OVERVIEW OF CANADIAN RAILWAY INDUSTRY MANUFACTURING AND MARKETING CAPABILITY

A report prepared for:

The Department of Regional
Economic Expansion and
Transport Canada

By:

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REFERENCE MATERIAL

1. Jane's World Railways, 1977-78 edition.

2. Export Consortia, A Canadian Study

   K. C. Dhawan and L. Kryzanowski
   Concordia University

3. Year Book of Railroad Facts, 1978 edition

   American Association of Railroads

4. Canada in the Worldwide Railway Market

   A Directory of Canadian Suppliers of Railway Equipment, Components and Services, Industry, Trade and Commerce, Government of Canada, 1978.

5. Containerization International Year Book - 1979.

6. Consulting Engineers Canada, 1977-78 edition.

7. The Financial Post

   The 1979 ranking of Canada's 500 largest companies.

8. The Financial Post

   Survey of Industrials - 1978.

OVERVIEW OF CANADIAN RAILWAY INDUSTRY

MANUFACTURING AND MARKETING CAPABILITY

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1. INTRODUCTION

Originating in discussions with representatives of the Railway Branch, Transport Canada in April 1979 and followed up by a meeting with government officials in Montreal on April 23rd, Canalog Logistics undertook the preparation of a proposal covering a broad overview study of Canadian railway industry manufacturing and marketing capability in the context of export opportunities to developing countries. Copy of the proposal is attached as Appendix A.

Canalog's proposal covering the above study was accepted and the project taken in hand effective May 1st. The time period allocated for conducting of the study was one month, it being recognized that the study was an overview, that it would be based largely on the knowledge of the consultant, the experience of selected senior staff within the Canadian National organization, and on interviews with government and industry representatives other than CN. Obviously, the time allotment did not allow for in-depth evaluation of the many aspects of the subject, nor did it allow for extensive documentation and statistical support. The time limit was further constrained by the requirement for a preliminary report and presentation by May 17th*.

* Presentation made in Ottawa on May 18th.

At a meeting with the Client in Ottawa, May 4th, it was agreed that the study would focus on railway freight operations and equipment and major items of railway track construction materials; it was further agreed that telecommunications services and equipment, while required extensively in railroad operations, represent a specialty area that would be given only general comment.

The Consultant acknowledges the cooperation of officers from the following companies:

Bombardier Inc.

CANAC Consultants Limited

Canada Cement Lafarge, Ltd.

Canadian National Railways

Canadian Pacific Consulting Services Limited

General Motors of Canada, Ltd.

Hawker Siddeley Canada Ltd.

National Steel Car Corporation

Steadman Containers, Ltd.

The above firms were selected from the much larger number of firms making up the Canadian railway industry, having regard to the ready availability of knowledgeable staff (primarily in Montreal) and the time constraint placed on the study.

2. BACKGROUND INFORMATION

The historical development of railways outside the highly industrialized nations of the world is related, in many instances, to the era of colonial empires under the British, French, Germans, Italians and others. Many of the developing countries in Africa, as an example, inherited with their national independence a railway system designed to European standards, equipped with European locomotives and cars, operated along the pattern of established European procedures, and using rail, ties, fastenings and other equipment supplied by European manufacturers. Some of these railroads were designed to haul general freight and a wide range of local produce, as well as passengers - a few were designed for bulk haul of specific commodities.

To maintain the existing railways following national independence, the railways referred to above tended, partly by choice, partly by necessity, to rely on the original suppliers for parts and components as well as new rolling stock.

The situation varied from country to country, but by the end of World War II, there was wide-spread pressure for upgrading of railway fixed plant, replacement of obsolete car and locomotive equipment, and the introduction of improved operating techniques.

During the post-war years through to now, the European railway industry has continued its major orientation to passenger business, has pursued a path of technological refinement and sophistication, and in the realm

of freight business, has tended to perpetuate the use of small capacity freight cars and light weight locomotives.

The North American railway industry on the other hand, faced with the demand for hauling very heavy tonnages over long distances, and having the opportunity to build on the experience of other world railways, developed a new level and style of technology involving heavy duty, rugged, high-capacity cars and locomotives, backed by a high level of research and technological development. The term, "North American technology" in the railway context, brings to the westerner's mind thoughts of bigness, industrial development, and technical excellence. To the railroader in Africa it is more likely to mean a locomotive of very rugged heavy-duty design that can operate for 500,000 kilometres over far from perfect track and under near tropical conditions with a bare minimum of maintenance and a very high level of dependability and availability.

The North American industry has made substantial penetration into the overseas railway equipment and materials supply markets. Canada's role in this market penetration has been significant. Bombardier Inc. with manufacturing facilities in Montreal, as an example, has exported diesel electric locomotives to some two score different countries over the past 25 years.

Notwithstanding the success of Canadian suppliers and Canadian consultants in penetrating the international railway markets to date, it is interesting to note that no record can be found where a Canadian firm or a Canadian consortium has been awarded a contract on a turnkey basis for a new railroad project, or a major extension of an existing line.

3. STUDY METHODOLOGY

Within the permanent and associated staff of Canalog Logistics there exists a widespread knowledge of the railway industry in Canada, the United States, and, to a lesser extent in foreign countries. To this knowledge can be added the resource knowledge and skills of senior staff in Canadian National, and the foreign experience of staff associated with CANAC Consultants Limited. The close working relationship between Canalog and Canadian Pacific Consulting Services Limited represents a further source of valuable information.

To carry out this study, therefore, and following initial discussion with officials of the Federal Government, the following approach was adopted:

a) Draw on the widespread knowledge of the Consultant's staff.

b) Conduct interviews with senior specialists with
   - CANAC Consultants Limited
   - Canadian National Railways
   - Canadian Pacific Consulting Services Limited

c) Conduct interviews with senior representatives of the two locomotive manufacturers and with selected car building firms in Canada, and with other representatives of the supply industry where appropriate.

d) Review available literature and recent reports having a bearing on the study.

e) From the information sources listed draw together a composite overview of industry capabilities, their problems and limitations in the export field, their advantages and disadvantages vis-à-vis their U.S. counterparts.

4. THE RAILWAY EXPORT MARKET - WHO AND WHERE?

When George Stephenson developed the first practical steam locomotive in the early 1800s he set off a world revolution in land transportation that continues to impact on every country having a railway.

So as to provide a global indicator of the magnitude of the world market for railway equipment, supplies and services, a listing has been prepared showing the countries outside of Canada and the United States to which the Canadian railway industry has made a contribution over the past 25 years, either in the form of consulting services, in the supply of rolling stock (cars and locomotives) or both. The list includes those countries where railway consulting studies have been carried out by CANAC Consultants Ltd. and Canadian Pacific Consulting Services Ltd., or where Canadian built locomotives have been supplied by General Motors of Canada, Ltd., and Bombardier Inc. The listing has then been expanded to show the principal railroads in each country, the rail route distance in kilometres, the track gauges encountered, the number of locomotives, diesel, electric and steam, the number of freight cars, and the country population. Railroad data for this listing has been extracted from "Jane's World Railways" 1977-78 edition. While every effort has been made to include all the countries encompassed by the above inputs from Canada, there could be some inadvertent omissions. Also, there are some instances where the data selected from "Jane's World Railways" is not complete. Population figures permit a comparison of railway size in terms of route length and rolling stock inventory vs. the number of people in the country. This listing is included as Appendix B.

Not included above are railways in China, in Russia, nor in the United States.

Since the Canadian railway industry has carried out work in each of the railway countries listed in Appendix B, it is not unreasonable to expect some degree of openness to further Canadian input. The total route kilometres of line represented in this listing, the total number of locomotives and cars, are as follows:

Selected World Railways

Route kilometres of line	-	283,648
Number of locomotives*	D -	11,658
	E -	2,037
	S -	15,520
	Total -	29,215
Number of freight cars		652,871

World railways could be categorized in several ways such as gauge of track, physical length, types of equipment and technology, traffic volumes (tonnages) moved, and the stage of development and size of the country in which they operate.

To provide a backdrop against which to scan the listing in Appendix B, the following composite grouping of railways is put forward. The divisions are very broad, of course, and it is possible to have two or more railroads of different groupings within the same country.

*D - Diesel-electric or diesel-hydraulic locomotives
E - Electric locomotives
S - Steam locomotives

I. Railroads in developing countries such as Kenya and Tanzania where traffic volumes tend not to be high; where passenger operations constitute an important element of the whole; where the country has no internal railway manufacturing industry, and is dependent on outside sources for specialist expertise, supply of railway materials and rolling stock; and where often there is a degree of dependence on a single supplier (or country) because of prior associations.

II. Railroads in developing countries such as Mauritania where the railway focus is on bulk commodity haul, often one commodity, e.g., iron ore; where efficiency of haul is a goal of operations; and where there is scope for the application (or extension) of so-called North American technology.

III. Railroads in "mature" countries such as Argentina and Venezuela where distances may be long; where the system is open to use of latest technology; where there is prospect for new resource development and hence a potential demand for input of technical and management skills from other countries and a possible market for export of railway industry goods, particularly rail and rolling stock.

IV. Railroads in very large countries such as China and Russia where railway distances are very extensive; where current traffic is heavy; where potential resource and industrial development is

likely to result in continued expansion of the railway system. In these countries there exists an indigenous railway manufacturing industry but because of their interest in technological excellence there may be a potential, at least in the short term, for export of railway industry goods and services so as to be exposed to the current level of North American railway industry developments.

V. Railroads in the United States where there exists an ongoing demand for improved technology, increased operating efficiency, and innovations that offer a competitive edge within the transport industry.

China

The Chinese People's Republic has recently opened its door to welcome dialogue with the Western world on matters of trade and technology. Canada has sponsored a number of visits to China by representatives of the Canadian railway industry. Typical reaction by returning representatives is that they are impressed by the size of the country, by the need for technological upgrading of industrial facilities including the railways, and for the opportunities for the export of North American goods, provided the necessary trade arrangements can be set up. A thumb-nail sketch of the Chinese People's Republic Railways is as follows:

Route length	- 46,500 km
Track gauge	- 4'-8½" (mainly)
Estimated number of locomotives (1975)	- 8,300
Estimated number of freight cars (1975)	- 200,000

*Source: Jane's World Railways - 1977-78 edition.

The Chinese have a manufacturing capacity for the production of locomotives and cars. Latest available estimated figures (1975) show a production for that year of 250 steam locomotives, 275 diesel locomotives, 5 electric, and 18,500 freight cars. In addition, over the past twenty years the record shows several locomotives, (electrics, diesel-electric, and diesel hydraulic) having been obtained from France, Germany, Sweden, Romania, and Japan.

With their capacity for building of locomotives and cars it is presumed that China is looking primarily to the import of foreign technology, rather than foreign built equipment. This importation of technology has been ongoing. As an example of this, almost 3000 km of railway line in China has been electrified in recent years using a 25,000 volt, 50 cycle single-phase system with assistance from France and Russia.

It is interesting to note that the Chinese are also exporting their railway expertise. The 1870 km Tazara Railroad, running from Zambia eastward through Tanzania to the Pacific port of Dar es Salaam, was built and equipped by the Chinese. It was completed in 1976.

Union of Soviet Socialist Republics

The railway system of the U.S.S.R. is divided into 26 railways, each autonomous as to day-to-day operation and finance.

In 1975, the system encompassed a route length of 138,260 km and there have been ongoing construction programs to provide access to new areas. The U.S.S.R. five-year plan (1976-1980) envisaged construction of 3000 km

of new railway track, acquisition of 2,200 electric locomotives, almost 9,000 road and switcher diesel locomotives, and 396,000 freight cars*.

The U.S.S.R. is essentially self-sufficient in respect to production of railway equipment and supplies. While there appears to be an interest in exchange of technical missions and access to current technological information, the prospects for export of railway equipment and services to the U.S.S.R. are considered remote at this time.

United States

With a population roughly ten times that of Canada, the U.S. has approximately 322,000 kilometres of railroad line or only about five times the route length in Canada. Railroads are primarily standard gauge (4'-8½") track. In 1977 the U.S. Class I railroads showed an inventory of 27,680 locomotives (including 196 electrics and 11 steam - the balance diesel powered) and 1.66 million freight cars**.

As in Canada, U.S. railroads are committed to the use of North American technology and A.A.R. (Association of American Railroad) standards permitting the interchange of railway cars from one railroad to another and movement to virtually any railway point in the two countries. As indicated by the above data on locomotive inventory, U.S. railroads are powered almost exclusively by diesel locomotive power.

With diesel locomotives due for replacement, on average, every 20 to 25 years and cars every 30 to 40 years, with changing technology tending to

*Source: Jane's World Railways, 1977-78 edition.

**Source: A.A.R. Yearbook of Railroad Facts - 1978 edition.

accelerate the pace, there exists a massive annual replacement market for this type of equipment in the U.S. The average horsepower of locomotives is increasing - up approximately 14%, 1977 over 1970; and average freight car capacity is also increasing, now standing at 75.5 tons (1977) up 12% in the same period.

Although the U.S. railway industry is inherently self-sufficient in respect to the manufacture of equipment, materials and supplies, and in addition is deeply involved in the export business, there is some penetration of the U.S. market by Canadian manufacturers in certain types of equipment. At the present time, for example, Canadian car builders are enjoying a record backlog of freight car orders from U.S. railroads and U.S. leasing companies.

Because of the common technology in place in the two countries, the cooperative association offered to all U.S. and Canadian railroads through the A.A.R., and the free movement of people and ideas across the international border, it would seem prudent that the Canadian railway supply and manufacturing industry maintain a strong focus on marketing their products on the U.S. as well as the Canadian market. While the offshore market should also be pursued, it is interesting to note that the U.S. Class I railroad freight car inventory of 1.66 millions is approximately 2½ times the car inventory summation shown in Appendix B for the 47 foreign countries in which Canadian firms have already done business.

