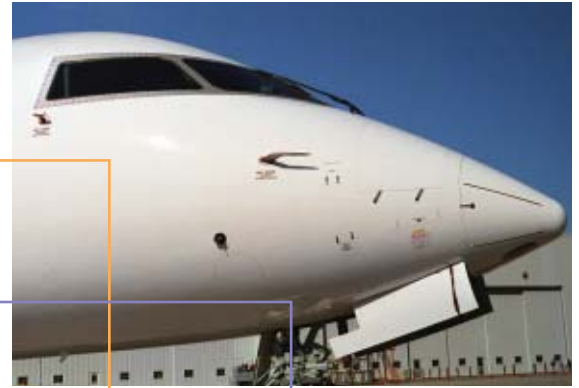
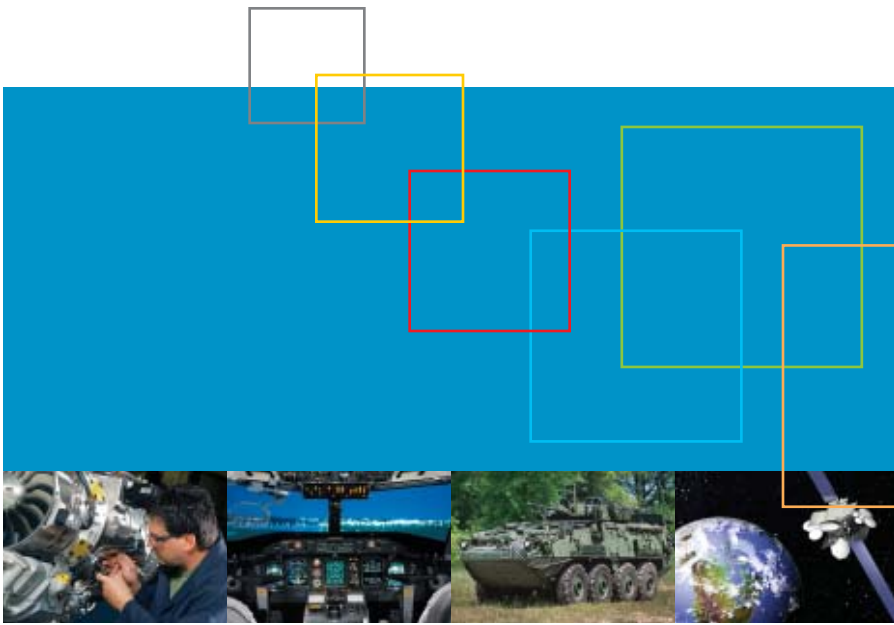




Government
of Canada

Gouvernement
du Canada

National Aerospace and Defence Strategic Framework



2005 → 2025

Strategic Aerospace and
Defence Investments

Technology Development
and Commercialization

Skills Development

Trade Policy and Trade Development

Sales Financing

Security and the Environment

Procurement

Canada

.....

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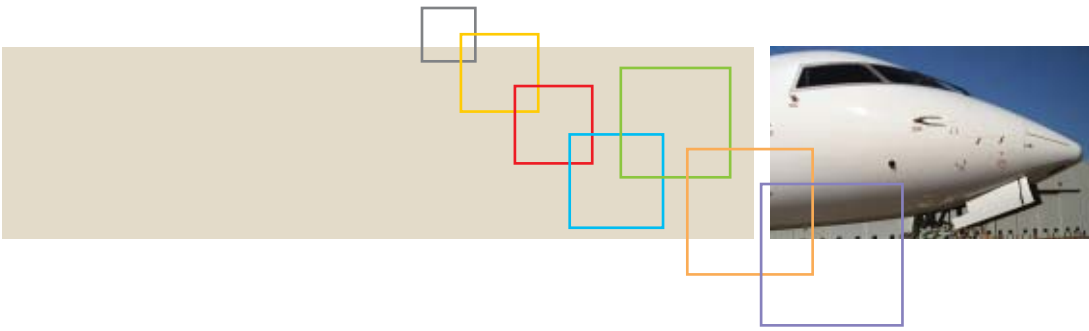
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Canadian Space Agency

Richard Ryczanowski



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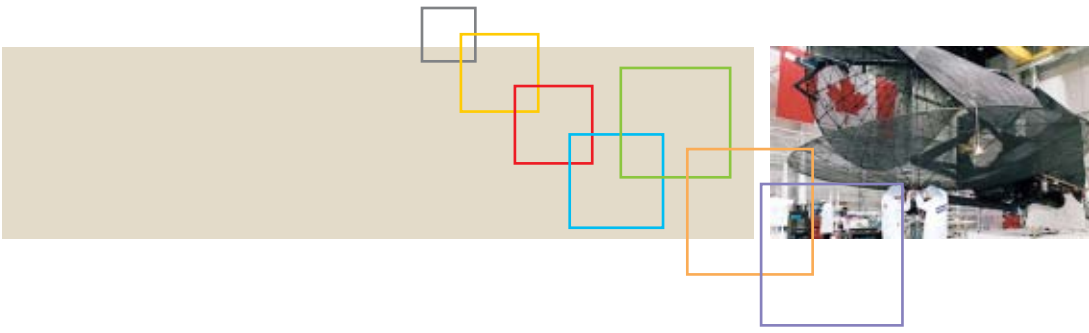
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“The government will do its part to enable the success of important sectors, including automotive, aerospace and other manufacturing, as well as agriculture and other resource-based industries.”

Speech from the Throne, October 5, 2004

“As we well know, [in the aerospace sector] Canada is among the best in the world and it is the government’s intention to maintain the structures and policies that will see it continue.”

Prime Minister Paul Martin, House of Commons, November 18, 2004



MINISTER'S MESSAGE

Canadians' prospects for the future are based on our collective ability to be competitive in a global economy. Canada currently enjoys strong economic fundamentals after having reversed its fiscal fortunes and improved its business environment. Canada has had eight consecutive years of budgetary surplus and has the lowest ratio of government debt to gross domestic product among G7 member countries. Its strong fiscal position has led to lower interest rates and taxes, while at the same time enabling increasing investments in key social and economic priorities such as education, infrastructure, health care, and science and technology.

Translating these advantages into well-paying jobs for Canadians is the goal of industrial policy. Enhancing individual industries' competitiveness is essential for sustaining strong economic performance and improving quality of life in the future.

As one of Canada's key high technology sectors, the aerospace and defence industry is an important sector in the Canadian economy. It has achieved a remarkable level of success in international markets, with Canadian aerospace and defence products well recognized around the world. The industry provides Canadians with highly skilled jobs and it is an engine of technology development. A strong aerospace and defence sector will contribute to the knowledge-based economy of the future.

The future will include many new challenges and opportunities for the Canadian aerospace and defence industry. To ensure that Canada addresses these challenges and seizes these opportunities, all stakeholders in the industry must take concerted action now. Securing the future health and growth of the aerospace and defence sector requires a strategic framework that anticipates emerging challenges and opportunities while implementing coordinated measures that position the industry to respond in a timely and effective manner.

The government has worked closely with aerospace and defence industry stakeholders to develop a National Aerospace and Defence Strategic Framework. The Canadian Aerospace Partnership provided a key forum for stakeholder discussion as well as consensus on many of the issues facing the industry and directions for moving forward. The Framework sets out Canada's position in the evolving global industry, a vision and objectives, and the strategic areas requiring attention by all industry stakeholders.

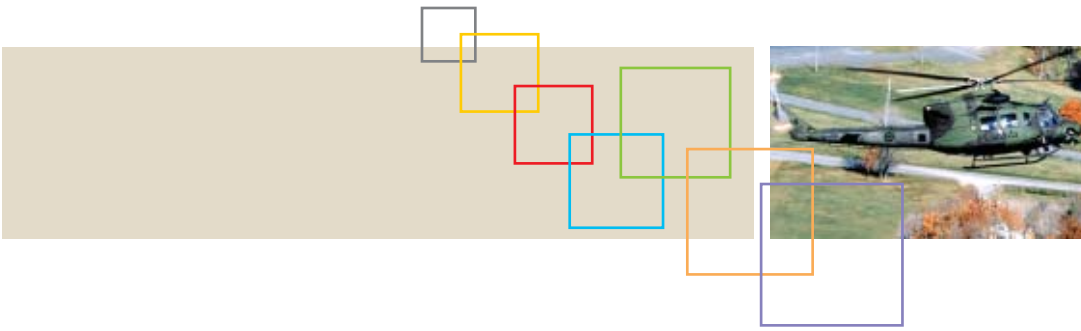


photo 1: Canadian Space Agency

photo 2: Patrick Doyle

The Framework will provide the basis for the continuing development of federal aerospace and defence industrial policy. It provides the foundation for continued collaboration between industry stakeholders to maintain Canada's role as a leading player in the global aerospace and defence industry. We will continue to refine and deepen our efforts. This document is a milestone for the Canadian aerospace and defence industry, and will play a prominent role as we move forward.

The Honourable David L. Emerson
Minister of Industry



EXECUTIVE SUMMARY

The National Aerospace and Defence Strategic Framework is a comprehensive framework of programs and policies to support the growth of Canada's aerospace and defence industry from coast to coast, and build on its strong globally competitive position. The Framework recognizes that both industry and government must consider new realities and develop a renewed framework for collaboration.

The Framework is national in scope and represents a collaborative way forward, drawing upon private sector dynamism and public sector commitment. It looks out over a 20-year time horizon and endorses a vision to the year 2025. It identifies the factors and forces facing the industry, recommends specific actions and promotes the use of evaluation and priority-setting tools to guide strategic choices. The Framework addresses both short- and long-term issues, with the ultimate goal of enhancing and sustaining the competitiveness and capabilities of the Canadian aerospace and defence sector. The Framework will guide future government policy and program decisions and present a basis for collaboration among stakeholders.

The Framework was developed in close collaboration with stakeholders across the federal community and in consultation with industry leaders through the Canadian Aerospace Partnership. In addition, there was input from stakeholders and the public during broad consultations in all regions of Canada.

The Framework is not about picking winners. The goal is to help a crucial industrial sector identify where, and how, it can be globally competitive. This includes the federal government doing its part in helping articulate the path for the industry to grow and compete over the next 20 years. The government will continue to work with all stakeholders in identifying critical issues and developing appropriate responses. The Framework defines the first of a series of actions the federal government will take and invites all stakeholders to actively participate in the realization of the vision through concrete action.

The aerospace and defence industry is a significant contributor to Canada's economic performance, with a strong presence in all regions across Canada. The Canadian aerospace industry generated revenues of \$21.7 billion in 2004, of which 84 percent came from exports. Collectively, the Canadian aerospace and defence sector contributed \$9.2 billion toward Canada's gross domestic product (GDP), accounting for more than 5 percent of Canada's total manufacturing GDP.

The Canadian Aerospace and Defence Industry

Canada is an important player in the global aerospace and defence industry. In terms of commercial aerospace, we are the world's fourth-largest producer (after the United States, the United Kingdom and France). Canadian aerospace and defence products and services are competitive in many market segments, including: regional and business aircraft; small gas turbine engines; commercial flight simulators; aerostructures; landing gear systems; helicopters; armoured vehicles; space-based robotics; remote sensing systems and satellites; avionics and mission systems; and, maintenance, repair and overhaul services. Canadian industry is a world leader in many of these segments.

The aerospace and defence industry is a significant contributor to Canada's economic performance, with a strong presence in all regions across Canada. The Canadian aerospace industry generated revenues of \$21.7 billion in 2004, of which 84 percent came from exports. Collectively, the Canadian aerospace and defence sector contributed \$9.2 billion toward Canada's gross domestic product (GDP), accounting for more than 5 percent of Canada's total manufacturing GDP. The industry invested more than \$1.2 billion on research and development (R&D) in 2004. In fact, the industry ranks as one of the top manufacturing sectors in terms of R&D intensity, export intensity and value-added per employee. It provides high-quality employment for upwards of 73 000 Canadians. As well, spin-offs from the aerospace and defence industry have a significant impact on other sectors, such as medical devices, Earth observation, agriculture and transformative technologies. The sector also contributes strongly toward achieving public policy goals and objectives in a wide variety of areas including defence, national security and protection of the environment.

Global aerospace sales are expected to reach US\$2 trillion over the next 20 years. The global industry is shifting, and the past decade has seen dramatic changes in the way business is conducted and how industry is organized. Furthermore, Canada's mature product base puts it at a critical juncture where it needs to make substantial investments in R&D and new-generation technology, product and capability development to take advantage of these opportunities.

Global aerospace competition is fierce, and other countries are adopting aggressive strategies to advance their aerospace and defence sectors. Emerging aerospace countries are seeking to establish indigenous capabilities by attracting major investments in exchange for potential market access. Low labour costs are also posing a critical challenge to Canadian industry, underlining the importance of moving to higher-value-added products and improved productivity.

Aerospace and defence stakeholders across Canada have recognized the opportunities and the challenges that lay ahead. The Canadian Aerospace Partnership, whose membership includes senior executives from industry, provincial governments, labour groups and academia, was established in April 2005. Its focus is to enhance the competitiveness of the Canadian aerospace and defence industry and to set out a vision and a plan of action with respect to all stakeholders.

The National Aerospace and Defence Strategic Framework

A Vision to 2025

The government endorses the vision developed by stakeholders across the industry:

Canada will be home to a growing, innovative and diversified industry, recognized as a leader in serving global aerospace and defence markets and a preferred location for investment.

