

**CANADIAN SPACE AGENCY  
REPORT ON PLANS AND PRIORITIES 2005-2006**

**SECTION 3: Supplementary Information – Financial Information**

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## 1. Departmental Planned Spending and Full Time Equivalents

(\$ in millions)	Forecast Spending 2004-2005	<b>Planned Spending 2005-2006</b>	Planned Spending 2006-2007	Planned Spending 2007-2008
Space Based Earth Observation	122.0	<b>144.5</b>	116.9	107.9
Space Science and Exploration	145.3	<b>156.9</b>	149.5	149.8
Satellite Communications	44.9	<b>34.0</b>	35.3	35.9
Space Awareness and Learning	10.8	<b>6.2</b>	6.4	6.6
Budgetary Main Estimates (gross) <sup>1</sup>	322.9	<b>341.6</b>	308.2	300.2
Non-Budgetary Main Estimates (gross)	0	<b>0</b>	0	0
Less: Respendable Revenue	0	<b>0</b>	0	0
<b>Total Main Estimates</b>	322.9	<b>341.6</b>	308.2	300.2
<i>Adjustments<sup>2</sup>:</i>				
Supplementary Estimates				
Royalties from activities related to the RADARSAT program	3.1	<b>4.1</b>	4.1	4.1
Operating Carry-Forward	5.9			
Capital Carry-Forward	(1.8)	<b>1.8</b>		
Collective agreements compensation	2.0			
Additional operating costs	(0.1)			
Contribution to government-wide 1B reallocation	(3.0)			
ARLU				
Reprofiling of funds	(31.9)			
Budget Announcements				
Next generation of radar satellites <sup>3</sup>		<b>7.0</b>	21.0	16.0
Planned procurement savings <sup>4</sup>		<b>(0.6)</b>		
<i>Total Adjustments</i>	<i>(25.8)</i>	<i>12.3</i>	<i>25.1</i>	<i>20.1</i>
<b>Total Planned Spending</b>	297.2 <sup>5</sup>	<b>353.9</b>	333.3	320.3
Total Planned Spending	297.2	<b>353.9</b>	333.3	320.3
Less: Non-Respendable revenue	0.9	<b>0.7</b>	0.7	0.7
Plus: Cost of services received without charge	4.1	<b>4.3</b>	4.3	4.3
<b>Net Cost of Program</b>	300.4	<b>357.5</b>	336.9	323.9
<b>Full Time Equivalents</b>	587	<b>614</b>	614	614

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

1. The four Program Activities shown in this table include amounts for Corporate Services, Strategic Development and Infrastructure (see Section 4).
2. Adjustments are to accommodate approvals obtained since the Main Estimates and include Budget Initiatives, Supplementary Estimates, etc.
3. The 2005 Budget announced funding of \$111 million over 5 years for the design of the next generation of radar satellites. This adjustment is not reflected in the other financial tables.
4. This reflects the reductions to Planned Spending as a result of the ERC exercise, which were announced in the 2005 Budget. This adjustment is not reflected in the other financial tables.
5. Reflects the best forecast of Total Net Planned Spending to the end of the fiscal year.

## 2. Program Activities

2005-2006										
Program Activity (\$ in millions)	Budgetary						Non-Budgetary	Total Main Estimates	Adjustments (planned spending not in Main Estimates)	Total Planned Spending
	Operating	Capital	Grants and Contributions	Gross	Revenue	Net	Loans, Investments and Advances			
Space Based Earth Observation	64.1	69.1	11.3	144.5	0.0	144.5	0.0	144.5	4.4	<b>148.9</b>
Space Science and Exploration	105.4	35.4	16.0	156.9	0.0	156.9	0.0	156.9	1.5	<b>158.4</b>
Satellite Communications	9.0	0.8	24.2	34.0	0.0	34.0	0.0	34.0	0.0	<b>34.0</b>
Space Awareness and Learning	4.5	0.0	1.7	6.2	0.0	6.2	0.0	6.2	0.0	<b>6.2</b>
<b>Total</b>	<b>183.0</b>	<b>105.4</b>	<b>53.3</b>	<b>341.6</b>	<b>0.0</b>	<b>341.6</b>	<b>0.0</b>	<b>341.6</b>	<b>5.9</b>	<b>347.5</b>

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

The four Program Activities shown in this table include amounts for Corporate Services, Strategic Development and Infrastructure (see Section 4).

