, which will permit the CSA to meet the mission objectives as identified by the space science community. Studies will enable a more comprehensive understanding of the several chemical processes that play a role in stratospheric ozone depletion.

Extensive work has been performed since the launch, and observations are now routinely translated into vertical profiles of atmospheric constituents in the stratosphere and the mesosphere. Preliminary scientific results will be presented at upcoming international scientific conferences.

To learn more about SCISAT, go to:
http://www.space.gc.ca/asc/eng/csa_sectors/space_science/atmospheric/scisat/scisat.asp

Planned Result: The study of stratospheric composition and ozone depletion processes at mid-latitudes, through the launch of high-altitude balloon experiments in August 2003, as part of validation campaigns for Canada's OSIRIS instrument onboard Sweden's Odin satellite and SCISAT-1.

Main Accomplishments: Due to the delay in the launch of SCISAT-1, the high-altitude balloon experiment was postponed by one year and will now take place in August 2004.

Planned Result: The participation of Canadian scientists in the study on global climate processes with the delivery of key radar components for NASA's CloudSat.

Main Accomplishments: Canadian companies successfully developed and delivered components for the Cloud Profiling Radar, which will provide new information needed to improve climate and numerical weather prediction models.

CloudSat is now scheduled for launch in April 2005. Extensive validation campaigns are planned to help validate the new data; the CSA is collaborating with scientists from the Meteorological Service of Canada to conduct a comprehensive airborne field campaign to study cloud systems in the Great Lakes area during the cold season.

Planned Result: A better understanding of global atmospheric circulation with the development, in collaboration with ESA, of an instrument called SWIFT (Stratospheric Wind Interferometer for Transport studies) scheduled to fly onboard the Japanese Space Agency's Global Change Observation Mission in 2007.

Main Accomplishments: The feasibility study on Canadian contributions to SWIFT was completed. Preliminary design and systems definition were delayed because Japan, which had offered to fly SWIFT on a satellite for the scientific study of the stratosphere, modified the science focus of its mission and withdrew its offer to accommodate the SWIFT instrument. The Mission redefinition is underway; including a plan for a Canadian Mission, using a small satellite platform developed within the CASSIOPE program and built in Canada. Other science instruments could be embarked on the same mission, and will likely involve other domestic or international partners.

Planned Result: The continued development of a small Canadian scientific satellite, the Enhanced Polar Outflow Probe (e-POP) scheduled for launch in 2006-2007. The scientific data collected by e-POP will help explain the particle exchange and energy coupling processes between the Earth's atmosphere and the space environment.

Main Accomplishments: The feasibility study and the System Requirements Review on the development of six instruments for e-POP – one instrument supplied by the U.S. Naval Research labs and one instrument from Japan's Institute for Space and Astronotica Sciences – were completed by the University of Calgary in January 2004. The e-POP mission, now integrated into the CASSIOPE Mission Contribution Program, is currently scheduled for launch in early 2007. The e-POP payload configuration will be Canadian-made. The Contribution agreement was signed in February 2004.

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

Main Accomplishments: Major ongoing Earth Observation application projects were continued with the participation of the Canadian Forest Service (national forest cover mapping), the Meteorological Service of Canada (cryosphere and its response to climate change), the Canada Centre for Remote Sensing (climate change and ecosystem impact) and Fisheries and Oceans Canada (ocean ecosystem monitoring).

In all, the CSA and other Government of Canada departments co-invested in 22 Earth Observation projects to collect space-borne data that can be used in addressing Government priority areas. New developments cover a broad range of application domains, such as: monitoring environmental changes in western arctic coastal communities; measuring water quality parameters in inland waters; mapping northern

boreal/sub-arctic wetlands and forest biomass; assessing sustainable agriculture management practices; and detecting marine oil pollution. Several of the government departments leading this work had no previous participation in the Canadian Space Program. The CSA started an evaluation study to assess the performance and responsiveness of the Government Related Initiatives Program (GRIP).

Planned Result: The modernisation and upgrade, completed by 2004-2005, of a Canada-wide array of ground-based instruments (known as Canadian Geospace Monitoring) to collect data on the entire Sun-Earth system, and complement a fleet of international space missions under the coordinated International Living With a Star (ILWS) Program.

Main Accomplishments: Significant achievements were made toward the development of a Canadian contribution to ILWS under a ten-year research and implementation roadmap. A comprehensive proposal was peer-reviewed and received high ratings by international experts. Testing on the new real-time data collection system was completed and is being reviewed. The transition from the old to the new data collection system is expected to be complete by March 2005.

Planned Result: The development and delivery of new and improved forecasts of space weather conditions affecting power-grids, telecommunications, and low-Earth orbiting satellite.

Main Accomplishments: The development of the space weather forecast facility, in collaboration with Natural Resources Canada, is progressing as planned. This will improve our understanding of auroras, magnetosphere, and particle processes driving space weather.