With the Framework, the government commits to working with the Canadian aerospace and defence industry and other stakeholders toward ambitious, achievable goals.

Through the work, commitment and collaborative partnership of governments, companies, workers, academic groups and other stakeholders, Canada will create an aerospace and defence industry that is a:

- globally recognized brand of Canadian excellence and source of national pride;
- creator of national wealth and provider of challenging and rewarding jobs for Canadians;
- key contributor to security and military readiness in Canada and among our allies; and,
- lever for effectively achieving a wide range of public policy objectives and needs.

Achieving the Vision

All aerospace and defence industry stakeholders will have to work together to achieve key objectives. The Framework directs industry and government action in pursuit of these goals. Specifically, the Framework directs collaborative action to ensure a Canadian industry that:

- comprises a critical mass of top-tier platform original equipment manufacturers (OEMs), each with a world-leading position in its respective market segment;
- possesses robust design and systems integration capabilities throughout the supply chain;
- offers comprehensive, in-service support solutions over the complete product life cycle;
- serves a diversified, global customer base;
- is at the forefront of technological innovation and productivity;
- outperforms the global industry in selected niche markets and sustains a “Top 5” global ranking overall;
- achieves an above-average compound annual growth rate and delivers above-average returns on investment relative to other international competitors; and,
- sustains a level of domestic value-added commensurate with that of its principal competitors.

Seven Pillars of the National Aerospace Strategic Framework

The Framework presents the goals, and calls upon all stakeholders to focus effort and investment on seven strategic areas that will enable the industry’s future success.

Large, multi-year international projects in the aerospace, defence and space sectors represent some of the best long-term growth opportunities for the Canadian industry, and are critical to its success.

Securing Strategic Aerospace and Defence Investments

Large, multi-year international projects in the aerospace, defence and space sectors represent some of the best long-term growth opportunities for the Canadian industry, and are critical to its success. Beyond the business benefits of participation, major platforms represent opportunity for technology access and development, as well as the establishment of long-term relationships. This access is critical as our industry competes for future business from around the world.

The government is committed to supporting Canadian industry through a number of initiatives, including: the adoption of a robust and coherent decision-making framework; the development of policy and analytical tools for assessing Canadian benefits and participation; and, supporting Canada's participation in strategic projects consistent with Canada's international trade obligations.

Technology Development and Commercialization

The aerospace and defence industry is founded upon products that have the highest level of technology and growth in the most successful aerospace and defence firms is directly linked to the investments in R&D. For the industry to remain successful, there will need to be sustained investment in product and process innovation at all levels of the supply chain, from companies and governments alike.

The government is committed to working with the industry to increase the levels of aerospace R&D performed in Canada. The government will create an aerospace and defence risk-sharing investment program, thus contributing to industry-led R&D projects that promote the development and application of the technologies that will define the growth of Canada's aerospace and defence sector. The program will invest in several areas covering the continuum of R&D, including a focus on the development of clusters of capabilities across Canada. The government will also promote research partnerships and collaboration among companies, universities, industry, government and not-for-profit organizations.

The government will also work with public institutions and with the industry to enhance and promote aerospace-related research by mobilizing and linking researchers in Canadian universities with researchers in the private, public and non-profit sectors.

A labour force that is well trained and adaptable underpins strong R&D performance and world-class manufacturing and business processes. Canada's aerospace and defence workforce has helped us achieve an enviable world ranking; however, Canada faces challenges in maintaining its position as the workforce ages and retirements occur.

Skills Development

A labour force that is well trained and adaptable underpins strong R&D performance and world-class manufacturing and business processes. Canada's aerospace and defence workforce has helped us achieve an enviable world ranking; however, Canada faces challenges in maintaining its position as the workforce ages and retirements occur.

The government will support innovative skills development projects in the aerospace and defence sector through existing and upcoming programs at Human Resources and Skills Development Canada, such as the recently announced Workplace Skills Strategy.

Trade Policy and Trade Development Initiatives

Canadian aerospace and defence products and services are world-class and can compete successfully in international markets. To maintain this position, industry requires the promotion of, and access to, an equitable international marketplace in which it can compete for business opportunities in both established and emerging markets. In addition, since the Canadian industry is highly integrated with that of the US, both large and small businesses will benefit from a constructive bilateral relationship with the US.

The government commits to developing a comprehensive investment and trade strategy, focussing on foreign direct investment and promoting Canadian capabilities abroad. Canada will participate aggressively in international aerospace and defence events and will continue to disseminate market information and intelligence about international business opportunities to Canadian aerospace and defence firms. Canada will also proactively seek global opportunities to increase industry participation on major aerospace and defence platforms and defence procurements.

Sales Financing

The ability to access sales financing support is imperative for the success of the Canadian aerospace and defence industry. Government sales financing support complements that provided by commercial lenders. Sales financing allows Canadian firms to compete with companies supported by their national governments, thereby allowing them access to new and developing markets.

The government will establish an Aircraft Sales Financing Framework that is consistent with Canada's international trade obligations. This framework will provide competitive and defensible sales financing in a fiscally prudent manner to support the sales of Canadian-manufactured aircraft. The government commits to actively participate in the current Organisation for Economic Co-operation and Development discussions on the Aircraft Sector Understanding.

Security and the Environment

The aerospace and defence industry plays a key role in helping the government protect Canadian interests and laws and helps ensure they are being respected and enforced. It also provides invaluable support to Canadian efforts to monitor and protect our environment.

The government is committed to participating in the major international security, defence and space programs that support Canada's security and industrial interests. It recognizes the importance of working with international partners on space exploration and defence and security research. In addition, the Framework commits the government to better use of Department of National Defence equipment procurements and technological innovations as levers for Canadian aerospace and defence industrial participation.

Procurement

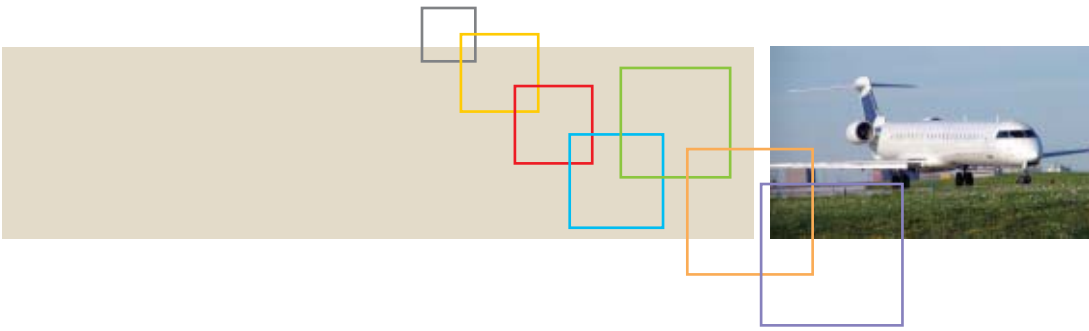
Given Canada's relatively small domestic defence requirements and its open market policies, there is growing pressure on domestic firms to shift work to other jurisdictions in order to assure access to those markets. A government procurement environment is needed to better use the opportunities presented by public procurement to promote innovation and commercialization by Canadian firms.

The government commits to developing a framework designed to better leverage industrial development from procurement. This includes considering policy options that would make the Industrial and Regional Benefits Policy more focussed on the aerospace and defence sector and the technologies that will be key to the sector's future success.

A Continuing Commitment

The Canadian aerospace and defence sector has enjoyed tremendous success and continues to be one of Canada's most important high technology sectors. However, changing realities require all stakeholders to commit to a shared vision.

The federal government has played a vital role in the growth, development and success of the aerospace and defence industry in Canada. The Framework continues the government's commitment to the industry, through a coordinated strategy and a commitment to continuing dialogue with all stakeholders. The Canadian Aerospace Partnership, which was instrumental in the Framework's development, will play a particularly important role.



National Aerospace and Defence Strategic Framework

INTRODUCTION

Over many years, Canada has developed into one of the world’s major aerospace and defence nations. This success is a product of private sector dynamism and public sector policies. Yet, current success is no guarantee of future performance. The global aerospace and defence sector is shifting dramatically. To sustain Canada’s position, industry and government must consider the new realities and must develop a renewed framework for collaboration — a new national strategic framework for Canada’s aerospace and defence industries.

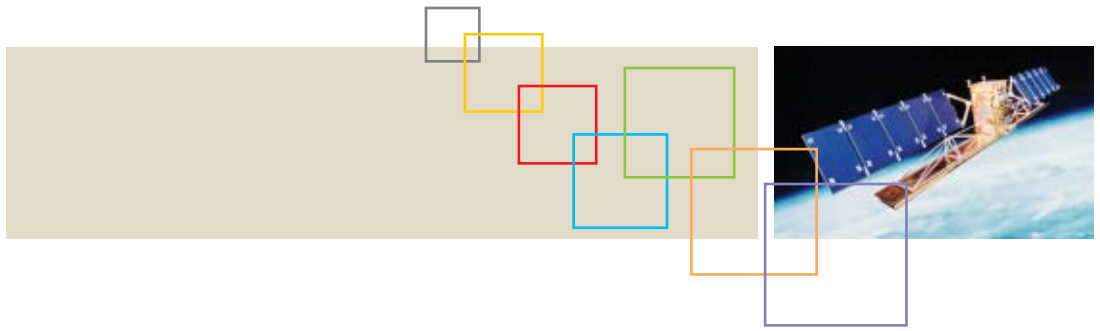
This framework identifies the forces facing the industry, specific actions and strategic choices. For government, it will guide future policy and program decisions, and presents a basis for collaboration with other stakeholders. The Framework is national in scope, inclusive of key stakeholders and supportive of public policy perspectives. It looks out over a 20-year time horizon, proposing a vision to the year 2025. It examines¹ both short-term and long-term issues with the ultimate goal of enhancing and sustaining the competitiveness and capabilities of the Canadian aerospace and defence sector.

Figure 1: Industry Snapshot 2004

Indicators
\$21.7 billion in sales
\$18.2 billion in exports (84%)
73 000 employees
\$1.2 billion in R&D

Source: Aerospace Industries Association of Canada, 2004 Survey.

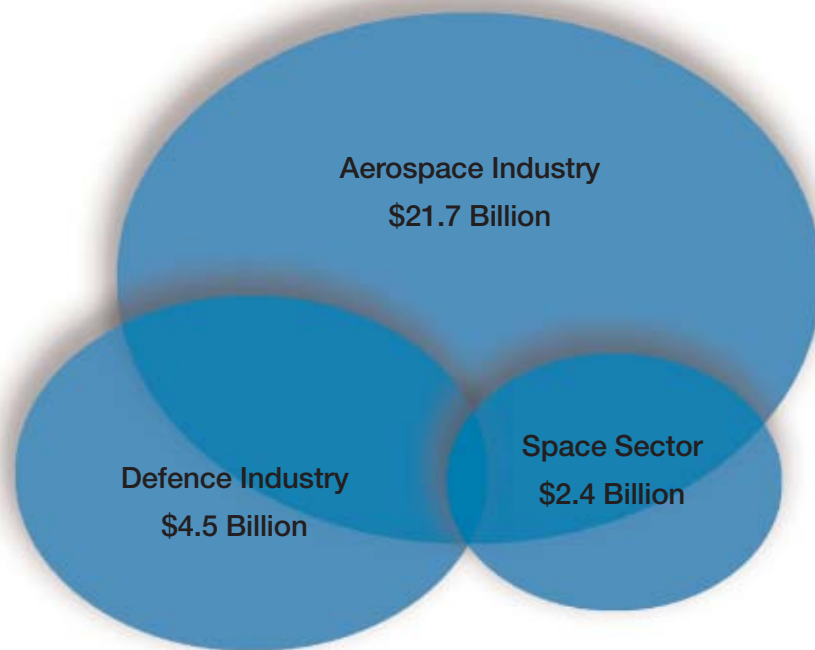
¹ Data on sales, international trade, employment and gross domestic product (GDP) are from Statistics Canada, unless otherwise specified. The industry data are based on the sectors covered by the Aerospace Product and Parts Manufacturing Industry category (3364) under the North American Industry Classification System (NAICS). This classification includes establishments whose main activity is the manufacture of aircraft, missiles and spacecraft, as well as their engines, propulsion systems, auxiliary equipment and parts in general. The in-factory overhaul and conversion of aircraft and their propulsion systems are considered part of this sector. Not included in the NAICS 3364 classification is the manufacture of aircraft instruments, such as navigation, measurement and command systems.



THE VIEW FROM 40 000 FEET: CANADA'S AEROSPACE AND DEFENCE INDUSTRY

The Canadian aerospace and defence industry is a major and innovative contributor to Canada's economic performance. The industry is composed of three main elements: aerospace, defence and space (Figure 2). The industry's contribution to the economy is illustrated by aerospace, which contributed an average of \$5.9 billion annually to Canada's gross domestic product from 1994 to 2003.

Figure 2: Aerospace, Defence and Space Revenues



The aerospace and defence industry is present in all provinces of Canada, with key industry clusters located in Montréal, Toronto and Winnipeg. The industry also has a significant presence in British Columbia, Saskatchewan, Alberta and the Atlantic region.

