Canadian Space Agency   Agence spatiale canadienne

STATE OF THE CANADIAN SPACE SECTOR

2001

EXTERNAL RELATIONS DIRECTORATE
CANADIAN SPACE AGENCY

Canada

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Aussi disponible en français

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The Canadian Space Agency is committed to leading the development and application of space knowledge for the benefit of Canadians and humanity.

About the Authors

The External Relations Directorate manages the strategic relationships between the Canadian Space Agency and its domestic and international partners. Key mandates include the development and implementation of policies and strategies relating to co-operation partnerships with domestic stakeholders (Federal and Provincial governments, industry and academia), international agencies and foreign industries. External Relations plays a pivotal role in supporting the commercial initiatives of Canadian space companies in world markets - a core mandate of the CSA - and in providing stakeholders with strategic and timely information.

About this Report

The **State of the Canadian Space Sector** report provides those working in the space sector, government and industry alike, with insight into the sector in which we operate. In turn, this information supports decision-makers in their endeavor to make informed and strategic choices for the future.

For more information

Information specific to Canadian space business and industry, including an electronic version of this report, is found at the following address: www.space.gc.ca (Science & Industry).

Acknowledgments

The CSA wishes to acknowledge the contribution of the organizations, both public and private, without which this report would simply not have been possible.

MESSAGE FROM THE PRESIDENT

Marc Garneau
CSA President

I am pleased to report that Canada's space industry has held the course during 2001, with companies maintaining or growing their revenues in an extremely difficult marketplace. At C$1.87B, total revenues in Canada's space sector grew 31% over those reported in 2000. In fact overall increases in both domestic and export revenues drove growth. Notably, export revenues, so important to remaining internationally competitive, grew 21% over the course of the year. Once again telecommunications activities generated over sixty percent of total revenues – remaining the core workhorse for the space sector.

However, early on in 2002 we began to detect signals that revenue trends were shifting downwards for space sector companies, largely due to major market changes in the telecommunications sector, shrinking order books and budget cuts. So we know that our industry captains are facing a multitude of challenges to remaining competitive. And yet they still remain not only committed, but dedicated to growing a successful Canadian presence in the international space sector.

This perseverance and resolve is exactly what will ensure that we continue to contribute to transforming knowledge and technology into industrial prowess, in all regions of the country and will ensure that we continue to make technological advancements for the benefit of all Canadians.

EXECUTIVE SUMMARY

In 2001, **Total Revenues** in Canada's space sector grew 31% over those reported in 2000, increasing from $1.431B[1] to $1.871B. Overall growth was driven by **increases** in both **Domestic** and **Export** Revenues; both the **Domestic** and the **Export** revenues of Canadian space sector companies increased in 2001, growing 39% and 21% respectively over levels found in 2000.

During 2001 there was a slight shift in the proportion of overall space revenues accounted for by domestic and export revenues. Whereas, Domestic revenues represented 58% of total revenues, an increase of 4% over results from 2000, it meant that Export revenues represented 42% of total revenues, down from its 46% share in 2000. Nevertheless, Canada's space sector continues to be significantly export-oriented, and demonstrates a strong export revenue performance having grown 164% between 1996 and 2001. By comparison domestic revenues increased 61% over this same timeframe, growing from $671M to $l.077B. It is also noteworthy that in 2001, Canada's space sector derived the significant majority of its revenues from non-government (or Private) sources, a figure that grew 120% between 2000 and 2001.

Of the four **Space Categories** monitored through the Annual Survey, Applications and Services and Ground Segment showed the strongest growth rates during 2001, up 69% for each category ($405M and $157M respectively). Space Research revenues also grew by a significant 81% (up $14M) while revenues in the Space Segment dropped 22% during 2001. Applications and Services represented 53% of total space sector revenues in 2001 compared with 41% in 2000.

Amongst the **Space Activities in Canada**, Telecommunications dominated space sector revenues in 2001, generating 67% or 1.2B of total reported space revenues. The comparable figure in 2000 was 63%. Earth Observation (EO) was the second strongest sector of activity, although it showed negative growth in 2001, declining 13% ($35M) over 2000 levels. EO activities generated 12% of total revenues. Robotics revenues represented 8% of total space sector revenues in 2001 and grew 23% ($30M). Significant growth was also shown in the Navigation activities, with a 132% increase over revenue levels in 2000 (from $67M to $155M). Space science activity increased 15% over revenue levels in 2000, growing from $52M to $59M and represented 3% of total revenues.

The 2001 **Regional Space Revenues** results found that once again Atlantic Canada showed the strongest growth, increasing 79% and also once again Atlantic Canada continued to derive the lion's share of its revenues from export sources. In 2001, 83% of its revenues were from exports (up from 80% in 2000). Ontario revenues also showed significant growth during 2001, up 63% (from $600M to $978M). While of a more modest nature, Quebec revenues also increased 4% during 2001. British Columbia and the Prairies both registered declines during 2001, down 23% and 26% respectively.