The Canadian Space Weather Forecast Centre (CSWFC) jointly supported by the CSA and NRCan, is entering into a phase where more user-specific functionality is being developed. The CSWFC is one of the Regional Warning Centres of the International Space Environment Service (ISES).

To learn more about CSWFC, go to: www.spaceweather.ca

To learn more about Understanding of the Environment, go to:
http://www.space.gc.ca/asc/eng/csa_sectors/earth/earth.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)

Spending for the Strategic Outcome Contributions to the Quality of Life:

2003-2004			
Planned Spending	**Authorities Received**	**Actual Spending**	**FTEs**
26.9	23.0	16.6	28.4

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 through Space Shuttle flights and use of the ISS.

Spending for the Space Life Sciences Program:

2003-2004		
Planned Spending	**Authorities Received**	**Actual Spending**
7.9	5.6	4.4

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 by developing instruments and facilities for carrying out experiments on Space Shuttle flights and the ISS.

Spending for the Microgravity Sciences Program:

2003-2004		
Planned Spending	**Authorities Received**	**Actual Spending**
9.0	9.1	6.9

The **Canadian Astronaut Office**, which is composed of the Canadian Astronaut Corps and Operational Space Medicine Group, was created to:

- develop and maintain human space flight expertise to meet the needs of the Canadian Space Program;
- participate in CSP activities that rely upon or benefit from the knowledge, skills, and attitudes of trained astronauts;
- increase public awareness of the Canadian Space Program and its social and economic benefits for Canada; and,
- advocate a Canadian economy based upon innovation and advanced education.

The Operational Space Medicine Group also participates in the development of technologies and procedures for enhancing performance and for the prevention, diagnosis and treatment of illness and injury during space flight with medical applications for the benefit of Canadians.

Spending for the Canadian Astronaut Office:

2003-2004		
Planned Spending	**Authorities Received**	**Actual Spending**
10.0	8.4	5.3

Any significant variance reported against Planned Spending set in the 2003-2004 RPP is explained in Section 7 - Spending by Strategic Outcome.

MAIN ACCOMPLISHMENTS AGAINST 2003-2004 RPP PLANNED RESULTS

Contributions to the Quality of Life

Planned Result: An understanding of how human and other life forms adapt to a weightless environment and the improvement of medical knowledge through experiments using the effects of microgravity.

Main Accomplishments: While pursuing the development of scientific instruments and the planning of experiments to be carried out onboard the ISS, the CSA still had to deal with the consequences following the interruption of Space Shuttle flights due to the loss of Columbia and its crew.

The Extra-Vehicular Activity Radiation Monitor (EVARM) experiment, launched on the ISS in August 2002, has provided very valuable information concerning radiation exposure of astronauts during space walks, and while inside the ISS. The first experiments with this device were completed, and the CSA is negotiating the possibility of performing additional experiments on the ISS with NASA due to the high quality data collected and its importance with respect to the new NASA Space Exploration vision.

Originally scheduled in May 2003, the Perceptual-Motor Deficits in Space (PMDIS) experiment to be performed during the STS-115/12A mission with Canadian Astronaut Steve MacLean, was delayed until shuttle flights resume. This experiment will look at why astronauts often experience potentially dangerous decreased hand-eye coordination when they first enter the space environment.

The Insect Habitat facility for the ISS was jointly developed by CSA and NASA in order to provide a controlled environment for insects (commonly used in genetic research) on the ISS. The Experiment Planning Model was completed this year to evaluate the performance of the system before final manufacturing begins. The experiment has been delayed until shuttle flights resume.

The experiment on cardiovascular adaptation to the space environment to be performed during the STS-118/13A mission with Canadian Astronaut Dave Williams, is now flight-ready and is awaiting the Shuttle's return to flight.

In January 2003, the System for Monitoring and Maintaining Robotic Operators Performance (SMP) was flown to the Russian Segment of the International Space Station. The SMP will allow better understanding of (robotic) performance degradation and skill recovery in micro-gravity. Data is currently being collected from cosmonauts/astronauts assigned to the ISS. Information gathered from the SMP project will help with the development of innovative training tools and methods with application in space and on Earth.

To learn more about Space Life Sciences, go to:
http://www.space.gc.ca/asc/eng/csa_sectors/space_science/life_sciences/life_sciences.asp

Planned Result: 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. The main Microgravity Sciences projects include the development of the Microgravity Vibration Isolation System, with a flight model to be delivered in 2003 for integration in ESAs Fluid Science Laboratory, and the Microgravity Isolation Mount Base Unit and ISS Furnace, with acceptance reviews scheduled in October 2004.

Main Accomplishments: After an extensive review of the Microgravity Vibration Isolation System (MVIS) project, the CSA decided to pursue the work, and the hardware is now being completed for integration in ESA's Fluid Science Laboratory (FSL). The MVIS will enhance the quality of material and fluid experiments conducted on the ISS. In return for this contribution, ESA will provide flight opportunities to Canadian scientists. Integration of MVIS in the FSL will occur no earlier than January 2005.