### 3. Voted and Statutory Items Listed in Main Estimates

<b>2005-2006</b>			
Vote or Statutory Item	Truncated Vote or Statutory Wording	<b>Current Main Estimates</b> (\$ in millions)	Previous Main Estimates (\$ in millions)
25	Operating expenditures	<b>173.4</b>	125.4
30	Capital expenditures	<b>105.4</b>	141.0
35	Grants and contributions	<b>53.3</b>	46.6
(S)	Contributions to employee benefit plans	<b>9.5</b>	10.0
	<b>Total Department or Agency</b>	<b>341.6</b>	<b>322.9</b>

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

#### 4. Net Cost of Department

(\$ in millions)	<b>Total</b>
Net Planned Spending (Total Main Estimates plus Adjustments as per the Planned Spending Table)	<b>347.5</b>
<i>Plus: Services Received without Charge</i>	
Accommodation provided by Public Works and Government Services Canada (PWGSC)	<b>0.1</b>
Contributions covering employers' share of employees' insurance premiums and expenditures paid by TBS	<b>3.8</b>
Salary and associated expenditures of legal services provided by Justice Canada	<b>0.4</b>
	<b>4.3</b>
<i>Less: Non-Respendable Revenue</i>	<b>0.7</b>
<b>2005-2006 Net Cost of Department</b>	<b>351.1</b>

## 5. Summary of Capital Spending by Program Activity

(\$ in millions)	Forecast Spending 2004-2005	<b>Planned Spending 2005-2006</b>	Planned Spending 2006-2007	Planned Spending 2007-2008
Space Based Earth Observation	51.3	<b>73.5</b>	51.2	42.4
Space Science and Exploration	50.2	<b>36.9</b>	33.9	38.2
Satellite Communications	3.4	<b>0.8</b>	2.0	2.1
<b>Total</b>	104.9	<b>111.3*</b>	87.1	82.6

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

\* The \$111.3 million includes \$105.4 million requested in Main Estimates, plus adjustments to be included in the Supplementary Estimates for the amount of \$5.9 million (see Table 1).

## 6. Sources of Respendable and Non-Respendable Revenue

### Respendable Revenue

(\$ in millions)	Forecast Revenue 2004-2005	Planned Revenue 2005-2006	Planned Revenue 2006-2007	Planned Revenue 2007-2008
Respendable Revenue	0.0	<b>0.0</b>	0.0	0.0
<b>Total Respendable Revenue</b>	0.0	<b>0.0</b>	0.0	0.0

### Non-Respendable Revenue

(\$ millions)	Forecast Revenue 2004-2005	Planned Revenue 2005-2006	Planned Revenue 2006-2007	Planned Revenue 2007-2008
<b>Space Based Earth Observation</b>				
Testing facilities and services of the David Florida Laboratory	0.4	<b>0.3</b>	0.3	0.3
<b>Space Science and Exploration</b>				
Testing facilities and services of the David Florida Laboratory	0.4	<b>0.3</b>	0.3	0.3
<b>Satellite Communications</b>				
Testing facilities and services of the David Florida Laboratory	0.1	<b>0.1</b>	0.1	0.1
<b>Total Non-Respendable Revenue</b>	0.9	<b>0.7</b>	0.7	0.7

<b>Total Respendable and Non-Respendable Revenue</b>	0.9	<b>0.7</b>	0.7	0.7
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Note: Due to rounding, decimals may not add up to totals shown.