5. THE RAILWAY EXPORT MARKET - EQUIPMENT AND SUPPLIES

The railway export market includes both goods and services. It is a highly competitive market for both. Several countries operate government backed consortia offering packaged deals including engineering services, systems design, management services, equipment supply and financing. Some client countries, because of past associations as part of a colonial system and because of established supply sources, continue to favour these established suppliers. In other countries indigenous industries, such as car and locomotive builders, virtually preclude penetration of that market by a foreign firm.

In the general area of "goods", Canadian National lists some 110,000 items in its comprehensive stores inventory. It is estimated that approximately 60% of these items are "sourced" from Canadian producers. This large number of items includes, of course, all items required to operate a very large coast-to-coast railway system, such as typewriters, calculators, office furniture, shop tools, machinery, electrical gear, rail, fastenings, signals, fuel, etc. This study focuses primarily on items such as freight cars, locomotives, spare parts, rail and rail fastenings. By agreement with the Client, the area of rail passenger equipment, commuter equipment and rapid transit equipment has been excluded, as has the very highly specialized field of railway telecommunications.

Freight Cars

Freight car equipment can be manufactured to different systems standards; a car produced to A.A.R. (American Association of Railroads) standards, as an example, can operate anywhere on the North American standard gauge (4 ft. - 8½") railway system and may involve interchange points from Mexico to Alaska. The A.A.R. standards, however, relate primarily to standards of basic design, such as structural strength for the car body, coupler design to ensure coupling compatibility with all other cars in the system, the same for air brake systems and air hose couplers, etc. Beyond certain basic design requirements freight cars manufactured for different North American railroads can vary widely in detail. Past attempts to obtain concensus on a "standard" railway freight car design in Canada or in the U.S. have not been successful.

Canadian railroads are inherently part of the North American railway system and subscribe to North American technology. The railway freight car manufacturers in Canada compete not only for a share of the market involving some 200,000 Canadian-owned freight cars, but temptingly can look at the United States market involving more than 1.6 million cars. In total, therefore, the market for manufacture of freight cars in North America is immense and the stakes for capturing large orders are high. Individual orders in Canada can run as high as 2000 units for one type of car.

The international export market for freight cars differs greatly from the North American market. Equipment for many offshore countries is

smaller in design, commonly involves construction to U.I.C. (Union Internationale Chemins des Fer) standards, must be built to a range of track gauges, and may involve inclusion of various components from "non-standard" sources, all of which may require the North American builder to review the engineering design to ensure the technical integrity of his product. In addition are all the problems of offshore delivery and in many instances, financing arrangements. To add to all this, export orders tend to be small by North American standards with 100 cars being a reasonable order. Orders may also be substantially less than this.

Since railway freight cars are normally built to some pre-specified standards (e.g., A.A.R., U.I.C.) and utilize components often available from more than one source, car builders do not consider themselves as being in the replacement parts business. This applies both for domestic as well as export production.

Locomotives

In contrast to freight car production as discussed above, locomotives both for domestic and for export use tend to represent a self-contained package. Locomotives must conform to certain standards to meet the purchaser's requirements, but much of the design in each case is peculiar to the particular manufacturer.

Locomotives are less a "mass-produced" item than a freight car. An order for 20 export locomotives represents a "good" order but some orders are substantially less, a few are substantially more.

Since a locomotive may cost C $800,000 compared to a freight car at C $40,000, a ratio of 20:1, it takes a much smaller order of locomotives to provide the necessary financial incentive than in the case of freight cars.

Locomotive builders are in the replacement parts business.

Canadian builders of locomotives produce a range of locomotive sizes from 1000 H.P. and up, with special designs for export use. Below 1000 H.P., a purchaser railroad would have to go to General Electric (U.S.) which produces a line of small units using caterpillar diesel engines, or alternatively could purchase from a European or Asian source.

Foreign railroads purchasing a new locomotive, especially small railroads with limited technical resources, often require assistance to maintain their locomotives in service. To this end, it is common practice for the builder to provide this assistance for the first couple years after delivery of the new units.

Track Materials

Two firms in Canada are in the business of rolling steel rail and fabricating track fastening materials with a third producing fastenings only. While the three firms are in the business of supplying track materials to meet domestic demand, their products are also available to the export market.

The domestic demand calls for rail and fastenings to a selected range of North American standards and specifications. The producers are set up to meet these standards and are in ongoing contact with the Canadian and U.S. railways as to possible future purchasing plans.

Export orders may call for specifications differing from North American standards. Where this occurs, the Canadian producers may request permission to bid on the nearest equivalent for which they are set up to produce. If this is not acceptable, they must either set their pricing to include set-up costs for the export standard or withdraw from competition. The volume of the order and the availability of production space would have a major bearing on the decision they take in each instance.

Other

From the Canadian perspective, by far the largest segments of the potential export market for railway materials and equipment are encompassed in the areas discussed thus far - freight cars, locomotives, and track materials. Certain other items are discussed as follows:

a) Canada has been a leader and innovator in the design and fabrication of transportable buildings, including those of modular design, and has enjoyed considerable success in foreign markets. Canadian National has adapted the pre-fabricated design concept for use in developing a so-called "White Fleet" of engineering services rail cars to house work crews and track gangs. The pre-fabricated units are mounted on available railway flat cars which can then be moved

from place-to-place in semi-permanently coupled combinations. A possible market for this type of equipment is envisioned in certain countries where the standard of living is high and field staff can demand a high standard of accommodation.

b) Essentially all signalling equipment used on Canadian railways, including grade crossing protective systems, is imported. Because of the limited demand in Canada for this very specialized equipment, there is little prospect of a competitive line of products being produced domestically. A more attractive approach might be a shared production program with U.S. manufacturers by means of a bilateral agreement between the two countries whereby certain components for the North American and export markets would be produced in Canada.

c) In the past, some track maintenance equipment (e.g., track motor cars) has been manufactured in Canada; other related equipment is currently in various stages of development in Canada with potential user input from Canadian railroads. Every railroad uses track maintenance tools and machinery of one type or another so that the potential market is large - the Canadian industry should continue its efforts to capture a share of that market.

d) By agreement with the Client, telecommunications equipment as a possible export item is being given only passing mention. Canadian railroads have extensive experience in this field and their telecommunications arms are active in commercial as well as railroad

applications. Canada is also one of the world's best served countries in terms of public telephone service; Canadians are amongst the most prolific users of telephones.

e) Canadian railways have aggressively promoted the use of intermodal containers. With the need to transport goods to Newfoundland over a 160-km ferry route linking a standard gauge and a narrow gauge railway, CN pioneered the development of a container system for this service. Today there are modern rail-marine container handling facilities at Halifax, Saint John and Vancouver with inland facilities to serve forwarding, delivery and origin operations. As a major user, Canada should be in position to offer expertise to other users and to have a part in the supply of containers and handling equipment.

6. THE RAILWAY EXPORT MARKET - SERVICES

Moving from the area of "goods" to that of "services", the Canadian railway industry is in the forefront of railway developments and can offer a wide range of services adaptable to the needs of the export market. These services can be viewed conceptually as two main streams of available assistance:

a) Advisory/Consultative Services

b) Action-oriented Services.

The line dividing these streams at times may become so fine that the streams merge into one. Eventually, however, they must separate if the day-to-day management and operation of the foreign enterprise being assisted is to be left firmly in the hands of the permanent national staff. In this context, the Canadian consultant or firm must always consider himself a visitor on foreign soil and should be looking at his assignments as having both a beginning and an end. To become inextricably involved in day-to-day operations could, in the long term, be viewed by the local authorities as a return to colonialism and give rise to nationalistic hostilities damaging to inter-country relations. Examples of this in recent years can be found in several areas; the "Yankee go home" reaction in parts of Europe and in the far East, and the flight or expulsion of Europeans and Asians from certain African countries, are two such examples.

The following is a list of specific areas where the Canadian railway industry can provide service assistance to foreign railroads, and to foreign governments concerned with railroads, with intermodal operations, and with surface transportation generally.

Specialty Areas of Canadian Railway Industry Expertise

- Accounting - corporate, revenue
- Advertising
- Architecture
- Budgets - capital, operating
- Capital investment
- Claims prevention
- Computer programming
- Container terminals - design
- Corporate planning
- Cost analysis
- Customer research
- Data processing - systems and programs
- Distribution - intermodal
- Economic analysis
- Economics of transportation - rail, road, pipeline, shipping
- Employee relations
- Engineering - bridges and structures, civil, electrical, mechanical, signals, track
- Engineering economics
- Equipment planning
- Express freight
- Feasibility studies
- Financial analysis and management
- Freight car/wagon design, utilization maintenance
- Freight costing and pricing
- Freight marketing
- Hotel organization and management
- Industrial development
- Industrial engineering - terminal design and operations
- Intermodal transportation studies
- Investment criteria and planning
- Job training
- Labour relations
- Loss and damage - analysis and prevention
- Maintenance - diesel and electric traction, trucks, freight and passenger cars/wagons
- Management control information
- Management development
- Manpower planning and training
- Marketing
- Market research
- Materials handling
- Methods analysis and control
- Motive power - capacity, types, operation and maintenance
- National transport policy studies
- Office systems and procedures
- Operations research
- Organization
- Personnel - administration and development
- Piggyback - truck on rail
- Productivity control
- Project planning and engineering
- Property development
- Public relations
- Purchasing - methods and procedures
- Purchasing - contract
- Rail/barge planning, design and operation
- Railway operations
- Rail lines - new, economics, engineering, route location, construction supervision
- Rail express freight - terminal design, fleet and terminal operations
- Rail passenger equipment
- Rail passenger train service planning
- Railway systems - restructuring
- Research - materials and processes, metallurgy, engineering
- Road transport - management and operations
- Safety and accident prevention
- Sales - analysis and development
- Security - watch and ward
- Signalling, train radio operations
- Shipping
- Statistics, information systems
- Stores - methods and procedures, inventory control
- Technical research
- Telecommunications - planning, systems, transmission, switching, engineering, plants - inside, outside, radio, computer
- Terminal planning, design and operation
- Track construction and maintenance
- Track and route capacity analysis
- Traction - diesel and electric planning, operations and maintenance
- Traffic analysis
- Transport modal studies - economic criteria for national development
- Transportation planning and engineering
- Truck equipment
- Trucking operations and maintenance
- Workshops - feasibility studies, design, production planning, management, standards
- Work study and planning
- Turnkey contract management
- Equipment inspection
- Logistic planning and management
- Environmental studies
- Environmental protection technology
- Project management - critical path project control

The subject of financial, or financing services, in the context of financing a specific project or purchase program is discussed in Section 13, Marketing Considerations.

7. CANADIAN RAILWAY INDUSTRY - EQUIPMENT/MATERIALS SUPPLIERS

During 1978 a survey of Canadian consulting firms and Canadian equipment/materials suppliers active in the Canadian railway field was carried out under the sponsorship of CIDA (Canadian International Development Agency). In respect to equipment/materials suppliers the following appendices are included as part of this study:

Appendix C - Canadian Suppliers - Locomotives and Cars

Appendix D - Canadian Suppliers - Track Materials

Appendix E - Canadian Suppliers - Railway Maintenance and Equipment

Appendix F - Canadian Suppliers - Railway Signals

Appendix G - Canadian Suppliers - Railway Telecommunications

The above listings represent firms in the railway supply and manufacturing industry that are registered with CIDA; these firms supply in Canada the major items of railway equipment that might be candidate for export to a foreign country. Obviously there are many other suppliers catering to the railway market in Canada (e.g., office equipment suppliers; computer equipment suppliers). It is presumed that these latter firms, if they are pursuing the export market through CIDA, are registered in a category other than railway.

The listing in Appendix D: Track Materials, as an example, does not include firms supplying railway ties, concrete ties in particular. It is recognized that fabrication of concrete ties in Canada for export to an offshore country might be prohibitively costly. However, the Canadian

railway industry now has extensive experience both in the manufacture and use of concrete ties. Export of this expertise including the "know-how" to set up production of concrete ties in a foreign country, possibly under license, is a prospect that could be explored.

The listing of suppliers referred to does not distinguish between those representing Canadian manufacturers, and those acting as outlets for U.S. or other exporting firms marketing their products in Canada. The firms listed under "Railway Signals", for example, would come within this latter category.

The lists available, therefore, are less than complete for purposes of this overview. While not possible within the time constraints of this paper, a request could be directed to each Canadian railway for release of a print-out of all supply firms doing business with these railways, and from this an inventory listing all Canadian supply firms, the products handled, and the extent of Canadian content.

To determine the firms having manufacturing facilities in Canada, the CIDA listings have been checked against the Canadian Trade Index, Directory of Canadian Manufacturers and their products - 1979. Firms listed in this index are thus noted on the CIDA listings in Appendices C, D and E. (Appendices F and G are not thus noted.)

Section 5 of this report - "The Railway Export Market - Equipment and Supplies", discusses several general problems faced by manufacturers of

freight cars, locomotives, and track material. The following is a brief survey of the specific firms in Canada that manufacture these items.

Freight Cars

Four firms manufacture freight cars in Canada as shown below. The productive capacities of their respective plants vary depending on the type of cars being produced, the availability of component parts obtained from outside suppliers, and the diversity of orders and types of cars being processed. The production capacity figures shown are approximate, but nevertheless representative.

