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I N D U S T R Y P R O F I L E

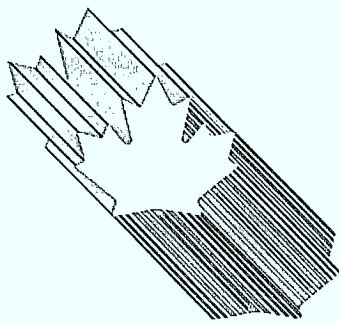


Industry, Science and
Technology Canada

Industrie, Sciences et
Technologie Canada

Defence Electronics

Canada



I N D U S T R Y

P R O F I L E

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FOREWORD

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In a rapidly changing global trade environment, the international competitiveness of Canadian industry is the key to survival and growth. This Industry Profile is one of a series of papers which assess, in a summary form, the current competitiveness of Canada's industrial sectors, taking into account technological and other key factors, and changes anticipated under the Canada-U.S. Free Trade Agreement. Industry participants were consulted in the preparation of the papers.

The series is being published as steps are being taken to create the new Department of Industry, Science and Technology from the consolidation of the Department of Regional Industrial Expansion and the Ministry of State for Science and Technology. It is my intention that the series will be updated on a regular basis and continue to be a product of the new department. I sincerely hope that these profiles will be informative to those interested in Canadian industrial development and serve as a basis for discussion of industrial trends, prospects and strategic directions.

Minister

1. Structure and Performance

Structure

The defence electronics industry includes companies that develop, manufacture and repair radio and communications equipment; radars for surveillance and navigation (both civil and military); air traffic control systems (both civil and military); acoustic and infrared sensors; computers for navigation and fire control; signal processors and display units; hybrid microcircuits and other special purpose electronic components and associated software. End users of these products are limited to the military, government agencies or commercial airlines, which set stringent manufacturing process and product performance specifications.

Canadian defence electronics companies generally serve market niches. The industry's products are sub-systems sold either to prime contractors for inclusion in larger defence systems (related to aircraft or ships), or to users directly, as is the case with army communications equipment.

There are approximately 150 firms* in the industry employing some 26 000 people*. Geographically, the industry is concentrated in Ontario and Quebec, where about 92 percent of production and 89 percent of employment can be found. The remainder is in Vancouver, Calgary, Edmonton, Regina, Winnipeg and Halifax.

In 1987, there were 12 top companies accounting for approximately 70 percent of the industry's \$2.4 billion* in revenues. They were Litton Systems Canada Limited; CAE Electronics Ltd.; Canadian Marconi Company; Unisys Canada Inc.; Raytheon Canada Limited; Computing Devices Company; ITT Canon Canada; Bendix-Avelex Inc.; Garrett Canada; Rockwell International of Canada Ltd.; MacDonald Dettwiler and Associates Ltd.; and Leigh Instruments Limited.

Foreign ownership in the industry is significant, with eight of the 12 largest companies U.S. owned, two British and the remaining two Canadian owned. Smaller firms are largely Canadian owned.

The industry is highly export oriented. In 1987, exports totalled \$1.4 billion*, or about 80 percent of total shipments. Eighty-one percent of these were to the United States, with the remainder distributed worldwide. In the same year, imports were approximately \$1.3 billion*, with more than 90 percent coming from the United States.

The trading patterns and, indeed, the industry structure itself, reflect the defence production and acquisition framework established by the Canada-United States Defence Development/Defence Production Sharing Arrangements (DDSA/DPSA). Under these arrangements, Canada discontinued its development of major weapons systems (which instead it obtains largely from the United States) in return for access to the U.S. market — essentially on the same basis as domestic producers. The decision to discontinue the development of major weapons systems in Canada has led to an industry with an export orientation focused on market niches.