## 7. Resource Requirement by Sector

2005-2006					
(\$ in millions)	Space Based Earth Observation	Space Science and Exploration	Satellite Communication	Space Awareness and Learning	Total Planned Spending
Space Programs	61.0	42.5	15.4	0.0	<b>118.9</b>
Space Technologies	50.0	17.2	13.6	0.4	<b>81.2</b>
Space Sciences	4.4	26.7	0.0	1.1	<b>32.1</b>
Canadian Astronauts Office	0.0	5.4	0.0	0.2	<b>5.6</b>
Space Operations	15.2	52.8	1.3	0.0	<b>69.2</b>
Corporate Services Sectors	13.9	12.4	3.7	4.5	<b>34.6</b>
<b>Total</b>	<b>144.5</b>	<b>156.9</b>	<b>34.0</b>	<b>6.2</b>	<b>341.6</b>

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

## 8. Details on Project Spending

(\$ in millions)	Current Estimated Total Cost	Forecast Spending to March 31, 2005	Planned Spending 2005-2006	Planned Spending 2006-2007	Planned Spending 2007-2008	Future Year Spending Requirement
<b>Space Based Earth Observation</b>						
(Q) RADARSAT-1 (MCP)	686.9	668.2	<b>12.5</b>	6.2		
(BC-Q) RADARSAT-2 (MCP)	421.6	372.8	<b>46.1</b>	2.7		
(O-Q) SWIFT (PPA)	42.8	3.2	<b>12.8</b>	17.7	6.7	2.5
(Q-O) HYDROS (PPA)	11.7	1.0	<b>0.4</b>	1.5	2.3	6.5
<b>Space Science and Exploration</b>						
(O) Herschel HIFI (PPA)	8.7	6.1	<b>2.6</b>			
(O) JWST (S)	66.2	3.6	<b>12.1</b>	16.1	17.4	17.0
(O) MARS PHOENIX (S)	23.9	7.9	<b>10.3</b>	5.7		
(Q-M) MIM Base Unit (MIMBU) (EPA)	6.3	3.5	<b>1.4</b>	1.4		
<b>TOTAL</b>	<b>1268.0</b>	<b>1066.2</b>	<b>98.1</b>	<b>51.3</b>	<b>26.3</b>	<b>26.0</b>

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

**Province where the capital project will be carried out:**

O = Ontario  
 Q = Quebec  
 BC = British Columbia  
 M = Manitoba

**Class of Project:**

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

## 9. Status Report on Major Crown Projects

### RADARSAT-1

#### Description

RADARSAT-1, Canada's first Earth Observation satellite, is the only fully operational civilian remote sensing satellite that carries Synthetic Aperture Radar (SAR). This technology, contrary to optical sensor satellites, has the capacity to image day and night, in all weather conditions, regardless of cloud cover, smoke, haze and darkness. Launched in November 1995, RADARSAT-1 was meant to operate for five years with an impressive 96% operational reliability, to consistently supply timely, high-quality data to RADARSAT International (RSI), a wholly owned subsidiary of MacDonald, Dettwiler and Associates (MDA) and other partners (federal and provincial government departments, NASA and the U.S. National Oceanic and Atmospheric Administration). RADARSAT-1 is now in its ninth year of operation.

RADARSAT-1 acquires high quality images of the Earth, covering most of Canada every 72 hours and the Arctic every 24 hours. It has proven itself in gathering the data needed for more efficient resource management (e.g. support to fishing, shipping, oil and gas exploration, offshore drilling, mapping) as well as ice, ocean and environmental monitoring, disaster management, and Arctic and offshore surveillance.

#### Leading and Participating Departments and Agencies

Sponsoring Agency:	Canadian Space Agency
Contracting Authority:	Public Works and Government Services Canada
Participating Departments:	Environment Canada Natural Resources Canada (Canada Centre for Remote Sensing)

#### Prime and Major Sub-Contractors

Prime Contractor: - EMS Technologies	- Ste. -Anne-de-Bellevue, Quebec
Major Sub-Contractors: - MacDonald, Dettwiler & Associates - SED Systems - EMS Technologies - COM DEV - Lockheed Martin	- Richmond, British Columbia - Saskatoon, Saskatchewan - Ottawa, Ontario - Cambridge, Ontario - Longueuil, Quebec
Other Contractors: - Ball Aerospace - RADARSAT International (RSI)	- Boulder, Colorado - Richmond, British Columbia

## Major Milestones

Major milestones of the RADARSAT-1 Major Crown Project are now complete.