Canada's aerospace and defence industry has several major indigenous firms, including Bombardier, CAE, CMC Electronics, Heroux Devtek, Magellan Aerospace, SNC and MDA. It has also attracted significant direct investment by several major foreign-owned firms, such as Pratt & Whitney Canada, Bell Helicopter Textron, Boeing, Honeywell, Goodrich,

Canada's space companies have world-leading capabilities in niche areas such as communications and navigation, Earth observation sensors, ground stations, services and applications, space robotics and scientific instruments. Annual revenues have increased by more than two-thirds from \$1.4 billion in 2000 to \$2.4 billion in 2004.

Messier-Dowty, Rolls-Royce and General Dynamics. Like many industries, it is highly concentrated, with the top 30 firms representing 95 percent of production. Bombardier represents about 45 percent of the industry's sales. Smaller companies, part of the local and global supply chains, round out a significant domestic supply base.

The space sector is a key element of the aerospace industry. While contributing to the economic well-being of the country, Canada's space program supports key policy areas such as security and sovereignty, the environment and sustainable development. In most cases, it is both essential and strategic to have a domestic space sector capable of meeting our national needs. As a result, the market dynamics for space vary greatly from the commercial aerospace sector, as governments are often the main — and in some cases the sole — customers for space products and services. Canada's space companies have world-leading capabilities in niche areas such as communications and navigation, Earth observation sensors, ground stations, services and applications, space robotics and scientific instruments. Annual revenues have increased by more than two-thirds from \$1.4 billion in 2000 to \$2.4 billion in 2004. Satellite communications continues to be the largest revenue generator, accounting for three-quarters or \$1.8 billion of total revenues. Other key segments include satellite navigation and space science. The industry's internationally competitive position is attested to by exports of \$1.2 billion in 2004, representing half of the industry's total revenues, the highest proportion of any space-faring nation.

The Canadian defence industry had sales of approximately \$4.5 billion in 2004, which represent approximately one-fifth of total aerospace and defence industry sales. Canada's defence-related research and development (R&D) is about \$225 million. Market segments include light armoured vehicles, small arms, tracked vehicle components, voice and data communications systems, avionics and mission systems, simulation and training equipment, protective clothing and apparel, ships, control systems, information technology equipment, and maintenance, repair and overhaul (MRO) services. Key indicators such as exports, trade balance, value-added and employment are trending upward. Industry clusters are concentrated in Quebec and Ontario with key, smaller clusters in the western and Atlantic regions. Participation in international programs is an emerging trend in the defence industry, as it is in aerospace in general. The challenge in measuring defence industry outputs is that defence is made up of portions of many other sectors such as space, security, information technology, biotech and shipbuilding, to name a few. As such, the development of defence technology is important for the transfer for dual use technology (civilian/military) and as a generator of growth in high-value-added sectors such as those mentioned previously.

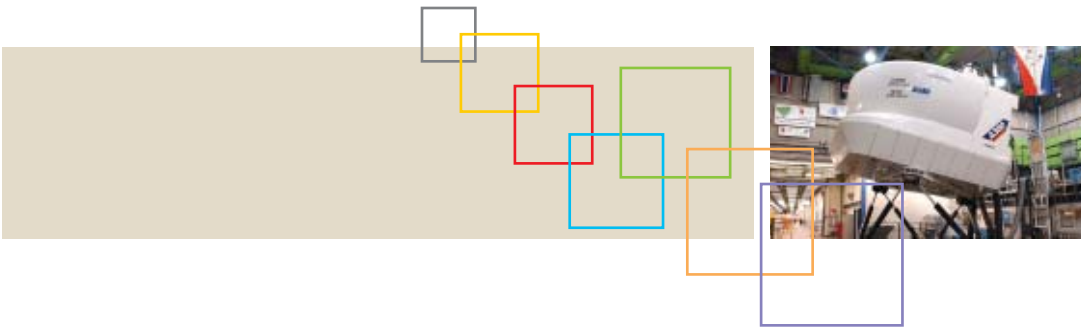


photo: Canadian Space Agency

The Canadian MRO industry includes more than 1100 companies that service commercial and military customers from around the world. The industry had sales of more than \$2.1 billion in 2004, and employed about 17 000 highly skilled workers.

In space and defence, firms have built their success on domestic government programs that developed and manufactured systems for national needs. These eventually became the core capabilities for commercial and government markets. In addition, the defence and space sectors have benefited from a myriad of agreements between the US and Canadian governments over more than 50 years that have led to a highly integrated North American technology and industrial base.

The Canadian MRO industry includes more than 1100 companies that service commercial and military customers from around the world. The industry had sales of more than \$2.1 billion in 2004, and employed about 17 000 highly skilled workers. It is comprised of original equipment manufacturers (OEMs), independent MRO providers and aircraft operators. The industry has an extensive range of maintenance and overhaul capabilities for complete fixed-wing aircraft, helicopters, engines and accessories, avionics, and systems and components.



CANADA'S EVOLVING POSITION IN THE AEROSPACE ENVIRONMENT

The global aerospace and defence industry can be characterized as an investment intensive and high-risk industry. It has undergone significant change in the past two decades. The global industry currently consists of a limited number of OEMs, or prime manufacturers, each with its own family of products and services that address the needs of commercial, military and space systems users. Financial pressures from a restructured airline industry, and the post-cold war era with its declining defence and space budgets, set the stage for industry developments over the past two decades. Driven by increasing project costs and risks, a process of industry consolidation at the prime manufacturing level has resulted in fewer players in both the commercial and military markets. In addition to consolidation at all stages of the value chain, the new platforms that the industry has been producing are fewer in number and have shorter development periods. As a result, suppliers need to react more quickly, raise their technological capabilities and have the ability to design subsystems in-house. This need has made it all the more important for companies to secure access to, and participate in, these new platforms at an early point, as later entry is nearly impossible.

As part of the ongoing transformation of the industry, the OEMs have been refocussing their roles, leading to profound changes in industry supply chains. On the commercial side, the OEMs are striving to reduce design–development cycle times in order to bring new products to market quicker and cheaper. Traditionally, the OEMs had full vertical design and integration responsibility for all of their products. Contract purchasing of parts and component systems from suppliers was largely limited to the build-to-print elements and subsystems. More recent developments have seen the OEMs refocus on their core competencies in design, integration and assembly. Instead of producing major subsystems themselves or dealing with numerous subsystems component suppliers, they have shifted responsibility for these activities down the supply chain. In response to financial pressures, the OEMs have moved to reduce their number of suppliers and have demanded that suppliers contribute to product development costs and take a share of the associated risks. This is forcing consolidation lower down the supply chain, with a small number of very large global companies that can provide complete subsystems packages. Tier Two firms in turn are downloading subsystem design responsibilities to suppliers lower down the supply chain, rather than ordering build-to-print parts.

The industry provides many Canadians with high-paying jobs. Over the past 10 years, for example, the aerospace industry has annually employed an average of 45 000 Canadians at wage levels that were 35 percent higher than the manufacturing average.



Canada's aerospace and defence industries have developed a strong position for themselves within this evolving global industry. While this position has developed because of particular strengths, the industry faces certain challenges as it moves forward into the future.

What Strengths Propel Canada's Aerospace and Defence Industry?

Home to Strong OEMs

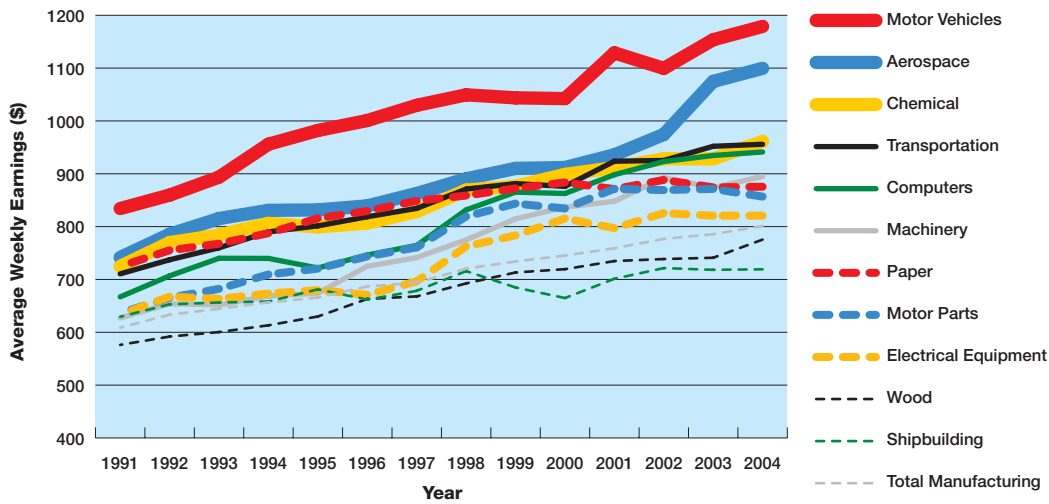
Canada's original equipment manufacturers have a strong presence in international markets. Firms like Bombardier, CAE, Pratt & Whitney Canada, Bell Helicopter Textron Canada and General Dynamics Canada are recognized around the world for the products they offer. These OEMs have substantial experience in developing leading-edge products that meet the needs of international markets and in exporting to those markets. They have achieved global success despite their small home market.

Productive Workforce

One of the key factors propelling the growth of the aerospace and defence industry in the past decade has been its workforce. For example, over the 1993–2003 period, aerospace product and parts manufacturing value-added per employee was 24 percent higher than the manufacturing average.

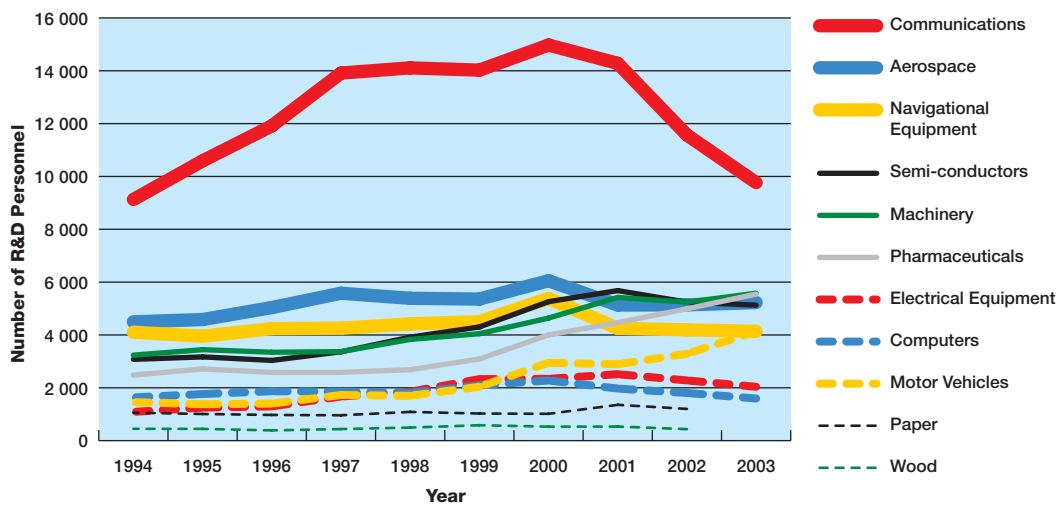
The industry provides many Canadians with high-paying jobs. Over the past 10 years, for example, the aerospace industry has annually employed an average of 45 000 Canadians at wage levels that were 35 percent higher than the manufacturing average. The industry has one of the highest average weekly earnings levels in the Canadian manufacturing sector (Figure 3). The industry has also employed an average of 5200 R&D personnel over that time period, ranking it second behind the communications industry in R&D employment (Figure 4).

Figure 3: Average Weekly Earnings for All Employees, Selected Canadian Industries, 1991–2004



Source: Statistics Canada, 2005.

Figure 4: Total R&D Personnel for Major Canadian Manufacturing Industries, 1994–2003



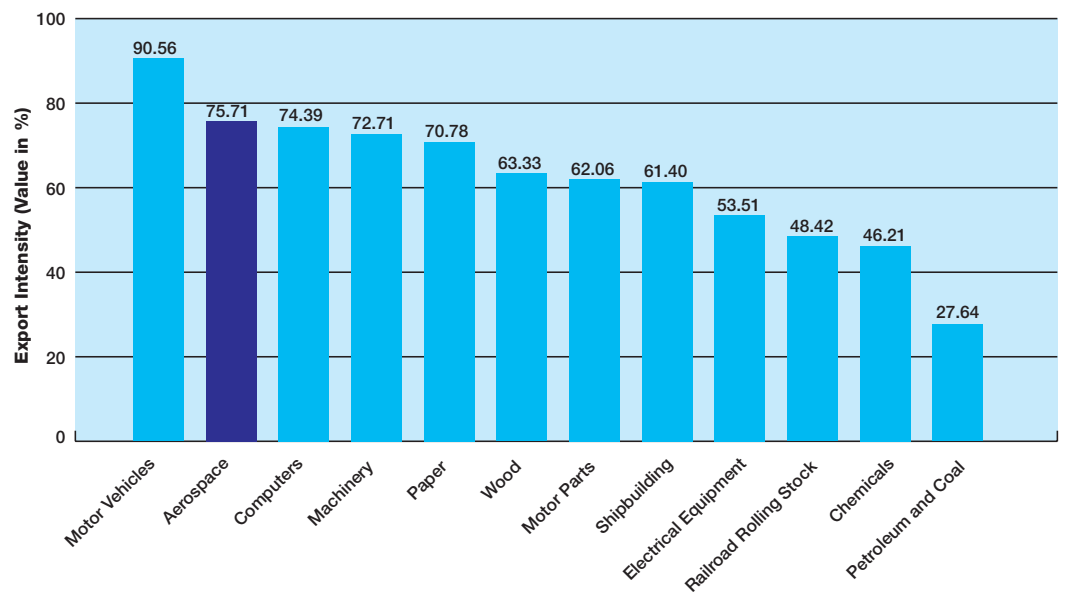
Source: Statistics Canada, 2005.