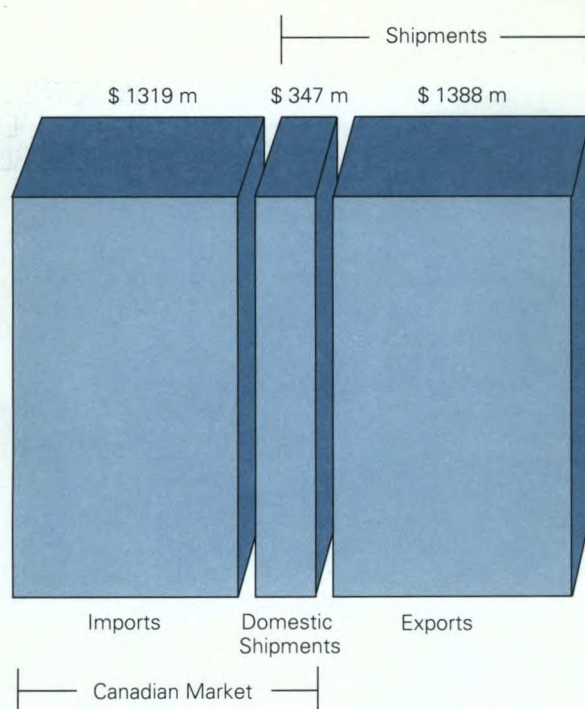
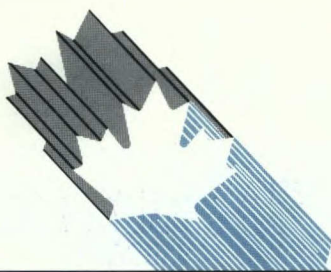
* ISTC estimate

Canada



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*Imports, Exports and Domestic Shipments
1987*

Small in comparison with their international competitors, Canadian-based companies compete with subsidiaries of larger international defence firms (including other divisions of their own parents) or other smaller-sized independent companies. The main international competitors include divisions of Tadiran (Israel), GM Hughes Electronics, Magnavox and Allied Signal (United States), Thorn EMI (United Kingdom), Thomson-CFS (France) and Standard Electric Lorenz (the Federal Republic of Germany).

Performance

Canada's defence electronics industry has grown steadily over the past five years. Shipments have increased by 18.5 percent, slightly less than the international market rate of 19.6 percent for this five-year period. Growth has been fuelled largely by U.S. defence spending, which has risen from approximately \$84.5 billion in 1982 to \$113.8 billion in 1987**. Since these figures do not include expenditures for defence programs with classified budgets, actual expenditures are considerably higher. As the Canadian Armed Forces began to acquire new equipment in the mid-1970s, the Canadian market for defence electronics products also increased.

A further indication of the industry's expansion is the change in its exports and imports over the last five years. Exports grew from \$583 million in 1982 to \$1.4 billion in 1987, while imports increased from \$565 million to \$1.3 billion during the same five-year period.

At present, the industry is financially sound. Traditionally, firms have allotted about 13 percent of their annual revenues to finance research and development and capital expansion projects. In addition, foreign parents, as well as new companies, have continued to invest in Canada.

2. Strengths and Weaknesses

Structural Factors

The structural factors which determine the competitiveness of the Canadian defence electronics industry are company size, the ability of the industry to advance technologically, and the ability of firms to market and sell to export markets.

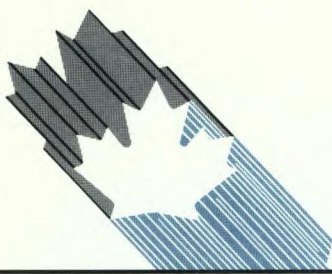
The cost of doing business in the industry is substantial, making it difficult for firms lacking significant financial resources to compete. These costs reflect the custom-made nature of defence products, the specialized manufacturing processes used and the rigorous test procedures specified in bid documentation. As part of an overall package, companies perform certain services (such as training), provide specialized manuals and meet rigorous audit requirements.

The orientation of the industry towards market niches, while supporting its international competitiveness, is also a weakness. Whereas larger defence firms have diversified, as U.S. corporations did following the Vietnam War, Canadian-based companies are relatively more exposed to the fluctuations in demand for defence products.

Canadian access to research and development opportunities, particularly in the United States, is essential since these developments will be the basis for production opportunities in response to future U.S. government weapon purchases.

Canadian companies have been successful in developing innovative, reliable, technologically advanced products. This has been achieved through a variety of instruments, including joint development programs with the Canadian government, participation in defence development sharing arrangement projects and by gaining access to proprietary world-class technologies held by parent companies. Some of these products include CAE Electronics' aircraft simulators, Canadian Marconi's communications and cockpit instrumentation, and Litton Systems' navigation systems and cockpit displays.