Canadian Manufacturers of Railway Freight Cars

Firm	Plant Location	Approximate Annual Production Capacity (Cars)	Parent Company (or other affiliation)
National Steel Car Corp., Ltd.	Hamilton, Ont.	4,000	Dominion Foundries and Steel Limited, Hamilton, Ont.
Hawker Siddeley Canada, Ltd.	Trenton, N.S.) Thunder Bay, Ont.)	3,000	Major shareholder - Hawker Siddeley Group, England - 59% foreign owned*
Marine Industries Limited	Sorel, Que.	1,500	Major shareholder - Société Générale de Financement du Québec - 86%**
Procor Limited	Oakville, Ont.	500 - 700	Trans Union Corporation, U.S.A.
Total Canadian capacity		8,000 to 10,000	

The Hawker Siddeley plant at Thunder Bay is currently occupied with the production of rail commuter cars and subway cars; an end to the backlog of orders for these types of cars is foreseen and it is understood that the plant will be converted to production of freight cars commencing late 1979.

*Financial Post - The 1979 ranking of Canada's 500 largest companies.
**Financial Post - Survey of Industrials - 1978.

In addition to the plants shown in the table above, Bombardier Inc. has a plant at LaPocatière, Que., currently engaged in the production of rail passenger equipment. This plant was built originally to produce subway cars for the Montreal "Metro" system.

Domestic demand for rail freight cars in Canada is highly cyclical. Over the past 25 years, there has been a requirement on the Canadian market for approximately 2500 new freight cars per year on average. A mildly dormant economy over the past couple years plus the cumulative impact of sophisticated car-control systems introduced by both major railways has held the levels of new orders far below this average. The depressed railway company demand in Canada, however, has been offset by continuing orders from the Canadian Wheat Board for covered hopper cars to move grain, and the entry by U.S. car buyers into the Canadian market. The result is that the Canadian car builders are now booked through to the last quarter 1980. This situation includes provision of manufacturing space for current export orders to Africa.

The U.S. car builders show almost no interest in the freight car export market. At current levels of domestic demand with orders booked into early 1981, this is understandable at the present time; once the current backlog of U.S. car orders is picked up one would expect first a cut-back in the rate of U.S. orders to Canadian firms followed by a reduction in new production in the U.S. If and when that happens, there could be a renewed interest in the export market, particularly for any large orders that might come up for competitive bids.

The export freight car business in Canada is dominated by Hawker Siddeley. They were recently awarded contracts for -

240 cars for Cameroon

104 cars for Togo

30 cars for Malawi

World export competition is intense. Several countries have their own car-building industry, some of them in low wage-cost areas. Canadian producers are liable to have difficulty on the open market, even taking into account the devalued Canadian currency. Notwithstanding the recent export orders to Hawker Siddeley, the bread-and-butter business for Canadian builders is the domestic market including the U.S.

Car builders are not in the spare parts business. A customary practice is to sell a 2-year supply of parts when a new export car is ordered. In doing this, the purchaser may find it possible to capitalize the cost of the parts under the special financing arrangements set up for the whole order and thus avoid later problems in obtaining "hard" currency for parts purchases.

Some of the constraints experienced by car producers as observed from interviews with industry representatives are as follows:

- export orders take more time and effort to negotiate and to carry out than do domestic orders and tend to be more complex.
- as much effort may be expended on pursuing a 50-car export order as a 1000-car domestic order. Export orders tend to come in small numbers.

- time lapse from initial bid on an export order through to signing a contract may extend as long as 18-months.
- engineering and production of export cars (rather than domestic cars only) require that a builder attract and hold additional skills within his organization. This means either more-highly-skilled people, or more people with specialized skills.

Locomotives

Two manufacturers are in the locomotive building business with production export designs from 1000 H.P. and up:

Canadian Manufacturers of Locomotives

Firm	Plant Location	Approximate Annual Production Capacity (Locomotives)	Parent Company (or other affiliation)
Bombardier Inc. Rail and Diesel Power Products Division	Montreal, Que.	150	Major shareholder - Les Entreprises de J. A. Bombardier, Ltée. - 69%*
General Motors of Canada Ltd. Diesel Division	London, Ont.	235	General Motors Corporation, U.S.A.

Both Canadian builders have been successful in the export business. General Motors has the advantage of affiliation with its parent company in the U.S. The Canadian subsidiary competes with its parent company for export orders.

*Financial Post - The 1979 ranking of Canada's 500 largest companies.

Bombardier, on the other hand, has an added measure of locomotive design flexibility being unattached to any U.S. builder. Bombardier uses a Canadian built diesel engine (built to an American design under license) in its locomotives.

Both locomotive builders are in the spare parts business. With the sale of an export locomotive the builder can anticipate a stream of parts orders over time, provided that the purchaser can raise the hard currency to pay for them. As with car orders it is customary to negotiate a 2-year supply of spare parts with each order for locomotives.

Both builders offer training programs and services to overseas clients, and both maintain an overseas staff of specialized service representatives to assist in dealing with maintenance and repair problems and in the ongoing problems of parts procurement.

Locomotives built in Canada and those built in the U.S. conform equally to recognize North American design standards and can be considered equivalent. Competitively, however, the consultant has been informed that the devalued Canadian dollar offers an edge for the Canadian product. Also, vis-à-vis the U.S. producers, the United States has tended to impose more extensive trade sanctions than have been in effect in Canada, thus providing an opportunity for the latter to move in, albeit, not without certain strained relations at the diplomatic level. Export of locomotives to Cuba from Canada in 1975 and 1976 is a case in point.

Appendix I lists the export locomotives orders filled by both manufacturers 1953 to year end 1978 and the current order situation.

Small export orders in the locomotive industry do not represent the same problems for the manufacturer as they do in the car building industry. As has been pointed out in Section 5 each locomotive unit tends to be a self-contained entity, each requiring specialized production attention. Manufacturers welcome small orders as well as large.

The locomotive industry in Canada shares with other manufacturers of railway equipment the problems and frustrations of protracted negotiations from initial bid through to award of a contract for an export order.

Track Material

The CIDA listing of Canadian Suppliers of Track Materials (Appendix D) shows a number of firms in this field not all of which, however, have production facilities in Canada. The principal supply sources of Canadian manufactured rail and rail fastenings is as shown below:

Company	Rail	Fastenings	Parent Company (or other affiliation)
Algoma Steel Corp'n. Sault Ste. Marie Ontario	x	x	Major shareholder - Canadian Pacific Investments, Ltd. beneficially owns 52.97% interest**.
Sydney Steel Corp'n. Sydney Nova Scotia	x	x	Cape Breton Development Corporation
Steel Company of Canada Montreal Quebec	-	x	Major shareholder - Texaco Inc., New York. 91% foreign owned*.

In addition to the above are several smaller firms producing lines of specialty products. Pandrol Canada Ltd., for example, produces the Pandrol rail fastening clip under license from Europe. Abex Industries

*Financial Post - The 1979 ranking of Canada's 500 largest companies.
**Financial Post - Survey of Industrials - 1978.

Limited in St. Catharines, Ontario, manufactures rail switches, rail frogs, switch stands, switch plates, turnouts, etc. Western Canada Steel Ltd. in Vancouver produces a line of track spikes. Woodings Canada Ltd., in Montreal, manufactures rail anchors.

Wood ties are obtained largely from Western Canada but are not considered an export item. Concrete ties, coming into increasing use in Canada, are made at three locations, Montreal, Winnipeg, and Edmonton. As discussed earlier, while the ties themselves are not candidate for export because of their bulk and weight and the cost to transport them long distances, the expertise both in use and in plant design and operation might be considered exportable.

Railway Maintenance and Equipment

Within the CIDA listing of railway maintenance and equipment suppliers (Appendix E) several of these firms produce certain products in Canada. Notation to this effect is shown on Appendix E. Of those with plants in Canada there are three having special interest at this point in the study:

a) Canron Railgroup, Toronto, Ontario

The Canron Railgroup is a part of Canron Inc., a Canadian based, widely diversified, multi-division organization with subsidiaries in the U.S.A., Australia, and Switzerland, and marketing contacts world-wide. Canron manufactures a line of rail mounted ballast tampers. They are also working on development of a high-speed tamper and have been active in the development of two new track maintenance machines, the P-811 and the RCO, as referred to further in Section 9.

b) Fairmont Railway Motors Ltd., Mississauga, Ontario

Fairmont is a subsidiary of Fairmont Railway Motors Inc., U.S.A. In Canada the firm produces a line of motor driven rail cars and hand cars.

c) Bert Pyke Ltd., Oshawa, Ontario

This firm produces a line of power switch brooms, utility and tie cranes, a tie spacer for railway track maintenance, and a ballast grader. It is understood that they are considering manufacture of the Sylvester track motor car.

Railway Signals

While the CIDA listing for this category has been included (Appendix F) essentially all signal equipment for Canadian railways is imported from the U.S.A. or elsewhere. As mentioned in Section 5, the feasibility could be explored of having selected components manufactured in Canada under a shared U.S.A./Canada production program to serve the North American and export markets.

Railway Telecommunications

Railway telecommunications is a highly specialized field having application in many areas other than railways. By agreement with the Client, the area is not pursued in this study.

Containers

World demand for shipping containers approximately doubled between 1974 and 1978. The "Containerization International Year Book - 1979" states

that at the end of 1978 there were over 2.25 million TEU (Twenty-foot Equivalent Units) of containers around the world and that well over $20 billion has been invested in the container concept. Projections for growth in container business over the next two decades are impressive and will require corresponding additions to container inventories.

Canadian National at one time owned a number of general purpose containers for use in domestic service. These have now been phased out in favour of highway semi-trailers. It is understood, however, that Canadian Pacific has ordered recently a total of 325 containers for use in Canada. The domestic market obviously is not large at the present time. The major market relates to international shipping with most of the containers owned or leased by shipping lines.

The sole Canadian manufacturer of containers listed in the above year-book is Steadman Containers Ltd., of Brampton, Ontario, with a 1977 listed production of 2500 T.E.U. By comparison, Japan is shown with nine manufacturers and 1977 production of 153,960 T.E.U.

Steadman Containers Ltd. is now owned by Interpool Limited of New York, a container leasing company. This affiliation offers valuable contacts for Steadman with owners and users of containers in international service. Steadman is currently working on an order for 1000 containers for ZIM Container Service. One other firm in the Montreal area, Alloy Manufacturing Limited, is reported to have done some custom work in the container field but on a limited scale.

8. CANADIAN RAILWAY INDUSTRY - CONSULTANTS AND TRANSPORTATION SPECIALISTS

Consulting Services and Technical Skills

The CIDA listing of consultants registered for railway work is included in this report as Appendix H but provides no indication of the types of skills available from each consulting firm, having regard to the range of skill areas referred to in Section 6. The questionnaire responses held by CIDA would provide more information but were not available for this study. So as to obtain some indication of the railway capabilities of the 89 firms registered with CIDA, the list was cross-checked with the profile sheets contained in the 1977-78 edition of "Consulting Engineers Canada". The following was the result.

Consulting firms shown on CIDA listing but not shown in "Consulting Engineers Canada" listing	- 54
Consulting firms shown both on CIDA listing and in "Consulting Engineers Canada" but for whom no profile is supplies in the latter	- 2
Consulting firms shown both on CIDA listing and in "Consulting Engineers Canada" but whose profile in the latter shows either no specific reference to railways or where the railway field does not show as one of the consultant's special fields of interest and experience	- 21
Consulting firms shown both on CIDA listing and in "Consulting Engineers Canada" and whose profile in the latter indicates specific competence in the railway field	- 12
Total consulting firms on CIDA listing	89

Of the 54 consulting firms in the "not listed" category are certain firms such as CANAC Consultants, and Canadian Pacific Consulting Services, the two leading railway consulting firms in Canada. There are special reasons why these are not listed with the Association of Consulting Engineers of Canada.

Two broad conclusions can be drawn from the above cross-check and analysis:

a) The number of consulting firms in Canada with comprehensive skills in the fields of railways, railway line construction, railway operations, railway systems design, etc., is small.

b) In addition to the comprehensive scope of railway industry skills available within the two major Canadian railways, CN and CP, which can be tapped through their respective consulting arms, there is a significant capability within the resources of the private consultants.

On any major railway project, of course, whether in Canada or overseas, and even though the two railways (CN and CP) represented the principal sources of technical staff for the project, certain specialized skills, certain levels of technical competence outside the railways would be required. Specialized geotechnical services, environmental skills, tunnel construction skills, etc., are examples of this type of extra-railway expertise.

In addition to the railway consulting skills available from Canadian consulting engineers and from the two principal Canadian railways, there are other potential sources of skills appropriate for application to international railway projects such as the following:

- Canadian Universities

  Several universities have transportation specialists on their professional teaching staffs. In addition are associated organizations such as the Canadian Institute for Guided Ground Transport at Queen's University, Kingston, and the Centre for Transportation Studies at the University of British Columbia.

- Consultants other than Consulting Engineers

  It is interesting that of the 89 consulting firms listed with CIDA, 54 firms are not shown in the "Consulting Engineers Canada" registry. There is a wide range of professional skills such as economists, planners, analysts, and managers required in a railway project but which are not included under the category of engineers.

- The Railway Supply Industry

  In a major overseas railway project undertaken by Canadian principals, it would be only reasonable to tap the extensive professional resources within the railway supply industry.

- Governments

  The Government of Canada has transportation specialists in numerous departments, many of whom have had extensive field experience in railway work. The Railway Branch of Transport Canada, the Research

and Development Centre, and the Canadian Transport Commission are cases in point. Provincial governments also have a wide range of staff specialists with training and experience in transportation work and railway work in particular.

Canadian Advantages

With the Canadian railway industry so closely a part of the North American railway industry, it is difficult to pinpoint specific quantifiable advantages that Canada might have vis-à-vis U.S. counterparts in the field of export "services".