Focus on Global Markets

The Canadian aerospace and defence industry has also been propelled by its strong focus on global markets. In addition to international sales of Canadian designed and built aerospace and defence products to airlines and other final users, the Canadian industry also participates in the supply chains of the major international OEMs. For example, Canadian firms are suppliers to Boeing, Airbus, Lockheed Martin and Raytheon.

This global focus has been reflected in the industry's strong export performance, especially over the past 15 years. The industry has a high export intensity and, between 1994 and 2003, exported an average of 75 percent of industry sales (Figure 5). Over the same period, annual exports averaged \$8.9 billion, and the industry had a positive average annual trade balance of \$1.7 billion per year. Aerospace has consistently been one of Canada's best-performing manufacturing export sectors.

Figure 5: Export Intensity of Selected Canadian Manufacturing Industries, 10-Year Average (1994–2003)



Source: Statistics Canada, 2005.

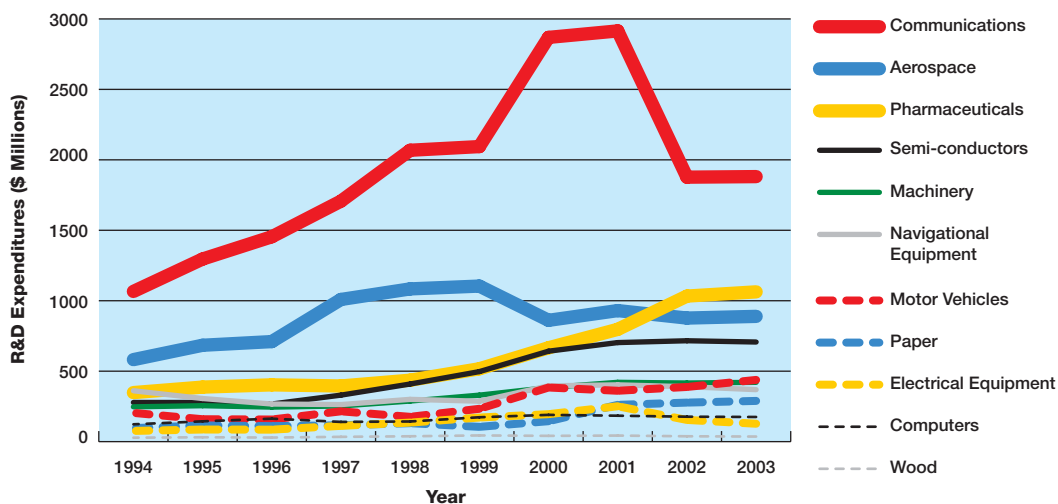
The aerospace and defence industry is a major performer of R&D in Canada, and the levels compare well with those in other industrial sectors. For example, the aerospace industry invested an average of \$873 million annually in R&D between 1994 and 2003, representing an average of eight percent of industry sales and accounting for an average of 14 percent of all manufacturing R&D.

Historically, the Canadian industry has had a close relationship with the US market. Over the past 10 years, more than 70 percent of Canada’s aerospace exports have gone to the US. For example, US airlines have been major purchasers of Canadian regional jets. On the defence side, the Canadian industry has benefited from a wide range of defence cooperation arrangements that were put into place in the 1950s and 1960s. The Defence Production Sharing Agreement was entered into in the late 1950s in order to provide the Canadian industry with general access to US Department of Defense procurement and to give the US access to an integrated North American defence industrial base. Furthermore, Canada agreed that it would acquire most of its major defence requirements from the US in order to maintain a balance of trade. The Defence Development Sharing Arrangement was signed by the US and Canada in 1963 to complement the Defence Production Sharing Agreement by allowing Canadian firms to take on cost-shared R&D for US Department of Defense requirements. The aim was to provide Canada with access to the latest technology in exchange for giving the US access to a larger R&D base.

Investment in Research and Development

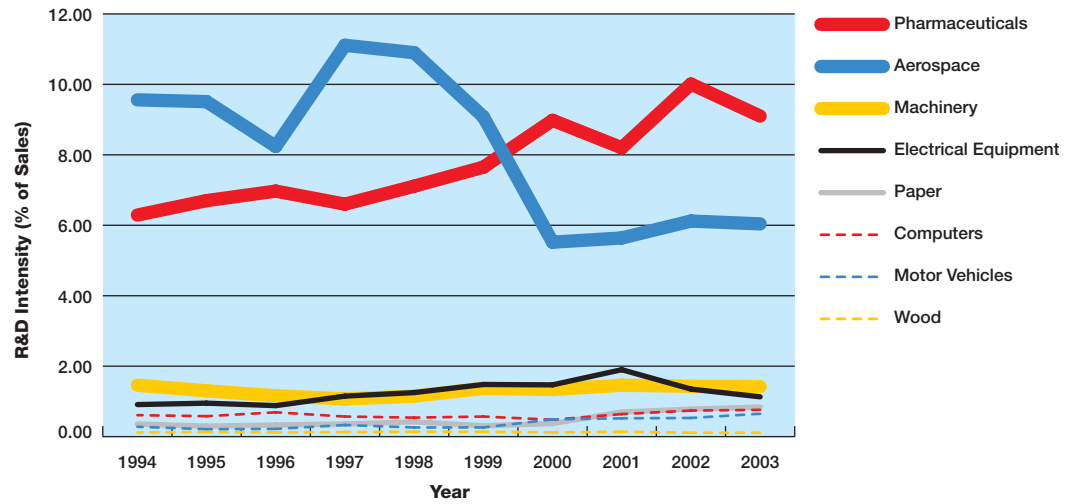
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Figure 6: Total Current R&D Expenditures for Major Canadian Industries, 1994–2003



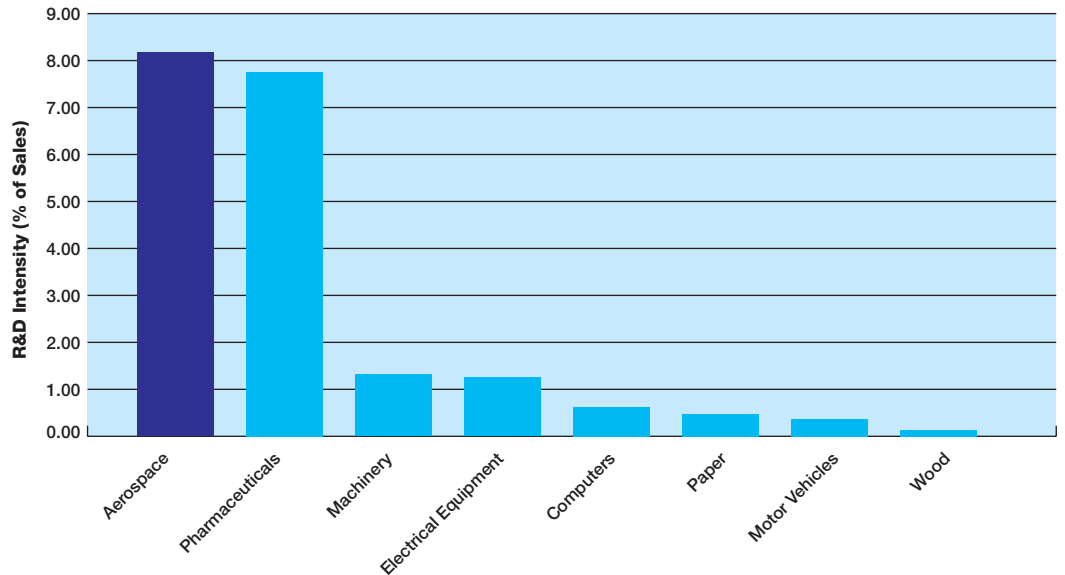
Source: Statistics Canada, 2005.

Figure 7: R&D Intensity (R&D as a Percentage of Sales), Selected Manufacturing Industries, 1994–2003



Source: Statistics Canada, 2005.

Figure 8: R&D Intensity (R&D as a Percentage of Sales), Selected Manufacturing Industries, 10-Year Average (1994–2003)



Source: Statistics Canada, 2005.

Specialization in Key Products and Technologies

The Canadian industry is an important player on the world stage and holds significant market share in key segments (Figure 9). Much of this success has been due to the key role that Canadian-owned firms play in the sector and to the presence of several globally connected firms with world product mandates (e.g. Pratt & Whitney Canada, Honeywell Canada). Canada has built up substantial expertise in these areas and has developed successful products that meet the needs of world markets. Growth in the Canadian industry has been driven by the capture of leading positions in these markets, which in turn forms a solid base on which to build the industry.

Figure 9: Key Segments in Which the Industry Has Proven Leadership

Segment	World Market Share
20–90 seat regional aircraft	47%
Small gas turbine engines	34%
Commercial flight simulators	80%
Visual simulation sector	70%
Civil helicopters	14%
Landing gear	31%
New large aircraft landing gear	60%
Transport aircraft environmental control systems	60%

Source: Aerospace Industries Association of Canada, Teal Group.

Supportive Government Policies

The industry's development has been backed by supportive government policies. The federal government has assisted the industry with: R&D support through Technology Partnerships Canada; industry infrastructure development; and, industry sales financing through the Regional Aircraft Credit Facility and Export Development Canada. Government has also been crucial in pursuing advances through in-house R&D activities and initiating next-generation services, such as Earth observation or satellite communication services, which were transferred to industry once demand was high enough to sustain commercial activity. The space sector has also been supported by the Space Technology Development Program, the Government-Related Initiatives Program and the Earth Observation Application Development.

Strong Technical Education

Canada's universities and colleges have internationally recognized programs to train aerospace engineers, aerospace manufacturing engineers, aviation technicians and aircraft maintenance engineers. The Canadian Aviation Maintenance Council (CAMC) has played a key role in developing curricula as well as accrediting programs for training institutions for the aerospace maintenance sector.

Solid Industry Infrastructure

The industry benefits from a solid aerospace and defence infrastructure such as university facilities, the National Research Council's Institute for Aerospace Research including the Aerospace Manufacturing Technologies Centre, the Canadian Space Agency's David Florida Laboratory, Defence Research and Development Canada and the Composites Innovation Centre. The industry also works with universities in support of the sector's R&D efforts.

High Regulatory Standards

Canada maintains high regulatory standards for its aerospace sector. Transport Canada's strong regulatory framework for aircraft certification and aircraft MRO push the Canadian industry to maintain high standards in aircraft development and maintenance.

The global aerospace and defence industry is emerging from a very difficult period. As the global industry returns to a growth path, the Canadian industry faces several challenges as it tries to maintain its position in the world aerospace and defence market.

Turbulence: Challenges Facing the Canadian Aerospace and Defence Industry

The global aerospace and defence industry is emerging from a very difficult period. As the global industry returns to a growth path, the Canadian industry faces several challenges as it tries to maintain its position in the world aerospace and defence market.

Small Domestic Market

The Canadian domestic market, both civil and military, is small and open to international competition. Total industry sales in the domestic market amount to \$4 billion per year, as compared with the US market of US\$150 billion per year. This small domestic market does not provide the springboard for international sales enjoyed by other countries. In the defence and space sectors, there is not the level of R&D support that drives aerospace innovation and technology development in many other countries. It also reduces the ability of the industry to counteract the cyclical fluctuations on the civil side of the business, the side on which the Canadian industry is highly dependent.

Maturing Product and Technology Base

The Canadian industry increasingly depends on a maturing product and technology base. While some of our key niches, such as landing gear and small gas turbine engines, have maintained a strong technology and product base, the dominant position of the Canadian industry in other key niches has recently come under threat. Canada's leadership in robotics, space radar, space imaging and satellite communications is threatened as other nations realign their space strategies. The maturing product base will increase pressure to fund basic research and new product development. Without such innovation and new products, industry sales will decline, as will Canada's position in the global market.

Much of the boom in Canada's aerospace and defence sales since the early 1990s was tied to commercial aircraft production. The Canadian industry now is heavily dependent on aircraft production, which accounts for close to half of the industry output. Given the maturation of the 50-seat regional jet market, the mainstay of previous industry growth, pressures will emerge for new products and technologies to sustain the industry's performance.



photo: Patrick Hum

Emerging players in eastern Europe, Russia and Asia, with a good base of aerospace skills, access to modern technology and low-cost labour, pose a challenge to the Canadian industry in labour-intensive activities.



Industry Structure

The lack of a critical mass of firms with systems integration capability limits the ability to provide systems packages for new domestic and international platforms. It also has an impact further down the supply chain and reduces the opportunities for Canadian suppliers. On the other hand, systems integrators in the defence industry serve the air, naval and land markets. These have been key contributors to the Department of National Defence and continue to be a source for ongoing and future procurement requirements.

Pressures on the Supplier Base

One of the key challenges facing the Canadian industry is adapting to the changes taking place in the global supply chains for major domestic or international platforms. As the OEMs push responsibility further down the supply chain, Canadian firms must take on more design, finance and risk responsibilities. When Canadian firms participate in foreign programs, they are often expected to cover their non-recurring costs. Smaller Canadian suppliers often lack the human resource, financial and technical capacity, to participate. In addition, smaller firms lack strong market recognition and global market presence on which to build.