** U.S. - Office of Management and the Budget, *Budget of the United States Government*, 1983 and 1988 eds.



Canadian companies are generally not large enough to support the investment required to be self-reliant in the key components used to manufacture defence electronics products. This dependency on foreign-made components has become a problem with the advent of devices such as "very high-speed integrated circuits" (VHSIC). Access to these components is restricted by the U.S. government for national security reasons, but is also essential in the production of the next generation of defence electronics products.

Parent companies provide Canadian subsidiaries not only with technology through world product mandates, but also with corporate links and market presence — necessary elements for success in American and other international markets. Small Canadian-owned companies are at a disadvantage because they lack the resources of larger foreign-owned firms.

Marketing, in particular, is one area where smaller Canadian firms are also at a relative disadvantage compared with larger defence firms. In the defence electronics industry, marketing requires direct contact with individual program officers in each of the military services. In addition, the bidding process is extremely complex and costly. Smaller Canadian companies find it difficult to support these overhead costs.

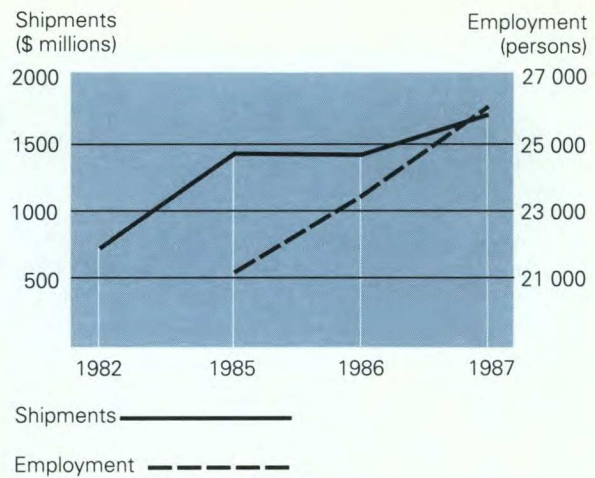
Finally, because of the importance of market presence and direct contact with military officials, Canadian-based firms will always have a disadvantage relative to companies manufacturing in the buying country. Locally based companies will continue to be in better positions to compete for contracts in that country.

Trade-related Factors

Trade in defence electronics products is neither a part of the Canada-U.S. Free Trade Agreement (FTA) nor the General Agreement on Tariffs and Trade (GATT) Procurement Code. Instead, defence trade is governed by bilateral defence agreements.

As noted earlier, the most important bilateral defence agreement for the Canadian defence electronics industry is the Canada-United States Defence Development/Defence Production Sharing Arrangements (DDSA/DPSA). The DDSA supports Canadian companies' access to U.S. government development projects. The DPSA facilitates Canada-U.S. trade through the waiver of duties and U.S. "Buy America" procurement preferences.

Tariffs on defence products are generally not a major concern. The following non-tariff barriers (NTBs) are of more consequence and concern.

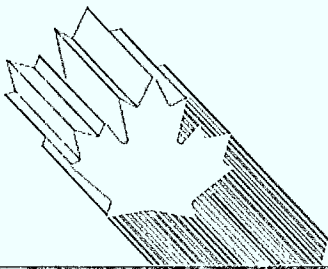


Total Shipments and Employment

Government support of defence industries is significant. For example, in recognition of the high costs of doing business in the defence market, U.S. firms are assisted through considerable opportunities to carry out government-funded product research and development. The U.S. Electronics Industry Association estimates that the budget of the Department of Defense for research, development, testing and evaluation will be approximately US\$50 billion (1986 dollars) annually for the next 10 years. In addition, a variety of programs are designed to ensure the continued viability of the U.S. defence industry. The U.S. programs include the Manufacturing Technology Assistance Program, the Industrial Modernization Incentive Program, targeted tax credits, depreciation allowances and special powers to subsidize elements of the U.S. industrial base for national security reasons.

In Canada, the federal government sponsors defence development through the Defence Industry Productivity Program (DIPP). The program assists companies through repayable assistance for capital investment, research and development, modernization and marketing. The assistance is modest relative to U.S. programs. The Canadian Department of National Defence's funding of research and development as a proportion of the defence budget is limited, compared to other NATO countries.

Foreign government defence department regulations and restrictions can become non-tariff barriers. Security and technology transfer restrictions are the areas of most problem. The security clearance process, particularly in the United States, is quite cumbersome and companies often obtain security clearances too late to meet the closing date for bids.