Ideas, technical papers and words do not recognize the 48th parallel. Railway industry people move back and forth across this border without restriction. Conferences, conventions, seminars, and technical and management meetings are attended jointly by Americans and Canadians. American railways in some instances have their own successful consulting arms, as in Canada; there are organizations in both countries involved in transportation research projects. (Two Canadian organizations have been mentioned previously; in the U.S. is the prestigious Battelle Institute, also the Transportation Research Institute, Carnegie-Mellon University, to provide two examples). In place of "specificities", one is driven to broad supporting arguments to defend Canada's position as a skilled contender in the highly competitive field of international railway expertise and the ability to export it. Some of these supporting arguments are given below.

a) Both Canada's two major railways are operating currently as financially profitable transportation enterprises; they offer a high standard of competitive rail services and the capability of intermodal handling; rail/highway, rail/marine, highway/marine, container movement and piggyback.

b) The two major railways, operating under the jurisdication of the National Transportation Act of 1967 and the degree of commercially oriented freedom provided by that Act, have shown remarkable initiatives in the development and marketing of agreed charges; they have moved to streamline commercially viable operations, and wherever possible have curtailed or eliminated loss services; they have introduced custom-designed unit train services to meet the needs of industry; they have introduced major computer based information systems and have made elements of these available, where appropriate, to the shipper.

c) Canadian railways have played an aggressive role in the development of computer based simulation techniques for application to the design of single track control systems, and the development of locomotive simulators for training of engine crews.

d) Canadian railway industry research has produced or has under development a number of technical innovations, several of which have potential for exportability.

e) With one major Canadian railway under private control and the other a Crown Corporation, the industry's window on the world can look in both directions, offering services and expertise to both privately owned and state-owned railways in other countries.

f) Canada being a smaller country than the U.S., and therefore less concerned with "bigness", the Canadian railway industry is better able to recognize and respond to the widely varying requirements of the foreign railway market.

g) Canada has its own railway manufacturing industry with full access to developments in the United States. The skills within the manufacturing industry, plus those available within the railways, and coupled with the research capabilities of Canada's universities and Federal organizations such as the National Research Council makes it possible for Canada to offer a comprehensive range of technical and consultative services to a foreign railroad.

9. CANADIAN CONTENT IN RAILWAY INDUSTRY PRODUCTS

Freight Cars

Freight cars built in Canada for export have a Canadian content ranging from about 80% to over 90% depending on the type of car, the size of the order, and the client. Some of the imported items used represent components for which the Canadian demand (including export) does not warrant setting up domestic production. Metal hatch covers for covered hopper cars, for example, require stamping machinery of a size not available in Canada.

Locomotives

Both Bombardier Inc. and General Motors fabricate the frames and shells for their respective locomotives.

Diesel engines for the Bombardier locomotive units are made in Canada under license from U.S. interests. The Bombardier diesel engine is the earlier ALCO engine which has been progressively updated to accommodate periodic technical improvements.

Electrical gear for Bombardier units is made in Canada by Canadian General Electric.

Truck castings, wheels, axles, couplers are made in Canada. The overall Canadian content in a Bombardier diesel locomotive unit is about 85% to 90% with fluctuations depending on conditions at the time of manufacture and the equipment ordered by the client.

General Motors import their engines and electrical traction gear from the U.S., the result being a somewhat lower Canadian content compared to Bombardier, or about 65% to 70%.

Track Materials

Rail produced in Canada is 100% Canadian content as is the bulk of items like tie plates, spikes, joint bars, track bolts, etc. Certain patented items are manufactured under license such as Pandrol clips, a device for fastening steel rail to concrete ties.

Other - Present and Potential

The Canadian railway industry including railway design and research facilities have produced a number of new products, or are in the process of developing them. Some examples are tabulated below:

a) CN's weigh-in-motion electronic freight car scales*. Manufacturing rights are held by Ramsey Engineering Co., Toronto, Ontario.

b) The Teoli "bathtub" hopper car designed originally for bulk coal movement is manufactured in the U.S. under license to The Youngstown Steel Door Co., U.S.A. CP Rail is using this design in the movement of coal from interior British Columbia to the Roberts Bank trans-shipment facilities.

c) Canadian firms are actively involved in the development of a "steerable" truck for use on freight cars, with a possible ultimate application to locomotives. The widespread use of steerable truck holds out

*CN Rail Research has developed a number of railway application specialty items.

promise of several benefits to the railways, such as reduced wheel wear, reduced rail wear, reduced risk of derailment and improved ride qualities for rolling stock.

d) A Vancouver firm, Glenayre Electronics, Ltd. is working on the development of a train movement electronic control device known as the Location, Identification and Control (LIC) system. If Glenayre is successful in bringing the concept to the point of practical proven application, there could be an export demand for the device. The system would provide a method of train movement control far more flexible than present train order control and probably less costly than a minimum system of centralized traffic control.

e) CN has developed an improved system of locomotive wheel slip control known as "positraction" with claims for an improvement in overall adhesion performance. The marketing rights for this device have been placed with the Vapor Corporation.

f) Working closely with the Canron Railgroup, and starting from an earlier European design, Canadian track engineers have produced a sophisticated design of track maintenance machines to further expedite the process of rail and tie changeout. Known as the P-811 for use with concrete ties and the RCO (for rail changeout machine) on wood ties, the equipment is now in commercial production.

g) Canron, with support from the Federal government, is working on development of a Canadian design high-speed ballast tamper. The new tamper, if development work is successful, could tamp at a rate of one to two miles per hour, several times the speed of existing tampers.

h) The Canadian Railway Locomotive Project Advisory Committee with representation from the Department of Industry, Trade and Commerce, Transport Canada, Transport Canada Research and Development Centre, National Research Council, Canadian Institute of Guided Ground Transport and the two major Canadian railways, CN and CP, is currently working on development of a high technology diesel electric locomotive. Such a product is only in the initial stages of conceptual development, but the program reflects the advanced thinking within the Canadian railway industry.

The above items are cited as examples of Canadian technology initiatives at work in the Canadian railway industry. Even with product development being handled in Canada, however, there is no guarantee of long run Canadian manufacture, having regard for the very large domestic market in the U.S.

Discussions with representatives of Canadian car and locomotive builders have not uncovered any indication that Canadian content requirements on Government funded exports have inhibited the export activities of these manufacturing firms.

10. SPECIALIZED EXPERTISE WITHIN CANADIAN RAILWAY INDUSTRY

What can and does the Canadian railway industry do "best"? The items touched on in this section are those arising out of interviews with senior representatives of the railways, the railway equipment manufacturers, and other transportation specialists:

a) Heavy/long train operations -

Canadian railways are in the forefront of North America bulk commodity haul by rail. Examples are export potash movements from Saskatchewan to Vancouver; coal movements Revelstoke to Vancouver; tank car unit train operation hauling oil Montreal to Kincardine, Ontario; use of mid-train slave power in mountainous terrain to permit long train operation on heavy grades.

b) Track upgrading with concrete ties -

There are now more concrete ties in place on Canadian railroads than on any other railroad in North America. Canadian cement producers have acquired the needed expertise in concrete tie production and are in position to extend that expertise outside Canada.

c) Design and application of computer based car-control systems -

Canadian railways are now reaping the benefits of their sophisticated car control systems. Where traffic increases in recent months and prospects for continued growth would previously have triggered

pressures for substantial purchases of new freight car equipment, railroads are finding that the additional traffic can be handled with the existing freight car fleet.

d) Intermodal handling and rail movement of containers -
Canada's close commercial ties with Europe, its geographical setting with major ports serving ocean shipping on both the Atlantic and Pacific coasts, and its role in developing trade with Pacific Rim countries, has given rise to an advanced capability in ocean-rail-highway container movement.

e) Cold weather railway operations -
With Canada's northern frontiers extending into the high Arctic, and with Canadian railroads now operating into the sub-Arctic, there has emerged a wealth of experience in extreme cold weather operations, snow handling, and line construction in permafrost territory. Obviously this is of little or no concern to a typical "third world" developing country, but it could be an advantage in fostering trade with countries such as Russia and China, or in the event of further railway development in Alaska.

f) Manufacture of locomotives and freight cars -
Locomotives and freight cars manufactured in Canada incorporate the latest in North American technology and have proven reliable in foreign service.

g) Environmental protection -

A wide range of studies dealing with possible construction of railways and pipelines into Canada's north have brought with them a sensitivity to the environmental risks associated with such development. While not considered an integral part of the railway industry, Canada has extensive environmental expertise to offer where railway projects for other countries are being considered. An example of this expertise in the railway context can be found in the Arctic Railway Study carried out by Canalog and Canadian Pacific Consulting Services in 1972-73.

h) Government-Industry relationships -

While not normally considered part of the railway industry, the input of government to the well-being of the railway industry in Canada has become a major factor. The railways in Canada have always been more than a tool of commerce; they have also served a political and social role in making Canada a nation. The Government of Canada has followed a prudent course in seeking to balance perceived regional and national socio-economic needs relating to transportation against the principle of allowing the Canadian railroads to compete commercially in an open market. The balance between these often contending forces is presently built into the National Transportation Act of 1967. Other countries might find in the Canadian situation a model after which to pattern their own transportation regulatory and financial framework.

i) Management Expertise -

Historically, the railways in Canada have tended to be marked by an image of conservatism, inflexibility and resistance to change; they have been accused of being arrogant, monopolistic and over-staffed. A review of developments over the past 25 years, however, involving wide-ranging technological changes such as -

- conversion from steam to diesel locomotives
- upgrading of main line track to accommodate traffic growth
- application of centralized traffic control to major portions of main line
- design and construction of modern major marshalling yards
- introduction of computer technology, development of car-control systems, information systems and simulation techniques

has shown railway management highly receptive to new ideas, new techniques, new equipment, and willing to invest heavily where these changes will pay off in reduced operating costs, a competitive advantage, or both.

This period of technological change has been accompanied by many other impacting changes such as the construction of new highways and the resulting severe competition from the trucking industry. Social changes have given rise to expanded employee expectations and inflation has cut the value of the Canadian dollar to a fraction of its worth in the early 1950s. CN, for one, has reduced its staff from a high of 131,000 in 1952 to less than 80,000 in

1978, a reduction of some 40%, but in the same period has accommodated a 92% rise in the level of revenue ton miles generated. Out of all this change the railways have emerged as a respected force in the Canadian economy, both major railways are in a profit position, and employee morale is high with average salary levels competitive with industry generally.

While recognizing that many factors have entered into the foregoing developments including the positive climate provided by governments, the present level of success is a tribute to the aggressive management style within the industry over the past two decades. Given the number of managerial level staff in the two national railways, their geographical and operational scope, and the past pattern of exposing senior staff to a range of management responsibilities, one might expect an exportable component that could be worked into the overall staff advancement programs. This has been done in measure through the operation of CNs and CPs respective consulting arms.

11. TURNKEY PROJECTS AND CONSTRUCTION CONTRACTS

No example has been found during the course of this study where a Canadian firm or Canadian consortium has been awarded an overseas railway contract covering all aspects of route location, engineering design, transportation studies, equipment supply and through to physical construction of the line, and to turn over the completed facility to the designated operating authority - a so-called turnkey project. To the contrary, railway projects, as with other large construction projects, tend to follow a pattern of sequential steps such as feasibility studies, economic studies, preliminary design studies, review studies, social impact studies, engineering design, design review, leading eventually to the preparation of design specifications and the calling for tenders. The complete process can extend over a long period of time with intervals between successive steps during which interested parties submit the findings to close scrutiny before deciding to proceed further. Also, several specialist consulting firms may be involved throughout the process, there being no guarantee that the party handling the initial studies will participate in later studies or in the eventual construction.

In many cases, a foreign country has within its boundaries an active construction industry able to undertake the construction phase of a new or upgraded railway line. There could be a need for special assistance in project management, there could be a need for special technical assistance, there could be a need to acquire additional machinery or new earthmoving equipment, but the basic competence and resources are available. Most governments, in fact, would likely insist that maximum possible use be made of the local construction industry.

In cases where the client country does not have an independent construction industry, there exists in Canada engineering construction firms with experience in international work, who will contract to carry out a construction project in a foreign country. Such firms will seek out local contacts, sign up whatever needed services are available locally, arrange for supply and shipment of vehicles, machines, supplies, materials, fuels, etc., and engage workers from the local labour market. They will send in the necessary supervisory force and field management team, arrange for necessary housing, and establish communications lines to home base. One such firm in Canada is LORAM, based in Calgary.

Where several options are open to a client concerning the contracting for railway construction work, he will likely want to call for tenders. To do this, he may rely on the same consultant he engaged to carry out the project design and use him also to provide the overall project management.

A major obstacle to prime involvement by Canadian contracting or project management firms in overseas construction projects is the liability aspects on a construction project. On the Venezuelan railway design and construction project being developed currently through Canaven, a wholly-owned CN subsidiary, it is understood that the original negotiations were initiated by CANAC Consultants and Canadian Pacific Consulting Services. At one stage the consultants found it necessary to remove themselves from any implication of financial responsibility on the project;

negotiations subsequently were elevated to the level of government-to-government contacts. Another development in this project is that the local construction industry in Venezuela has put together an association of contractors to participate in the project and who will provide the necessary performance guarantees covering the construction phase of the contract. This association of contractors is now a member of the three-party consortium preparing to handle the project.

Some of the problem areas to be faced by a contracting firm contemplating tendering on a construction project in a foreign country are as follows:

a) required knowledge of local language by management and supervisory staff;

b) required knowledge of local laws, regulations, established building practices, local customs, hiring practices;

c) required understanding of local culture, local social norms, local attitudes to outsiders;

d) essential knowledge of availability of suitable building materials (e.g. - aggregate for cement, timber for cribbing, etc.);

e) required knowledge of the local work force, of normal manpower work productivity and knowledge of the local pay scale;

f) required knowledge of local taxation system, local levies, road tolls, port commissions;

g) knowledge of insurance requirements, local financing requirements, local currency requirements, and necessary legal arrangements in respect to contract liability.