During 2001, the **Workforce in Canada's space industry** showed a modest growth of 5%, increasing from 5,950 to 6,275 workers. Quebec and Ontario continued to employ the majority of space sector employees representing 22% and 56%, respectively of the total space sector workforce.

[1] *All currency in Canadian dollars.*

EXECUTIVE SUMMARY

OVERALL RESULTS: 1996-2001

Year	Total Revenues	Domestic Revenues		Export Revenues		Workforce
		$	%	$	%	n
2001	1,871,511,842	1,077,212,382	58	794,299,460	42	6,275
2000	1,430,941,403	774,729,039	54	656,212,364	46	5,950
1999	1,425,498,040	854,697,263	60	570,800,777	40	6,408
1998	1,420,153,485	802,255,204	56	617,898,281	44	5,930
1997	1,256,362,092	690,006,322	55	566,355,770	45	5,336
1996	968,849,042	667,678,276	69	301,170,766	31	4,812

OVERVIEW OF THE REPORT

In order to measure the changes taking place in Canada's space sector, the CSA undertakes an annual survey and publishes the results in the *State of the Canadian Space Sector* report. The 2001 edition profiles the sector over the course of January 1 to December 31, 2001. Data is provided in the following areas:

- Overall space revenues;
- Domestic v. export revenues;
- Revenues of Canada's Top 30 organisations developing and/or using space to generate revenues;
- Revenues by space categories (Space Segment, Ground Segment, Applications and Services, and Space Research);
- Revenues by sectors of activity (Telecommunications, Robotics, Earth Observation, Space Science, and Satellite Navigation);
- Regional Revenues (British Columbia, Prairies, Ontario, Quebec and Atlantic Canada);
- Workforce characteristics.

METHODOLOGY

Questionnaires were sent to over 200 private sector companies, research organisations and universities in Canada who have a defined strategic interest in the space industry. Additional data were collected through internal consultation with CSA and government officials whose dealings with stakeholders were deemed statistically relevant.

It is important to note that the company-specific information used to compile this report remains strictly confidential and cannot be released in a manner other than in an aggregate form.[2] Consequently, in certain circumstances, the authors are prevented from providing a more detailed explanation or in-depth analysis of the results.

DEFINITION OF CANADA'S SPACE SECTOR

The Canadian space sector is defined as organisations (private, public and academic) whose activities rely on the **development and use** of space assets and/or space data. Accordingly, the sector encompasses the following activities:

Space Segment: Research and Development (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 Services: 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: Primarily research related to non- or pre-commercial space activities.

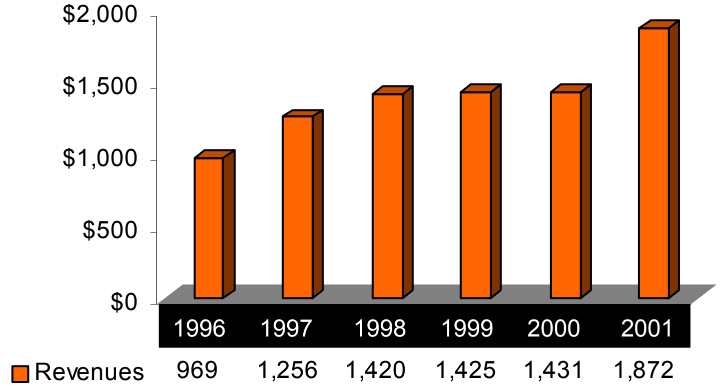
[2] *CSA acknowledges a margin of error in the final results of approximately 2.5%.*

REVENUES
Overall Revenues
Domestic v. Export Revenues

OVERALL REVENUES

After a period of relatively flat growth between 1998 and 2000, total revenues in Canada's space sector grew 31% ($440,570,439) in 2001 increasing from $1.431B to $1.87B. This positive growth in 2001 meant that between 1996 and 2001, space sector revenues have grown 93%, from $969M to $1.872B. They have also grown 49% since 1997.

Total Space Revenues: 1996-2001 (C$m)



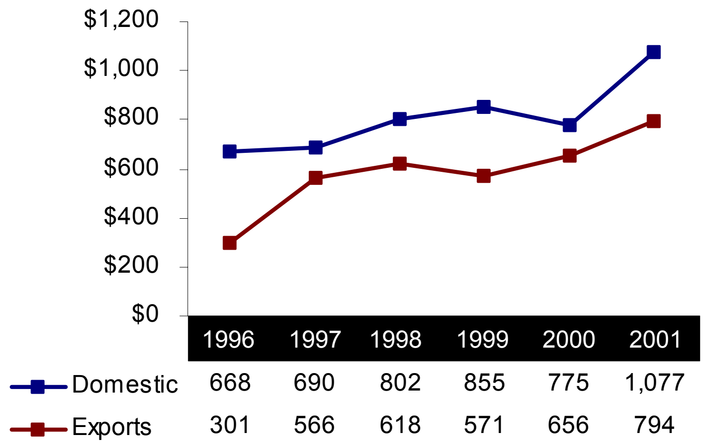
DOMESTIC v. EXPORT REVENUES

During 2001, revenues from domestic sources were $1.077B, representing an increase of 39% over those reported in 2000; between 2000 and 2001, domestic revenues grew from $775M to $1.077B.

