This report has been reviewed by the USAF Systems Command Liaison Office (Ottawa) and is approved for publication and release to the National Technical Information Service (Unlimited Distribution).

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Chief, AFSC Liaison Office (Ottawa)

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J. C. Bradford
Director, US Division
Defense Programs Bureau
Department of External Affairs

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GUIDE TO CANADIAN AEROSPACE RELATED INDUSTRIES

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This guide is a contracting source list of Canadian aerospace related industries to be used by USAF procurement offices, project engineers, and scientists. It provides company profiles, a company keyword index, and contact points for each company.
This Guide to Canadian Aerospace Related Industries presents a compilation of descriptive data on 153 companies located in Canada that have expressed interest in doing business with the United States Air Force. This Guide has been prepared with three main objectives in mind:

a. To encourage Air Force Systems Command Project Officers to take advantage of the industrial capability of Canada.

b. To engender interest within AFSC for participating in the US/Canada Defense Production and Development Sharing Programs.

c. To encourage Canadian aerospace industry to take a more active role in presenting their capabilities to the USAF.

The companies profiled in this Guide represent a cross-section of Canadian industry and research facilities with capabilities that may be of interest to the USAF research & development and logistics communities. There are numerous guides to Canadian industry published in Canada by the Canadian Government and by various trade associations. A reference list of these publications is included in Section I.

Comments and/or suggestions concerning the format or content of this Guide are solicited. Questions concerning the US/Canada Defense Production and Development Sharing Program or the subject matter of this Guide should be directed to Lt Col Donald J Pearson, or Dr Robert L McKenney, Jr., AFSC Liaison Office; 110 O'Connor St, Suite #202; Ottawa, Ontario, Canada; K1P 5M9. Telephone contact can be made at (613) 593-7725 (commercial), or Autovon 676-6523.

The cooperation and assistance of the Canadian Department of External Affairs in the printing of this report is greatly appreciated.
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Section I
INTRODUCTION

One of the functions of the Air Force Systems Command Liaison Office in Ottawa is to stay current on Canadian industrial capabilities and trends, and to make this information available to the USAF R&D community. All data are provided by the respective companies, which leads to new entries are obtained through newspapers, magazines and through contacts with various departments of the Canadian Government. This Guide presents a representative cross-section of the Canadian aerospace industry.

As would be expected for a modern, industrialized country, Canada's industrial base is very diversified. Their industries typically include:

- Aerospace
- Chemical
- Chemical Defense
- Communications
- Electronics
- Environmental
- Energy
- Fishing
- Medical
- Metal Working
- Ordnance
- Petroleum
- Space

Canada has a very large industrial commitment to the aerospace, communications, electronics, and space areas. As one might expect, these are primarily concentrated in the Ontario-Quebec corridor, extending from Windsor through Toronto and Ottawa and terminating in Montreal. Other locations with expanding industrial bases are the Winnipeg (Manitoba), Edmonton-Calgary (Alberta), and Vancouver (British Columbia) areas. Substantial contributions to the Canadian industrial capability are also afforded by the Quebec City (Quebec) and Halifax (Nova Scotia) areas.

As in the other editions of this Guide, this third edition does not attempt to group companies into specific categories such as aerospace or electronics. It simply associates their specific capability keywords with twenty general categories (See Section III). Neither does this Guide attempt to differentiate R&D capabilities from pure product lines. While most companies have product lines, some are very R&D oriented and seem eager to engage in R&D contracts. For those companies that appear primarily product oriented, it is assumed that they do have an R&D capability within their area of expertise.

Section II of this Guide presents Canadian industrial capabilities as a compilation of individual company profiles. The general format for the company profiles include the following subsections: NAME, ADDRESS, CONTACT POINT, AVERAGE WORK FORCE, GROSS SALES, PLANT SIZE, EQUIPMENT, EXPERIENCE, AND KEYWORDS.

The KEYWORD subsection begins with general category names, each preceded by its identifying number (e.g., 1 = Aircraft, 2 = Armament ... 20 = Miscellaneous), followed by specific capability keywords. Each of the latter words is followed by a number or series of numbers that refer to the appropriate general category with which the word is associated.

Section III (Company Keyword Index) relates company capabilities in the form of keywords to a series of twenty general category areas. The specific keywords are presented in columnar form in alphabetical order. The second column lists the identifying numbers associated with the general categories. The third column lists the company, in code form, associated with the keyword. The company code cross index forms Section IV.

Canadian trade publications that can be used to supplement this Guide, thereby providing a more complete listing of companies are listed below:

- Canadian Defense Products Guide, published by the Canadian Department of Industry, Trade and Commerce.
- Canada in the World of Electronics, 1982, distributed by the Canadian Department of Industry, Trade and Commerce.
- Canada in Space, prepared by the Interdepartmental Committee on Space, Ministry of State for Science and Technology.
- Canada's Aerospace Industry: A Capability Guide – 1982, produced by Creative Communications, a division of MacLean Hunter Ltd in cooperation with the Air Industries Association of Canada, the Canadian Department of Industry, Trade and Commerce, and Aerospace Canada Magazine.
- The CATalog, Apr 1983, publication of the Canadian Advanced Technology Association.

For the most part, Canada's high-technology industrial capability is on an even par with that of the United States, but generally on a somewhat smaller scale. It may certainly be considered another source base for USAF R&D procurements, as well as for commodity buys. It is hoped that this Guide will help provide the user with some insight into the Canadian system and encourage its use if deemed appropriate. Increased competition and "new blood" can only reduce USAF procurement costs and hopefully lead to better products.
Section II
COMPANY PROFILES

A.E.I. TELECOMMUNICATIONS
(Canada) Ltd

Code: AEI
Address: 419 Notre Dame Ave
Winnipeg, Manitoba, Canada R3B 1R3
Contact: Mr. K R Yates, President – (204) 942-7221

History: AEI, an established Canadian company for over 55 years, is a wholly owned subsidiary of the General Electric Company of England. There are no other Canadian locations.

Capability: AEI is involved in the engineering, manufacturing, distribution and installation of telecommunication switching systems. They have supplied major local and toll switching systems for Canadian metropolitan areas, as well as smaller dial offices, PABX systems, and peripheral equipment.

Average Work Force: Engineers – 10
Others – 122

Gross Sales: $8-$10M (Per Annum)
Plant Size: 40,000 sq ft

Equipment: The company has the following equipment available for use on projects:

* Laboratory Equipment: SWPT 6800 Computer Software System, Soroc Software Programming (Development) System, etc.

* Machinery Equipment: Ragen 750 Automatic Self Programmable PC Board Assembly System, Econopak 229 Automatic PC Board Soldering System, etc.

* Test Facilities: Environmental Chamber, adjustable from 0 to 70°C (32.0-158°F) for burn-in testing of various integrated circuits (PC boards).

Experience: AEI is involved in the production of Automatic Number Identification (ANI) systems and 911 Emergency Reporting Systems for world-wide markets. They have over 20 years of experience with ANI systems manufacture and have over 2.5 million lines of ANI equipment installed in North America and other world-wide markets.

Keywords: Communications; Telecommunications = 5; Switching = 5; PABX Systems = 5; Peripheral Equipment = 5; Automatic Number Identification Systems = 5; Telephone Gear = 5.