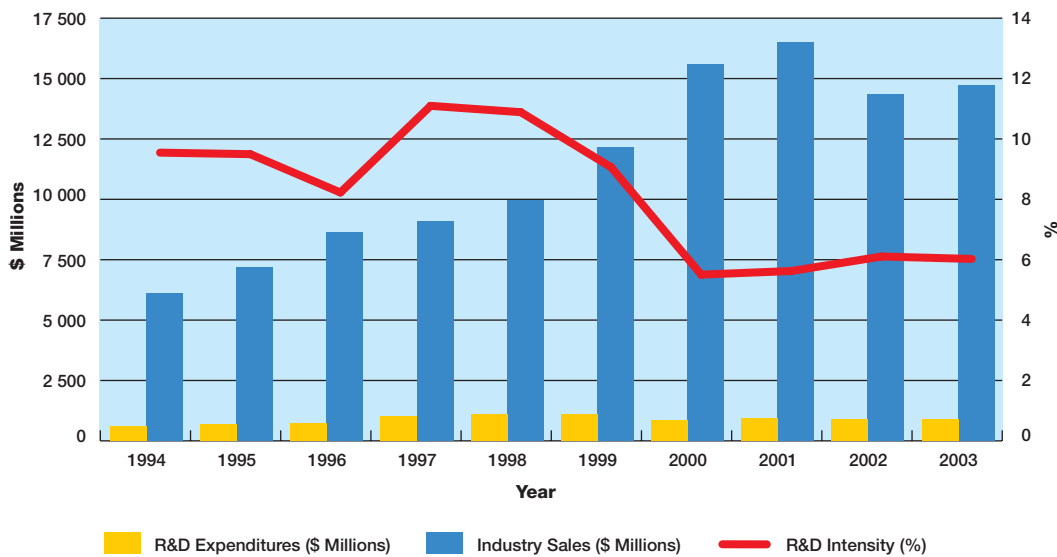
Competitors

The industry faces quickly growing competition from traditional and emerging areas, many with strong state backing. Canada's traditional competitors, for example, the United Kingdom, Brazil, and France, are working to strengthen their human resources and technology capabilities to move up to more high-value-added activities. In the space sector, countries are focussing on the development of their domestic industries and have funding available to participate in international programs. Emerging players in eastern Europe, Russia and Asia, with a good base of aerospace skills, access to modern technology and low-cost labour, pose a challenge to the Canadian industry in labour-intensive activities.

Research and Development

While the aerospace and defence industry is one of the major performers of R&D in the Canadian economy, there is evidence that industry investment in R&D has not kept pace with the development of the sector (Figure 10). In the aerospace industry, for example, industry sales have increased substantially in the past decade, but industry investment in R&D has not increased proportionately. This has led to a major drop in R&D intensity and a focus on product development. In general, there is a need for continuous investment in basic R&D to renew the technology base for the future. The level of pre-competitive collaboration in technology development needs to be improved.

Figure 10: Canadian Aerospace R&D Performance, 1994–2003

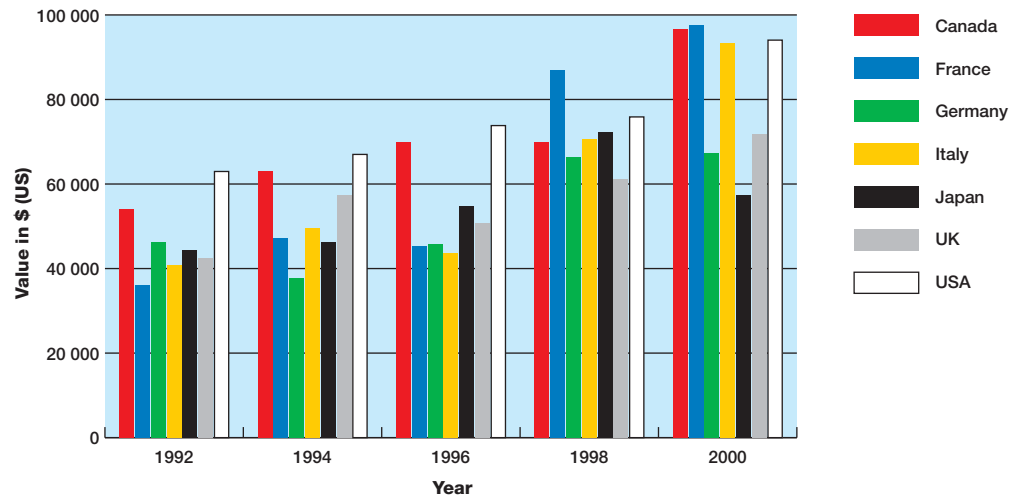


Source: Statistics Canada, 2005.

Productivity

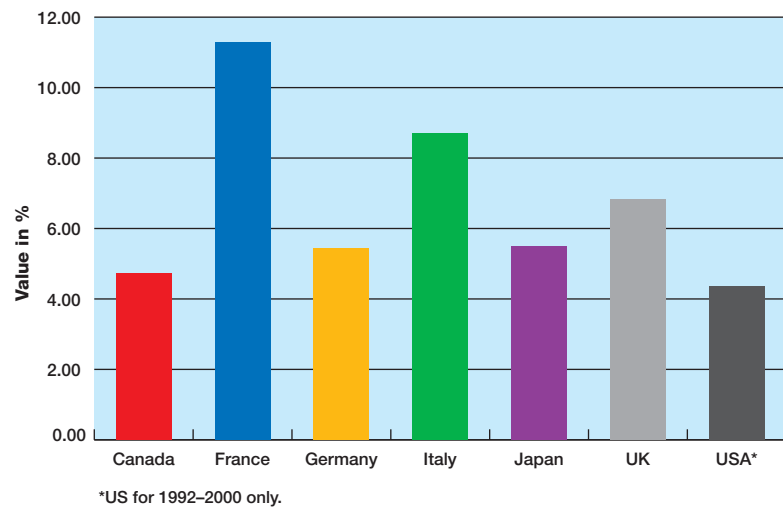
International comparisons indicate that Canadian industry is productive. For example, Canadian aerospace productivity picked up substantially in 1991 and, since that time, has generally exceeded that of Germany, Japan and the U.K. (Figure 11). However, Canada's long-term position is being eroded as its productivity growth is not keeping up with its competitors, lagging behind that of most of its major competitors with the exception of the US (Figure 12).

Figure 11: Aerospace Productivity (Value-Added per Employee), by Country, 1992–2000



Source: Organisation for Economic Co-operation and Development, 2005.

Figure 12: Aerospace Productivity (Value-Added per Employee), by Country, 10-Year Average Annual Rate (1992–2001)



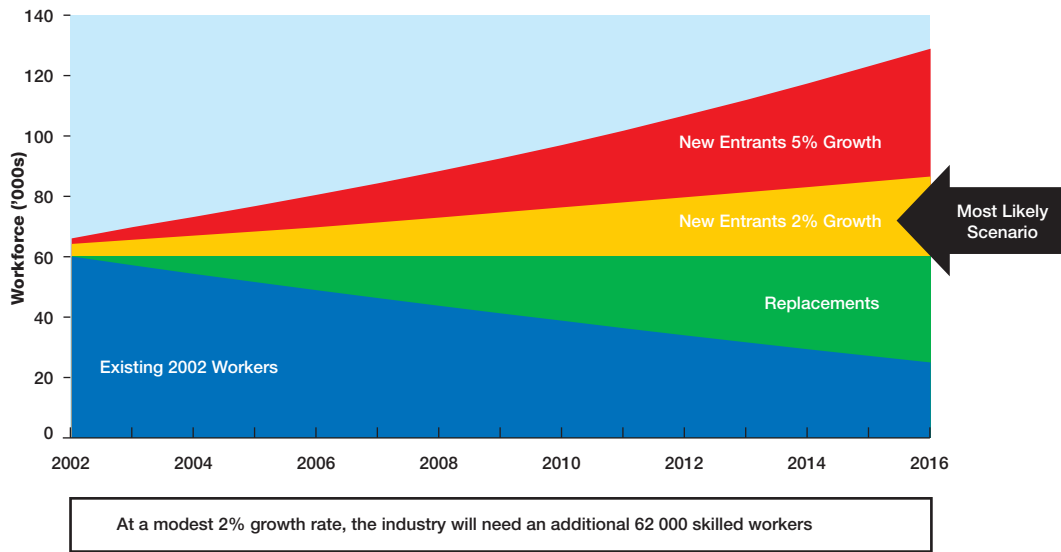
Source: Organisation for Economic Co-operation and Development, 2005.

Increasing retirement of workers, for example, is expected to have an impact in the next few years, particularly among skilled tradespeople, an area in which replacements take longer than average to train. By 2016, only 40 percent of the current manufacturing workforce and fewer than one-third of current aircraft maintenance engineers will be on the job.

Skills Shortages

Like aerospace industries in other countries, the Canadian industry will face shortages of skilled labour, which could hamper future growth. Increasing retirement of workers, for example, is expected to have an impact in the next few years, particularly among skilled tradespeople, an area in which replacements take longer than average to train. By 2016, only 40 percent of the current manufacturing workforce and fewer than one-third of current aircraft maintenance engineers will be on the job. It has been estimated that moderate future growth rates of up to two percent annually in manufacturing will require up to 62 000 skilled workers by 2016 (Figure 13).

Figure 13: Aerospace Industry Workforce Forecast for 2002–2016*



* Forecast based on 2 and 5 percent annual industry employment growth.

Source: Human Resource Study of Canadian Aviation Manufacturing and Maintenance Industry 2002.

In filling these skills shortages, the industry will face competition from other high technology sectors and from aerospace sectors in other countries. This will add to the difficulty of finding sufficient workers to meet the industry’s future needs.

Despite recent setbacks, indicators point to a growth scenario for the aerospace industry. For example, forecasts show substantial growth over the next 20 years in the civil aircraft sector. In its Global Market Forecast 2004–2023, Airbus forecasts 5.3 percent annual growth in worldwide airline passenger traffic and 5.9 percent annual growth in freight traffic. This translates into the delivery of 17 328 new passenger and freighter aircraft over the 20-year period, valued at US\$1.9 trillion.

Access to Foreign Markets

Canada has been successful in selling its strengths as a skilled, competitive and productive manufacturer of aerospace, defence and space products over the years; however, the export intensity of the Canadian industry makes it particularly vulnerable to protectionist pressures. Canada's special status in the US defence market, through mechanisms such as the Defence Production Sharing Agreement, needs revitalization. Market and technology access barriers are growing to reflect security concerns, especially in the key US market (e.g. International Trade in Arms Regulations).

Blue Skies Ahead: Industry Opportunities

The aerospace and defence industry is also an industry ripe with opportunity for those countries and industries that position themselves to take advantage of emerging developments.

Growth Sector

Despite recent setbacks, indicators point to a growth scenario for the aerospace industry. For example, forecasts show substantial growth over the next 20 years in the civil aircraft sector. In its Global Market Forecast 2004–2023, Airbus forecasts 5.3 percent annual growth in worldwide airline passenger traffic and 5.9 percent annual growth in freight traffic. This translates into the delivery of 17 328 new passenger and freighter aircraft over the 20-year period, valued at US\$1.9 trillion. In its 2005 Current Market Outlook, Boeing also predicts major growth for the civil aircraft sector. Boeing foresees annual airline passenger traffic growth of 4.8 percent and cargo growth of 6.2 percent between 2005 and 2024. To satisfy this growth, Boeing projects demand for 25 700 new passenger and freighter aircraft over the next 20 years, valued at US\$2.1 trillion. The commercial MRO sector provides another example of the growth potential of the aerospace industry. In its April 2004 forecast of the world MRO industry, AeroStrategy Management Consulting of Ann Arbor, Michigan, forecasts that the MRO market will grow at an annual rate of 5.3 percent between 2003 and 2013. It estimates that the market will grow from US\$35.8 billion in 2003 to US\$60 billion in 2013. This growth represents considerable opportunities for countries and companies that adopt timely and strategic approaches to the market.

Participation in Major Domestic Platforms/Projects

There will be opportunities for the Canadian industry to participate in major new domestic platforms/projects. On the military side, an increase in defence spending will provide prospects for domestic industry. In Budget 2005, the government committed to new funding of \$13.0 billion over five years for the Department of National Defence. This funding adds to a defence budget that has been rising since 2001. Upcoming major defence contracts include the Hercules replacement, Medium/Heavy Lift Helicopter, Mobile Gun System, Joint Support Ship, Military Satellite Communications and Fixed Wing Search and Rescue project. Budget 2005 also included some major space initiatives, including initial funding for the SAR Constellation program (approximately \$400 million over five years). The Canadian Space Agency will also examine a future hyperspectral mission.

Participation in Major International Platforms

Possibilities will also open up for Canadian firms through participation in major new international platform programs, replacement platforms, space programs and defence acquisitions. Current and upcoming civil platforms include the Boeing 787, Airbus A350, Boeing's replacement for the 737 and the Airbus update/replacement for the A320. Important international space platforms include the European-led Global Monitoring of Environment and Security system and the Aurora system, the US-led Global Positioning System 3 and Milsatcom systems, and those platforms associated with the US Vision For Space Exploration. On the defence side, the major upcoming platform is the Joint Strike Fighter. Canada already is a partner in the early stages of this development.