In 2001, domestic revenues represented 58% of total revenues, ($1.077B of $1.872B) an increase of 4% ($302,483M) over 2000 figures where it represented $775M of $1.431B.

Export revenues also increased during 2001, growing 21% ($138M) from $656M in 2000 to $794M in 2001. However, in spite of this growth, export revenues' proportion of overall space revenues declined from 46% to 42% between 2000 and 2001, offset by the stronger growth in domestic revenues. Nevertheless, over the 1996-2001 timeframe, total export revenues increased by 164% - once again underscoring the strong export orientation of the Canadian space industry. By comparison, domestic revenues increased 61% over this same timeframe, growing from $671M to $1.077B.

Domestic v. Exports Revenues (C$m) 1996-2001

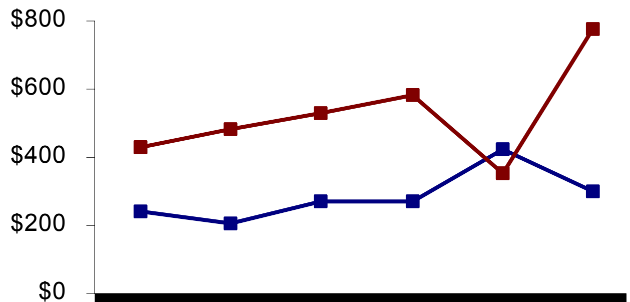


DOMESTIC REVENUES

Respondents were asked to identify the source of domestic revenues as either being derived from government ("Public") or non-government ("Private") sources. In 2001, of the total $1.077B total domestic revenues, non-governmental sources grew 120% over revenues reported during 2000, increasing from $353M to $778M in 2001, or by an amount of $425M. Conversely, domestic revenues from government sources declined 29% (or $123M), dropping from $422M in 2000 to $299M in 2001.

The rise in revenues from non-government sources and the concomitant decline in revenues from government sources reversed the trend observed during 2000, where government sources outweighed those from non-government sources (a finding observed for the first time since data collection began in 1996). The survey found that whereas the overall ratio between government/non-government sources of revenues in 2000 was 54/46%, in 2001 it was 28/72%, strongly in favour non-government or private sources.

Sources of Domestic Revenues (C$m)
Public v. Private: 1996-2001



	1996	1997	1998	1999	2000	2001
Public	241	208	271	272	422	299
Private	427	482	531	583	353	778

REVENUES
Export Revenues

EXPORT REVENUES

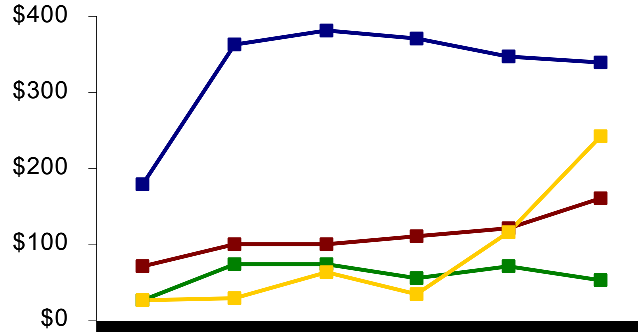
The 2001 survey results once again confirmed the **U.S.** as the strongest market source of export revenues for Canada's space organizations, representing 43% (or $339M) of the $794M in total export revenues. However, this represented a 2.5% decrease ($9M) over U.S. derived revenues reported in 2000 and a drop in the share of overall exports revenues from the 53% recorded in 2000. In fact, the 2001 revenues from the U.S. were the lowest reported since 1996.

Revenues from **Europe** increased by 33% ($40M) over those reported in 2000, growing from $121M to $161M. European-derived revenues continued to increase its proportion of the overall $794M export revenues, accounting for 20% of the export market in 2001 compared to an 18% share in 2000.

Revenues from **Asia** declined 25% ($18M) in 2001, down to $53M from the $71M reported in 2000. Asian-derived revenues represented 7% of total export revenues compared with 11% reported for 2000. However, when considered over a broader timeframe, revenues from Asian sources since 1996 have increased 112% and in spite the influence of fluctuating Asian economies, Asia continues to be a good source of revenues for Canada's space industry.

In 2001, Canada's space industry continued to strengthen its position outside of traditional trade markets. Revenues from the category "**Other**" again showed strong growth, increasing from $116M to $241M, or $125M between 2000 and 2001. This increase followed the trend of growing revenues observed for this category since tracking began in 1996. Sources of revenues reported in this edition of survey results, in this category, (for 2000 and 2001) include Canadian industrial activity in South and Central America, amongst others.