Industry continued to develop the Advanced Thermal Environment (ATEN) high-temperature furnace for use on the ISS. An Engineering model of ATEN has been completed and work is underway to evaluate its scientific performance.

To learn more about Microgravity Sciences Program, go to:
http://www.space.gc.ca/asc/eng/csa_sectors/space_science/microgravity/microgravity.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:

2003-2004			
Planned Spending	**Authorities Received**	**Actual Spending**	**FTEs**
26.8	27.9	24.0	56.7

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 contribute to international efforts aimed at understanding the universe and predicting its evolution.

Spending for the Astronomy and Space Exploration Programs:

2003-2004		
Planned Spending	**Authorities Received**	**Actual Spending**
17.1	18.9	15.2

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:

2003-2004		
Planned Spending	**Authorities Received**	**Actual Spending**
9.8	9.0	8.8

Any significant variance reported against Planned Spending set in the 2003-2004 RPP is explained in Section 7 - Spending by Strategic Outcome.

MAIN ACCOMPLISHMENTS AGAINST 2003-2004 RPP PLANNED RESULTS

World-Class Space Research

Planned Result: A better understanding of the universe and the basic physical and chemical make-up of our solar system through the participation of our scientific community in international Astronomy and Space Exploration programs.

As well, discussions will continue with potential international partners to collaborate on upcoming robotic missions as part of a Canadian strategy for exploring Mars, which will include benefits for Canada in science and industrial competitiveness.

Main Accomplishments: The CSA participated in the Balloon-borne Large Aperture Sub-millimetre Telescope (BLAST) that was launched in 2003. BLAST is a multi-national research collaboration, which provides the opportunity to conduct unique galactic and extra-galactic surveys.

After experiencing delays due to external factors, the Microvariability and Oscillations of Stars (MOST) micro-satellite was launched in June 2003. MOST, Canada's first space telescope and first science satellite since 1971, is designed to probe the interior of stars, set a limit on the age of the universe, and for the first time, detect light reflected by little known planets beyond our Solar System. Canadian MOST scientists have already obtained breakthrough scientific information on star seismology through complete and very precise photometric monitoring of stars. This new information has led to a publication in Nature, a pre-eminent international science journal.

Canada's participation in the Herschel/Planck mission to be launched in 2007 by ESA, progressed with the implementation of initial contracts for the development of essential components of two of the scientific instruments: SPIRE (Spectral and Photometric Imaging Receiver) and HIFI (Heterodyne Instrument for the Far-Infrared) will both contribute to enhancing our understanding of galaxy and star formation. For HIFI, the CSA is developing a Local Oscillator Source Unit (LSU). The preliminary design phase of the LSU was completed. The detail design is in progress and the instrument will be delivered mid-2005.

Canada is also working with NASA on the James Webb Space Telescope (JWST), the planned successor to the Hubble Observatory in 2012. Canada has negotiated an enviable role in the new Observatory through the development of the Fine Guidance Sensor/Tunable Filter Camera (FGS) that will provide continuous pointing information to the Observatory to stabilize the line-of-sight and allow JWST to obtain the required image quality. The preliminary design phase has started and is expected to be complete by mid-2005.

The CSA provided mission operations support to its first interplanetary mission with Japan’s Nozomi satellite, which unfortunately did not reach Mars as expected in January 2004.

Canada will contribute a Meteorological Station to study Mars' polar climate for the Phoenix Mission. The Meteorological Station will consist of a Light Detection and Ranging (LIDAR) instrument, as well as sensors for measuring atmospheric pressure and temperature. Scheduled for launch in August 2007, the University of Arizona's Phoenix mission was selected by NASA in August 2003 as the winning proposal for a low-cost mission to Mars (Scout Missions).

To learn more about Astronomy and Space Exploration go to:
http://www.space.gc.ca/asc/eng/csa_sectors/space_science/astronomy/astronomy.asp

Planned Result: The provision of world-class environmental space qualification services and facilities for the assembly, integration and testing of spacecraft systems and sub-systems; thus supporting both the Canadian space industry and the objectives of the Canadian Space Program.

Main Accomplishments: The David Florida Laboratory achieved a 55% loading rate in 2003-2004 (excluding maintenance and test set-up time) in support of 23 different clients and 72 separate programs. Client satisfaction surveys indicated an over 95% approval rating of DFL services. Major projects supported by DFL assembly, integration and qualification testing services included RADARSAT-2, MSS, SCISAT-1, MOST and Anik-F2, as well as Canadian and foreign company spacecraft components. Total revenues amounted to $2,017,444 with $689,816 being returned to the Consolidated Revenue Fund.

Planned Result: Market DFL services internationally, which involves the negotiation of "Facilities Use Agreements" to satisfy U.S. technology transfer concerns regarding commercial satellite programs, and undertake facility preparations and test technology development to respond to the qualification requirements of future missions.