Revised: Dec 83

AEL MICROTEL Ltd
Manutronics Division

Code: MAN
Address: 100 Strowger Blvd
Brockville, Ontario, Canada K6V 5W8
Contact: Mr. E R Macintosh, Marketing & Sales Manager – (613) 342-6621

History: In 1980, the Manutronics Division of AEL Microtel Ltd, a Canadian owned company, was established to market custom electronic manufacturing services. A percentage of the total resources currently available to Manutronics will be expanded to meet future needs. Microtel, Canada’s second largest manufacturer of telecommunications equipment is a wholly owned subsidiary of British Columbia Telephone Company.

Capability: Microtel’s resources are available in the areas of PCB blank designs, layout & fabrication, PCB assembly & test, automatic backplane wiring, computerized wire verification, hybrid circuit assembly & test, and complete product development and assembly, etc. Manutronics offers Microtel’s production and facilities on a contract basis to industry to meet specialized needs such as military standards P 5510 and 14520B.

Average Work Force: Total – 1200
Gross Sales: Manutronics – 1983 – $6M +
Manutronics – 1984 – $12M (Projected)
Manutronics – 1985 – $13M (Projected)

Plant Size: 473,000 sq ft

Keywords: 7 = Electronics; 12 = Machining;
20 = Miscellaneous; Fabrication/Assembly/Test = 7;
PC Boards = 7; Automated Backplane Wiring = 7; Printed Wiring Card = 7; Sheet Metal = 12; Hybrid Assembly = 7;
Plastic Molding = 12; Reed Capsule = 20; Relays = 7;
Cooks = 7; Custom Design & Development = 7.

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AERO MACHINING Ltd

Code: AER
Address: 5411 Industrial Blvd
Montreal-North, Quebec, Canada H1G 3H7
Contact: Mr. Gerard Beausoleil – (514) 324-4260

History: Aero Machining Ltd is a small machining company incorporated in 1963 in the Province of Quebec. There are no other Canadian or US locations.

Capability: Aero Machining Ltd provides services in tool design, production, maintenance, sub-assemblies, die and mold development, and fabrication. They specialize in general machining, three axis profiling or four spindle profilers, high tensiles, titanium, and D-6-AC material. Their quality control is governed by the "Aero Machining Ltd" quality control manual in accordance with MIL-Q-9858A and MIL-C-45662A. The company is approved for the manufacture of aircraft hydraulic servos, landing gear components, and missile and aircraft machined parts. Accumulative quality control records are kept to provide necessary traceability of inspection data. Their quality control policy is approved to meet the requirements of various US DOD QC specifications, as well as the Canadian DND 1015 specification, for the manufacture of aircraft mechanical parts and mechanical and hydraulic assemblies.

Average Work Force: Total – 120
Gross Sales: 1982 – $2.8M
Plant Size: 27,000 sq ft

Equipment: Their equipment includes lathes, borers, milling machines, profilers, drills, honing machines, and grinders. They have a hydraulic assembly and test facility for all hydraulic assemblies and parts manufactured by the company. They are currently bringing their NC capability up to speed.

Experience: Aero principal customers include Air Canada, Canadian Marconi, Douglas Aircraft, GE, United Aircraft, DeHavilland, Grumman Aircraft, and Canadian Vickers Ltd.

Keywords: 1 = Aircraft; 12 = Machining; 13 = Missiles; Titanium = 12; Tooling = 12; Die Fabrication = 12; Hydraulic Servos = 1, 12; Landing Gear Components = 1, 12; Airframe Parts = 1, 12; Missile Parts = 12, 13.

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ALBERTA RESEARCH COUNCIL

Code: ARC

Address: Executive Offices
7th Floor, Terrace Plaza
4445 Calgary Trail South
Edmonton, Alberta, Canada T6H 5R7

Contact: Ms. Dorothy M. Hollands, Corporate Secretary & Dir of Public Relations – (403) 438-1666

History: The Alberta Research Council is a provincial Crown Corporation founded in 1921 to advise the Alberta Government on scientific affairs and to promote the economic growth of Alberta through scientific and engineering research. It has over 500 employees at offices and laboratories mainly in Edmonton, and at offices in Calgary, Red Deer, Nisku, and Lethbridge.

Capability: The Research Council has established in its Long Range Plan five major areas of research – industrial and engineering research and assistance, oil sands, coal, natural resources, and frontier sciences. The industrial and engineering research program includes research activities in transportation, surface water engineering, projects in forest products, alternate energy and energy conservation. It also runs a gasoline and oil testing laboratory and provides short-term advisory and technical services to manufacturing companies in Alberta. Oil Sands Research includes geology studies, heavy oil cracking, and in-situ recovery. Coal research includes geology studies, liquefaction, pyrolysis, coal property definition, and gasification. Natural resources research activities include geological survey, soils surveys, groundwater, and atmospheric sciences research. Frontier science projects include research into new catalysts, electro-organic reactions, low temperature biology, and enzyme design studies using genetic engineering techniques.

Average Work Force: Scientists, Engineers, & Research Technicians

Gross Sales: The Research Council operates on a $38 million budget in 1983-84, half of which comes in the form of an annual provincial grant, and the other half which comes from contracts with provincial government departments and private industry.

Plant Size: 279,000 ft² (26,000 m²) (1982)
505,250 ft² (47,000 m²) (1984)
580,500 ft² (54,000 m²) (1987)

Equipment: The Research Council has a range of equipment for carrying out studies on oil sands and coal technology from fundamental science to bench scale pilot work; sophisticated chemical analytical instruments; distributed computing equipment. Its digital weather radar data archived on magnetic tape. The overall display allows the analyst to examine radar echoes. These data are used for storm analysis, hail description, flood prediction, aircraft-storm interaction or avoidance and spacecraft re-entry.

Experience: Weather Modification – Contract with Alberta Agriculture
Flood Forecasting – Contract with Alberta Environment
Radar Development – Contract with Environment Research and Development (US)
Digital Radar Data Processing – Contract with Fundacao Educacional de Bauru, Brazil

Experience in other areas of natural resources research and in research on oil sands, coal liquefaction, frontier sciences (biotechnology and hydrocarbon research), and industrial and engineering areas available on request (see keywords below).

Keywords: 4 = Chemistry; 8 = Energy; 9 = Environment;
15 = Radar; 17 = Software Services; 18 = Space Systems;
19 = Testing/Test Equipment; 20 = Miscellaneous;
Meteorology = 15; Digital Data Processing = 9, 15;
Computer Graphics = 9; Statistical Analysis = 9; Weather Forecasting = 9; Cloud Seeding = 9; Cloud Physics = 9;
Weather Modification = 9; Convective Storms = 9;
Hydrometeorology = 9; Precipitation Measurement = 9, 15,
18; Flood Forecasting = 9; Air Pollution = 9; Numerical Modelling = 9, 17; Biology = 20; Microbiology = 20;
Chemical Processing = 4; Industrial Engineering = 20;
Products Testing = 19; Materials Testing = 19;
Transportation = 20; Oil Sands = 8; Coal Liquefaction = 8;
Coal Pyrolysis = 8; Geology = 8, 9; Soils = 8, 9; Water = 8,
9; Ground Water = 8, 9; Surface Water = 8, 9.

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AMTEK MANAGEMENT Inc

Code: AMI

Address: 120 Holland Ave
Ottawa, Ontario, Canada K1Y 0X6

Contact: Mr. L E McClare, VP Operations – (613) 728-1831

History: AMTEK was formed in 1981 as a wholly owned Canadian company. It was formed to provide services to governments and industries on Integrated Logistic Support (ILS); Automatic Test Equipment; and contract and program management.