Major Milestones	Date
- Preliminary studies	Complete
- Feasibility and concept definition	Complete
- Systems requirement and preliminary design	Complete
- Development and testing up to qualification test review	Complete
- Manufacture of the prototype flight sub-systems up to acceptance testing of the sub-systems	Complete
- Assembly and integration of the sub-systems up to flight readiness review, plus post-launch and commissioning activities up to system acceptance	Complete
- First Antarctica mission	Complete
- Second Antarctica mission	Complete
- Original Mission Life of five years	Complete
- Satellite operations	April 1996 December 2005

## Progress Report and Explanation of Variances

Effective Program Approval was obtained for RADARSAT-1 in March 1991, with launch in November 1995 and beginning of operations in April 1996. The initial system included receiving stations for Synthetic Aperture Radar (SAR) data in Prince Albert (Saskatchewan), Gatineau (Quebec), Fairbanks (Alaska) and McMurdo (Antarctica). CSA and RADARSAT International (RSI) have since signed agreements with another 25 network stations distributed around the world: Argentina, Australia, Brazil, China, Japan, Korea, Malaysia, Norway, Puerto-Rico, Russia, Saudi Arabia, Singapore, Thailand, Turkey, the United Kingdom and the United-States. In addition to this list, agreements have been also signed with mobile stations for the direct reception of RADARSAT-1 data: four in the U.S., one in Taiwan and one in France. Presently, a fifth U.S. and an Italian mobile station are undergoing the certification process. Even more stations are expected to join the RADARSAT-1 network in 2005.

Following a commissioning period, routine operations of RADARSAT-1 commenced in April 1996. At the end of November 2004, 193,394 RADARSAT-1 user requests had been planned, and an estimated 349,584 minutes of SAR data had been acquired during more than 47,352 orbits. The average system performance is being maintained at 95.8%. The worldwide client base includes more than 600 commercial and government users from over 60 countries.

Several system improvements were made to the RADARSAT-1 operations planning system. First, the new Data Loss Information System (DLIS) database was integrated in the Mission Management Office database, providing visibility of data losses to Order Desk clients for the first time in the mission. The DLIS front-end interface was also improved to facilitate data entry and tracking of data losses. Second, the new OBR planning strategy was tested extensively with the Order Desk and made operational, thus optimising OBR usage by storing only user requested data on tape. Third, new functionality was added in the mission planning software and associated planning tools for allowing new network stations to the RADARSAT-1 network, well beyond the previous limit of 26 stations. In addition, the RSI Order Desk server was upgraded and successfully moved to CSA from RSI (Richmond, British Columbia) for improved performance, security, and maintainability. All four Order Desk servers are now located at CSA.

Moreover, in October 2000, the CSA became a signatory, along with ESA and the Centre National d'Études Spatiales (CNES) in France, to the International Charter on Space and Major Disasters. The emphasis of the Charter is on multi-satellite support for disaster response and mitigation efforts around the world utilising RADARSAT-1 and satellites of other Charter member agencies. Since its official launch, the Indian Space Research Organisation (ISRO) and the National Oceanic and Atmospheric Administration (NOAA) have also joined the Charter (September 2001) and participate fully in Charter operations. CONAE, or Argentina's Comisión Nacional de Actividades Espaciales, became the latest member when the Argentinean Foreign Minister signed the Charter on July 16, 2003, during a state visit of the President of Argentina to France. The operational integration of CONAE in the Charter has now been completed and CONAE has assumed its full responsibility under the Charter.