Sources of Export Revenues: 1996-2001 (C&m)

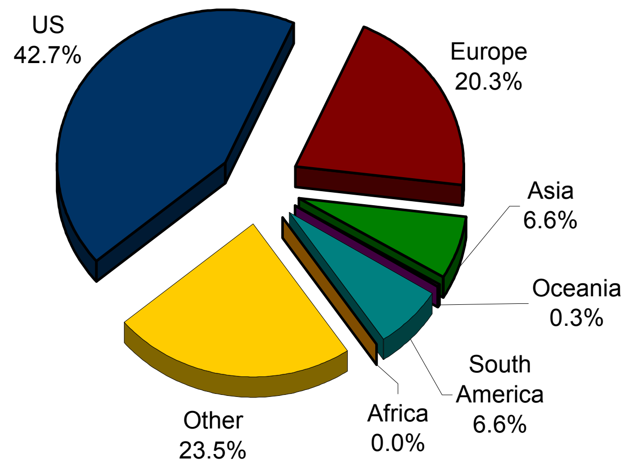


	1996	1997	1998	1999	2000	2001
US	180	364	383	370	348	339
Europe	71	100	99	110	121	161
Asia	25	73	74	55	71	53
Other	25	30	62	35	116	241

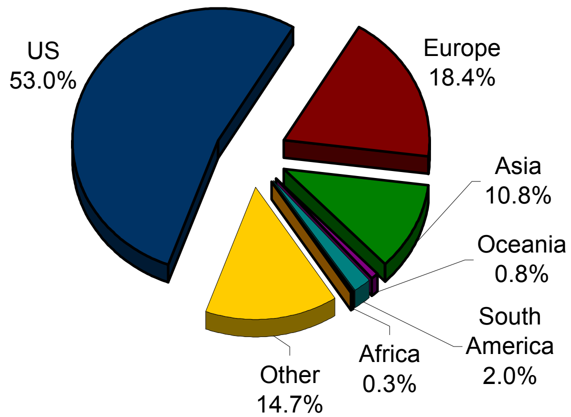
EXPORT REVENUES CONT.

Beginning in 2000, respondents were asked to further refine their reporting of revenues in the "***Other***" category by providing breakdowns for Oceania, South America and Africa so as to increase our understanding of these growing markets. The results of this new breakdown are provided in the accompanying graph. In the case of Africa and Oceania, revenues for 2001 have dropped dramatically (79% and 59% respectively) whereas revenues derived from South America have increased a substantial 300% ($39M) over those reported in 2000.

Sources of Export Revenues: 2001



Sources of Export Revenues: 2000



REVENUES OF CANADA’S TOP 30 SPACE ORGANISATIONS

In 2001, 98% of the total space revenues are accounted for by the Top 30 Canadian organizations developing and/or using space assets. This represents an increase of 1% over levels found in 2000 (97%) and is up 4% from the findings of 1999 (94%).

In 2001, **37** organizations reported revenues equal to or in excess of $1M, a 16% decline from the 44 so reporting in 2000. This is the lowest number of organizations that have reported revenues in the $1M range since tracking began in 1996 and falls significantly short of the 1996 results where 77 companies so reported.

REVENUES BY SPACE CATEGORIES

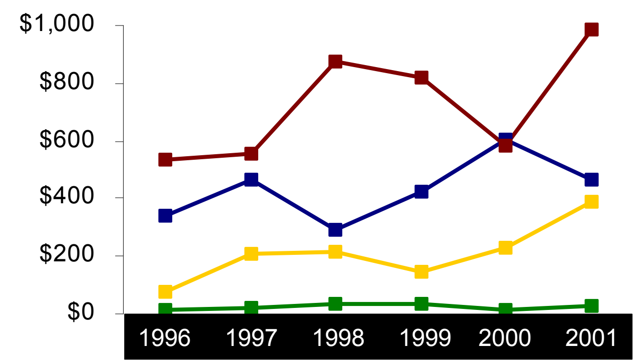
Space Segment: revenues declined, down 22% over levels achieved in 2000, falling from $602M in 2000 to $467M in 2001. Nevertheless, revenues for the Space Segment revenues have grown 37% since tracking began in 1996 and represented 25% of total space sector revenues in 2001. This compares with 42% of total revenues found in 2000.

Ground Segment: revenues showed even stronger growth in 2001 than observed in previous years, increasing 69% (or up $157M) and growing from $229M in 2000 to $386M in 2001. This represented 21% of total revenues whereas ground segment revenues in 2000 represented 16% of total revenues.

Applications and Services: revenues recovered from the downfall reported in 2000 and grew a significant 69% during 2001, growing from $584M in 2000 to $989M (or $405M) in 2001. Applications and Services represented 53% of total space sector revenues in 2001 compared with 41% in 2000. Since tracking began in 1996, revenues from Applications and Services have grown 86%.