Capability: AMTEK is a leader in Canada in the field of integrated logistic support having supplied services to Canada’s major acquisition programs – CP140 Aurora purchased from Lockheed, CF-18 from McDonnell-Douglas, the Canadian Patrol Frigate Program, Low Level Air Defense, and Gun alignment and control system. ILS development services have been provided to DND, Litton Systems Ltd, Canadian Marconi, and Leigh Instruments Ltd.

AMTEK has provided field service support to the Canadian government for Automatic Test Equipment. The company also provides training in electronics, ATE, procurement and contract management.

Average Work Force: 20 (Engineers & Technologists)

Gross Sales: 1983 – $1.2M

Plant Size: 4,500 sq ft

Experience: AMTEK clientele includes Department of National Defense, Department of Supply and Services, Royal New Zealand Air Force, Canadian Marconi, Litton Systems
Ltd, Bristol Aerospace Ltd, Leigh Instruments Ltd, Lockheed Aircraft, Hughes Aircraft, British Aerospace, Aviation Electric (Bendise), and Sperry.

Keywords: 1 = Aircraft; 3 = Avionics; 7 = Electronics; 19 = Testing/Test Equipment; 20 = Miscellaneous; Integrated Logistic Support = 1, 3, 20; ILS = 1, 3, 20; Program Management = 20; Logistic Support Analysis = 20; Level of Repair Analysis = 20; Training = 7; Automatic Test Equipment = 7, 19; Contract Management = 20.

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ANATEK ELECTRONICS Ltd

Code: ANA

Address: 240 Brooksbank Ave
North Vancouver, British Columbia,
Canada V7J 2C1

Contact: Mr. Scott C Lewis, General Manager - (604) 980-7061

History: Anatek is a Canadian owned company incorporated in 1969. It is active in both the Canadian and US electronics markets. The company manufactures thick film hybrid microcircuits.

Capability: Anatek's expertise is in the areas of custom thick film hybrids, epoxy die attach, gold ball bonding, laser passive and active trimming, and cermaic packaging.

Average Work Force: 25 - Total

Gross Sales: $2M

Plant Size: 10,000 sq ft

Experience: Custom microcircuits have been supplied to GTE Lenkurt Electric (Canada) Ltd, NCR, and a host of telecommunications and computer peripheral manufacturers. Anatek's future R&D efforts will be directed at the RF device and military market.

Keywords: 7 = Electronics; Thick Film Microcircuits = 7; Thick Film Hybrid Parts = 7; RF Components = 7; Amplifiers = 7; Filters = 7; PCM Filters = 7; Resistor Networks = 7; Active Filters = 7; RF Amplifiers = 7; Oscillators = 7.

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C. V. W. ARMSTRONG CONSULTANTS Ltd

Code: ACL

Address: 280 Albert St, 6th Floor
Ottawa, Ontario, Canada K1P 5G8

US OFFICE
8247 Lewiston
San Antonio, Texas 78250

Contact: Mr. Cedrick V W Armstrong, President - (613) 230-3942

History: The company is Canadian owned and was incorporated in 1979. It has one Canadian office and one US office. The company started as purely a consulting company, but has recently branched out into both hardware and software engineering and development.

Capability: The company's technical capability is in research and development and systems engineering related to computer systems. Areas of expertise include distributed systems, fault-tolerant systems and systems for high speed data acquisition and radar signal processing.

Average Work Force: PhD - 1
Eng - 1
Others - 2 (Possible 6 in 1984)

Gross Sales: 1983 - $250,000
1984 - $500,000 (Projected)

Plant Size: 1,200 sq ft

Equipment: One word-processing & communications terminal and processor and microprocessor development system.

Experience: Major projects have included the high speed data acquisition system for a low-angle tracking radar system, a multiprocessor simulator for multi-target tracking studies and the evaluation of specialized computer systems for use in defense. Training course development and delivery has also been provided to a number of customers.

Keywords: 6 = Computers; 10 = Image Processing & Optics; 15 = Radar; 17 = Software Services; Consulting = 6; Special Purpose Processors = 6; Signal Processing = 6, 15; Image Processing = 6, 10; Multiprocessor Systems = 6; Firmware Design = 6; Microprogramming = 17.

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THE ARMSTRONG MONITORING CORP

Code: AMC

Address: 215 Colonndale Rd South
Nepean, Ontario, Canada K2F 7K3

Contact: Mr. David M Jenkins, Marketing Dir - (613) 225-9531

History: The AMC is a Canadian owned electronic gas detection firm founded in Jan 81. The company has offices throughout Canada and the US.

Capability: The AMC is primarily involved in the manufacturing of fixed and portable dangerous gas detection equipment. In the fixed, they offer rack and wall mount systems incorporating a remote calibration sensor/transmitter that produces a time and money-saving factor. In the area of sensors, they range from electrochemical, catalytic and solid state. Offered in the solid state is the specific H2S sensor which is poison-proof. On the portable side, they range from hand-held units to the 'amc 3000' series. In the 3000, AMC offers their exclusive 3 meter and 3 sensor concept which allows 3 separate conditions to be monitored simultaneously (oxygen deficiency, toxic and combustible gases). AMC's human resources allows them to comprehensively maintain all levels of manufaturing from in-house R&D (consisting of engineering staff and chief product technician), to Quality Control, Quality Assurance, right through to their on-the-job training program.

Average Work Force: Engineers - 4
Degrees - 7
Others - 15

Gross Sales: 1981 - $ 92,000
1982 - $360,000
1983 - $660,000
1984 - $924,000 (Projected)
Athabasca's products

- Geophones and seismographs
- Leak detection system for underground petroleum products storage tanks
- Laser related devices

Their weather radar system correlates radar reflections from storms with antenna azimuth and elevation positions and reflection intensities to derive a comprehensive picture of the storm and its characteristics. The system includes a conventional S or C band radar, the interfacing electronics hardware package, and a PDP 11/34 computer. It features a strong interactive graphics capability.

Their ambient air quality monitoring systems generally include monitoring trailers equipped with instrument towers, data acquisition and computing terminals along with gas analysers, meteorological sensors, and peripheral devices. These systems are currently designed to detect SO₂, NOₓ, NO, NO₂, CO, H₂S, CO and CO₂, to less than 10ppb levels. The basis for detection is chemiluminescence, fluorescence, UV and IR absorption. Athabasca's meteorological instruments include a Windflo anemometer, Comprop anemometer (positon pitch propeller) for turbulence measurements, atmospheric flux monitor, and differential air temperature system. The automated suspended sediment sampler is designed to take water samples for later analysis. The device can either sample continuously (at preselected intervals) in a "rain gauge" mode. In the latter mode, it remains dormant, consuming almost no power until it is activated by a tipping bucket type of rain gauge.

Their Pibal tracking system is used for the determination of wind speed and direction and/or temperature, at incrementally increasing altitudes. It basically consists of two theodolites on a 1000 ft base line tracking a balloon, each instrument being equipped with shaft encoders that measure azimuth and elevation angles. These data are conveyed to a data acquisition system (Athabasca designed) which is programmed to calculate and print out the altitude, wind speed and direction, downwind position, and temperature.