It should be noted that information on most of the foregoing items, if not all, must be at hand before the contracting firm can prepare his cost estimates and respond to the request for tender.

There is therefore a wide range of possibilities to be faced depending on the size of the country involved and the construction capabilities available. It is understood that certain European firms specialize in this type of international construction work and will undertake contract work either as part of a consortium or under sub-contract.

Consortia

The term "consortium"-used in its broadest sense, denotes an affiliation of two or more firms to join in the carrying out of a specific project or to participate in an ongoing program. The term is commonly applied in the consulting field to consulting firms that agree to submit a joint proposal covering a project opportunity and who, if awarded the contract, carry through in its execution.

Canalog and Canadian Pacific Consulting Services have frequently joined in such an arrangement for the conduct of a study project, one of the prime benefits being the capability of selecting specialist personnel from a wider resource base and thus achieving a better match between the project on the one hand, and the people to run it on the other.

Messrs. K. C. Dhawan and Lawrence Kryzanowski of Concordia University, in their book, "Export Consortia, A Canadian Study", discuss the record of some 24 consortia which they have been able to identify. Overall, the success rate of the Canadian-based consortia examined was not high and some have lapsed into disuse.

In the construction field, consortia can serve the purpose of distributing risk. In certain circumstances they represent a melding of political interests so as to facilitate getting the job done.

In brief, the consortia approach, whether set up as a formal organization, or operated under less rigid terms of reference, can be used as a marketing tool in the pursuit of off-shore projects.

12. CONSTRAINTS, IMPEDIMENTS AND PROBLEMS ENCOUNTERED IN INDUSTRY DEALING WITH OTHER COUNTRIES

Throughout this report there are various comments concerning the problems faced by consultants and manufacturers in attempting to sell their product or products on the export market. In this section an effort is made to bring these together and, in addition, to include specific problem areas not mentioned previously. There is no particular significance to the order in which the following items are listed.

12.1 Manufacturers geared to serve the domestic market must ensure that export operations do not jeopardize the security of their principal business. Domestic orders are prospective repeat orders. Export orders may not be. This reasoning can dampen the enthusiasm for promotion of export business.

12.2 Export orders may be small by comparison with domestic orders to the home market. North American manufacturing industry operates most efficiently at high volume production levels. Disproportionate inputs of plant set-up time, engineering time, management and supervisory time, are likely required for an export order compared to a large domestic order.

12.3 Export orders have a certain "nuisance cost" representing development time, use of non-standard components specified by the client, travel time and expenses involved in contract negotiations.

12.4 Responding to a bidding request from a foreign country may only serve to show the client how much he would save or how much more it would cost compared to purchase of the equivalent domestic product. A "shadow" bid of this nature consumes staff time and other expenses on the part of the Canadian bidder with no real prospect of success.

12.5 In the domestic environment, a company knows the market for its product and knows the competition. He knows he is competing against firms whose costs for various purchased parts and components will be roughly comparable to his own, wage rates will be generally similar. In the export context, the supplier is dealing with many more unknowns, a large number of firms may be competing, and there may be hidden "deals" afoot.

12.6 Materials and equipment for domestic use are produced in conformity to North American standards. A bid for export work must either conform to the standards applicable to the export country or the bidder can request permission to quote on the domestic standard approximating the export standard. In either case he is at a disadvantage; to conform requires additional cost, to not conform risks a non-acceptable bid. An example of this is rail where a wide range of standards apply outside of North America.

12.7 Manufacturing for export requires the input of specialist skills geared to the specification requirements of the ordering country. These skills must either be obtained by hiring the appropriate additional staff, or existing staff must be more highly skilled.

12.8 Negotiation of export contracts is more complex than domestic contracts and requires input of more time and effort. Negotiations may extend over very long periods of time. For example, the submission of proposals and subsequent negotiations relating to the anticipated major railway development project in Venezuela under Canaven Ltd. extend back to 1976.

12.9 Export of major equipment (e.g. cars and locomotives) may require provision of maintenance assistance over a period of time following delivery. This may also involve the provision of training assistance, both in Canada and locally.

12.10 Success of an export product and hence the prospects for future new orders depends in large measure on a reliable source of field service advice and information. This may call for a permanent field representative who may then have to cover a widely scattered territory involving several countries.

12.11 Field servicing of major export equipment (particularly locomotives) requires the continuing availability of spare parts. Initial equipment orders usually include a 2-year supply of parts. Even with this provision, critical parts may become in short supply, locomotives are held out of service, others are cannibalized for parts, and the manufacturer is criticized for an unrealiable product.

12.12 Canada along with other Western countries has joined periodically in trade restrictions or trade embargoes against other countries for a

variety of reasons. While the political issues (or in some cases moral issues) may be clear, the decision to participate in such restrictions requires a suppression of straight commercial interests. It is the exporter/manufacturer who takes the front line brunt of such decisions.

12.13 Cultural, social and economic differences between Canada and developing countries must be considered and weighed carefully in the conduct of consulting studies. A country where the average per capita annual earnings are only a few hundred dollars may not be interested in the latest labour saving techniques. On the other hand, in order to accomplish certain work, use of heavy machinery or specialized equipment may be essential.

12.14 Canadian exporters and consultants in the railway field may be called on to solicit, organize, initiate or coordinate financing for a particular project as part of a packaged proposal. Such financing may be available through government agencies such as CIDA, or the EDC (Export Development Corporation) or may be sought from private sources. The requirement to arrange export financing represents an added dimension in a proposal compared to a conventional domestic proposal and involves additional time, effort and special skills.

13. MARKETING CONSIDERATIONS

This section is designed to present several factors that impact on the marketing process - it is not presented as a discussion of the marketing process per se.

A Canadian manufacturer or consultant bent on serving the export market will encounter, in most instances, intense competition. There are no known elements of the Canadian railway industry that represent an absolute monopoly on the world market. Competitiveness in respect to manufactured goods may involve several factors such as:

- nature of the product
- quality of the product
- availability/delivery time
- supporting field organization
- supply line for spare parts
- access to training services
- delivered cost of the product
- availability of financing
- professional calibre and local acceptance of manufacturer's representatives.

A parallel list for consulting services and specialist expertise would include the following:

- type of services offered
- professional calibre of technical and managerial staff
- ability to recruit supplementary staff
- competence in the language of the client and his ability to communicate with the client
- availability of senior staff representatives to discuss with client project requirements
- awareness of local conditions, local customs, local attitudes, local sensitivities
- availability of financing
- cost of services

Assuming ongoing commercial relationships with their respective clients, both manufacturers and consultants will establish a reputation on the basis of the product or products they market, whether good or bad, which will determine in large part their competitiveness on future projects.

Several of the elements listed above are discussed herewith. The sequence is not structured and each element referred to may have application to a manufacturer and his products, to a consultant and his professional services, or to both.

Language, Culture, Background

Obviously a minimum level of fluency in the client's language is essential. Even where English or French may be the local language of commerce, a knowledge of the national language represents a plus. Total communication, however, involves an awareness of local customs, of the style of outward reaction to various emotions, of sensitivities that could give rise to offense; total communication is a meeting of the minds, a compatibility of thought.

Canadians, generally, appear to be well liked and well received in foreign countries. On a per capita basis, Canadians travel extensively abroad. The bilingual reputation that Canada has is a plus, even where the representative may have no knowledge of the national language. Canada is perceived as a nation having no imperialistic or political designs in its commercial outreach. Experience suggests that Canadians, more so than Europeans, are genuinely committed to the principle of completing a

foreign assignment or project, leaving ongoing control and management in the hands of trained nationals, as opposed to the practice of continuing involvement. The thinking of some developing countries that Canada is a country of perpetual snow and ice is gradually being corrected by the working presence of Canadians in those countries.

Calibre of Personnel

While Canada has no monopoly on technical and professional expertise in the railway field, Canadian railways are held in high esteem in other countries for their progressive and innovative policies. Canada as a nation is dependent on transportation, as one major factor, to hold it together. The capability to draw on the staff resources of two very large transcontinental railway systems involving not only rail transport but air, marine, and highway as well, makes it possible for Canada to offer to foreign clients a high competence in technical, managerial and professional skills covering all aspects of railway and intermodal transportation systems.

The Canadian Product

The Canadian product in the railway field is the North American product. The North American product geared to North American technology is in growing demand. Canada offers a high quality product in locomotives, cars, track materials and technical and professional skills for export to other countries; the product is essentially North American - we are in direct competition with our United States counterparts. On the

other hand, Europeans and to some extent Asians as well, are geared to their own technology of light weight, high technology, passenger oriented operations on track and roadbed maintained to high standards. The North American technology offers railway equipment of rugged design that can operate satisfactorily and with high reliability on track built and maintained to less than the highest standards.

Where a country requires a heavy traffic, high tonnage, bulk haul operation, North American technology is a plus; Canada can offer that type of system - both equipment and design.

At present levels of domestic demand the Canadian car and locomotive building industry is dependent on the export market for survival. Certain firms have developed special expertise in dealing with foreign countries. In some situations, Canadian firms can offer better delivery times on equipment than their U.S. counterparts.

Availability of Staff

While the two major railways in Canada represent a large resource of proven manpower skills which can be tapped for export consulting projects, the resource is not unlimited. Thus far, Canadian consulting firms have been able to recruit appropriate staff for export projects but not without some sign of stress. In this respect, the Canadian situation is viewed as more favourable than in the U.S. where the consulting industry has a much larger share of the export market but must recruit from generally smaller and more diverse sources.

For a recently launched project in Nigeria a total of 400 technical staff and railway specialists were recruited from India. Not only would this recruitment scale heavily stress the available supply of qualified staff in Canada, there is evidence from ongoing recruitment experience that Canadian personnel show a reluctance to accept long term offshore assignments.

The supply of a staff of 400 as noted above is interpreted to reflect the project planning philosophy of a consulting group that has access to almost unlimited staff resources within their own country. The Canadian plan for the same project would have involved a much smaller staff from Canada.

Follow-up Servicing

Primarily applicable to marketing of locomotives, a product's reputation is affected by the quality of field servicing that is made available by the manufacturer both during and following expiry of the warranty period. Clearly, the number of field staff assigned by the manufacturer must be supported by the amount of business he receives, either in spare parts or new equipment. As more and more Canadian built locomotives are supplied to offshore countries, it should be possible to upgrade the level of field services to the user. Both Bombardier Inc. and General Motors have their own representatives in the field and, in addition, make extensive use of local agencies. General Motors Diesel is in position to share the support of the field servicing organization maintained by their U.S. principals.

Existing telephone and telex communication between developing countries and North America varies from satisfactory to poor. However, with facilities being constantly upgraded, the possibility arises of a "hot line"* direct dial service to a home office technical centre, staffed to advertised hours, and equipped with telephone, telex and facsimile. A foreign user with this service would always have direct access to the best possible technical advice. The demand for this type of service would have to be explored along with the technical and cost aspects involved, and to be feasible, probably would have to extend to the widest possible range of Canadian products.

Spare Parts

The non-availability of spare parts for foreign users of locomotives and other heavy equipment can be a major problem and can reflect adversely on the manufacturer's reputation. Were it simply a matter of transportation and distribution, the problems could be dealt with. However, there is the total span of problems ranging from initial ordering paper work in the field, local authorization, communication problems, inventory position at home plant, delays in handling, documentation, processing through customs, establishing handling priority at delivery port and ultimate delivery to the client's shop. In addition, the client may have problems raising payment funds in hard currency.

The concept of a central clearing house* in Canada to expedite the ordering and delivery of spare parts from Canadian suppliers has been broached. Such an organization could serve a range of Canadian suppliers on a

*The concept of a central clearing house as discussed above, and the idea of a technical and spare parts "hot line" have been received somewhat skeptically in the course of interviews with certain industry representatives. The concepts are put forward here as essentially "think-tank" ideas for possible further consideration.

commission basis, could carry an inventory itself of certain high demand items, and could arrange to hold certain critical items at appropriate overseas points in anticipation of a need from any one of several countries. The concept could also be expanded to provide certain technical services, particularly if tied in to the suggested "hot line" referred to earlier. The organization might also be used to facilitate financing, particularly if operated under a government guarantee. The concept is viewed as similar to the operation of "Crown Agents" in Britain as an example.

Training

The availability of training programs offered by Canadian suppliers and others appears to be an established item in the exporter's "bag" of marketing tools. While the railway industry in Canada can offer an excellent range of training programs and skills, the Europeans also are well equipped and can point to their past record of having set up training schools in their colonial wards. The railway training school in Nairobi, Kenya, is an example of the programs and facilities developed in a previous era.

There is a view held by some that the best training procedure is to bring selected nationals from client countries to Canada and the U.S. where they can be processed through existing training facilities and can be exposed, in the case of locomotive maintenance staffs, to the manufacturing operation. There is always the possible concern on the part of the client, of course, that in sending a man to Canada for training, he might decide not to come back. There is clearly a role

both for the periodic training of selected foreign specialists in Canada in existing training schools, and for local training of nationals on an ongoing basis.

As one example of Canadian expertise in the training of train and engine crews, CN has been operating a training school at Gimli, Manitoba, complete with the latest in locomotive simulators.

Cost of Goods and Services

As an overview study there has not been time to pursue in detail and on a representative scale the question of comparative costs of Canadian goods and services laid down in overseas countries. The general picture obtained from knowledgeable experts working in this field, however, is that costs for Canadian produced goods are competitive vis-à-vis equivalent U.S. goods, as are also the costs of Canadian technical services. Compared to European sources, Canadian goods and services tend to be less costly. It was also pointed out, however, that a critical factor in this is the devalued Canadian dollar. Were the Canadian dollar at par with the U.S. dollar, Canadian exporters could find their products priced too high on the international market.