The U.S. Small Business Set-Aside Program is another significant barrier to Canadian companies. Under this program, defence electronics firms in the United States are defined as small businesses if they employ fewer than 750 or 1500 people (depending on the product area). The set-aside provision eliminates foreign competition (including Canadian companies) if sufficient U.S.-based competition (two or three firms) exists. Typically, the procurement "set-aside" for small business is of a size and scale which would otherwise allow Canadian companies to compete. In addition, the Small Business Subcontracting Program requires prime contractors to set aside a portion of subcontracts for U.S. small business, further excluding Canadian firms.

The U.S. budget process also presents problems. Individual defence budget items are subject to detailed congressional scrutiny and approval. An active congressional lobby is often successful in preventing the funding of projects proposing foreign weapons systems.

In addition, the U.S. *Defense Appropriations and Authorization Bills* are used to introduce broader measures which eliminate foreign competition. These measures generally have not been aimed at the electronics industry although the Bayh Amendment does restrict access to research and development opportunities.

The Government of Canada's pursuit of procurement industrial benefits is sometimes viewed in the United States as a barrier to trade. The government uses this highly selective instrument to negotiate arrangements designed to make a lasting contribution to the Canadian economy. The Canadian program, as it is now structured, contrasts with those of other countries as it is not based on numerical targets, such as 100 percent of a contract's value, nor does it include lower value purchases as does the U.S. Small Business Set-Aside Program. The Canadian approach is to negotiate with foreign and domestic prime contractors on purchases of more than \$100 million. By reaching mutually beneficial arrangements with companies that contribute to the Canadian economy and the corporations involved, long-term industrial and regional development objectives can be achieved.

Technological Factors

The defence electronics industry is highly dependent on the development of new technologies and products for its continued existence. This reflects the defence posture of the United States (and NATO) — deterrence through technological superiority — and has created a constant demand for innovative products.

Canadian firms have been successful in producing competitive defence electronics products through world-product mandates (obtained from parent firms), access to projects in the United States, Canadian defence research projects, and company-sponsored development. Canadian companies are in a favourable position internationally in market niches such as radar, telecommunications, simulators, navigation systems and instrumentation, and software. Despite these strengths, the industry still relies heavily on imported technology and components, especially in the field of micro-electronics.

Systems integration is becoming increasingly important to defence electronics. The Canadian industry has limited capabilities in performing large-scale systems-integration activities. This is an area where Canadian capability is in the developmental stages. In addition to larger firms, such as Litton Systems Canada Limited, Unisys Canada Inc. and CAE Electronics Ltd., a number of smaller firms are entering the field, including Prior Data Sciences and MacDonald Dettwiler and Associates Ltd. A challenge for these firms will be to gain experience in the U.S. military's new software programming language "ADA" which will be used in most large U.S. and NATO systems in the future.

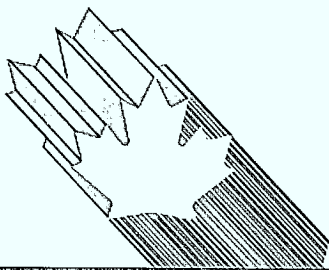
In the application of production and manufacturing technologies, the Canadian industry increasingly uses computer-aided design and manufacturing (CAD/CAM) techniques. As an adjunct to this capability, a service industry has developed for companies unable to absorb the start-up costs of design equipment and prototype development.

3. Evolving Environment

The defence electronics industry is going to face intense competition in selling to the U.S. market in the next few years. Growth in U.S. demand for defence products is not expected to continue at its current rate. Furthermore, market access problems may be intensified as the U.S. government responds to a decline in the competitiveness of its domestic defence industry.

The impact of these changes on Canada's defence electronics industry is unclear. While growth in the number of tanks, ships and aircraft purchased might slow down, this trend may be offset because the proportion of electronics in each is expected to increase.

Significant opportunities to compete for Canadian government purchases are anticipated over the next few years. There is also potential to increase Canada's share of the U.S. defence market as it is currently less than one percent.



The repair and overhaul (R&O) of Canadian defence systems will remain a source of work for the industry, although not as important as in the past. This change is due to a greater emphasis on replacement of individual components rather than repair.