The Athabasca leak detection system utilizes the principle of vacuum induction of air bubbles to detect wall perforations in underground/enclosed storage tanks for petroleum products. The system consists of a monitoring van equipped with appropriate instrumentation and vacuum equipment and a hydrophone probe that identifies the distinctive bubble signature induced by the reduced pressure, and simultaneously detects the presence of water. The test method is fast, economically acceptable and is in industry practice as well as being superior to other methods currently in use. The system detects pinhole size leaks as well as larger ones, and is not subject to most of the drawbacks of the other leak test procedures.

Athabasca’s products include:

- Weather radar data processing systems
- Ambient air quality monitoring and meteorological systems
- Ultraviolet spectrometers
- Meteorological instruments
- Pibal Tracking Systems
- Automated suspended sediment samplers

Plant Size: 14,000 sq ft

Equipment: Calibration chambers, environmental chambers, Monroe 0C8820 (In-house Computers), and analog electronics production facility.

Experience: Customers both US and Canadian, range from coal mining (methane) applications in Gillette, Wyoming to carbon monoxide detection in various institutions in major centers in Canada. They are interested in doing business with the USAF.

Keywords: 4 = Chemistry; 7 = Electronics; 9 = Environment; 16 = Security & Safety; 17 = Software Services; 20 = Miscellaneous; Hazardous Gas Detectors = 9, 16; Toxic Gas Detectors = 9, 16; Electronic Gas Detectors = 7, 9; Sensors = 9; Electrochemical Devices = 4, 7, 9; Catalytic Sensors = 4, 9; Solid State Devices = 7, 9; Hydrogen Sulfide Sensors = 7, 9, 16; Pollution Monitoring Equipment = 9; Combustible Gas Monitoring Equipment = 9, 16; Data Acquisition Capability = 7, 9, 17, 20; Repair & Overhaul = 7; Thermal Conductivity Devices = 7, 9; Calibration Capability = 9.

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ATHABASCA RESEARCH CORPORATION Ltd

Code: ATH

Address: 16600-107 Ave
P. O. Box 2405
Edmonton, Alberta, Canada T5J 2S1

Contact: Mr. T E Adams, President – (403) 483-3762/3506

History: Athabasca Research Corp Ltd is a Canadian owned high technology company with one subsidiary in Canada – Tanknology Canada Ltd. The company was incorporated in 1976 primarily to provide specialized services in the design of instruments and systems for air quality monitoring, meteorological measurements, and data acquisition and control systems for the petroleum industry and government agencies.

Capability: Athabasca Research is actively engaged in the provision of multi-disciplined scientific and engineering systems and services. Their background experience includes the manufacture of geophones and recording seismographs for oil exploration purposes. A significant portion of their present activities are environment oriented; including research, data collection and interpretation, and the development and manufacture of associated instrumentation. They are active in the area of environmental monitoring program management and take responsibility for all aspects including hardware specification, procurement, operation and maintenance and data reduction. They provide turnkey operation of complete environmental and meteorological monitoring systems.

Their Pibal tracking system is used for the determination of wind speed and direction and/or temperature, at incrementally increasing altitudes. It basically consists of two theodolites on a 1000 ft base line tracking a balloon, each instrument being equipped with shaft encoders that measure azimuth and elevation angles. These data are conveyed to a data acquisition system (Athabasca designed) which is programmed to calculate and print out the altitude, wind speed and direction, downwind position, and temperature.

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They have conceived, designed and are currently negotiating a contract with the Canadian Department of National Defense to develop a Tactical Target Scoring System. The system can accurately measure the impact position of air delivered ordnance, e.g., bombs, rockets, missiles, etc., on tactical test ranges. It utilizes a unique sensing and data acquisition system that can interpret and transmit objective impact information to the range control facility. The system is independent of visibility restrictions, lighting conditions and can detect the munition's impact with or without an accompanying blast or marking charge. It is self-contained, requiring no external power sources, can be remotely activated or deactivated, and conveys information by either conventional RF link or via a data collection platform.

Finally, they have demonstrated expertise in laser technology. Their Lasaline (or Lasalline) product expands a laser beam in one direction by an optical method to form a line that can be used as a reference line. They have also developed and manufactured a laser extinction monitor. This device detects particulate matter in air and can give an accu-
rate concentration. It is particularly useful in pollution monitoring, e.g., particulates in stack emissions.

**Average Work Force:** Total – 12

**Gross Sales:** No Data

**Plant Size:** 7,000 sq ft

**Experience:** Athabasca Research has experience with both the Alberta and Canadian Governments, Universities and Canadian Industry. Industrial clients include Petro Canada, Imperial Oil Company, Shell Canada Ltd, Amoco Canada Ltd, Texaco Canada Ltd, Gulf Oil Company, Dow Chemical, Sheritt Gordon Mines, Bell and Howell Canada Ltd, and Alberta Government Telephones. They have no experience with the USAF, but are interested in working with the USAF in the future.

**Keywords:** 7 = Electronics; 8 = Energy; 9 = Environment; 11 = Lasers; 15 = Radar; 17 = Software Services; 19 = Testing/Test Equipment; 20 = Miscellaneous; Geophones 7, 8; Recording Seismographs = 7, 8; Acoustic Sensing = 7; Data Acquisition = 7, 9; Geophysics = 7, 8; Environmental Sensors = 7, 9; Meteorological Stations = 9, 20; Meteorological Equipment = 9, 20; Environmental Analysis = 9; Environmental Forecasting = 9; Leak Detection System = 9, 19; Pollution Sensing = 9, 19; Pollution Analysis = 9; Weather Radar = 9; Trace Gas Detection = 9, 19; Laser Optics = 11; Weather = 15; Environmental Programs = 17; Instrumentation = 9, 19; Monitoring = 9; Ultraviolet Spectrometer = 19, 10; Wind Speed Determination = 9; Wind Direction = 9; Underground Storage Tanks = 9, 19; Tactical Target Scoring System = 9; Range Instrumentation = 19; Ordnance Impact Position = 19.

**Revised:** Dec 83

**ATLANTIS FLIGHT RESEARCH Inc**

**Code:** AFR

**Address:** 3924 Chesswood Drive
Downsview, Ontario, Canada M3J 2W6

**Contact:** Mr. Dale Simmons, General Manager – (416) 630-8611

**History:** Atlantis is a wholly owned Canadian company incorporated in 1978. There are no other Canadian divisions or US subsidiaries.

**Capability:** Atlantis manufactures avionics test equipment, simulators/computer assisted training systems and specialized aerospace instrumentation.

The company has a firm commitment to the ongoing design and development of new products for the avionics test equipment line. A series of Interface Panels support bench test applications on a variety of avionics systems ranging from VHF navigation systems to cockpit voice recorders. Two new pieces of test equipment provide Autoland and Ground Proximity Warning System testing on the new digital avionics aircraft such as the Boeing 757/767, as well as on aircraft using analog avionics. Another unit now entering production in both manual and automatic test equipment versions, will support general purpose bench testing of new digital avionics systems using the ARINC 429 bus. The company is now starting development of test equipment to support military aircraft using digital MIL-1553 bus. Custom test equipment is also designed for specialized applications.


Atlantic also offers research & design, and manufacturing services with custom microprocessor applications/instrumentation. They are currently designing and manufacturing a Digital Autopilot/Guidance System for a rocket-powered drone for the Canadian Department of Defense. Previous projects have included industrial control systems and software for nuclear power station monitoring systems.