Other countries such as Korea and India manufacture railway equipment. The Canadian railway industry would likely have difficulty competing against these areas of relatively low labour costs. In some instances, Canadian manufacturers have licensing arrangements in other countries. An example is Bombardier Inc. locomotives produced in India. Japan is

heavily into the manufacture of railway equipment for export. With their integrated approach involving government, labour and industry and offering major diversified manufacturing capabilities, they represent a powerful competitive force in the international railway supply market.

Financing

The supply of goods and services to offshore countries frequently involves the need for financing arrangements. Within Canada, there is the Canadian International Development Agency (CIDA) which was set up to offer Canadian aid to other countries both in terms of technical and developmental services, also in terms of extending financial grants or low interest long term loans to support special projects in these countries, using, of course, Canadian technical personnel as far as possible. Operating on an essentially commercial basis is the Export Development Corporation (EDC) which borrows funds from available sources and channels these into export projects having a high content of Canadian labour and materials. The Canadian railway industry has benefitted from the services of both these organizations.

There is also available to exporters of goods and services the financing offered by private banks.

Where a Canadian supplier or consultant finds it necessary to act in the capacity of a financial broker he may find that with three possible sources to approach there is no financial focus to guide him. The Canadian supplier may find himself in competition with a European supplier

who has coordinated support from his own government which in turn is ready to make special "package" arrangements. Furthermore, the Canadian finds himself with no middle ground between a CIDA type loan and a commercial type loan.

This absence of a middle ground in financing suggests the need for a "third window", as one interviewed party has put it. The problem may not be simple, recognizing the commitments that Canada shares with other countries on international trade practices and guidelines. The problem surfaces, however, as an important issue, and calls possibly for the services of a coordinating agency that will bridge the two extremes and provide the needed financial focus.

A further concern expressed was the time element in obtaining a decision on availability and terms of government funding. Where financing is arranged from private banks, these decisions are given promptly.

The comments offered above should not be construed in any way as criticisms of the two government agencies involved. To the contrary, those interviewed spoke highly of the services offered by both. Furthermore, there emerged the view that Canadian firms active in the export markets are better off in respect to financing services than their counterparts in the U.S.

While there have been certain offshore railway studies carried out by Canadian consultants supported by World Bank funds, equipment suppliers expressed disappointment at their lack of success in bidding on World Bank contracts.

Government Services

Comments on the services offered to exporters by the Government of Canada in respect to passports, trade information, contacts, communications, field data, etc., both in Canada and abroad were generally very favourable. It was felt that the government does an excellent job in lining up trade missions, in giving foreign specialists exposure to Canadian capabilities. Some of the constructive suggestions noted are as follows:

- Automatic posting of trade officers gives rise to a loss of continuity in foreign dealings. Overlapping terms of incoming and outgoing officers would be beneficial.

- The Canadian presence in foreign countries could give more emphasis to trade representatives.

- More activity in sponsoring trade missions would be welcome.

Agents

In recent years there has been widespread publicity concerning alleged questionable dealings between Canadian firms (and others) and agents and representatives of other countries. In December 1976, the Honourable Robert Andras, then President of the Treasury Board, issued a statement entitled - "Government Policy and Guidelines Concerning the Commercial Practices of Crown Corporations".

While the above guidelines are binding on government departments and on Crown Corporations, their influence extends into the private sectors from the aspects of desired demonstration of responsible and ethical business behaviour, the likely impact of public opinion resulting from any possible future revelation of impropriety, and the involvement of government in many export operations generated by the private sector. Private firms in Canada that are listed with the U.S. Securities and Exchange Commission must abide by certain requirements in respect to payment of agent commissions as a condition of such listing.

There are thus certain imposed requirements in this area both for Crown Corporations and for private firms listed in the U.S. as above. For private firms in Canada not listed with the U.S. Securities and Exchange Commission, there is the risk of adverse publicity for any alleged "wrong-doing" in export dealings.

The term "agent" in the above context has taken on an unfortunate connotation. The fact is that many firms have had long established business relationships with foreign agents and agencies. Such relationships are tied to recognized commercial arrangements such as payment of a negotiated fee for specific services, or a negotiated commission on sales of the manufacturer's products handled by the agent. These commercial arrangements are entirely normal and in many cases enable the manufacturer to market his product in countries where the volume of business would not warrant setting up his own sales and service organization.

14. POSSIBLE STEPS TO ENHANCE COMPETITIVE POSITION OF CANADIAN RAILWAY INDUSTRY IN THE INTERNATIONAL MARKET

The following action-oriented ideas arising out of this overview study represent steps that might be explored or direction indicators that might be pursued with the objective of enhancing the competitive position of the Canadian railway industry in the international market. The term "ideas" has been chosen with intent, since each constitutes only the possible seed of an ultimate specific proposal or recommended action. There is no intended priority attached to the sequence of the "ideas" presented herewith:

14.1 Review the range of essential railway systems high technology components with a view to a limited selection where Canada might participate in their manufacture (along with U.S. manufacturers) as part of a negotiated shared supply of the North American and the export market. Signalling equipment is one area that might be examined.

14.2 Review with industry representatives specific areas in the manufacture of locomotives and cars where Canadian suppliers of parts and components might specialize as participants in an overall North American production strategy. Electrical equipment, truck castings, control systems (e.g. positraction) components for steerable trucks, are suggested candidates for consideration.

14.3 Review present technical developments and assess long term market potential for each - make selection of specific development items to be candidates for special research and development assistance.

14.4 Review present trade mission programs. Assess value of expanded program in the field of railway rolling stock, track materials and track maintenance equipment (e.g. the P-811 track rebuilding machine being built by Canron).

14.5 Review existing staff assignments in selected key foreign countries to ensure adequate balance between diplomatic services and trade emphasis with particular reference to the potential railway equipment market.

14.6 Review existing practices in regard to postings of trade officers on foreign assignments; consider greater overlap between incoming and outgoing postings.

14.7 Examine present Government funding practices with objective of providing desired "project focus" (as opposed to "program focus"). Explore the indicated need for "third window" financing arrangements bridging the respective CIDA and EDC philosophies; explore the implications of such bridging arrangements.

14.8 Review present trade strategies to ensure high priority being given to promotion of Canadian railway consulting services abroad - the principle being that a high quality consulting project can be the opening for subsequent direct promotion of Canadian produced railway equipment and supplies.

14.9 Consider the possible need, desirability implications, complications, timeliness and general feasibility of the "clearing house" concept to provide foreign buyers a one-window centre for ordering railway oriented goods and spare parts. Coupled with this is the concept of a "hot line" service for spare parts ordering and for technical maintenance assistance.

15. SUMMARY OF FINDINGS

15.1 Canadian manufacturers produce in Canada a wide range of railway oriented products for which there exists a competitive export demand. Of special interest in this context are railway locomotives, railway freight cars and track materials. Other items include containers, transportable buildings and some track maintenance equipment.

15.2 Canadian railway consultants and transportation specialists offer a wide range of specialist skills and experience that can be brought together for the carrying out of railway oriented studies and systems design projects in foreign countries.

15.3 The capability is available within Canada to study, plan, design, organize, build and equip a complete railway system in a foreign country on a turnkey basis. Canadian experience in railway turnkey projects in foreign countries is limited.

15.4 The international market for railway equipment and consulting services is massive but competition is intense, frequently involving government-backed organizations and consortia. Certain countries with indigenous equipment manufacturing facilities and a strong railway industry may virtually exclude outside competition.

15.5 The Canadian railway industry, both in respect to exportable goods and services, is generally competitive with the U.S. counterparts; the present discount on the Canadian dollar appears to generate a modest

cost advantage in Canada's favour. Canadian equipment suppliers and Canadian railway consultants are meeting with some success in capturing a share of the international railway industry market.

15.6 The Canadian and the U.S. railway industries are committed to North American technology. In this context, Canadian and U.S. railway products (cars, locomotives, track materials, etc.) are generally equivalent. North American railway technology is in demand in foreign countries, especially where there is need for heavy haul, high tonnage, and bulk commodity handling.

15.7 The export market for railway equipment outside North America entails a variety of standards, track gauges and special requirements. Pursuit of this market requires the input of special skills, a competence and willingness to work through the complexities and delays of foreign contracting negotiations. The size of individual orders for equipment is small compared to domestic demand.

15.8 The Canadian railway industry has initiated several technological developments having commercial application in the railway field. A number of these are yet in the research and development stage but hold promise for future application. Because of the prospects for a larger market in the U.S. than in Canada, there is no guarantee that a successful product developed in Canada will be manufactured in Canada.

15.9 The United States represents a massive market for railway equipment. Current heavy demand for freight cars in the U.S. is being reflected in orders to Canadian car builders. With both countries committed to North American technology and standards, all possible efforts should be made for the Canadian railway industry to capture a share of the U.S. market.

15.10 Canadian content of railway equipment produced in Canada emerges broadly as follows:

Freight cars	80% to 90% plus
Locomotives	65% to 90% plus
Track materials	near 100%

Canadian content requirements on Government funded export projects do not appear to inhibit in any way the capability of Canadian manufacturers to operate in the international market.

15.11 Canadian Government financing through CIDA is geared to the philosophy of aid grants and long term low interest loans. Financing through the EDC is commercially oriented with the objective to facilitate the export of Canadian goods and services. Private financial sources are motivated by commercial interest. There is evidence of a need for a financing capability that bridges these two extremes.

15.12 Russia and China both operate large railway systems; both have indigenous manufacturing capabilities; both appear interested in technical exchanges with the North American railway industry; there is no known current indication of interest on their part in any major purchases of North American railway equipment.

15.13 Canadians are well received in foreign countries. Canada abroad is perceived as being unaligned and without imperialistic aims. The bilingual nature of Canada is considered an asset in dealing with foreign countries.

APPENDICES

Proposal for

A study to provide a broad overview of Canadian railway manufacturing and marketing capability

Prepared for: The Department of Regional Economic Expansion, and Transport Canada

By: Canalog Logistics Limited
Montreal, Quebec

25 April 1979

CANADIAN RAILWAY MANUFACTURING AND MARKETING CAPABILITY STUDY

Proposal for a study to provide a broad overview of Canadian Railway Manufacturing and Marketing Capability.

1. INTRODUCTION

The Department of Regional Economic Expansion and Transport Canada desire to have a study to provide a broad and comprehensive overview of the Canadian industry potential to market turnkey railway projects and/or Canadian project management in non-specified developing countries.

This study will include the preparation of a matrix which will facilitate the identification of areas where the Canadian industry has advantages or disadvantages over the United States railway industry.

2. OBJECTIVE

The objective of this study is to identify experience and capacity of the industry to respond to potential markets overseas in the immediate or near future. The capabilities of Canadian project management and turnkey contracting in this field will also be noted.

3. SCOPE

This study is intended to provide an overview of the export potential of the Canadian industries involved in railway systems over a very broad range. Therefore, the scope of study ranges from Canadian industry's

capabilities in project management and contracting through design, construction, start-up and operation on the one hand and includes an industry's capabilities in route selection, equipment, rolling stock, switching and signalling equipment, and system control technology. Information with respect to environmental protection technology and organizational aspects (e.g. Crown Corporation operation) in which Canada is a leader should also be included.

Case histories, to the extent that they are available and relevant, of previous Canadian involvement in off-shore railway construction and operation will be part of the study.

4. TASKS

4.1 Outline what advantages (selling points) a Canadian company or consortium would have in selling complete railway systems or components thereof abroad.

4.2 Provide a listing of companies which supply railway system design, engineering, construction, equipment, operation and management with special emphasis on those systems or industries in which Canada would have a particular technological or cost competitive advantage especially vis-à-vis the U.S. when serving an international market in developing countries.

4.3 Identify the impediments to producing a proposal with total Canadian content, i.e., which elements of the railway supply industry are missing or inadequate in Canada.

4.4 Identify possible typical constraints to a totally Canadian proposal, e.g., requirement to use indigenous industries.

4.5 Identify possible typical disadvantages that a proposal relying totally on Canadian railway manufacturing capability would have.

5. SOURCES OF INFORMATION

The information will be collected as required and as time permits from a number of sources including relevant federal government departments, Crown Corporations, and private companies including utilities and engineering/contracting firms.

6. TIMING AND REPORTS

6.1 Work will start immediately upon receipt of a signed contract.

6.2 A preliminary presentation and report will be given to the client on the 17th day from the contract date.

6.3 Three copies of the final report will be submitted to the client one month after the signature of the contract by the two parties.

7. PERSONNEL

The study will be under the direction of Mr. J. L. Marchand, Assistant General Manager of Canalog, and Mr. A. C. Weaver, formerly (until February 28, 1979) General Manager of Canalog. The curriculum vitae of Messrs. Marchand and Weaver are attached.

8. STUDY FEE AND PAYMENT SCHEDULE

In consideration for the work described above, Canalog Logistics Limited proposes a fee of nine thousand five hundred dollars ($9,500) payable in two installments as follows:

½ or $4,750 upon presentation of a preliminary report, and

½ or $4,750 upon acceptance of three copies of the final report.

Canalog Logistics Limited
Montreal, Quebec

SELECTED WORLD RAILWAYS

Country	Railway	Gauge	Route Length (km)	Number of Locomotives		Number of Freight Cars	Country Population
Algeria	Société Nationale Chemins de Fer Algériens	4'-8½"	3912	D	165	N.A.	18,500,000
Argentina	Argentina Railways	2'-5½" 3'-3-3/8" 4'-8½" 5'-6"	40912	D E S	1236 14 1020	49,299	26,400,000
Australia	Hammersley Railways) Goldsworthy Railway) Mt. Newman Railroad)	4'-8½"	987	D	100	4,577	14,220,000
Bangladesh	Bangladesh Railway	3'-3-3/8"	2874	D S	356 569	19,064	82,500,000
Brazil	Rede Ferroviara Federal S.A.	2'-6" 3'-3-3/8" 5'-3"	32883	D E S	1250 62 85	33,692	115,450,000
Cameroon	Regie Nationale des C.F. de Cameroun	3'-3-3/8"	839	D S	49 32	1,243	6,820,000
Congo	C.F. Congo - Ocean	3'-6"	515	D	57	1,165	1,500,000
Costa Rica	Ferrocarril del Sur) la Cra) Ferrocarril Nacional Al) Atlantic)	3'-6"	600	D S	62 1	1,065	2,120,000

N.A. - not available

Source: Jane's World Railways, 1977-78 edition.