Main Accomplishments: DFL developed a comprehensive international marketing plan and updated their brochure and web page to provide clients with the most recent facility information and capabilities. A detailed long-term capital plan has been prepared, and DFL is currently working on a fee schedule update that will serve as a basis for setting future fees. A number of "Facility Use Agreements" were negotiated with offshore prime contractors for the testing of their space flight hardware. DFL achieved and maintained the new ISO 9001:2000 standard certification, which focuses on customer satisfaction and continuous improvement.

The CSA operated and maintained the physical plant as a national asset and DFL is well positioned to respond to any and all challenges and opportunities that might arise. On the test technology development side, a new thermal vacuum computer data acquisition and control system has been developed and implemented.

To learn more about the David Florida Laboratory, Canada's premier space qualification facility, go to: http://www.espace.gc.ca/asc/eng/dfl/dfl.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 with representatives of the Inter-departmental Workgroup on Education.

Spending for the Strategic Outcome Social and Educational Benefits for Canadians:

2003-2004			
Planned Spending	**Authorities Received**	**Actual Spending**	**FTEs**
2.4	1.5	1.4	2.9

The CSA is leveraging the unique appeal of space to improve scientific literacy among students and educators. Through an integrated and proactive public appearance and outreach strategy, Canadian astronauts, CSA scientists, engineers and program specialists are offering their expertise and enhancing the awareness of Canada's contribution to leading-edge space science and technology, while encouraging youth to pursue careers in science and engineering.

PROGRAMS

The **Youth Awareness and Educational Program** inspires and encourages youth to undertake careers in Science and Technology (S&T) by: running reward and recognition activities; conceiving and distributing space science and technology-related information and teaching materials; conducting interactive distance-learning classrooms and teacher-training conferences; and, directing proactive public information campaigns across Canada.

Spending for the Youth Awareness and Educational Program:

2003-2004		
Planned Spending	**Authorities Received**	**Actual Spending**
1.1	1.0	0.9

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:

2003-2004		
Planned Spending	**Authorities Received**	**Actual Spending**
1.3	0.5	0.5

Any significant variance reported against Planned Spending set in the 2003-2004 RPP is explained in Section 7 - Spending by Strategic Outcome.

MAIN ACCOMPLISHMENTS AGAINST 2003-2004 RPP PLANNED RESULTS

Social and Educational Benefits for Canadians

Planned Result: Foster scientific literacy among students and educators mainly through an increase in educator and student participation in the space-centred learning initiatives; an enhanced use of targeted and educational space-based materials by not-for-profit and educational institutions; and, an expanded network of leveraged expertise and partnered initiatives across Canada.

Main Accomplishments: The CSA Educator Web site had 87,367 visits (reflecting a 240% increase in the number of visits), with the average length of each visit lasting approximately 16 minutes. Overall, the CSA Youth/Educator Web site recorded a 38% increase in visits, growing from 161,542 to 222,744 visits over the course of the year.

The number of educators subscribing to the specialised CSA Space Education database has increased by 37% in this period, growing from 1001 to 1374. Educators subscribed to this CSA database receive regular information on space learning materials and activities. Interest for targeted space science and technology learning materials and information has increased by 275% since 2001-2002, when just 500 educators were registered.

The CSA produced 4 new space science and technology related curriculum resource packages that have been made available on the Educator Web site. *Tomatosphere*, a project that leverages partnership with other government departments, as well as the private and not-for-profit sectors, reached 165,000 students at the primary and secondary levels.

Among the many space education-centred outreach initiatives, the CSA conducted 2 distance-learning workshops hosted by CSA Astronauts, who joined 210 educators gathered at the John H. Chapman Space Centre in St. Hubert via video-conference from Houston, Texas. Eight proactive Astronaut tours were co-ordinated throughout the country, reaching stakeholders at the primary, secondary and university level. CSA scientists, researchers and technology experts offered their expertise in presentations, and engaged in discussions with teachers from every region of Canada attending the annual CSA Space Educator Conference.

The CSA more than doubled the number of space education-related grants, increasing the number of accepted proposals from 7 to 16. These grants facilitated partner projects with 8 science centres and museums, 5 schools, 2 space camps and one science fair located in 6 provinces throughout Canada. Seven new collaboration opportunities to deliver information on the Canadian Space Program were accepted. Among them, the "Bourse de l'île du savoir/École des Petits Chanteurs du Mont-Royal", a collaborative initiative between the Canadian Space Agency, the "Commission scolaire de la Pointe-de-l'Île", and the "Ministère de l'Éducation du Québec", resulted in the CSA disseminating space-related content through presentations and on-site training with members of our science and engineering community. Following their experience, the educators developed a comprehensive space-focussed and cross-curricular program, which was implemented

throughout the school year and made available to all educators in the Montreal French School Board.