**Average Work Force:** 
- PhDs = 1
- Engineering = 5
- Manufacturing = 5
- Others = 3

**Gross Sales:**
- 1979 = $ 45K
- 1980 = $180K
- 1981 = $250K
- 1982 = $315K
- 1983 = $750K
- 1984 = $1,100K (Projected)

**Plant Size:** 3,800 sq ft

**Experience:** Atlantis has supplied equipment to the Canadian Department of Defense, original equipment manufacturers (e.g., Canadair, Boeing), the corporate aviation sector, major avionics facilities and airlines. Current US sales have been mainly commercial with no sales to the USAF. They are interested in expanding their business to include the US military.

**Keywords:**
- 1 = Aircraft; 2 = Armament; 3 = Avionics; 6 = Computers; 7 = Electronics; 17 = Software Services; 19 = Testing/Test Equipment; 20 = Miscellaneous. Test Equipment = 3; Training Aids = 1; Radio/Radar Attimeters = 19; VHF Navigation Systems = 19; VHF Transceivers = 19; HF Transceivers = 19; Flight Data Recorders = 19; Cockpit Voice Recorders = 19; Engine Component Simulator = 19; Animated System Trainers = 1, 19; Simulators = 1, 20; Software Development = 17; System Simulation = 1, 20; Training Simulators = 1, 2, 3, 20; Research & Development = 6, 7, 19.

**Revised:** Dec 83

**AVIATION ELECTRIC Ltd**

**Code:** AVE

**Address:** Mailing, P. O. Box 2140
St Laurent, Quebec, Canada H4L 4X6

**Contact:** Mr. John Beaven, Director, Marketing – (514) 744-2811

**History:** Aviation Electric Ltd, a unit of the Bendix Aerospace Sector of Allied Corp, is a major supplier of aerospace/military components and systems to both domestic and international customers. Founded in 1931, the company is recognized today as one of the world’s largest producers of fuel control systems for small gas turbine engines, and is a world leader in the design and manufacture of military ground systems.

**Capability:** Currently marketed are electronic on-board military vehic le compass systems and navigation systems. A technically advanced Artillery Gun Alignment and Control System designed and developed for the Canadian Department of National Defense provides rapid alignment of towed and
self-propelled artillery. This system is currently undergoing field trials and will be released to production in the near future.

Supporting the design engineering group is a large manufacturing operation equipped with the most modern 3- & 4-axis machining centers both horizontal and vertical, as well as fully automatic and/or programmable high precision cylindrical and internal grinders. As many components used in the Aviation Electric fuel control system must be machined to tolerances of 50 millionths of an inch or less, Aviation Electric is recognized in the industry as a highly reliable supplier of subcontract precision machining capability. Currently, several programs requiring extremely close tolerance machined parts are being undertaken for a number of selected US companies.

In addition to its high performance machining and design capabilities, Aviation Electric Ltd also operates one of the largest repair and overhaul facilities in Canada. In its shops, aircraft instruments, wheels, brakes, aircraft accessories, navigation aids, and airborne radios, produced by more than 300 different manufacturers are repaired, overhauled or modified for over 300 customers in 35 countries. The company also operates a large variety of test stands where the fuel control systems following overhaul are subjected to extensive testing to simulate actual flight conditions.

To supplement its line of aerospace products, Aviation Electric Ltd is the exclusive sales and service representative for a number of high technology electronic systems. These include automatic test equipment, liquid and gas chromatographs, marine and air traffic control radar simulators, and air pollution monitoring instruments.

The company is also a leader in quality assurance and is one of the first Canadian aerospace companies to institute the "quality control" concept. Its quality assurance system meets the requirements of Canadian Government Specification DND 1015 and US Government Specification MIL-Q-9858, and it is also approved by the Department of Transport, the Federal Aviation Administration, and NATO.

**Average Work Force:** Engineering = 50  
Production = 425  
Marketing = 40  
Others = 335

**Gross Sales:**  
1980 = $63M  
1981 = $68M  
1982 = $70M  
1983 = $60M (Est)

**Plant Size:** 220,000 sq ft

**Experience:** Aviation Electric Ltd's present customers include: Department of National Defense - repair and overhaul of aircraft instruments, accessories, navigation aids and airborne radar; Pratt and Whitney Canada - engine fuel control systems; Air Canada - wheel and brake parts and instruments, deHavilland - avionics equipment, flight and engine instruments and accessories, Canadian - electrical connectors, drone alignment systems and aircraft accessories; and General Electric (USA) - engine fuel control systems.

**Keywords:** 1 = Aircraft; 3 = Avionics; 7 = Electronics; 12 = Machining; 15 = Radar; 20 = Miscellaneous; Repair & Overhaul = 1, 3, 15; Engine Fuel Control Systems = 1; Compass Systems = 20; Navigation Systems = 1; Artillery Alignment and Control Systems = 20; Precision Machining = 1, 12; Design = 1; Design to Requirements = 1; Wheel Parts = 1, 12; Brake Parts = 1, 12; Instruments = 1; Avionics Equipment = 3; Connectors = 7; Drone Alignment Systems = 1; Accessories = 1.

**Revised:** Dec 83.

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**AVTECH ELECTROSYSTEMS Ltd**

**Code:** AVT  
**Address:** (Mailing)  
P O Box 5120, Station F  
Ottawa, Ontario, Canada K2C 3H4  
(Location)  
15 Grenfell Crescent, Suite #205  
Nepean, Ontario, Canada K2G 0G3

**Contact:** Dr. W. J. Chudobiak, President - (613) 226-5772

**History:** Avtech ElectroSystems Ltd is a small, private Canadian, high technology company incorporated in 1975. There are no other branches or affiliates in Canada or the US. The company is represented in France, W. Germany, Japan, Austria, the UK, and Italy.

**Capability:** Avtech was established for the purpose of designing and marketing nanosecond waveform instrumentation. Since its start, it has become recognized as a leading supplier of nanosecond waveform generators and accessories with over 100 models. Their product line includes pulse generators, impulse generators, monocyte generators, pulse amplifiers, transformers, power splitters, bias insertion units, and scope probes.

The all solid-state waveform generators are available as stand alone lab instruments, or as miniature DC powered modules. The amplitude and the voltage rate of rise for some of their units are at least an order of magnitude higher than those provided by standard tunnel diode pulse generators. The combination of some aspects of microwave integrated circuit technology with ultra-fast semiconductor device switching technology (including SRF, hot carrier diodes, avalanche, VMOS and bipolar switches), has yielded 100 psec rise and fall times, PRF beyond 250 MHz, amplitude to 350 volts, peak currents to 100 amperes, and single cycles of RF to 1500 MHz. They can design, develop and build to customer requirements.

Avtech's inverting and impedance transformers are designed to be used with general purpose laboratory pulse generators, with subnanosecond risetime pulse generators and circuits, and other units. They provide inverted output pulse with a magnitude equal to the input signal magnitude, and can match to other impedance levels or can obtain higher output currents.

Avtech's power splitters provide two outputs which are either both in phase (non-inverted) with the input signal, or with one output non-inverted and with one inverted. They are designed for use with nanosecond speed laboratory pulse generators, with CW signals, or with other units to frequencies as high as 1 GHz. Their bias insertion unit is designed for both CW and subnanosecond risetime baseband pulse applications. The scope probe was designed to be used with a 50 ohm sampling oscilloscope, to allow probing of test points in microstrip structures and in discrete RF circuits and subnanosecond pulse circuits, operating at frequencies as high as 5 GHz and with risetimes as low as 100 psec.