Country	Railway	Gauge	Route Length (km)	Number of Locomotives	Number of Freight Cars	Country Population
Cuba	Cuba National Railways	4'-8½"	5201	D 374 E 12	6,315	9,590,000
East Africa	East African Railways Corporation	3'-3-3/8"	5894	D 192 S 235	16,099	14,800,000 - Kenya 16,450,000 - Tanzania 12,775,000 - Uganda 44,025,000
Egypt	Egyptian Railways	2'-5½" 4'-8½"	4857	D 434 E 50 S 39	17,717	39,500,000
El Salvador	International Railways of Central America	3'-0"	459	D 2 S 36	513	4,340,000
Greece	Hellenic Railways Organization, Ltd.	1'-11-5/8" 2'-5½" 3'-3-3/8" 4'-8½"	3584	D 188	10,170	9,300,000
Guinea	C.F. de la Guinea C.F. Conaky-Fria C.F. de la Cie Miniero du Conaky C.F. de Boke	3'-3-3/8" 4'-8½"	903	N.A.	N.A.	4,775,000
Honduras	F.C. Nacional de Honduras Standard Fruit Company Railway Tela Railroad Co.	3'-0" 3'-6"	543E	D 38 E 16 S 2	2,819	2,900,000

E - estimated

Country	Railway	Gauge	Route Length (km)	Number of Locomotives	Number of Freight Cars	Country Population
Iraq	Iraqi Republic Railway	4'-8½"	1235	D 163 S 19	3,280	12,350,000
India	Indian Government Railways	2'-0" 2'-6" 3'-3-3/8" 5'-6"	60067	D 1288 E 639 S 9222	N.A.	643,000,000
Ivory Coast	Regie des Chemins de Fer Abidjan-Niger	3'-3-3/8"	1173	D 63	1,247	6,714,000
Jamaica	Jamaica Railway Corp'n.) Kaiser Bauxite Co.) Alpart Railway)	4'-8½"	373	D 34	813	2,110,000
Korea (South)	Korean National Railroad	2'-6" 4'-8½"	3822	D 306 E 90 S 68	16,208	37,000,000
Liberia	Lamco J.V. Operating Co.) Bong Mining Co.)	4'-8½"	348	D 33	810	1,850,000
Malawi	Malawi Railways Ltd.) Central African Railway) Co., Ltd.)	3'-6"	566	D 30	649	5,530,000
Malaysia	Malaysian Railway) Rompia Mining Company Ltd.)	3'-3-3/8"	1745	D 223	6,566	12,950,000
Mali	Regie du C.F. du Mali	3'-3-3/8"	642	D 22	330	6,150,000

Country	Railway	Gauge	Route Length (km)	Number of Locomotives	Number of Freight Cars	Country Population
Mexico	Ferrocarriles Nacionales de Mexico (plus data for ten other railroads)	3'-0" 4'-8½"	20,231	D 1327 E 5 S 2	39,133	66,950,000
Mozambique	Caminhos de Ferro de Mozambique Trans-Zambesian Railway Co. Ltd.	2'-5½" 3'-6"	3,436	D 61 S 93	N.A.	9,950,000
New Zealand	New Zealand Government Railways	3'-6"	6,904	D 476 E 14 S 2	29,530	3,130,000
Nicaragua	F.C. del Pacifico de Nicaragua	3'-6"	350	D 9	185	2,390,000
Nigeria	Nigerian Railway Corp.	3'-6"	3,505	D 179 S 176	5,738	66,650,000
Pakistan	Pakistan Railway	2'-6" 3'-3-3/8" 5'-6"	8,565	D 337 E 29 S 710	37,530	77,500,000
Panama	Chiriqui Land Company Railways F.C. Nacional de Chiriqui Panama Railroad	3'-0" 5'-0"	552	D 68	2,467	1,820,000
Portugal	Compantia dos Caminhos de Ferro Portuguese Sociedade "Estoril"	3'-3-3/8" 5'-5.55"	3,593	D 203 E 3 S 121	8,760	10,000,000

Country	Railway	Gauge	Route Length (km)	Number of Locomotives	Number of Freight Cars	Country Population
Peru	Empresa Nactional de Ferrocarriles del Peru (plus data for six other railroads)	1'-11-5/8" 3'-0" 3'-6" 4'-8½"	2,143	D 109 S 69	5,191	17,000,000
Senegal	C.F. du Senegal	3'-3-3/8"	1,032	D 58	1,051	5,090,000
South Africa	South African Railways and Harbours Administration (plus data for five other railroads)	3'-6"	23,335	D N.A. E 498	171,317	26,765,000
Spain	Red Nacional de Los Ferrocarriles Espanôles (plus data for 40 other railroads)	1'-11-5/8" 3'-3-3/8" 3'-6" 4'-0" 4'-8½" 5'-5.67"	4,802	D 853 E 431 S 328	48,379	36,730,000
Sri Lanka	Sri Lanka Railways	5'-6"	1,496	D 148	4,094	14,200,000
Swaziland	Swaziland Railways	3'-6"	219	Hired from Caminhos de Ferro de Mozambique	703	520,000
Taiwan	Taiwan Railway	2'-6" 3'-6"	1,000	D 161 S 141	7,172	16,678,000
Tanzania	(Included under East Africa - does not include Tazara Railway)					

Country	Railway	Gauge	Route Length (km)	Number of Locomotives	Number of Freight Cars	Country Population
Thailand	State Railway of Thailand	3'-3-3/8"	3,855	D 207 S 241	9,398	45,380,000
Togo	Reseau des Chemins de Fer du Wharf du Togo	3'-3-3/8"	442	D 21	378	2,410,000
Tunisia	Société Nationale des Chemins de Fer Tunisiens	4'-8½"	1,928	D 122	5,387	6,400,000
Turkey	Turkish State Railways	4'-8½"	8,253	D 192 E 12 S 819	19,168	43,120,000
Venezuela	Venezuela State Railways	4'-8½"	173	D 11	221	13,150,000
Yugoslavia	Yugoslav Railways	1'-11-5/8" 2'-6" 3'-3-3/8" 4'-8"	11,856	D 354 E 162 S 1432	63,300	21,900,000
Zambia	Zambia Railways	3'-6"	1,044	D 97	128	5,500,000

CANADIAN SUPPLIERS - LOCOMOTIVES AND CARS

*General Motors of Canada Ltd.
Diesel Division
P. O. Box 5160
London, Ontario
N6A 4N5

*Bombardier Inc.
1505 Dickson Street
Montreal, Quebec
H1N 2H7

*Hawker Siddeley Canada Ltd.
Trenton Works Division
P. O. Box 130
Trenton, Nova Scotia

*Hawker Siddeley Canada Ltd.
Canadian Car Division
P. O. Box 67
Thunder Bay, Ontario
P7C 4V6

*Marine Industries Ltd.
C. P. 550
Sorel, Quebec
J3P 5P5

*National Steel Car Corporation Ltd.
P. O. Box 450
Hamilton, Ontario
L8N 3J4

*Procor Ltd.
2001 Speers Road
Oakville, Ontario
L6J 5E1

*Listed in Canadian Trade Index - 1979
Directory of Canadian Manufacturers and
their Products

Source: "Survey of Consultants Registered
in Railway Sector" CIDA - 1978.

CANADIAN SUPPLIERS - TRACK MATERIALS

*Abex Industries Ltd.
236 Glenridge Ave.
St. Catharines, Ontario
L2R 6T7

*Algoma Steel Corporation Ltd.
Sault Ste. Marie, Ontario
P6A 5P2

Bethlehem Steel Export Corp.
1010 Ste. Catherine St. W.
Montreal, Quebec
H3B 3R7

*Lister Bolt and Chain Ltd.
1771 Savage Road
Richmond, British Columbia
V6Y 1R1

*Pandrol Canada Ltd.
8180 Cote de Liesse Road
Montreal, Quebec
H4T 1G8

*Portec Inc.
c/o Portec Limited
1010 Ste. Catherine St. W.
Montreal, Quebec
H3B 1G4

*Steel Company of Canada Ltd.
P. O. Box 460
Montreal, Quebec
H3C 2T3

*Sydney Steel Corp.
P. O. Box 1450
Sydney, Nova Scotia
B1P 6K5

*Western Canada Steel Ltd.
Fasteners Division
450 S.E. Marine Drive
Vancouver, British Columbia
V5X 2T2

*Woodings Canada Ltd.
3 Place Ville Marie
Montreal, Quebec
H3B 2E3

*Listed in Canadian Trade Index - 1979
Directory of Canadian Manufacturers and their Products.

Source: "Survey of Consultants Registered in Railway Sector"
CIDA - 1978.

CANADIAN SUPPLIERS - RAILWAY MAINTENANCE AND EQUIPMENT

Aircraft Appliances & Equipment Ltd.
152 East Drive
Bramalea, Ontario
M6N 2P1

*American Hoist & Derrick Co. of Canada Ltd.
145 Heart Lake S.
Brampton, Ontario
L6W 3K3

*ATCO Industries Ltd.
1243 McKnight Blvd. N.E.
Calgary, Alberta
T2F 5T5

*Berminghammer Corporation Ltd.
Wellington Street
Marine Terminal
Hamilton, Ontario
L8L 4Z9

*Bert Pyke Ltd.
185 Hillcroft St.
Oshawa, Ontario
L1G 2L6

*Brown Boveri Canada Ltd.
4000 Trans-Canada Highway
Pointe Claire, Quebec
H9R 1B2

*Canadian Ingersoll Rand Co. Ltd.
620 Cathcart Street
Montreal, Quebec
H3B 1M1

Canadian Oxygen Ltd.
355 Horner
Toronto, Ontario
M8W 1Z7

*Canrep Inc.
3745 St. James Street W.
Montreal, Quebec
H4C 1H4

*Canron Railgroup
Railway Division
171 Eastern Avenue
Toronto, Ontario
M5A 1H7

*Champion Road Machinery Sales Ltd.
Box 308
40 Victoria Street
Goderich, Ontario
M7A 4C6

Case Power & Equipment Ltée.
3030 Pitfield
Montreal, Quebec
H4S 1K6

*Clark Equipment of Canada Ltd.
25 Michigan Blvd.
St. Thomas, Ontario
N5P 1H2

*Cleaver-Brooks of Canada Ltd.
161 Lorne W.
Stratford, Ontario

*Listed in Canadian Trade Index - 1979
Directory of Canadian Manufacturers and their Products.

Source: "Survey of Consultants Registered in Railway Sector" CIDA - 1978.

*Compair Canada Ltd.
2185 N. Sheridan Way
Toronto, Ontario

Eastern Railway Supplies of Canada Ltd.
1608 The Queensway, Room 104
Toronto, Ontario
M8W 1V4

*Fairmont Railway Motors Ltd.
6320 Northwest Drive
Mississauga, Ontario
L4V 1J7

*Ford Motor Co. of Canada
Tractor and Equipment Operations
The Canadian Road
Oakville, Ontario

*Gendall Industries Ltd.
4505 74th Avenue
Edmonton, Alberta
Q6B 2H5

*General Motors of Canada
Diesel Division
P. O. Box 5160
London, Ontario

*Harper Detroit Diesel
10 Diesel
Etobicoke, Ontario

*I.E.C. Holden Ltd.
8180 Cote de Liesse Road
Montreal, Quebec
H4T 1G8

*International Harvester Co. of
Canada Ltd.
208 Hillyard Street
Hamilton, Ontario

*John Deere Co.
Hunter Road
Grimsby, Ontario

*Kent Homes
P. O. Box 50
Buctouche, New Brunswick

Kershaw Manufacturing Canada Ltd.
2062 Chartier Avenue
Dorval, Quebec
H9P 1H2

*Lincoln Electric Co. of Canada Ltd.
179 Wicksteed Avenue
Toronto, Ontario
M4G 2B9

Loram Equipment
3900 Arrow Head Drive
Hamel, Minnesota 55340
U.S.A.
(Also 9th Avenue S.W., Calgary,
Alberta)

*Massey Ferguson Industries Ltd.
915 King Street W.
Toronto, Ontario
M6K 1E3

*Matheson & Co. Ltd.
New Glasgow, Nova Scotia

*Miller Welders Canada Ltd.
8451 Parkway
Montreal, Quebec
H1J 1M8

Modern Track Machinery Canada Ltd.
2465 Cawthra Road
Unit 116
Mississauga, Ontario
L5A 3P2

*Listed in Canadian Trade Index - 1979
Directory of Canadian Manufacturers and their Products.

National Electric Coil
St. John, Quebec

*Newcor Canada Ltd.
3126 Devon Drive
Windsor, Ontario
N3X 4L2

Pettibone Corp. Railroad Division
510 Andreville, Apt. 2M
Nun's Island
Montreal, Quebec

Plasser Canada Ltd.
2705 Marcel Street
Montreal, Quebec
H4R 1A6

Prairie Equipment Ltd.
88 Fennell Street
Winnipeg, Manitoba
R3T 3M4

Rail Car Co. Ltd.
3 Place Ville Marie
Suite 309
Montreal, Quebec
H3B 2E3

Special Construction Machines Ltd.
166 Bentworth Avenue
Toronto, Ontario
M6A 1P7

Treco Inc.
St. Romuald
Cité Lévis
Quebec

*Webster Air Equipment Ltd.
148 Stonach Crescent
London, Ontario
N5V 3A1

*Woodings Canada Ltd.
3 Place Ville Marie
Suite 309
Montreal, Quebec
H3B 2E3

*Listed in Canadian Trade Index - 1979
Directory of Canadian Manufacturers and their Products.