Japan's membership application has been accepted and Japan is expected to sign the Charter soon with operational integration to follow. So far, there have been 63 activations of the Charter on events such as: floods in France, Canada, Russia, Austria, Germany, Indonesia, Morocco, Argentina, Nepal, the Dominican Republic, the Philippines, Sudan, Haïti, Namibia, the Czech Republic, and Colombia; landslides in Slovenia, Italy, Nepal, Russia and the Philippines; earthquakes in El Salvador, India, Afghanistan, Turkey, Algeria and Iran; volcanic eruptions in Italy, Congo, Montserrat, Colombia and Spain; oil spills off the coasts of Ecuador, Lebanon, Denmark, Yemen and Spain; forest fires in France, Portugal, Canada and Bolivia; and, wind storms in India and Mexico. One of the recent Charter activations took place following devastating forest fires in British Columbia. RADARSAT-1 images and the CSA satellite operations team played a lead role, thus providing a great deal of international visibility for the Canadian Space Program.

The RADARSAT-1 system has been improved to provide a less than 2.5-hour turnaround (on average) in the electronic delivery of images to the Canadian Ice Service (CIS) for the production of ice charts and bulletins for the Canadian Coast Guard and other marine clients. The CIS continues to be one of the leading users of RADARSAT-1 data since the first operational data began to flow in February 1996. Recently, the CIS has been collaborating with Noetix Research, CSA, and RSI on an ESA-sponsored Global Monitoring for Environment and Security (GMES) Project - The Northern View - to provide regular RADARSAT-1 images in support of a Floe Edge Service for two communities in the Canadian Arctic.

The RADARSAT-1 Background Mission has archived one of the largest microwave remote sensing data collections in the world. In fact, it is the first multi-mode uniformly collected database of its kind ever created. The data archive is the result of several Background Mission global coverage campaigns undertaken in the past seven years. These include a complete coverage of the world's continents, continental shelves and polar ice caps, as well as complete coverage of a large majority of Earth's entire landmass with two RADARSAT-1 imaging beams for the first ever beam-pair stereo data collection. This is the world's largest radargrammetric dataset currently available. Some of the continents, including North America, were covered more than once to generate seasonal snapshots. Several time- and site-specific coverage types have also been done, such as remote oceanic island localities and major cities and capitals. A seasonal coverage of the tropical deltas is also underway. High-resolution RADARSAT-1 image mosaics of Canada, the U.S., Australia and Africa were produced with Background Mission data. The four-season continuous coverage of the Arctic basin is underway, to continue until the end of satellite operations. This coverage supports growing interest in the Arctic and climate change.

RSI continues to provide Earth-Observation data, derived information products, and leading-edge services to global clients. The broad range of RSI products includes geo-corrected imagery, digital elevation models, and application-specific products such as flood and ocean oil-seep vectors to meet the demands for new markets. Products are delivered to clients via Internet in near-real time for time-critical operations such as disaster management and ship navigation. Other services include training, monitoring and emergency response services, and custom product generation, as well as Geographic Information Systems (GIS) project implementation.

### **Industrial Benefits**

The Canadian Space Agency undertook a study to determine the achievements of RADARSAT data in support of ice mapping and related activities in Canada. To date, the Canadian Ice Services is the only Canadian Government operational user of RADARSAT-1 data. RADARSAT-1 provides observations over a wider geographical area, at much lower cost and risk, and in much less time than with an aircraft. As a result, CIS has been able to improve its operational efficiency. Over five years (1995 to 2000), the net average annual savings to CIS operations have been about \$7.7 million per year

(\$38.5 million over 5 years), with the same per year benefits continuing up to and including the eighth year of operations for RADARSAT-1.

The Canadian Coast Guard (CCG), the largest direct customer of CIS products, has felt these benefits most significantly. The CCG Ice Operation Centres can provide improved routing information to commercial shipping, which allows for faster transit times. The shipping industry has benefited from the accuracy of RADARSAT information to produce ice charts. The shipping companies believe that as a result of RADARSAT-based ice charts, there have been savings in transit time through ice-infested waters. These commercial shipping savings are estimated to be \$18 million a year. Other benefits included less damage to ships and a reduction in the need for CCG escorts. The CCG has estimated dollar savings in both operating costs and transit time to be between \$3.6 million and \$7 million a year, depending on the severity of ice conditions.