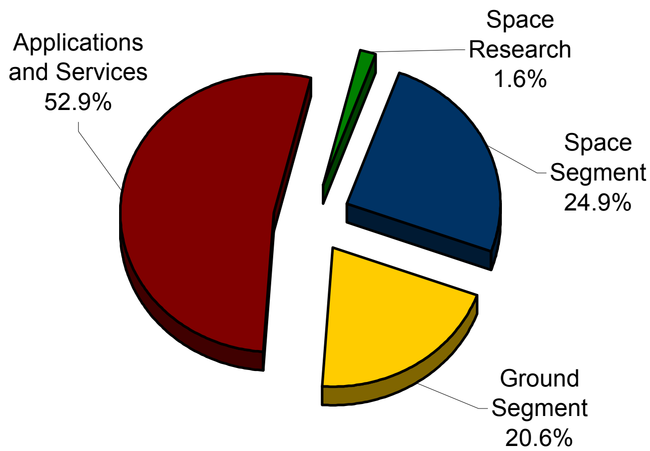
Space Research: revenues in 2001 returned to levels observed in 1998, increasing to $30M (80% increase over 2000). Space Research revenues in 2001 accounted for 1% of total space revenues, a level consistent with the research findings in 1996, 1997, and 2000.

Total Revenues by Space Category: 1996-2001 (C$m)



	1996	1997	1998	1999	2000	2001
Space Segment	342	466	294	425	602	467
Ground Segment	79	211	215	147	229	386
Apps & Services	532	558	876	816	584	989
Space Research	16	21	34	38	16	30

Proportion of Revenues by Space Category: 2001



REVENUES
Revenues by Sectors of Activity

REVENUES BY SECTOR OF ACTIVITY

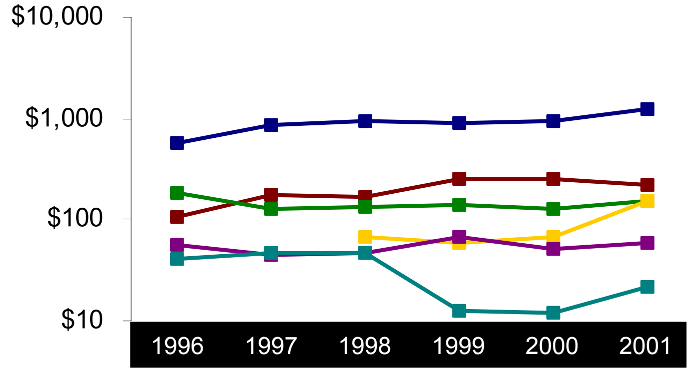
Telecommunications: Once again, Telecommunications dominated Canada's space sector revenues in 2001, generating 67% or 1.26B of total reported revenues compared with 63% in 2000. Revenues in 2001 were the highest recorded since tracking began in 1996 and grew 37% ($341M) between 2000 and 2001. Overall, telecommunications revenues have increased by 117% ($681M) between 1996 and 2001.

Earth Observation: Revenues in Earth Observation (EO), traditionally the second largest space sector activity, showed negative growth in 2001, declining 13% ($35M) over 2000 levels. EO revenues represented 12% of total revenues, down from the 18% found in 2000. Further, although, revenues in this sector have grown 104% between 1996 and 2001, this is largely due to peak performance during 1999 and 2000.

Robotics: Revenues in 2001 for this sector grew by 23% ($30M) over those observed in 2000 (from $126M to $156M) reversing the downward trend observed in 2000. In 2001, Robotics activities generated 8% of total revenues in the space sector compared with 9% in 2000, 10% in 1999, 9% in 1998 and 10% in 1997.

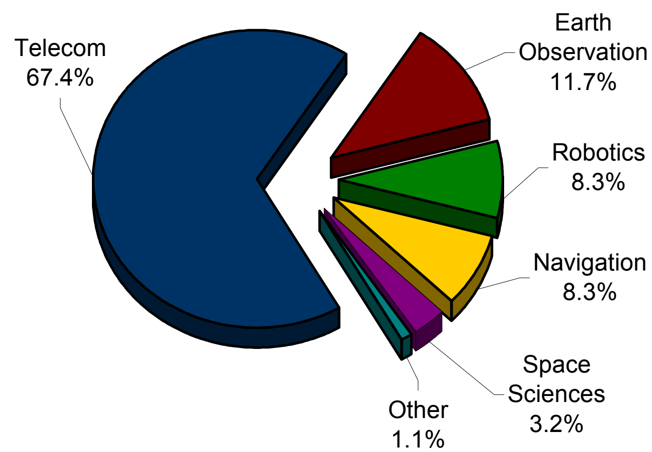
Navigation: Navigation sector activities showed strong growth in 2001, up a significant 132% from levels found in 2000. Revenues grew from $67M to $155M ($88M) between 2000 and 2001. Navigation revenues represented 8% of the total space revenues, a 3% increase over 2000 figures, where Navigation generated approximately 5% of total revenues. Since specific tracking of this sector (separate from the "Other" grouping) began in 1998, revenues have grown by $88M or 131%.