To learn more about the Youth Awareness and Educational Program, go to:
http://www.espace.gc.ca/asc/eng/youth_educators/educators/educators.asp

Planned Result: The implementation of the new Grant and Contribution programs, in partnership with other federal departments and agencies, to support awareness, research and training in space science, space medicine and space technologies.

Main Accomplishments: Programs were jointly delivered with the Natural Sciences and Engineering Research Council of Canada (NSERC) and/or the Public Service Commission, as well as new training initiatives with industry and universities, to help train Canadian scientists, engineers and technicians for high technology and space-related industries.

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.

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

2003-2004			
Planned Spending	**Authorities Received**	**Actual Spending**	**FTEs**
5.8	5.4	5.1	33.7

The CSA is absolutely committed to building national pride through proactive public awareness initiatives focused on Canadian achievements and breakthroughs in space science, exploration and technological innovation.

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; major factors that are enhancing international recognition of Canada as an innovative space science and technology leader.

PROGRAMS

Promotion of Awareness of the Canadian Space Program is directed through a proactive and integrated communications strategy focussing on the achievements and benefits that flow from Canada's leadership in space, and by managing the strategic relationships between the CSA and its domestic and international partners and stakeholders.

Spending for the Promotion of Awareness of the Canadian Space Program:

2003-2004		
Planned Spending	**Authorities Received**	**Actual Spending**
5.8	5.4	5.1

Any significant variance reported against Planned Spending set in the 2003-2004 RPP is explained in Section 7 - Spending by Strategic Outcome.

MAIN ACCOMPLISHMENTS AGAINST 2003-2004 RPP PLANNED RESULTS

Promotion and Awareness of the Canadian Space Program

Planned Result: Increased awareness of the Canadian Space Program with Parliamentarians, stakeholders and the general public through a proactive communication strategy focusing on key space achievements.

Main Accomplishments: Over the course of 2003-2004, and in the wake of the Space Shuttle's anticipated return to flight, the CSA granted and conducted 360 interviews with representatives of the media; equivalent to the 366 recorded on a variety of issues in the previous year. The figures for 2002-2003 do not include the more than 400 interviews, which were conducted immediately after and in the weeks following the tragic demise of the Space Shuttle Columbia. In 2003-2004, the CSA Speakers' Bureau accepted invitations to address more than 14,000 Canadians gathered at 78 events in 7 Canadian provinces.

The proactive Canadian Astronaut tours responded positively to 95 out of 211 received invitations, taking the opportunity to reach out to Canadian students, educators, professors and administrators at the primary, secondary and university level, members of the business community, and key stakeholders across Canada.

In 2003-2004, the CSA Web site recorded an increase of 11,000 visitors to its corporate site (to reach a total of 579,599 visitors), who consulted 11,882,532 pages.

Major communications awareness campaigns were mounted to draw attention to the launch of MOST, Canada's "humble" space telescope micro-satellite and the first all-

Canadian space science satellite in thirty years. Closely following this successful launch, public attention was drawn to the launch of SCISAT-1, a small all-Canadian satellite dedicated to measuring the transport of chemical pollutants in the upper atmosphere. These two satellites were promoted as prime examples of the CSA's new Micro and Small Satellite Program.

A major Government of Canada announcement in Vancouver inaugurated the innovative CASSIOPE Mission, combining a commercial payload offering high capacity data transfer to remote operations anywhere in the world with a specialised scientific instrument that will help scientists study space weather phenomena in the Earth's upper atmosphere. This announcement also opened the contracting for the design of the CSA Small Satellite Bus.

In collaboration with Canada Post and in celebration of International Stamp month, the CSA staged a national media event bringing together all eight of its Canadian Astronauts to inaugurate the issue of a special Astronaut stamp series that has been made available to Canadians through 22,000 Canada Post outlets across the country.

CSA participation at major international conferences such as IGARSS 2003, World Forestry Congress, IAC-2003 and the Remote Sensing Symposium has positioned Canada as a leading space-faring nation with niche market expertise in telecommunications, remote sensing, space-robotics and the design of world class technologies, sensors and scientific expertise.

An active guided public visit program accommodated 2,161 visitors at the headquarters of the Canadian Space Agency, the John H. Chapman Space Centre in St. Hubert Quebec.

To learn more about the CSA Awareness initiatives, go to:
http://www.space.gc.ca/asc/eng/media/press_room/press_room.asp

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

Main Accomplishments: To help position Canadian stakeholders to seize market opportunities, the CSA carries out key ongoing intelligence projects such as:

- production of " The Annual Global Space Sector Market Trends";
- daily space news briefs;
- production of the "Annual State of the Canadian Space Sector" review;
- updating "The Directory of the Canadian Space Sector";
- monitoring the regional distribution of CSA contracts; and,
- elaborating strategies and plans for international and domestic partnerships.

Showing a clear commitment to a transparent decision-making process, the CSA held consultations on the overall direction of its Canadian Space Strategy with the Interdepartmental Committee on Space, the CSA Advisory Council, and several advisory groups; all of which draw their membership from government, space industry, scientific research and academia stakeholders.

