



Canadian Space Agency
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CANADIAN SPACE AGENCY

CHARACTERIZATION OF THE CANADIAN SPACE SECTOR

FOR 1996



Canada

**This survey and report were undertaken by
the External Relations Directorate at the Canadian Space Agency.**

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FOREWORD

As space touches the lives of more and more people around the world, it becomes increasingly apparent that the era of commercial space activity has dawned. Space helps us communicate with each other, make better use of the Earth's resources, protect our environment, predict weather patterns, and discover more about the world and universe in which we live. In all of this, and in much more, the role of space companies is indispensable.

Canada's impressive accomplishments in space testify to the breadth and depth of the Canadian space sector's capabilities. The launch of Alouette-I in 1962 made Canada the third country in the world to join the Space Age. We were the first country to have a domestic, commercial telecommunications system (Anik) and the first to use direct broadcast satellite television. We possess some of the world's best capabilities in satellite telecommunications, own the world's most advanced commercial Earth observation radar satellite, Radarsat, and carry out world class space science and microgravity research. We enjoy global leadership in space robotics. Canadarm, our robot on NASA's space shuttle, has become an internationally recognized symbol of our technological capabilities. Along with the United States, Russia, Japan, and Europe, Canada is a full partner in the largest and most complex international science and technology project in history, the International Space Station. The success of these accomplishments lies, in large part, with the capabilities of Canada's space sector.

That sector is changing and growing. Whereas the Canadian space sector traditionally was dominated by a few companies, today it is comprised increasingly of larger numbers of smaller

companies and whereas space industrial activity traditionally consisted mostly of manufacturing space hardware, today it has evolved to include services and applications derived from space infrastructures.

With this in mind, the Canadian Space Agency undertook an effort to obtain comprehensive, accurate, and up-to-date statistics on the Canadian space sector, as distinct from other sectors under which elements of the space sector have usually been subsumed in government studies and economic analyses. Given the changes that the sector is undergoing, our efforts also led to the development of a new definition of the Canadian space sector. The new definition takes into account all activities related to the development and provision of technologies, products, services and applications that are derived from the use of space-based systems and data.

As this report shows, the Canadian space sector plays an important role in the Canadian economy, generating jobs and wealth. In year 1996, Canada's space sector generated close to \$1 billion in sales, of which 30% were exports, and directly employed close to 5,000 people.

I would like to warmly thank all the firms and organizations which replied to our survey, as well as our partners in other federal departments that provided support and advice.

W.M. (Mac) Evans
President
Canadian Space Agency

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EXECUTIVE SUMMARY

This study was carried out to establish a profile of the Canadian space sector. It presents a revised definition of the sector and statistics as to its size and structure. It takes into account not only traditional space industry activities but also many new applications and services generated from the growing use of space systems and data.

For the purpose of our study, we drew up a list of 255 organizations that met the criteria of the new definition and asked them to fill out and return the appended questionnaire. We worked jointly with representatives of Statistics Canada and Industry Canada and with many government, private-sector and institutional partners involved in Canadian space industry development.

Some 168 organisations (close to 66%) participated in the study. Their responses indicates that during the 1996 fiscal year, the Canadian space industry generated **close to \$1 billion in revenues, of which close to \$300 million (30%) was in the form of exports, particularly to the United States. Over \$81 million was allocated to Research and Development activities and close to 5,000 jobs are attributable to the sector.**

The study looks at four major sectors of activity: telecommunications, robotics, Earth observation and space science. Telecommunications account for nearly 60% of the sector's revenues.

Most space industry activities are concentrated in Ontario and Quebec, with a significant portion in British Columbia and the Prairie Provinces. The Atlantic Region has a substantial number of SMEs in emerging sectors.

The percentage of space industry activities arising from government contracts is steadily declining, although it remains substantial in traditional activities. The percentage is much lower for applications and services-related activities.



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1. BACKGROUND

The space industry in Canada and throughout the world is changing at a frenetic pace, especially in the fields of satellite telecommunications and Earth remote sensing, two of the Canadian Space Program priority areas. The Canadian Space Agency (CSA) is working closely with Canadian researchers and the space industry to come up with a more accurate definition of the space program and implement space program strategies. One of the roles of the CSA is to ensure that various innovative space technologies and data are further developed and applied.

In existing studies and surveys, the Canadian space industry is very often associated with seven major companies: Spar Aerospace; COM DEV Ltd; Bristol Aerospace; CAL Corporation; MacDonald Dettwiler and Associates (MDA); IMT Communication Systems (formerly MPR Teltech Ltd); SED Systems and Calian Technology. The available statistics are based primarily on the activities of these companies, which are involved in the manufacturing of space systems and Earth-based facilities. In light of the growing use of satellites and the development of numerous space industry applications and services, we believe that all organizations involved in these activities should be included in any comprehensive profile of the Canadian space sector.