Total Revenues by Sectors of Activity (C$m) 1996-2001 (Logarithmic)



	1996	1997	1998	1999	2000	2001
Telecom	580	861	960	901	920	1261
Earth Obs.	107	177	166	246	254	219
Robotics	184	126	134	140	126	156
Navigation	0	0	67	58	67	155
Space Sci.	57	45	47	68	52	59
Other	41	47	47	12	12	21

Proportion of Revenues by Sectors of Activity: 2001



REVENUES BY SECTOR OF ACTIVITY CONT.

Space Science: The increased activity in the 2001 Space Research category reported earlier was reflected in the sector revenues, showing a 15% increase over revenues in 2000. Between 2000 and 2001, revenues rose from $52M to $59M. Revenues generated from Space Science activities in 2001 represented 3% of total revenues. In terms of overall trends, revenues have shown a modest 3.5% increase between 1996 and 2001.

Other: Space-related activities in areas other than those classified above, reported a significant 78% increase in revenues between 2000 and 2001, rising from $12M to $21M, or a $9M in total. Activities in the "Other" activity represented 1% of total space revenues.

REVENUES BY REGION

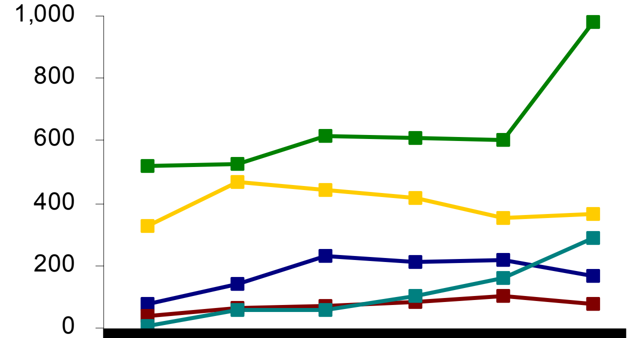
British Columbia: Revenues for British Columbia during 2001 declined over 2000 levels by 23%, or $51M, down from $217M to $166M respectively. This returned British Columbia to revenues levels achieved prior to 1998. Despite this downturn however, revenues for British Columbia between 1996 and 2001 have grown 124%. British Columbia revenues represented 9% of total revenues for the space sector in 2001.

B.C. continued to derive the large majority of its revenues from the domestic market ($127M), which in 2001 represented 76% of its total revenues, compared to 24% ($40M) derived from export markets. It is worth noting that B.C. exports dropped 53% between 2000 and 2001. Overall, between 1996 and 2001, B.C.'s domestic space revenues increased by 234%, from $38M to $127M. Exports increased 14% during this same timeframe.

Prairies: After registering strong revenue growth in 2000, total revenues for Canada's Prairie region (Alberta, Saskatchewan and Manitoba) declined 26% ($26M) during 2001; revenues dropped from $101M in 2000 to $75M in 2001 falling to near 1998 levels. In 2001, the Prairies generated 4% of the total space sector revenues. Further, between 1996 and 2001, total revenues have risen 82%.

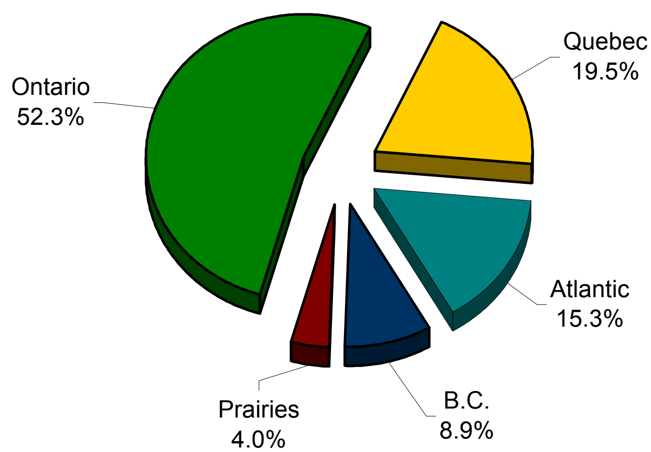
Canada's Prairie region derived the majority (69%) of its total revenues from exports in 2001, reporting a total of $52M in exports. Still, this represented a small drop of 2.5% over exports reported in 2000. Domestic revenues declined 51% during 2001, dropping from $48M to $24M (or $24M). However, in terms of overall trends, between 1996 and 2001, the Prairie's domestic space revenues increased by 60% while exports grew 96%.

Revenues by Region: 1996-2001 (C$m)



	1996	1997	1998	1999	2000	2001
B.C.	74	139	229	211	217	166
Prairies	41	67	72	85	101	75
Ontario	518	525	614	611	600	978
Quebec	328	467	445	416	353	366
Atlantic	9	58	60	103	160	286

Regional Proportion of Total Revenues: 2001



REVENUES BY REGION CONT.