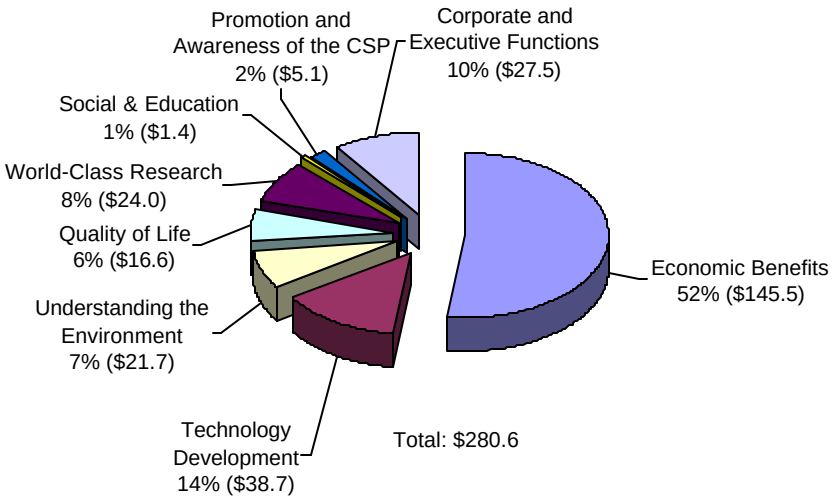
To learn more about the CSA promotion initiatives, go to CSA Science and Industry:
http://www.space.gc.ca/asc/eng/default.asp

SECTION: 7 Spending by Strategic Outcome

Description	Planned Spending ($ in millions)	Actual ($ in millions)	Variance ($ in millions)	Comments
Economic Benefits – Satellite Communications	33.0	42.7	(9.6)	Increase of Canada's contribution to the European Space Agency Advanced Research in Telecommunications Systems Program (ARTES) ($-3.4) CSA's contribution to the new CASSIOPE Program for the development of a satellite communication payload (Cascade), a scientific payload for exploring polar plasma and atmospheric outflow processes (e-POP) and a small satellite platform manufacturing capability in Canada. ($-6.3)
Economic Benefits – Earth Observation	87.9	45.2	42.7	Most of the surplus of $42.7M was generated by delays encountered by the RADARSAT-2 Major Crown Project's main contractor and its subcontractors in the design and manufacturing of some of the satellite components causing a significant delay in the spacecraft assembly, integration and test. Part of the surplus was reallocated to accelerate initiatives under Satellite Communications and Technological and Development and Diffusion Strategic Outcomes.
Economic Benefits – Canadian Space Station Program	51.7	57.7	(6.0)	As part of its obligation, Canada has to support the operation and maintenance of the Mobile Service System. Additional expenditures were related to Logistic and Sustaining Engineering and Ground Infrastructure to the Mobile Servicing System. ($-6.0)
Technological Development and Diffusion	27.1	38.7	(11.6)	Additional funding of $11.6M 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	30.5	21.7	8.7	Surplus due to delays in initiating Capital projects, more specifically the Swift project.

Quality of Life	26.9	16.6	10.3	Surplus are mainly due to a significant slow-down of activities relating to flying life and microgravity experiments in space since the Columbia accident in February 2003. ($7.6) Funds kept in reserve to cover potential risks in different projects. Unspent funds in 2003-04 were re-profiled to 2004-05. (2.7M)
World-Class Space Research	26.8	24.0	2.8	Surplus due to delays in initiating Capital projects, more specifically JWST and HIFI.
Social and Educational Benefits	2.4	1.4	1.0	Funds for Research Partnership Program reallocated after annual CSA Priority Review.
Promotion and Awareness of the Canadian Space Program	5.8	5.1	0.7	None
Corporate and Executive Functions	26.5	27.5	(1.0)	None

Strategic Outcomes and Business Line for 2003-04
Actual Spending
(Percentage and Millions)



SECTION: 8 Annexes

8.1 Financial Tables

8.1.1 Summary of Voted Appropriations

Financial Requirements by Authority ($ in millions)

Vote		2003-2004			
		Main Estimates	Planned Spending	Total Authorities	Actual
	Canadian Space Agency				
30	Operating expenditures	118.3	118.3	125.3	115.2
35	Capital expenditures	145.7	145.7	129.4	100.2
40	Grants and Contributions	45.4	45.4	57.3	57.1
(S)	Contributions to Employee Benefit Plans	9.2	9.2	8.1	8.1
	TOTAL	**318.7**	**318.7**	**320.1**	**280.6**

Notes:

- Due to rounding, figures may not add up to totals shown.
- Planned Spending corresponds to Main Estimates Budget.
- Total Authorities are Main Estimates plus Supplementary Estimates and other Authorities.
- Difference between Total Authorities and Actual Spending is mostly due to the re-profiling of funds in RADARSAT-2 from 2003-2004 to 2004-2005 and 2005-2006.