2. METHODOLOGY

The CSA launched its Canadian space industry characterization exercise in June 1997 by setting up a Working group made up of various federal government partners involved in space industry development. The Working Group's mandate was to provide the CSA with support and advice for conducting this study.

The Working group worked on the drafting of a new industry definition and, at a later stage, gathered basic statistics using a short, simple questionnaire intended to encourage as many organizations as possible to participate. The Working group helped draft this questionnaire, which was approved by the National Sector Team for Space before it was sent to the organizations.

A list of 255 organizations that met the criteria of the new definition was drawn up from various sources, such as the Canadian Space Directory, the list of RADARSAT data users, CSA's industrial database and the GIAC (Geomatic Industry Association of Canada) membership list. All of the leading companies in the Canadian space sector responded. The results presented in this report were weighted in order to account for non respondents and obtain an accurate profile of the sector. The method used to weight the results is explained in appendix 4.



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3. NEW DEFINITION

In the course of our various meetings, discussions and readings, we developed a new definition of the space industry. This revised definition was approved by federal departments and agencies involved in the development of the Canadian space sector. Our provincial and industrial partners expressed their agreement with the definition at a meeting of the National Sector Team for Space in September 1997.

THE CANADIAN SPACE SECTOR

The Canadian space sector consists of organizations (private, public and academic) whose activities rely on the development and the use of space assets and/or space data.

In accordance with this definition, the Canadian space sector encompasses the following activities:

Space-based

R&D, manufacturing, testing, integration and launch of platforms (satellites, spacecraft and robotic systems), complete systems, subsystems, and components.

Ground Segment

R&D, manufacturing, testing, and integration of facilities on Earth for controlling space-based systems and satellites, for linking satellites to operational terrestrial networks and for processing satellite-derived data.

Applications and Other Services

The development and/or provision of services and value-added products and technologies that are derived from the use of space systems and/or data, and the provision of consulting and engineering services.

Space Research

The research related to non-commercial space activities.



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4. PRESENTATION OF SURVEY RESULTS

4.1 Overall results

In 1996, the Canadian space sector generated revenues of close to \$1 billion and employed approximately 5,000 people.

As shown in table 1, more than 43% of the revenues (\$420 million) came from the traditional space and ground segment activities and almost 55% (\$532 million) from applications and services-related activities.

The survey results confirm that most of the revenues are attributable to a small number of large firms. When the revenues of the four largest companies in each category are added up, we see that they account for 85% of the revenues for the Space Segment, 62% of the revenues for the Ground Segment and 75% of the revenues in the Applications and Other Services category.

Table 1
Overall Results

Category	Revenues	Domestic Revenues		Exports Revenues		R&D Expenditures	Employees
	(\$)	(\$)	(%)	(\$)	(%)	(\$)	
Space Segment	341 533 436	167 440 507	49.0	174 092 929	51.0	39 585 334	2 015
Ground Segment	79 181 687	37 877 528	47.8	41 304 159	52.2	14 012 018	645
Applications and Other Services	531 799 211	446 800 603	84.0	84 998 608	16.0	17 147 102	1 760
Space Research	16 334 708	15 559 638	95.3	775 070	4.7	10 520 542	392
Total:	968 849 042	667 678 276	68.9	301 170 766	31.1	81 264 996	4 812



4.2 Presentation of results by region

Table 2 outlines the distribution of space activities by Canadian region and shows that revenues and jobs generated by space activities are concentrated mainly in Ontario and Quebec. We note a significant contribution from British Columbia and the Prairie Provinces. Interestingly enough, over 17% of the organizations are located in the Atlantic Provinces and fall mostly into the Applications and Other Services category.

Table 2
Distribution of space activities by region

Region	Revenues		Domestic Revenues	Export Revenues	Employees	
	(\$)	(%)	(\$)	(\$)	(n)	(%)
British Colombia	73 560 653	7.6	38 434 588	35 126 065	721	15.0
Prairies	40 651 940	4.2	14 819 393	25 832 547	288	6.0
Ontario	517 806 089	53.4	338 778 347	179 027 742	2 470	51.3
Quebec	328 119 230	33.9	270 000 156	58 119 074	1 172	24.4
Atlantic	8 711 130	0.90	5 645 792	3 065 338	161	3.3
Total:	968 849 042	100	667 678 276	301 170 766	4 812	100



4.3 Presentation of results for domestic revenues

Table 3 gives the sources of domestic revenues for Canadian space organizations. The data confirm that the amount of space activity attributable to government contracts is still very substantial in the traditional sectors and in research. This due to the fact that organizations in these sectors participate actively in major crown projects that still obtain their funding from government sources. The government contracts portion is much less significant in the Applications and Other Services category.