Ontario: Revenues showed strong growth in Ontario, growing by $378M or 63% in 2001, increasing from $600M to $978M. This strong revenue growth fortified Ontario's position as the major generator of space revenues in Canada, and represented 52% of total space revenues in 2001. Between 1996 and 2001, total revenues have grown 89%.

Seventy-nine percent (79%) (or $768M) of Ontario's space revenues were derived from domestic sources while 21% (or $210M) came from exports during 2001. Domestic-derived revenues increased 72% during 2001 and exports increased 37%. Between 1996 and 2001, domestic revenues have increased 126% ($429M) and exports have increased 17%($31M).

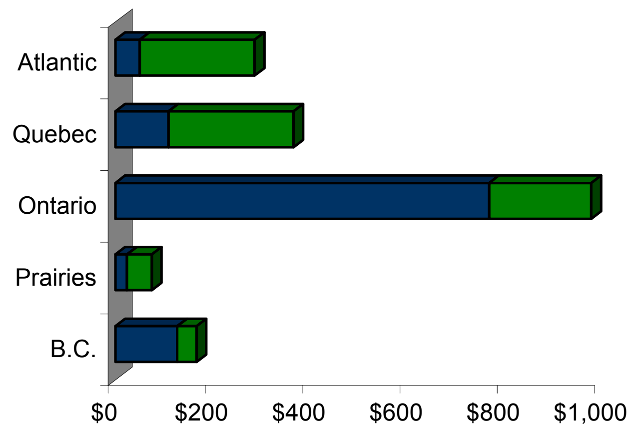
Quebec: Revenues from Quebec increased $13M or 4% during 2001 and represented 20% of total space revenues in Canada. However, Quebec revenues have still not returned to levels reported in 1997 through 1999. Nevertheless, between 1996 and 2001, overall revenues increased 12%.

In 2001, Quebec continued its trend of deriving the significant majority of its revenues from exports ($257M/70%) versus $109M/30% derived from domestic sources. Export revenues increased 10%, growing from $234M in 2000 to $257M in 2001. Domestic revenues, however, did drop 9%, down from $119M in 2000 to $109M in 2001. Whereas export revenues grew a significant 343% ($199M) between 1996 and 2001, domestic revenues have dropped 60% ($161M) during the same time period.

Atlantic: Revenue increases in Atlantic Canada were significant in 2001, growing from $160M to $286M ($126M). This was a 79% growth rate. Atlantic Canada represented 15% of Canada's total space revenues.

Once again, Atlantic Canada continued to derive the lion's share of its revenues from export sources; 83% of total revenues came from export markets in 2001. Growth was significant in both export and domestic revenues. Export revenues grew 80% during 2001 and domestic revenues grew 72%. Since tracking began in 1996, Atlantic Canada's export revenues have shown steady and significant annual growth. Domestic revenues have also grown, showing over 700% growth since 1996.

Domestic v. Export Revenues by Region: 2001 (C$m)



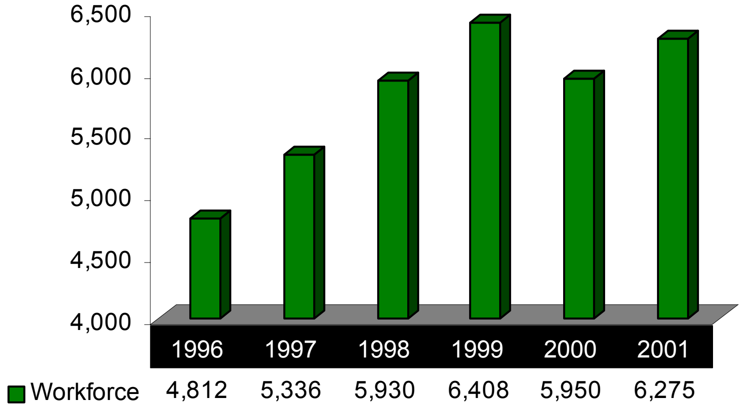
	B.C.	Prairies	Ontario	Quebec	Atlantic
Exports	40	51	210	257	236
Domestic	127	24	768	109	50

SPACE SECTOR WORKFORCE
Workforce Groups

SPACE SECTOR WORKFORCE

During 2001, the workforce in Canada's space industry showed a modest growth of 5% increasing from 5,950 to 6,275 workers or adding a total of 325 employees to their rosters.