8.1.2 Comparison of Total Planned Spending to Actual Spending

Departmental Planned versus Actual Spending ($ in millions)				
	2003-2004			
Space Knowledge, Applications and Industrial Development	**Main Estimates**	**Planned Spending**	**Total Authorities**	**Actual**
FTEs	630	630	630	550
Operating	126.8	126.8	132.7	122.6
Capital	146.5	146.5	130.1	100.9
Grants & Contributions	45.4	45.4	57.3	57.1
Total Gross Expenditures	**318.7**	**318.7**	**320.1**	**280.6**
Less:				
Respendable Revenues	0.0	0.0	0.0	0.0
Total Net Expenditures	**318.7**	**318.7**	**320.1**	**280.6**
Other Revenues and Expenditures				
Non-respendable Revenues	(1.7)	(1.7)	(4.0)	(4.0)
Cost of services provided by other departments	4.1	4.1	4.1	4.1
Net Cost of the Program	**321.1**	**321.1**	**320.2**	**280.7**

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 mostly due to the re-profiling of funds in RADARSAT-2 from 2003-2004 to 2004-2005 and 2005-2006.

8.1.3 Historical Comparison of Total Planned Spending to Actual Spending

Historical Comparison of Departmental Planned versus Actual Spending ($ in millions)						
			2003-2004			
Space Knowledge, Applications and Industrial Development	**Actual 2001-2002**	**Actual 2002-2003**	**Main Estimates**	**Planned Spending**	**Total Authorities**	**Actual**
Canadian Space Agency	336.1	328.9	318.7	318.7	320.1	280.6
TOTAL	**336.1**	**328.9**	**318.7**	**318.7**	**320.1**	**280.6**

Notes:

- ✧ Planned Spending corresponds to Main Estimates Budget.
- ✧ Total Authorities are Main Estimates plus Supplementary Estimates and other Authorities.
- ✧ Difference between Total Authorities and Actual Spending is mostly due to the re-profiling of funds in RADARSAT-2 from 2003-2004 to 2004-2005 and 2005-2006.

8.1.4 Crosswalk between Strategic Outcomes and Business Line

Business Line: Space Knowledge, Applications and Industry Development ($ in millions)			
	2003-2004		
Strategic Outcomes	**Planned Spending**	**Total Authorities**	**Actual Spending**
Economic Benefits	172.7	170.4	145.5
Technology Development and Diffusion	27.1	40.1	38.7
Understanding of the Environment	30.5	23.7	21.7
Contribution to Quality of Life	26.9	23.0	16.6
World-Class Space Research	26.8	27.9	24.0
Social and Educational Benefits for Canadians	2.4	1.5	1.4
Promotion and Awareness of the CSP	5.8	5.4	5.1
Strategic Outcomes – Sub Total	**292.2**	**292.0**	**253.1**
Corporate and Executive functions	26.5	28.1	27.5
Total	**318.7**	**320.1**	**280.6**

Notes:

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

8.1.5 Revenues: Respendable and Non-Respendable

Revenues ($ in millions)					
Respendable Revenues					
			2003-2004		
	Actual 2001-2002	Actual 2002-2003	Planned Revenues	Total Authorities	Actual
Canadian Space Agency	0.0	0.0	0.0	0.0	0.0
Unplanned	0.0	0.0	0.0	0.0	0.0
Total Respendable Revenues	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Non-Respendable Revenues					
Canadian Space Agency	3.9	3.7	1.7	4.0	4.0
Unplanned	0.0	0.0	0.0	0.0	0.0
Total Non-Respendable Revenues	**3.9**	**3.7**	**1.7**	**4.0**	**4.0**
Total Revenues	**3.9**	**3.7**	**1.7**	**4.0**	**4.0**

8.1.6 Transfer Payments (Grants and Contributions)

Transfer Payments ($ in millions)						
Space Knowledge, Applications and Industrial Development			**2003-2004**			
Canadian Space Agency	**Actual 2001-2002**	**Actual 2002-2003**	**Main Estimates**	**Planned Spending**	**Total Authorities**	**Actual**
GRANTS						
Class grant program to support awareness, research and training in space science and technology	1.0	0.4	2.0	2.0	1.3	1.2
Total Grants	**1.0**	**0.4**	**2.0**	**2.0**	**1.3**	**1.2**
CONTRIBUTIONS						
Contributions to the Canada/European Space Agency (ESA) Cooperation Agreement	19.6	29.6	22.3	22.3	29.5	29.3
Payload Flight Demonstration Program	26.0	21.7	20.5	20.5	20.3	20.3
Class contribution program to support awareness, research and training in space science and technology	0.4	0.4	0.7	0.7	0.2	0.2
Contributions to the Cascade Technology Demonstration/Enhanced-Polar Outlaw Probe Small Satellite (CASSIOPE mission)	0.0	0.0	0.0	0.0	6.1	6.1
Total Contributions	**46.1**	**51.6**	**43.5**	**43.5**	**56.1**	**55.9**
Total Transfer Payments	**47.0**	**52.0**	**45.4**	**45.4**	**57.3**	**57.1**