CANADIAN SUPPLIERS - RAILWAY SIGNALS

Canadian General Electric Co. Ltd.
940 Lansdowne Avenue
Toronto, Ontario
M6H 3Z4

Eastern Railway Supplies (Canada) Ltd.
1608 The Queensway
Toronto, Ontario

General Railway Signal of Canada Ltd.
1 Place Ville Marie
Montreal, Quebec
H3B 2C1

SEL Canada-ITT Industries of Canada Ltd.
P. O. Box 138
Toronto-Dominion Centre
Toronto, Ontario
M5K 1H1

Servo Corporation of America-JGW Systems Ltd.
56 Sparks Street, Suite 100
Ottawa, Ontario

Vale Enterprises Ltd.
375 Bord de Lac
Dorval, Quebec
H9S 2A5

Wabco Ltd., Uniswitch Division
1155 Dorchester Blvd. W.
Suite 1003
Montreal, Quebec

Woodings Canada Ltd.
3 Place Ville Marie
Montreal, Quebec
H3B 2E3

Source: "Survey of Consultants Registered in Railway Sector" CIDA - 1978.

CANADIAN SUPPLIERS - RAILWAY TELECOMMUNICATIONS

A. C. Simmonds & Sons
7275 Sherbrooke St. E.
Montreal, Quebec
H3B 2C1

AES Data Ltée/Ltd.
570 McCaffrey Street
Montreal, Quebec
H4T 1N1

Andrew Antenna Co. Ltd.
606 Beech Street
Whitby, Ontario
L1N 5S2

Armco Canada Ltd.
P. O. Box 3000
Guelph, Ontario
N1H 6P2

ATCO Industries Ltd.
1243 McKnight Blvd., N.E.
Calgary, Alberta
T2F 5T5

Bayly Engineering Ltd.
167 Hunt Street
Ajax, Ontario
L1S 1P6

Butler Manufacturing Co. (Canada) Ltd.
P. O. Box 5006
Burlington, Ontario
L7R 9Z9

Canada Wire and Cable Co.
80 Bloor Street West, 6th Floor
Toronto, Ontario
M5S 2V1

Canadian General Electric Co. Ltd.
100 Wingold Avenue
Toronto, Ontario
M6B 1R2

Canadian General Electric Co. Ltd.
398 Atwell Drive
Rexdale, Ontario
M9W 5C3

Canadian Marconi Co.
2442 Trenton Avenue
Montreal, Quebec
H3P 1Y9

Coba Electronics Ltd.
218 Brunswick Blvd.
Pointe Claire, Quebec
H9R 1A6

CTS of Canada Ltd.
80 Thomas Street
Streetsville, Ontario
L5M 1V9

Digital Devices Ltd.
8235 Mountain Sights, Suite 300
Montreal, Quebec
H4P 2B4

Source: "Survey of Consultants Registered in Railway Sector" CIDA - 1978.

EXCEL
c/o Zentronics
99 Northfinch Drive
Downsview, Ontario
M3N 1W8

Farinon Electric of Canada Ltd.
657 Orly Avenue
Dorval, Quebec
H9P 1G1

Gandalf Data Communications Ltd.
Gandalf Building
Gandalf Plaza
9 Slack Road
Ottawa, Ontario
K2G 0B7

General Datacomm Industries (Canada)
7457 Trans-Canada Highway
St. Laurent, Quebec
H4T 1T3

Glenayre Electronics Ltd.
1551 Columbia Street
North Vancouver, British Columbia
V7J 1A3

GTE Automatic Electric (Canada) Ltd.
100 Strowger Blvd.
Brockville, Ontario
K6V 5W8

GTE Lenkurt Electric (Canada) Ltd.
7018 Lougheed Highway
Burnaby, British Columbia
V5A 1W3

IBM Word Processing Division
1440 St. Catherine St. W.
Montreal, Quebec
H3G 1R8

International Aeradio (North America) Ltd.
70 Don Park Road, Unit 15
Markham, Ontario
L3R 1G4

International Systcoms Ltd.
4900 Fisher Street
Montreal, Quebec
H4T 1J6

ITT Communications
175 Dawson Road
Guelph, Ontario
N1H 1A1

Lenbrook Industries Ltd.
1145 Bellamy Road, Unit 2
Scarborough, Ontario
M1H 1H5

Louis Albert Associates Inc.
2264 Stevenage Drive
Ottawa, Ontario
K1G 3N4

Mechron Engineering Co. Ltd.
2437 Kaladar Avenue
Ottawa, Ontario
K1N 8B9

Marsland Engineering Ltd.
350 Weber Street, N.
Kitchener, Ontario

Motorola Canada Ltd.
3125 Steeles Avenue, E.
Willowdale, Ontario
M2H 2H6

National Sound Services Ltd.
Morrisburg, Ontario
K0C 1X0

Nelma Electronics Ltd.
1707 Sismet Road, Unit 9
Mississauga, Ontario
L4W 2K8

Northern Telecom Ltd.
1600 Dorchester Blvd., W.
Montreal, Quebec
H3H 1R1

Slater Products Ltd.
681 King Street W.
Hamilton, Ontario
L8N 3E7

NR Systems Ltd.
2373 Stevenage Drive
Ottawa, Ontario
K1G 3W1

Powertronic Equipment Ltd.
125 Nantucket Blvd.
Scarborough, Ontario
M1P 2N8

Plantronics Canada Ltd.
8110 South Trans-Canada Highway
St. Laurent, Quebec
H4S 1M5

Pye Electronics Ltd.
8580 Darnley
Montreal, Quebec
H4T 1M6

SAB Harmon Industries Inc.
1958 Rosefield Road, Unit 37
Pickering, Ontario
L1V 3A9

Siemens Electric Ltd.
7300 Trans-Canada Highway
Pointe Claire, Quebec
H9R 1C7

Steel Co. of Canada Ltd.
525 Dominion Street
Montreal, Quebec
H3J 2B7

Teletype Corporation
5555 Touhy Avenue
Skokie, Illinois 60077
U.S.A.

Westinghouse Canada Ltd.
Electronic Systems Division
Burlington, Ontario
L7R 4B3

CANADIAN CONSULTING FIRMS

Acres Consulting Services Ltd.

ADGA Systems International Ltd.

ADI Ltd.

Alcan Project Services Ltd.

ANFA Consultants Ltée/Ltd.

Assoc'd Transportation Cons. Ltd.

Beauchemin-Beaton-Lapointe Ine.

Brent Manufacturing Ltd.

CANAC Consultants Ltd./Ltée.

Canadian ORT Organization

Canadian Pacific Consulting Services Ltd.

Canadian Resourcecon Ltd.

Canalog Logistics Limited

Cartwright Consulting Assoc. Ltd.

Centre du Prod. des Transports du Que.

Cole, Sherman & Associates Ltd.

Concept Dist. & Mark'g. Serv. Ltd.

Francois Cordeau, Ing. Conseil

Les Consultants B.P.R.

W. H Crandall & Assoc. (Mgt.) Ltd.

CSP Foods Ltd.

Source: "Survey of Consultants Registered in Railway Sector" CIDA - 1978.

S. H. Davis Forwarding Ltd.

Delcanda International Ltd.

R. J. Demers & Associates

Robert Desbiens (Consultec)

Development Planning Assoc. Ltd.

M. M. Dillon Ltd.

Dubois Ferland St-Hilaire et Assoc.

Du Toit Associates Ltd.

Experco Ltée.

Fenco Consultants Ltd.

Gaucher Pringle Consultants Ltée.

Gauther, Larocque, Samson

Giffels Associates Ltd.

Hedlin Menzies & Associates

Hickling-Johnston Ltd.

Howe International Ltd.

IBI Group

Intern'l Port Operating Cons. Ltd.

Ker, Priestman & Associates Ltd.

Kez International Ltd.

Laberte et Associes Ltée.

Lavalin International Inc.

N. D. Lea & Associates Ltd.

Logtrans

McElhanney Surveying & Eng. Ltd.

Montreal Engineering Co. Ltd.

Morrison, Hershfield, Burgess, etc.

Alan Moss & Associates Ltd.

Nattress Engineering

Frederick E. Palmer & Associates

Pass Management Consultants Ltd.

Peat, Marwick & Partners

F. L. Peckover, Eng.

Piette, Audy, Bertrand, etc.

Price Waterhouse Associates

T. Pringle & Son Ltd.

Quasar Systems Ltd.

Reid, Crowther & Partners Ltd.

RGD Enterprises

RMB Technical Services Ltd.

Roche International Ltée.

P. S. Ross & Partners

Wilbur Smith & Associates Ltd.

SOMER

Stanley Associates Engineering Ltd.

Stevenson & Kellogg Ltd.

W. Strok & Associates Ltd.

Swan Wooster Engineering Co. Ltd.

Systems Approach Consultants Ltd.

TDX Inc.

Techman Ltd.

Techtrol Ltd.

Tecsult International Ltée

Thorne Riddell Associates Ltd.

David Tighe Inc.

Tottrup & Associates Ltd.

Transconsult Ltd.

Transea Shipping Ltd.

Trimac Consulting Services Ltd.

The Trow Group

Regis Trudeau & Associes Inc.

Urbanprobe Associates Ltd.

J. Philip Vaugh & Associates Ltd.

R. S. Wallace & Associates Ltd.

W. L. Wardrop & Associates Ltd.

Waterside Cargo Co-Operative

Westex Consultants Ltd.

Willis, Cunliffe, Tait & Co. Ltd.

BOMBARDIER INC.

EXPORT SHIPMENTS OF LOCOMOTIVES

1953 TO 1978

Country	Quantity	Horsepower	Year Shipped
Spain	1	1600	1953
Mexico	12	1600	1953-54
Mexico	3	1000	1954
Argentina	25	1800	1957
Brazil	10	1800	1962
Argentina	70	1200	1963
Mexico	5	1200	1963
Mexico	75	1800	1963-64
India	37	1200	1964
India	32	1200	1967
India	30	1200	1969
Pakistan	24	1200	1969
Pakistan	16	2000	1969
U.S. (White Pass & Yukon R.R.)	7	1200	1969
Sierra Leona	3	2000	1970
East Africa	20	2000	1971
East Africa	15	2400	1971
Jamaica	6	950	1971
U.S. (White Pass & Yukon R.R.)	3	1200	1971
Nigeria	54	1500	1972

Source: Bombardier Inc.

Bombardier Inc.

Country	Quantity	Horsepower	Year Shipped
Yugoslavia	20	2600	1972
Malawi	4	1500	1973
Mexico	8	3600	1972
Mexico	20	3000	1972
Tunisia	22	2000	1973
Portugal	20	2000	1973
Greece	20	2700	1973-74
Mexico	8	3600	1973
U.S. (Prov. & Worcester)	2	2000	1974
U.S. (Prov. & Worcester)	3	2000	1975
Peru	15	3300	1974
Peru	5	950	1974
Peru	5	1200	1974
Greece	10	3600	1975
Ceylon	14	2000	1975
Jamaica	6	950	1974
Iraq	30	2000	1975
Mexico	15	2000	1975
Cuba	30	2400	1975
Jamaica	6	950	1975
Iraq	31	2000	1976
Cuba	20	2400	1976

Bombardier Inc.

Country	Quantity	Horsepower	Year Shipped
Venezuela	2	2000	1976
Tunisia	20	1350	1978
Portugal	13	2700	1978
Bangladesh	12	1200	1978

ORDERS

U.S. (Amtrak)	2	2700	
Tanzania	15	2000	
Malawi	16	1500	
Cameroon	20	2000	
Mexico	72	2400	

GENERAL MOTORS OF CANADA

DIESEL DIVISION

EXPORT SHIPMENTS OF LOCOMOTIVES

1953 TO 1978

Country	Quantity	Horsepower	Year Shipped
Brazil	5	1300	1953
Bangladesh	40	1300	1953-56
Brazil	4	1300	1953
Sweeden	1	1300	1953
Liberia	2	1000	1954
Sri Lanka	5	1300	1954
Norway	1	1300	1954
New Zealand	15	1300	1955
Sri Lanka	3	1300	1956
Brazil	25	1300	1957
Sri Lanka	2	1300	1958
Sri Lanka	2	1300	1961
New Zealand	12	1300	1961
New Zealand	12	1300	1961
Brazil	56	1300	1963-64
New Zealand	20	1300	1963-64
Brazil	15	2000	1964-65
New Zealand	10	1300	1964

Source: General Motors of Canada Limited

General Motors of Canada

Country	Quantity	Horsepower	Year Shipped
New Zealand	5	1000	1965
New Zealand	12	1000	1965
New Zealand	8	1300	1965-66
New Zealand	12	1300	1966
New Zealand	34	1300	1967
Yugoslavia	70	2000	1970
Yugoslavia	2	2000	1971
Mexico	10	3000	1972
Yugoslavia	15	2000	1972
Yugoslavia	37	2000	1972-73
Yugoslavia	58	2000	1973
Yugoslavia	3	2000	1974
Egypt	15	2000	1976
Algeria	15	3000	1976
Alberia	25	2400	1976
ORDERS			
New Zealand	20	1500	1979
Togo	3	1500	1979
Ivory Coast	19	2400	1979
Senegal	2	2400	
Pakistan	30	1500	
Egypt	65	1500	
Yugoslavia	6	2000	