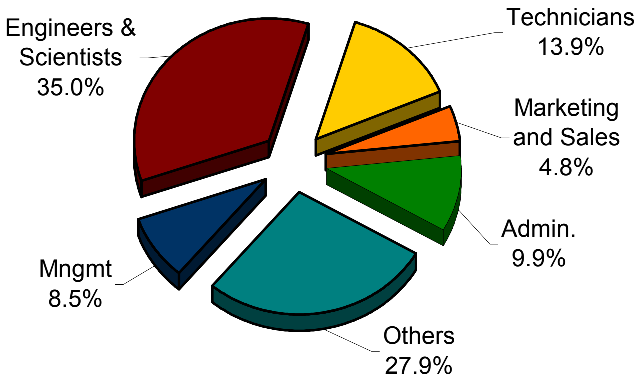
Space Sector Workforce: 1996-2001



WORKFORCE GROUPS

Of the five main sector employment groups, the "Engineers and Scientists" group comprised the highest number of employees, namely 2,196 or 35% of the space sector workforce. The chart below provides a breakdown of the distribution of employment groups working in the Canadian Space Section in 2001.

Workforce by Space Employment Categories: 2001



Workforce Groups by Region: 2001

	BC	Prairies	ON	QC	Atlantic	Total
Mngmt	30	26	264	126	88	534
Eng/Sci.	306	212	919	710	49	2,196
Tech.	42	84	313	253	180	872
Mktg/Sls	28	15	111	35	111	300
Admin.	25	20	407	108	64	624
Others	26	17	1,511	134	61	1,749
Total	457	374	3,525	1,366	553	6,275

WORKFORCE BY REGION

British Columbia employed 457 or 7% of the nation's space workforce in 2001, which constituted a decrease of 44% (or 360 fewer employees) than in 2000. These figures represented the lowest employment level reported since tracking began in 1996.

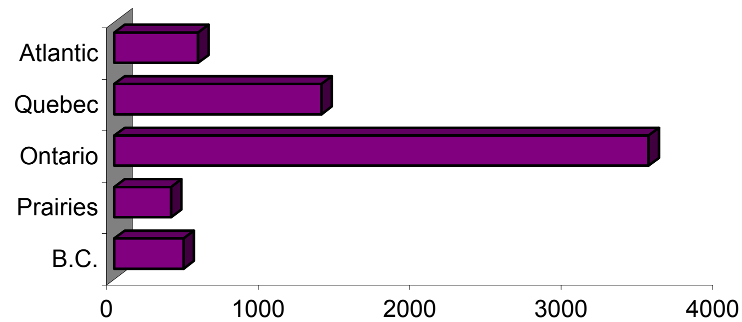
The **Prairies** employed 6% (374) of the space sector workforce in 2001 but also reported a decrease of 25% (down 125 employees) over 2000 figures, dropping to near 1996 figures (374 for 2001 and 288 for 1996). However overall, between 1996 and 2001, the Prairie space sector workforce has grown by 30%.

Conversely, in 2001 **Ontario** strengthened its position in employing the clear majority of workforce, a total of 3,525 or 56% of space sector employees. This represented an increase of 26% over figures for 2000 and added 732 employees to the overall nation's workforce. The space sector workforce in Ontario has grown by 43%, from 2,470 to 3,525, between 1996 and 2001 and 42% since 1996.

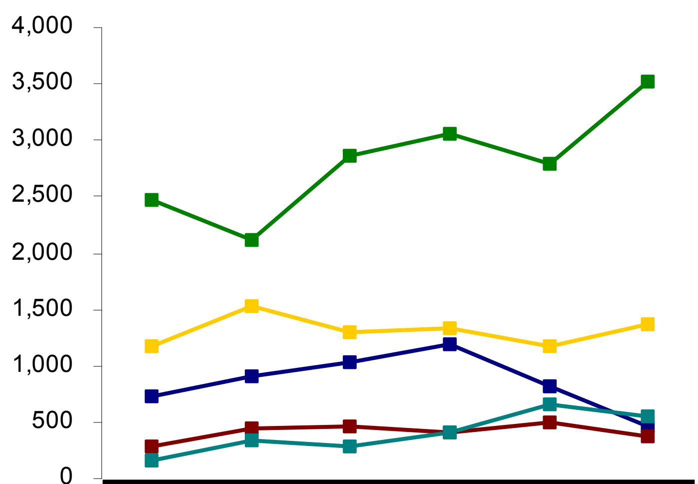
Representing 22% (1366) of the total space sector workforce, the **Quebec** based space sector employment statistics also improved during 2001, increasing 16% over 2000. Quebec added 190 employees to the nation's space sector. During the period between 1996 and 2001, Quebec has increased space sector employment by 17%.

Atlantic Canada employed 9% of the country's space sector workforce in 2001 (553) but showed a decrease over 2000 figures of 17% (or 112 less employees). However, in spite of this decrease, between 1996 and 2001, Atlantic Canada has grown its space sector workforce by 243%.

Space Sector Workforce by Region: 2001



Space Sector Workforce by Region: 1996-2001



	1996	1997	1998	1999	2000	2001
B.C.	721	905	1,023	1,193	817	457
Prairies	288	447	463	414	499	374
Ontario	2,470	2,115	2,870	3,066	2,793	3,525
Quebec	1,172	1,534	1,291	1,335	1,176	1,366
Atlantic	161	335	282	401	665	553