Notes:

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

8.1.7 Resource Requirements by Organisation and Business Line

Comparison of 2003-2004 (RPP) Planned Spending and Total Authorities to Actual Expenditures by Organisation and Business Line ($ in millions)

Space Knowledge, Applications and Industrial Development				
	2003-2004			
Organisation	**Main Estimates**	**Planned Spending**	**Total Authorities**	**Actual**
Space Systems	69.4	69.4	45.1	22.7
Space Technologies	94.0	94.0	115.3	111.2
Space Sciences	40.7	40.7	40.6	33.6
Canadian Astronauts Office	10.0	10.0	8.4	5.3
Space Operations	70.8	70.8	75.8	74.3
Corporate Functions	17.0	17.0	18.4	17.9
Executive Functions (including President's Office)	16.8	16.8	16.4	15.6
TOTAL	**318.7**	**318.7**	**320.1**	**280.6**
% of TOTAL				**100 %**

Notes:

- ✧ Due to rounding, figures may not add to totals shown.
- ✧ Planned Spending corresponds to Main Estimates Budget.
- ✧ Total Authorities are Main estimates plus Supplementary Estimates and other Authorities.
- ✧ Difference between Total Authorities and Actual Spending is mostly due to the re-profiling of funds in RADARSAT-2 from 2003-2004 to 2004-2005 and 2005-2006.

8.1.8 Capital Projects

Projects ($ in millions)

Space Knowledge, Applications and Industrial Development	Current Estimated Total Cost	Actual 2001-2002	Actual 2002-2003	2003-2004 Main Estimates	2003-2004 Planned Spending	2003-2004 Total Authorities	2003-2004 Actual
Canadian Space Agency							
(O, Q) Canadian Space Station Program (MCP)	1391.8	15.2	15.5	3.4	3.4	0.2	0.2
(Q) RADARSAT-1 (MCP)	686.9	12.4	12.8	12.5	12.5	11.8	11.3
(BC, Q) RADARSAT-2 (MCP)	421.6	66.8	51.1	50.2	50.2	28.1	7.4
(O) MOST (EPA)	9.8	2.5	2.1	1.0	1.0	0.9	0.9
(O) Insect Habitat (EPA)	10.4	2.7	2.4	0.9	0.9	1.6	1.4
(O) Cloudsat (EPA)	15.7	6.0	5.3	2.1	2.1	1.1	1.1
(Q, M) SciSat-1 (EPA)	60.3	19.4	14.1	4.7	4.7	3.7	3.7
(Q, O) MIM Base Unit (MIMBU) (EPA)	6.3	0.7	2.7	1.5	1.5	0.0	0.0
(Q, M) MVIS (EPA)	10.0	2.5	2.0	0.0	0.0	3.8	3.8
(O) Hershel HIFI (PPA)	8.7	0.0	0.9	2.5	2.5	2.4	2.0
(TBD) Swift (PPA)	42.8	0.0	0.0	3.5	3.5	0.8	0.4
(Q, O) Hydros (PPA)	11.7	0.0	0.3	1.1	1.1	0.4	0.4
(TBD) JWST (S)	67.2	0.0	0.0	0.0	0.0	0.0	0.0
(TBD) Mars Phoenix (S)	23.9	0.0	0.0	0.0	0.0	0.0	0.0

Notes:

- ✧ The sums include contributions to Employee Benefit Plans.
- ✧ Due to rounding, figures may not add to totals shown.
- ✧ Difference between Total Authorities and Actual Spending is mostly due to the re-profiling of funds in RADARSAT-2 from 2003-2004 to 2004-2005 and 2005-2006.

8.1.9 Contingent Liabilities

Contingent Liabilities ($ in millions)			
	Amount of Contingent Liability		
List of Contingent Liabilities	**March 31, 2002**	**March 31, 2003**	**Current as of March 31, 2004**
Claims, Pending and Threatened Litigation:			
Litigation:			
CS500-05-042325-983	14.4	14.4	14.4
CSA7140-3-1	-	0.2	-
Total	**14.4**	**14.6**	**14.4**

Notes:

- A lawsuit for damages in the amount of $5 millions was instituted in June of 1998 pertaining to some questions related to intellectual property. The claimant then raised his claim to $14.4 millions. The case was heard in May and June 2004, and as of August 13, 2004 we are awaiting judgment. Issue unlikely.

8.1.10 Status Summary of Major Crown Projects

Information on the Canadian Space Station Program, and 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

8.2 Procurement and Contracting

Procurement and contracting is at the core of 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 2002-2003, the CSA awarded all of its contracts in accordance with *Government Contracts Regulations*.