In the past, the prime contractor SPAR and its Canadian sub-contractors created over 2,000 person-years of high technology employment during the construction phase of RADARSAT-1. Ongoing mission operations employ 75 people at CSA headquarters in Longueuil (Quebec), 7 in Saskatoon (Saskatchewan), 15 at ground stations in Prince Albert (British Columbia) and Gatineau (Quebec), as well as more than 80 at RSI in Richmond (British Columbia). In the highly competitive marketplace for space-based information, RSI continues to capture roughly 15% of the world's space borne remote sensing market. RSI has continued to process scenes and integrate RADARSAT data into information products for delivery to nearly 600 clients in 60 countries, and furthermore, RSI has signed up 80 international distributions, 18 RADARSAT-1 Network Stations and 11 Resources Centres. The market development for data archives is likely to be significant and an area in which new benefits may develop.

## **RADARSAT-2**

### **Description**

The next generation of Canadian SAR-based satellite, RADARSAT-2, will be the most advanced satellite of its kind in the world. RADARSAT-2 will continue to provide all-weather, day-and-night coverage of the entire globe to support fishing, shipping, oil and gas exploration, offshore drilling, mapping and ocean research. Equipped with a C-band radar system, it will be the first fully commercial SAR satellite to offer multi-polarization, an important aid in identifying a wide variety of surface features and targets. It will also have the capability to image both the right and left with a resolution down to three metres and to access an area of 800 kilometres on either side. This translates into a new range of products and services, which will contribute valuable new information on natural resources and the global environment.

The RADARSAT-2 Major Crown Project, in partnership with MacDonald, Dettwiler and Associates (MDA), is elaborating the design, development, testing, deployment and operations of a space-borne SAR satellite to provide global coverage of terrestrial phenomena as a follow-up to RADARSAT-1. Total project cost, including the launch, is estimated at \$521 million, with the government contributing \$430 million, and the balance of \$91 million provided by MDA.

RADARSAT-2 design and construction improves upon RADARSAT-1, with new capabilities to ensure Canada's continued leadership in the satellite remote sensing global marketplace and to create a commercial industrial satellite remote sensing industry in Canada.

### **Leading and Participating Departments and Agencies**

Sponsoring Agency:	Canadian Space Agency
Contracting Authority for the CSA/MDA Master Agreement:	Canadian Space Agency
Participating Departments:	Natural Resources Canada (Canada Centre for Remote Sensing) Environment Canada Industry Canada Fisheries and Oceans National Defence Foreign Affairs International Trade

## Prime and Major Sub-Contractors

Prime Contractor:  - MacDonald Dettwiler, and Associates	- Richmond, British Columbia
Major Sub-Contractors:  - EMS Technologies  - Alenia Aerospazio - AEC Able Engineering Co. - RADARSAT International (RSI) - Boeing, Delta Launch Services	- Ste.-Anne-de-Bellevue, Quebec - Rome, Italy - Goletta, California - Richmond, British Columbia - Huntingdon Beach, California

## Major Milestones

The major milestones of the MCP, by phase, are the following:

Phase	Major Milestones	Date
A and B	Requirement Definition	June 1999
C	System Design	May 2002
D1	Sub-system Construction	February 2005
D2	Integration and Testing	October 2005
E1	Pre-launch Preparations	December 2005
E2	Launch System Commissioning	December 2005 March 2006
E3	Operations	2006 to 2013

## Progress Report and Explanation of Variances

In June 1994, the government directed the CSA to develop “an arrangement with the private sector for the development and operation of a RADARSAT follow-on program to maintain continuity of data following RADARSAT-1.” In February 1998, following a formal Request for Proposal, MDA was selected to construct and operate RADARSAT-2.