The technological developments in the evolving environment will pose significant challenges to the industry. For example, integrated circuits, which are the basic components common to defence electronics products, are becoming increasingly complex. Except for application-specific integrated circuits (ASIC) and hybrid microcircuits, the vast majority of integrated circuits are imported from the United States. In addition, the areas holding the greatest potential for value added to new defence systems and sub-systems are in software or systems integration, which make defence systems function. As noted earlier, Canadian capacity in this area is limited, although growing.

Avionics products, such as cockpit instrumentation, are being replaced by integrated instrumentation. Canadian companies are currently working to develop capabilities in this area. Similarly, conventional wiring in aircraft is giving way to "fibre-optic-bus architecture." The cathode-ray tube is also being replaced with solid-state displays.

The growing cost and complexity of developing and manufacturing defence electronics products have given rise to a greater level of international co-operation. These ventures are not only taking place with companies in the United States but also in Europe.

The FTA will not have an impact on the defence electronics industry.

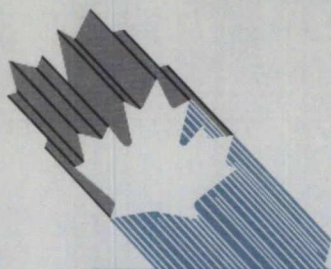
4. Competitiveness Assessment

The Canadian defence electronics industry is successful in competing in the unusual conditions that characterize defence markets. Continued success is anticipated in the future. The emphasis on national security and defence objectives (rather than on purely economic objectives) and the high costs and risks inherent in the industry, however, mean that governments will continue to play roles in the development of domestic defence electronics industries.

For further information concerning the subject matter contained in this profile, contact:

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PRINCIPAL STATISTICS*

SIC(s) COVERED: N/A

	1982	1985	1986	1987
Establishments	150			
Employment	N/A	21 100	23 450	26 100
Revenues (\$ millions)**	905	1 976	2 015	2 390
Shipments (\$ millions)**	740	1 461	1 455	1 735
Investment (\$ millions)	133	266	284	312
Profits after tax (\$ millions)	N/A	186	149	171

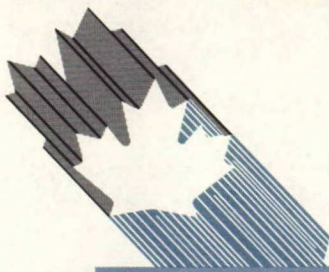
TRADE STATISTICS*

	1982	1985	1986	1987
Exports (\$ millions)	583	1 169	1 164	1 388
Domestic shipments (\$ millions)	157	292	291	347
Imports (\$ millions)	565	1 110	1 106	1 319
Canadian market (\$ millions)	722	1 402	1 397	1 666
Exports as % of shipments	79	80	80	80
Imports as % of domestic market	78	79	79	79
Canadian share of international market - %	N/A	0.3	0.3	0.3

REGIONAL DISTRIBUTION* — Average over the last 3 years

	Atlantic	Quebec	Ontario	Prairies	B.C.
Establishments - % of total	7	11	62	11	9
Employment - % of total	2	21	68	4	5
Shipments - % of total	1	21	71	2	5

(continued)



MAJOR FIRMS

Name	Ownership	Location of Major Plants
Litton Systems Canada Limited	American	Toronto, Ontario Halifax, Nova Scotia
CAE Electronics Ltd.	Canadian	Montréal, Quebec
Canadian Marconi Company	British	Montréal, Quebec Kanata, Ontario
Unisys Canada Inc.	American	Winnipeg, Manitoba Montréal, Quebec
Raytheon Canada Limited	American	Waterloo, Ontario
Computing Devices Company	American	Nepean, Ontario
ITT Cannon Canada	American	Toronto, Ontario
Bendix-Avelex Inc.	American	Montréal, Quebec Cornwall, Ontario
Garrett Canada	American	Toronto, Ontario
Rockwell International of Canada Ltd.	American	Toronto, Ontario
MacDonald Dettwiler and Associates Ltd.	Canadian	Vancouver, British Columbia
Leigh Instruments Limited	British	Ottawa, Ontario

* Statistics Canada data on this sector are not available. All figures are ISTC estimates.

** Shipment figures represent the value of manufacturing sales up to the point of installation. Revenue figures include shipment figures plus other revenues such as earnings from research and development, repair and overhaul.

N/A Not available

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