**Average Work Force:** Total = 5

**Gross Sales:**  
1981 = $320K  
1982 = $450K  
1983 = $800K  
1984 = $720K (Projected)

**Plant Size:** 3,000 sq ft

**Experience:** Approximately 98% of Avtech's sales are export. Their products have been supplied worldwide to companies, universities and government agencies, e.g., USAF, Harry Diamond Laboratories, Los Alamos Scientific Laboratory, Northrop, Honeywell, Westinghouse, Boeing, and Lockheed. Avtech also supplies replacement parts to the Department of National Defence, the Federal Aviation Administration, and NATO. Avtech is also approved by the Department of Transport, the Federal Aviation Administration, and NATO.

**History:** Avtech ElectroSystems Ltd is a small, private Canadian, high technology company incorporated in 1975. There are no other branches or affiliates in Canada or the US. The company is represented in France, W. Germany, Japan, Austria, the UK, and Italy.
BAKER ENGINEERING ENTERPRISES Ltd

Code: BEE
Address: 9620-27 Ave
Edmonton, Alberta, Canada T6N 1B2
Contact: Mr. Len Friedenberg, President – (403) 463-0922

History: Baker Engineering is a Canadian owned company incorporated in 1973 with a US subsidiary (BEE Agra Corp) located in Denver, Colorado. The company's original aims were research, design and manufacture of electronic instrumentation, specifically for use in the agricultural industry.

Capability: Engineering expertise at Baker Engineering is directed towards the areas of mechanical electrical transducer design, analog & digital monitoring and control circuitry, microprocessor applications to monitoring control problems, and electro-mechanical servo component design. Baker Engineering product line includes a combined efficiency monitor, and liquid sprayer application monitor. Many other agriculturally oriented monitors are in the Baker Engineering product line. A second general area of product development was toward an electric fence controller that operates on existing fences with wood posts without the requirements for wire insulators and grass/brush free status. Particular attention is paid to production engineering & testing, and quality control with appropriate documentation.

Average Work Force: Engineers – 7
Gross Sales: $1.5-$2.0M
Plant Size: 12,600 sq ft

Equipment: In-house equipment to insure quality productivity includes computer controlled printed circuit board drilling, transformer and coil winding; printed circuit wave soldering facility; sheet metal shearing, punching, and forming; and a thermoplastic injection molding facility.

Experience: During the past two years, about 10 to 15% of sales have been to the US, primarily through their US affiliate. They have no experience with the US DOD.

Keywords: 7 = Electronics; 12 = Machining. Measurement Systems = 7; Control Systems = 7; Transducer Design = 7; Analog = 7; Digital = 7; Monitoring Systems = 7; Infection Molding = 12; Injection Molding Tools = 12.

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BARON COMMUNICATIONS Ltd

Code: BCL
Address: P. O. Box 82010
6939 East Hastings St
Burnaby, British Columbia, Canada V5C 5P3
Contact: Mr. Harry Baron, President – (604) 291-8272

History: Baron Communications (formerly Challenger Electronics) was formed in 1960 as a wholly owned Canadian Corporation with representatives in Washington, Oregon, California, Arizona, Texas, Michigan, and Illinois.

Capability: Baron specializes in the manufacture, design, and development of various types of tone signalling, alarm & status, and control systems, radio, and telephone interconnect terminals & associated mobile control heads.

Average Work Force: 14
the following systems: Another product of the company is Barringer’s research and development activities have led to systems and technology. Towards this end, continue developing new oil and gas exploration instrument equipment. An increase in their product line by geochemical techniques and instrument systems and technology that they initially developed for mineral exploration. They turing of certain exploration instrumentation and monitoring for oil and gas exploration instrument systems and technology that Barringer has for many years been involved in the manufacture of, has been devoted a substantial portion of their efforts toward adapting environmental and process monitoring. They have recently developed a substantial portion of their efforts toward adapting for oil and gas exploration instrument systems and technology. They continue developing new oil and gas exploration instrument systems and technology.

Barringer’s research and development activities have led to the following systems:

- The INPUT® (Induced PULse Transient) – This system was the original development of Barringer and is the only commercial airborne electromagnetic prospecting system to use a pulsed field principle. The system has been successful in its application in the search for mineral deposits. The success of the system was recently recognized by the Society of Exploration Geophysicists which awarded Dr Anthony R Barringer the Kauffman Gold Medal of the Society for his contributions to the science and practice of geophysics via the INPUT system. According to the Society’s statistical returns, 70% of all the world’s commercial airborne electromagnetic surveys are carried out with the INPUT system.

COTRAN® (COrrelation TRANsients) – This system uses a new approach to signal processing that can only be achieved by digital techniques. The airborne computer analysis of the data is believed to give the system substantial advantages in terms of sensitivity and interpretability. Only one COTRAN system exists at the present time, and is currently undergoing evaluation in surveys that are part testing and part operational.

TIVAC - This system is aimed at detection of hydrocarbon leakage over oil deposits by geophysical remote sensing methods.

Metal detection systems have also been developed by Barringer as a spin-off from its airborne geophysical equipment. A modification of the original design was used for traffic counting and ramp metal detection on conveyor belts. Subsequently, this patent has been used as a metal detector in walk-through systems installed in airports. It has also been used on conveyor belts to protect ore crushers from damaged by ingesting pieces of metal that accidentally get mixed in with the ore. A new prototype system has functioned well and has demonstrated a significant advantage in that it can be programmed to ignore pieces of metal, such as the clips of conveyor belts which give a signal that will usually trigger a false alarm. It is anticipated that there will be further development of the COTRAN principle, possibly using new microcomputer technology, allowing production costs to be reduced so that the system can be supplied to a number of new applications. This system may also be used for military range clearance.

A new product known as a RatiOmeter is an optical device for measuring the reflectance ratios of pairs of wavelengths in the visible and infrared region. The instrument has application in identifying clay minerals for mapping purposes when exploring for mineralization and in the follow-up of targets of interest selected from satellite imagery and aerial photography, particularly with regard to the forthcoming US Landsat-D satellite and the French SPOT (Systeme Probatoire pour Observation Terrestre) satellite. Both of these satellites use infrared channels that generate new kinds of information that can be checked on the surface with the Ratiometer. The first production run is in progress.

RESPEC II – A microprocessor-controlled field reflectance spectrometer was added to Barringer’s product line in 1983. This product provides graphs and tables of commonly sought spectral quantities – reflectance vs wavelength, averages of spectra, difference of spectra, mean reflectance over variable wavelength ranges, and standard deviations in time and wavelength-averaged spectra.

Barringer has for many years been involved in the manufacturing of certain exploration instrumentation and monitoring equipment. An increase in their product line is planned. Towards this end, 13,000 sq ft of space have been added to their Toronto facility.

Another product of the company is its range of on-stream heavy water monitors for monitoring the heavy water content of flow streams in nuclear reactors. Barringer is a supplier for the CANDU, Canadian heavy water reactor, which has been expanded use in Canada and other countries.

COSPEC® (COrrrelation SPEctrometers) – These are the only commercial available remote sensing devices for
the monitoring of atmospheric concentrations of sulphur dioxide and nitrogen oxide. They perform a unique function in the monitoring of air pollution. The joint use of the networks of ground sensors and remote sensing equipment is used as a tool for modeling air pollution episodes and various research investigations of air pollution problems.