The CSA and MDA signed a Master Agreement in December 1998 for the RADARSAT-2 mission, under a firm price agreement in which the government contribution was \$225 million, in exchange for data. MDA was to invest \$80 million. The Master Agreement between the CSA and MDA was updated in January 2000 to reflect changes in the

schedule and the latest cost estimates. The company (MDA) is responsible for spacecraft operations and business development, while the CSA is responsible for arranging the launch and maintaining the long-term national archive of RADARSAT-2 data. The CSA will also provide an additional "in-kind" contribution of certain assets, plus the services of its David Florida Laboratory and the NRC Institute of Aerospace Research Laboratory for spacecraft integration and testing.

In November 1998, Treasury Board approved the RADARSAT-2 Major Crown Project with a funding envelope of \$242.2 million. In March 2000, Treasury Board approved an increase of \$47.1 million to cover the cost of changing bus suppliers, required by U.S. - government restrictions imposed on the U.S. bus supplier at that time, and an increase of \$12.3 million for upgrades to existing satellite ground station infrastructures. In June 2000, Treasury Board approved an increase of \$108 million to cover the cost of procuring a commercial launch as a result of NASA withdrawing from the agreement to provide launch for RADARSAT-2 in exchange for data, as it did for RADARSAT-1. In June 2001, Treasury Board approved an increase of \$6 million to cover the cost of critical modifications to be made to the RADARSAT-2 spacecraft in order to accommodate a potential future tandem mission with RADARSAT-3.

The development of the RADARSAT-2 satellite has progressed, though at a slower pace than planned. Delays encountered by the main contractor and sub-contractors in the production of some of the satellite components have resulted in a significant delay in the assembly, integration and testing of the spacecraft. The Extendible Support Structure (ESS), one of the primary spacecraft sub-systems, was delivered to the Assembly, Integration and Test (AI&T) site at the David Florida Laboratory (DFL) in October 2003. The Solar Arrays and the Bus were delivered to DFL in April and May 2004, respectively. The Payload is to be delivered in parts from December 2005 to February 2006. The development of the ground segment is nearing completion. MDA has proceeded with the spacecraft AI&T activities and this will continue until October 2005. 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 remain operational beyond the time for which funding is available for this purpose, at an additional cost of \$1.8 million. This will increase the current estimated total expenditure from \$414.6 million to \$416.4 million. This risk has been previously identified and the necessary funding to cover the additional cost has been set aside in the CSA Five Year Risk Assessment and Source of Funds Plan.

### **Industrial Benefits**

Significant industrial benefits in the space and earth observation sector are expected from this next-generation satellite system. The RADARSAT-2 program will generate employment growth in the Canadian knowledge-based economy, mostly from export sales, and spur the growth of small- and medium-sized businesses as the Canadian infrastructure and services industry continues to grow.

A major objective of this project is the transition of the Earth Observation industry from the public sector to the private sector. The intention is to build on the SAR data and value-added markets established with RADARSAT-1 to strengthen the Canadian industry's position as a supplier of SAR-related technology, systems and value-added products and services. Specifically, manufacturing potential and competitiveness will be encouraged in Canadian industry in the areas of phased array antenna design/manufacture, high performance receiver/transmitter design and manufacture, and enhanced structure design. Moreover, opportunities will be created for the export of ground station systems. The new capabilities also make new applications possible, creating new and expanded markets for data sales and value-added products.

As of October 31, 2003, the Canadian Space Program has funded \$185.9 million worth of work to Canadian industry directly attributable to the Radarsat-2 Major Crown Project (MCP). Direct industrial benefits from the construction of the RADARSAT-2 system will benefit all regions of Canada. The regional distribution of direct industrial benefits is shown in the following table.