Expansion into New and Emerging Technologies and Markets

New and emerging areas (e.g. electronics, software, composite materials, etc.) and markets (security, counter-terrorism, etc.) will open up avenues for Canadian firms to participate or expand in the sector. Some of these areas are outside the traditional aerospace and defence activities. Examples would include: unmanned vehicle systems (UVS); small (personal) jet aircraft; nanotechnologies; hyperspectral technologies; diagnostics, prognostics and health management (DPHM) systems; sensors; complex networked systems; data and information management; and, software-based diagnostic and information management systems.

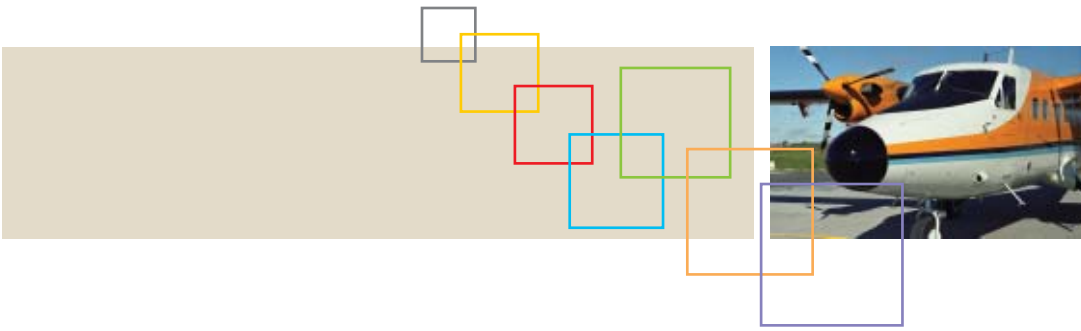


photo: Bombardier Inc.



Market for MRO

Canada has a strong MRO capability, and the growing worldwide market for such services will present opportunities for Canadian firms. Canadian firms can look beyond their traditional market of North America to focus on emerging MRO markets such as Asia and South America. Non-labour-intensive MRO activities such as engine repair and overhaul will provide opportunities. A focus on quality, innovative repair technologies, short turnaround times and cost savings will continue to be important.



ENHANCING OUR AEROSPACE FUTURE: NATIONAL AEROSPACE AND DEFENCE STRATEGIC FRAMEWORK

The new realities facing Canada's aerospace and defence industry are calling for a fresh look at the strategic approach taken in the sector. By adopting the Framework, Canada will join a host of other countries, including some of its key competitors, that have developed strategies to promote the development and competitiveness of their national aerospace sectors in light of significant changes in the industry.

Why Invest in Aerospace and Defence?

Most governments in countries around the world that have aerospace and defence industries invest in the development of those industries. One of the primary drivers for government intervention is the link between the industry and national security. The economic characteristics of the industry with its high development costs, high risks and long payback periods, combined with the highly cyclical nature of the sector, have also been driving forces calling for government involvement. These characteristics make it difficult for the private sector to shoulder all financial requirements alone and require the government to intervene to support the sector. Internationally, governments have used various policy instruments on the supply and demand side to create an environment that nurtures the industry. Instruments utilized include state ownership, domestic market protection, R&D funding, directed public procurement, export sales financing, domestic content requirements and offsets (including placing work with local firms for aerospace and defence contracts). Within that supportive environment, the aerospace and defence industry is the driving force, and it finances, designs, develops, produces and markets aerospace and defence products.

Traditionally, government investment in the industry was justified on defence and national security grounds, but economic factors and the pursuit of national objectives are also important justifications. Investments in the aerospace and defence industry help meet some key economic and social policy objectives.

National Pride

The aerospace and defence industry is a source of national pride and a symbol of Canada's technical accomplishments. Canada was one of the first three nations into space and the first in North America with a jet-powered passenger aircraft. The Canadian industry has produced some major success stories, including the Alouette and Anik satellites, the Beaver, Otter and Twin Otter

Examples of aerospace technology spin-offs include those that have found important commercial application such as microminiaturization technology used to produce the first single-chip pacemaker, carbon pistons that are lighter and more heat-resistant than aluminium pistons for automotive applications, and non-destructive evaluation technologies for steel structures and other structures where detection of fatigue and corrosion is critical.



airplanes, the PT6 turboprop engine, the Canadarm I and II, and the Canadair Regional Jet. The Canadarm played a crucial role in the recent return to flight of the US National Aeronautics and Space Administration's space shuttle. Canadian-made aerospace and defence products can be found all over the world and are a powerful symbol of Canadian achievements.

Economic Prosperity

Support for the industry contributes to the government's goal of having a growing, innovative and prosperous economy. As previously noted, the sector contributes to employment, innovation and trade. Aerospace and defence also supports the government's regional economic development objectives, as activities in the sector are located in all regions of the country.

Technology Benefits

Investing in aerospace and defence promotes technology development within the Canadian economy. Not only does this investment promote the development of aerospace and defence technology, but it also helps promote development in other sectors of the Canadian economy as the aerospace and defence industry is in the vanguard of using new technologies. As a first user, the aerospace and defence industry utilizes the output of several high technology industries including electronics, information technology and new materials. Examples of aerospace technology spin-offs include those that have found important commercial application such as microminiaturization technology used to produce the first single-chip pacemaker, carbon pistons that are lighter and more heat-resistant than aluminium pistons for automotive applications, and non-destructive evaluation technologies for steel structures and other structures where detection of fatigue and corrosion is critical.

Contributing to Canada's Security

The products and services produced by the industry are used in support of the federal government's defence and national security requirements. The sector is heavily involved in providing equipment and related support services to the Department of National Defence and agencies entrusted with public security. When the Department of National Defence purchases a foreign-made defence platform, Canadian suppliers play a crucial role in meeting Canadian requirements and providing life cycle support for those platforms. Technologies produced by the sector, such as remote sensing, satellite communications and unmanned vehicle systems, are key tools in confronting the emerging threats to national security. The sector also allows Canada to contribute to international cooperation, peace and security through partnerships with its allies to develop and procure defence technology.

Observing and Protecting Canada's Environment

Technology from the aerospace and defence industry has played, and will continue to play, an important role in helping to achieve environmental and sustainable development goals. For example, Canadian-developed remote sensing technology is playing a key role in monitoring the environment. Earth observation satellites such as RADARSAT I, RADARSAT II and SCISAT help raise our understanding of environmental changes and improve environmental management. Another example is provided by R&D investment into more environmentally friendly aerospace technologies that will help reduce the impact of aviation on the environment. Pratt & Whitney Canada, for example, is undertaking long-term research aimed at developing engine technology that is more fuel efficient, makes less noise and gives off fewer emissions.

Importance of Government to the Aerospace and Defence Industry

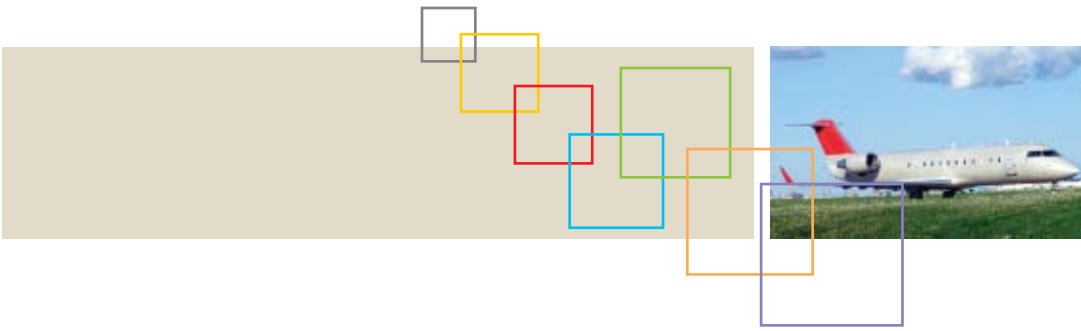
Governments have worked as key partners with industry, labour and academia in the effort to develop the industry. Government investment has made a substantial contribution to the concerted investments made by all industry stakeholders. In the past, actions such as public investments made through the ownership of de Havilland and Canadair, augmented by leading technology developments achieved by public research organizations, led to the development of the Challenger business jet and the Dash 8 regional turboprop. Other examples of critical public investments include those made to attract major international firms such as Bell Helicopter Textron Canada. Canada's public research organizations assisted Pratt & Whitney Canada in its rise to pre-eminence in small turbine engines and MacDonald Dettwiler & Associates' international successes in space robotics. Access to US markets was enhanced for Canadian defence products through the Defence Production Sharing Agreement and the Defence Development Sharing Arrangement.

The federal government continues to work with other industry stakeholders to assist the aerospace and defence industry. It does so through support for R&D, public procurement, sales financing and research infrastructure. Programs and policies such as Technology Partnerships Canada and the Industrial and Regional Benefits policy, as well as organizations such as Export Development Canada, the Canadian Commercial Corporation and the National Research Council's Institute for Aerospace Research, continue to provide targeted assistance to the industry. The Canadian Space Agency provides support through its domestic platforms/programs, space R&D and participation in international space initiatives.

Some provinces have also provided assistance to the industry. Quebec has recently provided support for R&D on several major aerospace projects (including Bell Helicopter Textron Canada and Pratt & Whitney Canada) and has also provided sales financing. More recently, it has agreed to provide a repayable contribution to support research and development with respect to C-Series-related R&D projects. Manitoba assists the Composites Innovation Centre located in that province. In the Atlantic region, Prince Edward Island has helped to create Slemon Park, an aerospace business park near Summerside, which is home to established aerospace firms in a growing sector of the province's economy. In the West, Saskatchewan has invested in, and is home to, the Canadian Light Source, a state-of-the-art synchrotron located at the University of Saskatchewan. The Alberta government contributed funding for the Southern Alberta Institute of Technology's new education and training centre for aerospace in Calgary. The B.C. government contributed toward the construction of a new aerospace training facility in Richmond, B.C. for the British Columbia Institute of Technology.

Working in Partnership with Industry Stakeholders

Recognizing that the past success of the Canadian aerospace and defence industry was due to a strong partnership between government, industry and other stakeholders, the government, in concert with the industry, launched the Canadian Aerospace Partnership (CAP) in April 2005. CAP is focussed on enhancing the global competitiveness of Canada's aerospace industry. The CAP comprises senior executives from industry, federal and provincial government ministers as well as senior labour and academia representatives. Working in partnership, CAP members have developed a long-term strategic vision for the aerospace industry and, through the creation of working groups, have examined issues related to major platforms, technology investment, procurement, skills and market access. Their initial conclusions, as well as broad consultations across Canada and with all federal government departments, are reflected in large measure in this strategic framework.



THE NATIONAL AEROSPACE AND DEFENCE STRATEGIC FRAMEWORK: THE CANADIAN INDUSTRY TO 2025

The aerospace and defence industry offers great potential for Canada in the future. The industry can build on the base of past successes to meet future challenges and take advantage of future opportunities.

A Vision for the Aerospace and Defence Industry in Canada to 2025

The government endorses the vision developed by stakeholders across the industry:

Canada will be home to a growing, innovative and diversified industry, recognized as a leader in serving global aerospace and defence markets and a preferred location for investment.

With the Framework, the government commits to working with the Canadian aerospace and defence industry and other stakeholders toward ambitious, achievable goals.

Through the work, commitment and collaborative partnership of governments, companies, workers, academic groups and other stakeholders, Canada will create an aerospace and defence industry that is a:

- source of national pride and a globally recognized brand of Canadian excellence;
- creator of national wealth and provider of challenging and rewarding jobs for Canadians;
- key contributor to security and military readiness in Canada and among our allies; and,
- lever for effectively achieving a wide range of public policy objectives and needs.

Objectives of the Strategy

To achieve this vision, all stakeholders in the aerospace and defence sector will have to work together to achieve certain objectives. The actions taken under this strategic framework will be directed at helping achieve a Canadian aerospace and defence industry that:

- comprises a critical mass of top tier platform OEMs, each with a world-leading position in its respective market segment;

Canada's aerospace and defence industry will need to build on its strengths through involvement in major strategic initiatives. Such projects include the development of strategic domestic platforms designed to build on the Canadian strength in aircraft manufacturing. It also includes Canadian industry participation in key international platforms.

- possesses robust design and systems integration capabilities throughout the supply chain;
- offers comprehensive, in-service support solutions over the complete product life cycle;
- serves a diversified, global customer base;
- is at the forefront of technological innovation and productivity;
- outperforms the global industry in selected niche markets and sustains a “Top 5” global ranking overall;
- achieves an above-average compound annual growth rate and delivers above-average returns on investment compared with other aerospace and defence nations; and,
- sustains a level of domestic value-added commensurate with that of its principal competitors.

The federal government is committed to doing its part to achieve this vision. Although the existing level of government support is significant, the Framework builds on it and ensures that the government's resources will be applied where most effective and in a coordinated manner among departments. To deliver on these goals, the government considers the strategic importance as well as new policy and program changes that are needed to address seven key pillars.

Securing Strategic Aerospace and Defence Investments

Strategic Importance

Canada's aerospace and defence industry will need to build on its strengths through involvement in major strategic initiatives. Such projects include the development of strategic domestic platforms designed to build on the Canadian strength in aircraft manufacturing. It also includes Canadian industry participation in key international platforms.

Participation in major national and international strategic initiatives is also an important element of growth for the industry, as these programs are likely to provide work for the next 20 to 30 years. They are, in essence, the next wave of opportunities for Canadian suppliers — particularly for those with some systems integration capabilities. An important element to Canadian participation in strategic initiatives is the development of regional aerospace and defence clusters, which can serve to increase Canadian capabilities.