Additional specialized optical systems for monitoring gases are manufactured by the company, including the GASPEC® infrared system for remote detection of gases, and its Correlation Interferometer that is used in related areas. These instruments are generally manufactured on special order for governmental agencies such as NASA.

SURTRACE® – This system is a helicopter-mounted airborne geochemical technique which uses a long flexible probe mounted beneath the helicopter to vacuum surface micro-layer samples of material off the ground. Special tape sampling equipment is carried in the helicopter to store the samples sequentially, and a technique known as LASERTRACE has been developed for providing 25 element analyses of the minute traces of material collected from the ground surface. The analytical technique is fully automated and computerized and is capable of high volume production. The system has already been used successfully in operational programs. Experience to date with the equipment has been restricted to mineral type surveys, however, potential applications in the hydrocarbon field have been established by the use of related ground equipment over oil fields. A ground version back-pack model has also been successfully used.

AIRTRACE® – This is a system that extracts and analyzes aerosol in the atmosphere and is a forerunner of the SURTRACE system. Although the AIRTRACE equipment is operational, its usage is limited to specific meteorological conditions. This limitation results in high costs of surveys and hence is a restriction on more general use of the AIRTRACE method.

AIRBORNE LASER FLUOROSENSOR – This is a successful airborne laser that has been constructed for a Canadian government organization and has functioned very effectively in tests and surveys designed to detect and classify oil sticks.

GASPEC – A remote sensing gas filter cell spectrometer which NASA Langley Research Center has used in flight tests and which has proven satisfactory in monitoring atmospheric carbon monoxide. This equipment was incorporated as one of the five experiments carried on board the first Space Shuttle. The experiment is based on Barringer's design, and the space flight hardware was constructed by TRW Systems Group. The experiment was very successful and new data on the global distribution of carbon monoxide has been published.

The GASPEC concept is also to be used in the ERBS (Earth Radiation Budget Satellite) wherein it will detect HF, HCl, CH₄, and NO by looking at the rising and setting sun from the satellite (the HALOE or HALogen Occultation Experiment).

MERCURY SPECTROMETER – A mercury spectrometer, and speciation train for separately analyzing for elemental mercury, mercuric chloride, methyl mercuric chloride and dimethyl mercury has been developed and a custom instrument delivered, complete with calibration system. The instrument is capable of detecting 5 picograms of mercury per second, more than adequate to monitor mercury in the natural (clean) environment.

MICROWAVE EMISSION DETECTOR – A new detector of both metals and non-metals (Br, Cl, C, F, Hg, P, S) for gas chromatography has been developed. It uses a polychromator and a Beenakker cavity continuing helium at atmospheric pressure. Detection by microwaves to provide simultaneous detection to limits of 5 to 30 picograms per second and dynamic ranges over a thousand.

Average Work Force: (Canada Only) Engineers – Scientists – 36 Technical Support – 20

Barringer Research retains on staff a diverse group of Scientists and Engineers in the physical sciences. Barringer Research retains expertise in analytical chemistry, geochemistry and microbiology. The professional and supporting technical staffs shown above are for the metropolitan Toronto location only. The total US and Canadian professional strength is 52 Scientists and 13 Engineers.


Plant Size: Barringer Resources Inc. Barringer Research Ltd. and Barringer Magenta Ltd lease the following office and laboratory space:

<table>
<thead>
<tr>
<th>Location</th>
<th>Sq Ft</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1626 Cole Blvd</td>
<td>15,200</td>
<td>Office &amp; Laboratory</td>
</tr>
<tr>
<td>Golden, Colorado</td>
<td></td>
<td></td>
</tr>
<tr>
<td>304 Carlingview Dr</td>
<td>28,700</td>
<td>Office, Laboratory &amp; Mfg</td>
</tr>
<tr>
<td>Rexdale, Ontario</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1455 Deming Way</td>
<td>7,200</td>
<td>Laboratory</td>
</tr>
<tr>
<td>Sparks, Nevada</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5161 Ward Road</td>
<td>3,000</td>
<td>Laboratory</td>
</tr>
<tr>
<td>Wheat Ridge, Colorado</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3750 19th St, N. E.</td>
<td>2,900</td>
<td>Laboratory</td>
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<tr>
<td>Calgary, Alberta</td>
<td></td>
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</tr>
<tr>
<td>Field Aviation</td>
<td>1,000</td>
<td>Avionics Workshop</td>
</tr>
<tr>
<td>Hangar Malton (Toronto), Ontario</td>
<td></td>
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</tbody>
</table>

Experience: Barringer experience is world-wide. Recent R&D clients include British Petroleum, Petro-Canada Explorations Inc.; TRW Systems Group (USA); National Research Council of Canada; Canadian Department of National Defense; Ontario Hydro; Department of Supply & Services (Canada); Rexnord Inc (USA); Atomic Energy of Canada Ltd; NASA Langley Research Center (USA); and Atmospheric Environment Services (Canada). Previous contracts for the USAF include one for Wright-Patterson AFB, OH – "Remote Detection of Chemical Vapors using Correlation Interferometric Techniques" in 1969, and one contract for Brooks AFB, TX – "Development of a Hydrazine/Carbon Monoxide GASPEC" in 1976-1979.

Keywords: 7 = Electronics; 9 = Environment; 10 = Image Processing & Optics; 11 = Lasers; 17 = Software Services; Infrared Instrumentation = 7; Airborne Surveys = 9; Environmental Analysis = 9; Remote Sensing = 9; Trace Gas Detection = 9; Spectroscopy = 12; Geographic/Geologic Analysis = 17; Electro-Optics = 10; Signal Processing = 7; Date Analysis = 7; Metal Detection = 9; Instrument Manufacture = 7; Remote Gas Detection = 7; Airborne Laser Fluorosensor = 9; Hazardous Gas Detection = 9.

Revised: Dec 83
BELL AEROSPACE CANADA
TEXTRON
(Division of Textron Canada Ltd)

Code: BEL
Address: P. O. Box 160
Grand Bend, Ontario, Canada N0M 1T0
Contact: Mr J B Timbrell, Managing Director – (519) 238-2333

History: Bell Aerospace was registered to do business in Canada in 1966. The parent company is Bell Aerospace Textron located in Buffalo, New York.

Capability: Bell Aerospace concentrates in the areas of design, development, manufacturing, and production. They specialize in air cushion vehicles and systems.

Average Work Force: Engineering – 6
G & A – 9
Others – 80

Gross Sales: 1982 – $15M
Plant Size: 38,000 sq ft

Equipment: Computer terminals and specialized graphic terminals.

Experience: The company is perhaps best known for its capability to generate strategic information in relation to Arctic operations. From remote sensing data, the company is able to generate environmental information on ice and ocean systems applicable to the engineering design of structures. On the basis of this information, company engineers are able to turn the information into specific structural design parameters, and carry out preliminary, as well as detailed engineering designs of structures for service in the Arctic frontier regions. In the area of arctic and ice engineering and consulting, the company has been employed by most of the major US companies, including Exxon, Amoco, ARCO, Sohio, Phillips, Mobile, and Chevron. In addition, principal Canadian clients in the Arctic include Dome, Petro-Canada, and Gulf Resources. Finally, the company is well known for its ability to develop novel structures for service in frontier conditions. Such structures have included portable aircraft shelters made of aerospace materials to military specifications. To date, such aircraft shelters have been developed for the Canadian Department of National Defense for military service in support of Arctic airborne operations.