**Regional Distribution of RADARSAT-2 Contracts  
(as of July 12, 2004)**

<b>PROGRAM</b>	<b>British Columbia</b>	<b>Prairie Provinces</b>	<b>Ontario</b>	<b>Quebec</b>	<b>Atlantic</b>	<b>Total Canada</b>
RADARSAT-2	53.1%	0.1%	5.1%	41.1%	0.69%	100%

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

**Summary of Non-Recurring Expenditures (\$ in millions)**

	Current Estimated Total Expenditure	Forecast to March 31, 2004	Planned Spending 2004-2005	Future Years
RADARSAT-2	421.6	365.7	7.1	48.8

## 10. Details on Transfer Payments Program

Contribution to European Space Agency (ESA)				
Start Date: January 1, 2000	End Date: December 31, 2009	Total Funding as of March 31, 2005: \$150.4 million		
<b>Purpose of Transfer Payment Program (TPP):</b>				
Enhance Canadian industry's technological base and provide access to European markets for value added products and services in the field of Earth Observation (EO) and Telecommunications, allow the participation of Canadian academia and make possible the demonstration of Canadian space technologies in European Science and Exploration missions.				
<b>Expected Results:</b>				
Successful development and demonstration of advanced technologies, systems, components, or studies provided for in the contracts awarded by ESA to Canadian firms under the following ESA EO programs: ENVISAT, EOEP/ EOPP, Earth Watch GMES, TerraSar, and Aurora.				
Successful development and demonstration of advanced technologies, systems, components, or studies provided for in the contracts awarded by ESA to Canadian firms under the following ESA Telecommunications programs: ARTES 1,3,5,9, Artemis and GalileoSat.				
Growing utilisation of data obtained from ESA on markets and Earth Observation/ Telecommunications technologies as strategic information for government departments, agencies and industries in Canada.				
Demonstration of space-qualified technologies and products developed by Canadian firms for the space exploration markets.				
Development of new alliances and/or strengthening of established alliances between Canadian and European companies, to diversify Canada's international space partnerships and complement its long-standing relationship with the U.S.				
(\$ in millions)	Forecast Spending 2004-2005	<b>Planned Spending 2005-2006</b>	Planned Spending 2006-2007	Planned Spending 2007-2008
Space Based Earth Observation	13.5	<b>11.2</b>	9.6	10.8
Space Science and Exploration	3.1	<b>3.1</b>	3.3	3.3
Satellite Communications	13.3	<b>9.2</b>	9.3	9.3
Total Contributions	30.0	<b>23.5</b>	22.2	23.4
<b>Total Program Activity</b>	<b>30.0</b>	<b>23.5</b>	<b>22.2</b>	<b>23.4</b>
<b>Total TPP</b>	<b>30.0</b>	<b>23.5</b>	<b>22.2</b>	<b>23.4</b>

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

Note: This table details contribution programs with funding in excess of \$5 million per annum.

CASSIOPE Mission				
Start Date: November 1, 2003	End Date: October 31, 2008	Total Funding as of March 31, 2005: \$23.5 million		
<b>Purpose of Transfer Payment Program (TPP):</b>				
Support the integration of two payloads, the CASCADE telecommunications Ka-band component and the enhanced Polar Outflow Probe (e-POP) scientific instrument, on a single generic Canadian small satellite bus.				
<b>Expected Results:</b>				
Development and demonstration of the CASCADE Ka-band telecommunications payload that will be designed and constructed by Canadian companies. CASCADE is the precursor of communication satellite constellations that will help position Canadian industry on the international market both as a supplier of advanced components and as a service provider.				
Development of a small Canadian scientific satellite, the enhanced Polar Outflow Probe (e-POP), which will probe the upper atmosphere and ionosphere region where solar variability influences global change in various time scales.				
Development of a generic Canadian small satellite bus that could also be used for future Canadian missions.				
(\$ in millions)	Forecast Spending 2004-2005	<b>Planned Spending 2005-2006</b>	Planned Spending 2006-2007	Planned Spending 2007-2008
Space Science and Exploration	9.2	<b>13.0</b>	3.6	0.4
Satellite Communications	8.3	<b>15.0</b>	14.5	1.5
Total Contributions	17.5	<b>28.0</b>	18.1	1.9
<b>Total Program Activity</b>	<b>17.5</b>	<b>28.0</b>	<b>18.1</b>	<b>1.9</b>
<b>Total TPP</b>	<b>17.5</b>	<b>28.0</b>	<b>18.1</b>	<b>1.9</b>

Note: This table details contribution programs with funding in excess of \$5 million per annum.