Table 3
Distribution of domestic revenues

Category	Government		Other		Total
	(\$)	(%)	(\$)	(%)	
Space Segment	152 203 421	90.9	15 237 086	9.1	167 440 507
Ground Segment	27 536 963	72.7	10 340 565	27.3	37 877 528
App. and Other Services	45 763 247	10.2	401 037 356	89.8	446 800 603
Space Research	15 341 715	98.6	217 923	1.4	15 559 638
Total:	240 845 346	36.2	426 832 930	63.8	667 678 276



4.4 Presentation of results - Export Revenues

Table 4 outlines the distribution of total exports by geographic region. The international space industry is still concentrated in the United States and most Canadian organizations export to this market. However, Europe also buys a large portion of Canada's space industry products. Asia is a profitable market and 8% of Canadian exports are directed there.

Table 4
Distribution of export revenues by geographic region

Category	United States		Europe		Asia		Other		Total
	(\$)	(%)	(\$)	(%)	(\$)	(%)	(\$)	(%)	(\$)
Space Segment	131 420 457	75.6	39 290 342	22.6	2 560 390	1.5	532 376	0.3	173 803 565
Ground Segment	10 718 634	25.8	18 293 521	44.0	6 733 285	16.2	5 848 083	14.0	41 593 523
App. and Other Services	37 137 841	43.7	12 717 709	15.0	16 040 796	18.9	19 102 262	22.4	84 998 608
Space Research	407 055	52.5	304 120	39.2	55 317	7.1	8 578	1.1	775 070
Total:	179 683 987	59.7	70 605 692	23.4	25 389 788	8.4	25 491 299	8.4	301 170 766



4.5 Presentation of employment results

According to results in table 1, the activities of Canadian space organizations generated 4,812 jobs in 1996. Table 5 shows the distribution of these jobs by occupational group.

Table 5
Distribution of employees by group

Category	Management/ Administration		Engineers/ Scientists		Technicians		Others		Total
	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)	(n)
Space Segment	403	20	744	36.9	294	14.6	574	28.5	2015
Ground Segment	103	15.9	405	62.8	83	12.9	54	8.4	645
App. and Other Services	480	27.3	680	38.6	300	17.0	300	17.0	1760
Space Research	9	2.2	327	83.4	13	3.3	43	10.9	392
Total:	995	21.6	2156	44.8	690	15.0	971	20.2	4812



4.6 Presentation of results by sector of activity

Results from the study can be broken down into the following major industry sectors of activity: telecommunications, robotics, Earth observation, space science and other activities. As shown in table 6, telecommunications accounted for over 60% of Canadian space sector revenues. Within that sector of activity the Applications and Other Services category generated the highest share of revenues – 78%.

Table 6
Distribution of space revenues by sector of activity

Sector of activity	Space Segment		Ground Segment		Applications and Other Services		Space Research		Total	
	(\$)	(%)	(\$)	(%)	(\$)	(%)	(\$)	(%)	(\$)	(%)
Telecommunications	129 728 541	38.0	32 127 360	40.6	417 964 788	78.6	197 921	1.2	580 018 610	59.9
Robotics	154 145 525	45.1	24 128 315	30.5	6 114 225	1.1	47 698	0.3	184 435 763	19.0
Earth Observation	13 499 747	3.9	17 822 012	22.5	75 328 550	14.2	364 301	2.2	107 014 610	11.0
Space Sciences	37 120 948	10.9	2 107 575	2.6	3 011 336	0.6	14 549 887	89.1	56 789 746	5.9
Other	7 038 675	2.1	2 996 425	3.8	29 380 312	5.5	1 174 901	7.2	40 590 313	4.2
Total:	341 533 436	100	79 181 687	100	531 799 211	100	16 334 708	100	968 849 042	100



5. CONCLUSION

As this report shows, the Canadian space sector has undergone important changes over the last few years. The growing use of space systems and space data in the development of new applications and services has strengthened existing organizations and led to the creation of new ones. The revised definition allow us to better understand this reality.

Commercial space activities are growing strongly worldwide. This trend can mainly be related to the enormous growth observed in the satellite communication sector, and to a lesser extent, in the Earth observation sector. Canadian space organizations have developed globally renowned expertise in niche markets, and Canada is well positioned to benefit from numerous emerging opportunities. We can therefore expect even stronger and faster development of the Canadian space sector in the coming years. The CSA, in collaboration with its federal and provincial partners, is committed to sustaining this growth. With support from this new definition of the Canadian space sector, the CSA is better equipped to precisely measure the magnitude of such growth.