Canada is home to several domestic prime manufacturers. It will be essential for those primes and other leading OEMs to develop new platforms in Canada, adding new products to the maturing product base. These new platforms will provide opportunity for the domestic supplier base and help deal with the declining content on domestic platforms. They will sustain strategic R&D, design and integration capabilities in Canada. They will also provide a flagship for industry development, create economic growth and assist in attracting foreign direct investment.

Participation in major international platforms often requires some form of pay-to-play, whereby industry or governments make a financial commitment or contribution to participate in a program. This contribution can take the form of a cash contribution to common development costs, absorbing engineering costs and free prototypes for flight test programs. In the case of defence and space platforms, these contributions are usually government-to-government, which can guarantee access to the program or a percentage of work on it, along with benefits with respect to Canadian defence and space objectives.

Current Programs and Recent Actions

The federal government supports strategic investment in the industry by:

- funding technology development through Technology Partnerships Canada (TPC). At present, individual projects are evaluated on a case-by-case basis, though some platform-specific funds have been established. The criteria for TPC investment include contributing to the government's strategic objectives, technological feasibility, the importance of TPC funding to the project and repayability. Several Canadian aerospace and defence firms that have been supported by TPC have used their technology to win supplier contracts on Airbus and Boeing platforms (e.g. Goodrich and CAE on the A380 program);
- **Bombardier CSeries:** In May 2005, the federal government agreed to provide a repayable contribution of up to \$350 million to support research and development with respect to CSeries-related R&D projects at Bombardier. The funding will support the development of new, next-generation aircraft technologies;
- **Bell Helicopter Textron Canada MAPL:** In February 2005, the federal and Quebec governments announced that they would each provide Bell Helicopter with \$115 million in repayable contributions for research and development of the Modular Affordable Product Line project. The project involves the design, development and production of components required to field a new family of light civil helicopters; and,

- **Joint Strike Fighter (JSF):** In February 2002, the government announced formal participation in the system development and demonstration phase of the JSF program with a US\$150 million commitment over 10 years. The Department of National Defence is providing US\$100 million and TPC may provide US\$50 million to companies developing new technologies for the JSF program. The government's investment allows Canadian companies access to the largest defence procurement in US history that includes multinational collaboration.

New Policies and Program Initiatives

The government will:

- establish criteria for government participation in strategic projects and develop platform specific strategies to promote Canadian industrial participation in such projects;
- support investment in new aerospace and defence platforms through a new aerospace and defence technology development program (more details under Technology Development and Commercialization);
- support the development and maintenance of a comprehensive and current database of Canadian aerospace and defence capabilities in partnership with Canadian industry as a tool for investment attraction, cluster development and marketing; and,
- promote and support the adoption of the latest certification standards to ensure Canadian firms meet standards and requirements needed to participate on major platforms.

Challenges for Other Stakeholders

The Canadian industry should consider initiatives that would:

- lead to the development and manufacturing of new platforms in Canada;
- input into the identification and assessment process for selecting programs that could benefit from government support/participation;
- develop deeper domestic and international industrial partnerships to better compete on major platforms. Partnerships will allow Canadian firms, especially small and medium-sized enterprises, to participate on major platforms;

Increased investment in manufacturing process development will help improve the competitiveness of the sector, improve productivity and relieve pressure on the supplier base. Increased R&D efforts in MRO will help meet the challenges posed by foreign competitors. Increased R&D activity will also provide a challenging environment on which to build the skills base of the sector.

- develop competitive domestic supply chains and partners to ensure Canadians can compete for major platform work packages; and,
- invest in new technologies, capabilities and other aerospace firms to develop systems integrator capabilities.

Technology Development and Commercialization

Strategic Importance

One of the fundamental drivers of the aerospace and defence industry is R&D. Growth of the most successful aerospace and defence firms is directly linked to investment in R&D that leads to successful product commercialization. The Canadian industry can thrive and prosper if it strengthens its commitment to R&D at all stages (basic, pre-competitive, product development) and to the commercialization of new technologies and processes. R&D forms the basis for the development of new products designed to serve the needs of domestic and world markets. It also enables firms to increase their competitiveness through the development of new processes and manufacturing techniques that lower costs and increase productivity.

Actions under this strategic area will help address weaknesses in terms of research, technology development, validation and demonstration. These actions will put Canadian firms in a better position to take up new opportunities on domestic and foreign platforms and opportunities opened up by new and emerging areas. Increased investment in manufacturing process development will help improve the competitiveness of the sector, improve productivity and relieve pressure on the supplier base. Increased R&D efforts in MRO will help meet the challenges posed by foreign competitors. Increased R&D activity will also provide a challenging environment on which to build the skills base of the sector.

Current Programs and Recent Actions

The federal government supports technology development in the industry by:

- funding pre-competitive aerospace and defence technology development. Since the creation of TPC in 1996–97, the program has provided nearly \$1.7 billion in technology development support to the aerospace and defence industry. The government has also provided significant funding through predecessor programs to TPC, including the Defence Industries Productivity Program;



- creating a favourable R&D environment through the Scientific Research and Experimental Development tax credit;
- developing Technology Roadmaps for low-cost composites and aircraft design as well as MRO. Technology Insertion Roadmaps, a streamlined approach to Technology Roadmaps, have been created for aircraft cabin management systems integration and for diagnostics, prognostics and health management systems technologies. The Technology Roadmap and Technology Insertion Roadmap processes enable all sector stakeholders to work on a collaborative basis to assist with the pre-competitive development of new technologies;
- establishing and funding the National Research Council's Institute for Aerospace Research (IAR), which has five laboratories that focus on developing and maintaining the core competencies and knowledge base crucial to the needs of the Canadian aerospace and defence community. The IAR's Aerospace Manufacturing Technology Centre was formally opened in the fall of 2005. The IAR also co-sponsored the Office of Collaborative Technology Development, a public/private sector partnership, which was established in 1999 to assist in defining and launching collaborative technology development projects;
- providing technical and funding assistance to small and medium-sized enterprises, including support for pre-commercialization of new technologies, through the National Research Council's Industrial Research Assistance Program (IRAP);
- supporting Defence Research and Development Canada, an agency of the Department of National Defence, which responds to the scientific and technological needs of the Canadian Forces. The government also funds the Defence Industrial Research Program;
- supporting research projects brought through the Natural Sciences and Engineering Research Council of Canada's (NSERC) Cooperative R&D Program; and,
- supporting the advancement and development of science and technology through various Canadian Space Agency programs, including space technologies, Earth observation, satellite communications. In particular, the Space Technology Development Program awards R&D contracts to Canadian industry to develop next-generation technologies for future missions and enhance competitiveness on world markets.

New Policies and Program Initiatives

The government will:

- develop a new aerospace and defence technology development program as part of the restructuring of TPC. The program will:
 - position Canada’s aerospace and defence sector to address new emerging aircraft program and defence platform opportunities through the development of new leading-edge technologies;
 - adopt a comprehensive framework for the support of strategic R&D and demonstration projects;
 - establish a supplier development initiative; and
 - fund collaborative technology initiatives and demonstrator projects;
- support the development of Canada’s regional aerospace and defence industrial base;
- support the development of new Technology Roadmaps and Technology Insertion Roadmaps for upcoming aerospace and defence technologies to foster collaborative technology development and product commercialization; and,
- work with public institutions and with the industry to enhance and promote aerospace-related research by mobilizing researchers in Canadian universities and engaging in the private, public and non-profit sectors.

Challenges for Other Stakeholders

The Canadian industry should consider initiatives that would:

- achieve an overall increase in R&D intensity and a sustained percentage increase in private sector R&D expenditures;
- broaden R&D investment from primarily product development to include basic research, development of critical technologies, validation and demonstration;
- increase its involvement in collaborative research efforts, both domestically and internationally, that involve other firms, research institutes and educational institutions;

A highly skilled and trained workforce is a key enabler in the aerospace and defence industry. A labour force that is well trained, adaptable and up-to-date in its skills, underpins strong R&D performance and the world-class manufacturing and business processes that are key to high productivity. Maintaining Canada's current aerospace and defence industry production will also require a significant increase in recruitment as the workforce ages.



- assist in the funding and development of Technology Roadmaps and Technology Insertion Roadmaps to guide future collaborative technology development activity, allowing greater dissemination of new technologies;
- increase its support of aerospace research at Canadian educational institutions by supporting the research work of students and faculty and by contributing to infrastructure and equipment needs;
- assist smaller firms in the supply chain by supporting their competitiveness and increased productivity through the adoption of new standards; and,
- increase capital expenditures in new machinery and equipment to increase productivity.

Academia should work collaboratively with industry and other stakeholders to further R&D efforts in the industry. Attracting and retaining the best faculty could be achieved by creating a demanding research agenda.

Skills Development

Strategic Importance

A highly skilled and trained workforce is a key enabler in the aerospace and defence industry. A labour force that is well trained, adaptable and up-to-date in its skills, underpins strong R&D performance and the world-class manufacturing and business processes that are key to high productivity. Maintaining Canada's current aerospace and defence industry production will also require a significant increase in recruitment as the workforce ages. Initiatives under this strategic area will help address skills and training issues by improving the skills base of the industry, attracting young people to the sector and improving the linkages between industry and educational institutions. Improved workforce skills will also increase productivity and competitiveness.

Current Programs and Recent Actions

The federal government supports skills development in the industry by:

- establishing and funding activities of industry-driven human resources sector councils through the Sector Council Program at Human Resources and Skills Development Canada (HRSDC). In the aerospace sector, HRSDC has supported the Canadian Aviation Maintenance Council (CAMC) since the late 1980s;

- CAMC is responsible for the development and delivery of human resources strategies and services for the aviation maintenance sector, including labour market research, occupational analyses and standards, industry/education/government training partnerships, youth internships and career awareness, and prior learning assessment and recognition.

New Policies and Program Initiatives

The government will:

- support innovative skills development projects in the aerospace and defence sector through provisions of the Workplace Skills Strategy.

Challenges for Other Stakeholders

The Canadian industry should consider initiatives that would:

- increase corporate investment in workforce skills and training;
- assist in work of the Canadian Aviation Maintenance Council;
- develop greater linkages between industry and educational institutions in all regions of Canada to ensure that educational programs meet the needs of the sector;
- make direct investments in education by offering co-operative education positions, providing equipment to schools and offering staff time to educational programs;
- work with academia through NSERC programs, particularly the partnerships programs that support research and the training of undergraduate and graduate students; and,
- promote the aerospace and defence sector as a desirable career choice for youth.

Provincial governments have an important role in human resources and skills development, including funding and support for aerospace and defence industry training. Educational institutions need to continue to work with industry to ensure that their programs and curricula are meeting the requirements of the sector. There are also opportunities for enhanced collaboration, such as through NSERC, and funding for research infrastructure, for example, through the Canadian Foundation for Innovation.

Trade Policy and Trade Development Initiatives

Strategic Importance

The Canadian industry is successful in international markets. Approximately 78 percent of Canadian aerospace and defence output is exported, with more than 70 percent of that sent to the US. Canadian firms require continued access to foreign markets and investment. This requires promotion of Canadian aerospace and defence firms and their capabilities as well as the development of contacts in foreign markets. Similarly, foreign direct investment increases Canadian capabilities and creates new economic opportunities.

The Canadian industry is highly integrated with that of the US. Our firms are often a small part of the global supply chain and, as such, rely on US firms to supply inputs and provide a market for our exports. Heightened security concerns in the US have the potential to disrupt this relationship.

In the defence and space sectors, Canadian firms must increasingly deal with countries that limit or eliminate competition from foreign suppliers and follow buy-at-home policies. For example, growing protectionist sentiment in the US is cause for concern and is having an impact on the goal of an integrated North American defence industrial base. Given Canada's small domestic defence market, access to foreign technology and markets is important to the success of the Canadian aerospace and defence industry. Respecting legitimate security safeguards and requirements, while continuing a relatively open exchange of technology and goods between the two nations, enhances each country's goals with regard to its defence industrial base and national security. In addition, protectionist actions by foreign governments place pressure on Canadian firms to shift work to other jurisdictions, to ensure access to those markets.

Initiatives under this strategic area will seek to address the global aspects of the aerospace and defence supply chain by working to improve the Canadian industry's presence in, and access to, foreign markets. They will also help the industry meet the increasing challenge posed by foreign competitors in the global marketplace.

Current Programs and Recent Actions

The federal government supports trade issues in the industry by:

- being a strong advocate for Canada's aerospace and defence industry on trade and market access issues by opposing efforts of our major trade partners to limit access of our firms to their

technology and to their markets or unfair aircraft sales financing and other trade practices of other countries and by seeking to improve Canada's position vis-à-vis the International Trade in Arms Regulations;

- promoting the industry abroad through Trade Team Canada: Aerospace and Defence. Trade activities include Canadian participation at the Paris, Farnborough and other trade shows, MRO conferences, Eurosatory, Defence Systems and Equipment International, as well as the extensive network of trade officers at embassies and consulates around the world; and,
- assisting in foreign military sales through the Canadian Commercial Corporation and the Department of National Defence.

New Policies and Program Initiatives

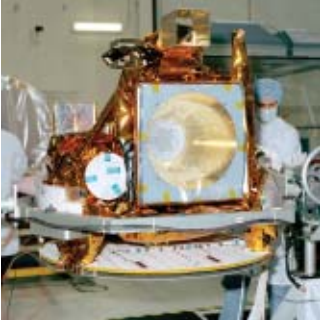
The government will:

- develop and implement an investment and trade strategy that focusses on attracting and retaining foreign direct investment and promoting Canadian aerospace and defence capabilities abroad;
- participate aggressively in key international trade shows and exhibitions (Defense Systems and Equipment International, Eurosatory, Farnborough International Airshow, Paris International Air Show, etc.) to showcase Canadian industrial strengths, competitiveness and capabilities in the aerospace and defence sector to the international community;
- assist in foreign military sales through the Canadian Commercial Corporation and the Department of National Defence;
- develop and implement country commercial strategies for key emerging markets with targeted initiatives in the aerospace and defence sector to support increased small and medium-sized enterprise market success;
- engage in a proactive promotion effort with the US Department of Defense as a priority within the government's Enhanced Representation Initiative, which focusses on improving Canadian performance in US markets;
- more proactively seek global opportunities and assist industry efforts to increase small and medium-sized enterprise participation in major platforms and aerospace and defence procurement; and,



photo: Canadian Space Agency

The ability to provide sales financing support is imperative for the success of the aerospace industry. The government's ability to offer such support at times when private sector investors lack the interest or capacity to provide appropriate funding is essential.



- continue to collect, analyse and disseminate timely, accurate and high-quality market information and intelligence about international business opportunities to Canadian firms through the implementation of comprehensive market information and intelligence programs.

Challenges for Other Stakeholders

The Canadian industry should consider initiatives that would:

- assist in setting the priorities and strategies for an aerospace and defence investment and trade strategy;
- actively share potential business opportunities for Canadian aerospace and defence firms as part of a market intelligence network. The network would enable firms to learn of new supplier opportunities in a timely manner;
- assist the government with the development of action plans for target markets that would secure international sales; and,
- relay Canadian aerospace and defence industry concerns to international suppliers and foreign decision makers.

Sales Financing

Strategic Importance

The ability to provide sales financing support is imperative for the success of the aerospace industry. The government's ability to offer such support at times when private sector investors lack the interest or capacity to provide appropriate funding is essential. Government support when there is private sector withdrawal from the market due to elevated risk factors and buyer credit difficulties is particularly important.

Sales financing support also allows Canadian firms to access new developing markets. The federal government will continue to provide sales financing for Canadian aerospace and defence products on terms that respect our international trade obligations.

Current Programs and Recent Actions

The federal government supports sales financing in the industry by:

- providing sales financing through Export Development Canada's Corporate and Canada Accounts for the purchase of aerospace and defence products;
- negotiating multilateral and bilateral trade agreements/understandings to facilitate trade and develop an international framework for aircraft sales financing. For example, Canada is engaged in negotiating with Brazil on trade in regional aircraft. Canada is also negotiating multilaterally at the Organisation for Economic Co-operation and Development (OECD) to modernize the Aircraft Sector Understanding on Export Credits for Civil Aircraft;
- maintaining discipline in providing support to Canadian aerospace firms on terms that meet Canada's international trade obligations and are consistent with market terms; and,
- providing sales financing through the Regional Aircraft Credit Facility to ensure that Canadian aircraft manufacturers can sell aircraft in the domestic market when faced with foreign competition backed by government support.

New Policies and Program Initiatives

The government will:

- establish an Aircraft Sales Financing Framework to provide competitive and defensible financing in a fiscally prudent manner. This will support the sale of Canadian manufactured aircraft in anticipation of the new Aircraft Sector Understanding of the OECD. Support will be consistent with Canada's international trade obligations; and,
- actively participate in the current discussion on the Aircraft Sector Understanding of the OECD.

Challenges for Other Stakeholders

The Canadian industry should consider initiatives that would:

- increase private sector participation in financing new aircraft sales, including Canadian and foreign program suppliers, to replace the need for government support whenever possible;

- increase participation in sales financing from provinces with significant content in domestic aircraft programs, through mechanisms that respect Canada’s international trade obligations;
- develop innovative financing vehicles that can be supported by the government. Such vehicles must meet Canada’s international trade obligations and best utilize limited financial resources; and,
- provide input into the creation of the Aircraft Sales Financing Framework by advocating the industry’s position and requirements for Canadian government sales financing policies and mechanisms.

Security and the Environment

Strategic Importance

The aerospace and defence industry provides invaluable support to Canadian efforts to monitor and protect our environment and our approaches. Aircraft, spacecraft and ships perform these duties every day. For example, Earth observation satellites using remote sensing technology play a key role in monitoring the environment. Coast guard aircraft also patrol our shores, protecting our environment and enforcing Canadian environmental rules and regulations. Aircraft, spacecraft and ships also help promote Canadian sovereignty in the farthest reaches of our coasts and economic zones and allow Canada to ensure that its interests are being respected and its laws enforced, where necessary.

Secure access to strategic goods and services is necessary for national security reasons. A country’s ability to protect itself and support its allies depends on its ability to deliver and maintain strategic materiel through its defence industrial base.

Even in the case of equipment that the federal government sources from multinational producers, there is a strategic need to be able to support that equipment in Canada. The Department of National Defence has explicitly stated that domestic sources of maintenance and repair are of national strategic importance and has invoked the national security provisions included in international trade agreements for various in-service support contracts.

Public procurement initiatives under this strategic area provide access to public procurement projects. They will also assist with the development of the supplier base by allowing Canadian suppliers opportunities to participate on domestic programs.

Current Programs and Recent Actions

The federal government supports security and the environment by:

- providing the Canadian Space Agency with funding of \$300 million a year. The Canadian Space Agency undertakes a number of activities including the development of the Canadarm I and II, civil space research, industrial development and international cooperation;
- co-funding the Earth observation RADARSAT II satellite, which will have agricultural, marine and pollution monitoring roles as well as extensive mapping capabilities. RADARSAT II is scheduled to be launched in the second half of 2006;
- increasing defence spending by \$13 billion over five years and undertaking a modernization of the Canadian military through the procurement of new equipment and systems, including the Maritime Helicopter Program, CF-18 and Aurora patrol aircraft upgrades, etc.;
- putting in place the Munitions Supply Program when the government privatized the production of military munitions two decades ago. For industrial policy and security of supply issues, the government decided to maintain domestic sourcing and to take advantage of a larger customer base through exports; and,
- issuing the policy document *Focussing on Opportunities: A New Policy Framework for the Canadian Shipbuilding and Industrial Marine Industry* in 2001 in response to recommendations made by industry and labour representatives, which outlined a set of programs and policies aimed at encouraging trade and investment and also reiterated the government's commitment to domestic sourcing for its shipbuilding and repair requirements.

New Policies and Program Initiatives

The government will:

- participate, when possible, in key major international security, defence and space programs, such as the federal government has done in the Joint Strike Fighter program, prioritizing those where Canada's security and industrial interests align;
- initiate negotiations with international partners on a potential Canadian contribution to major international space exploration efforts;



photo: Canadian Space Agency

- invest in defence and security research of interest to Canada and its allies through Canadian research programs such as the Defence Industrial Research Program, the Applied Research Program, the Technology Development Program and the new aerospace and defence technology development program;
- continue to use the Defence Research and Development Canada research establishments to foster innovation and R&D in partnership with our allies and industry;
- apply the Industrial and Regional Benefits policy in a way that supports the aerospace and defence sector and this strategy;
- encourage participation in international research programs (e.g. the US Defense Development Sharing Agreement and the European Union Framework Programs); and,
- exploit opportunities for major upgrades and technological innovation in the maintenance of Department of National Defence fleets.

Challenges for Other Stakeholders

The Canadian industry should consider initiatives that would:

- identify and develop technology areas and platforms of importance; and,
- increase its research, development and manufacturing activities in Canada in response to the above government actions to develop innovative defence solutions.

Procurement

Strategic Importance

Public procurement in the aerospace and defence sector is of key importance to both government and industry. For government, the need to be strategic in terms of leveraging outcomes from procurement planning and implementation stems from its various goals, including value for money, support for technology creation and development, commercialization, skilled labour, national control over sensitive technologies, and operations and trade with our allies that promote international peace and security. For industry, stable and well-managed domestic procurement enables it to make strategic investments in capital equipment, processes, training and R&D, and helps ensure that Canada maintains a high-value-added economy that can

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compete for global markets as well as an industrial base that can support our national needs. Firms find “home” country procurement essential for access to the international marketplace since this is seen as a sign of a firm’s credibility.

In order for Canada to remain in the vanguard of aerospace and defence nations, strategic use of public procurement can play a central role. Other countries in the global economy explicitly use government procurement to support and further develop their industrial bases by purchasing, when possible, goods and services from their aerospace and defence companies. Examples include various domestic preference requirements that are consistently applied by our closest allies. Exporters in the aerospace and defence sector routinely must satisfy these requirements if they wish to sell into these markets leading to pressure to establish activity there. Procurement for defence and security purposes necessary for the protection of essential security interests, such as arms, ammunition and war materials or other materials indispensable for national security or national defence, may be exempted from the provisions of free trade agreements, on a case-by-case basis by appropriate levels of authority.

Current Programs and Recent Actions

There have recently been a significant number of government procurement reform initiatives and procurement trends that are having a significant impact on how the government procures aerospace and defence goods. For example, in order to reduce procurement times and costs while meeting essential operational requirements, the government has adopted procurement processes and strategies that focus on commercial off-the-shelf (COTS), high level specifications as was the case in the recently approved Hercules replacement project for National Defence, joint procurements with allies, standing offers and package procurements (total life cycle contracts). These policies can have an impact on Canadian industry.

As a result of Canada’s limited ability to supply all its major defence goods domestically, the government has chosen to have an open defence market that does not discriminate against foreign suppliers, but does require industrial participation commitments by contractors. This is the case in the most recent approval to proceed with the replacement of the Hercules aircraft for National Defence. The government’s Industrial and Regional Benefits (IRB) policy provides the Framework for using federal defence/security procurement as a lever to promote long-term, high-quality industrial and regional development objectives. IRBs help improve industrial competitiveness, market access and commercialization, and increase investment in high technology sectors.

The IRB policy provides broad support to the domestic industrial base on specific eligible procurements. This approach allows bidders to propose transactions that make business sense to them, while trying to satisfy a variety of operational, industrial development and other socio-economic priorities of the government. There is scope within the IRB policy to more explicitly support aerospace and defence and promote certain technologies as investment options from bidders.

New Policies and Program Initiatives

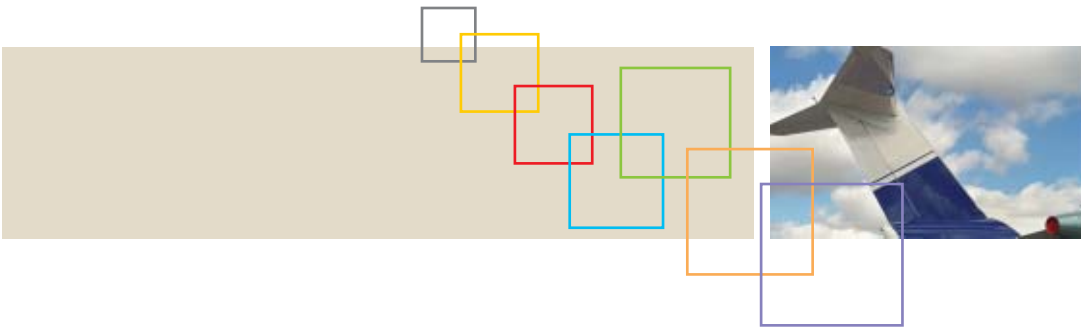
The government will:

- better leverage long-term industrial development from defence, security and space procurements and consider policy options to meet this goal, including making the IRB policy more strategic in its outcomes and placing an increased focus on the aerospace and defence sector (e.g. the IRB policy targeting technologies of importance to the aerospace and defence industry);
- continue to facilitate industry planning by making available the new Strategic Capabilities Investment Plan to industry, thereby allowing it to make investments in productivity and competitiveness in tune with public procurement needs;
- seek to encourage innovation and skills enhancements through procurement; and,
- pursue joint international procurement opportunities to increase Canadian market access.

Challenges for Other Stakeholders

The Canadian industry should consider initiatives that would:

- increase investment in equipment and process improvements; and,
- focus on innovation and improved competitiveness.



CONCLUSION

As one of Canada's strategic high technology sectors, the aerospace and defence industry will be a key contributor to the knowledge-based economy of the future. While the continued success of the industry cannot be guaranteed, it has a strong base from which to grow by taking advantage of future opportunities.

The National Aerospace and Defence Strategic Framework, guided by its vision and propelled by its seven key policy pillars, will guide future policy initiatives and actions to 2025. The Framework sets out a variety of actions to be undertaken by all industry stakeholders, including the actions that the government will undertake to secure the long-term future of Canada's aerospace and defence industry.

The federal government has played a vital role in the growth, development and success of the aerospace and defence industry in Canada. The Framework continues the government's commitment to the industry via a coordinated strategy with all industry stakeholders that also helps achieve key national policy objectives.

The Framework is not a rigid plan. It will evolve as all industry stakeholders adapt their actions to changing circumstances, both domestic and global. The Framework will help underpin the continuing success of aerospace and defence industry in Canada. Policy development will be an ongoing process, and the government will undertake periodic reviews of the Framework to ensure that it remains relevant.