Keywords: Aircraft; Air Cushion Vehicles; Air Cushion Systems; Air Cushion Equipment; ACET; ACET Program; Canadian Coast Guard; Arctic.

BOEING OF CANADA Ltd
Winnipeg Division

Code: BOE
Address: 99 Murray Park Road
Winnipeg, Manitoba, Canada R3J 3M6
Contact: Mr. L L Bryson, Vice President – (204) 888-2300

History: The Boeing Winnipeg plant was established in 1971 and is a wholly owned subsidiary of The Boeing Company of Seattle. There is one other Canadian division located in Amnpor, Ontario.

CAPABILITY: Boeing is a Canadian leader in high strength/weight ratio fiber composite plastic components for aircraft, space, and other advanced technology applications. The company has the engineering, manufacturing, and development expertise to design and build solid laminate or sandwich panel components. Glass, high-modulus graphite and organic fibers, and thermostet resin systems, including epoxies, polyesters, phenolics or polyimides, are used with state-of-the-art capability. Structural and nonstructural glass fiber, and advanced fiber composite components are currently produced for a diversified range of products covering a technological spectrum from aircraft and satellite components, to thermofomed acrylic bathtubs, light rail vehicles, and farm machinery components.

A stated objective of the company’s management team is to establish Boeing of Canada as a center of excellence for composites manufactured within the Boeing Company, and as the Canadian leader in the composite industry. To achieve this objective, an expanded research and development program and increased engineering tool design and fabrication capa-
The Winnipeg Division’s Quality Assurance Program operates to one standard of quality which is in conformance with the requirements of the Ministry of Transport Engineering and Inspection Manual (FAR Part 21, Subpart G), the Department of National Defense Specification DND 1015 (equivalent to MIL-Q-9838A), and with the Boeing Company Corporate Policy 5H1. Quality is maintained throughout the manufacturing process by inspectors appointed by Manager of Quality Assurance who in turn is approved by the Ministry of Transport. Complete laboratory tests are carried out on process test panels as required by customers and pertinent authorities. All raw materials are purchased from qualified suppliers and incoming shipments are subject to Quality Control receiving inspection to ensure that all requirements are met.

**Experience:** Boeing-Winnipeg assumed production responsibility for the majority of all Boeing commercial aircraft. Significant contracts for graphite composites for Satcom and Anik D satellite programs were secured. A technology transfer program, including establishment of a tool design group and upgrading of tooling and part fabrication capability, was initiated in preparation for increased graphite and hybrid work on the new Boeing 757/767 aircraft programs.

**Some of Boeing-Winnipeg customers include:**

- **Canadair (Challenger)** – fairing flap hinge, assembly wing tips, leading edge flap, access panels, smoke sensor, side console, cover assembly, inboard fairing, latch housing, aft wing-to-body fairing, and horizontal stabilizer tips.
- **deHavilland** – panels, fairings, DHC 7 kevlar trough, and nose avionics bay. DHC-8 Nose Equipment bay.
- **Hughes** – satellite components.
- **SPAR Aerospace** – graphite epoxy plates, and waveguides & satellite components.
- **Boeing Vertol** – rain gutters, and CH47 inlet screens.
- **Boeing** – 707, 727, 737, and 747.
- **Geonics** – magnetometer booms.
- **Geophysics** – magnetometer booms.
- **Aerodat** – magnetometer booms.
- **AVCO** – Graphite-epoxy missile components.

**Keywords:** Aircraft: 18 = Space Systems; 20 = Miscellaneous; Airframe Components = 1; Airframe Structures = 1; Composite Components = 1, 18, 20; Fiberglass Components = 1, 18, 20; Laminates = 1, 18, 20; Graphite Epoxy Components = 1, 18, 20; Sandwich Components = 1, 18, 20.

**Revised:** Dec 83

**BRISTOL AEROSPACE Ltd**

**Code:** BAL

**Address:**
660 Berry St
P. O. Box 874
Winnipeg, Manitoba, Canada R3C 2S4

Rockwood Propellant Plant
Stony Mountain, Manitoba, Canada
(20 miles from main plant)

**Contact:** Mr. Keith Burrows, Marketing VP – (204) 775-8331

**History:** Bristol was founded in 1930 and incorporated in Canada in early 1947. It is a wholly owned subsidiary of Rolls Royce Holdings, (Canada) Ltd. Bristol owns and operates the Rockwood Propellant Plant (not a separate division) at Stony Mountain, Manitoba. There are no other subsidiaries operated by the company.

**Capability:** Since inception in 1930, Bristol has moved from manufacturing and repairing seaplane floats (1930-1943) to a company with numerous distinct products and services.
Equipment: The equipment presently in use at CAD/CAM is a CALMA GDS-1 Interactive Graphics System that consists of: (1) Data General Eclipse CPU, (2) Four 48x60 inch digitizing tables with dual 19x11 inch CRTs, (3) Color design/edit station with tablet and CRT, (4) CALCOMP 970 pen plotter (on-line), (5) GERBER 4432 Photoplotter (off-line), and (6) Kodak film processing laboratory.

Plant Size: 5,000 sq ft

Experience: CAD/CAM has contract experience with various departments of the Canadian Government, including the Departments of National Defense and Transportation. Canadian industrial experience includes such companies as Northern Telecom, Bell Northern Research, Litton Systems, and AES Data Ltd. US industrial experience includes ITT Aerospace and IBM.

Keywords: 7 = Electronics; 17 = Software Services; Circuit Layout = 17; PC Board Design = 7; Thick Film Hybrid Parts = 7; Thick Film Hybrid Design = 7; Thin Film Hybrid Parts = 7; Thin Film Hybrid Design = 7.

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CAE INDUSTRIES Ltd

Code: CAE

Address: Corporate Offices Suite #3060 P.O. Box 30 Royal Bank Plaza Toronto, Ontario, Canada M5U 2J1

CAE ELECTRONICS Ltd 8555 Cote de Liesse P.O. Box 1800 Saint Laurent, Quebec, Canada H4L 4X4

Contact: Dr. Murdoch McKinnon, R&D Manager - (514) 341-6780

History: The company was incorporated in 1947 as Canadian Aviation Electronics Ltd to engage principally in the repair and overhaul of electronics and electro-mechanical equipment and devices. The name was changed to CAE Industries Ltd in 1963 to more accurately reflect its expanding interests in many diverse fields of industry. Diversification and acquisition began in 1961 with the formation of CAE Electronics GmbH in West Germany. Other subsidiaries include CAE Electronics Ltd, Northwest Industries Ltd, CAE Fiberglass Products Division, CAE Aircraft Ltd, Canadian Bronze Company Ltd, CAE Machinery Ltd, Webster Mfg (London) Ltd, Accurcast Die Casting Ltd, CAE-Montepet Diecast Ltd, CAE Morse Division, CAE Lubricators Division, Cleveland-CAE Metal Abrasive Ltd, USP Industries Inc, and CAE Magnesium Products Division. All are Canadian-based except the one subsidiary located in West Germany. This profile will concentrate on CAE Electronics Ltd.

Capability: CAE Electronics Ltd designs and manufactures sophisticated commercial and military aircraft flight simulators and airborne magnetic anomaly detection equipment. They have also become a major producer of computer-based data acquisition and control systems in the areas of electrical power generation and transmission, oil production, gas transmission, air traffic control, and space.

In the simulator area, they are a leading designer and producer of flight simulators. They have produced the first FAA approved phase III commercial aircraft simulator for United Airlines. Their simulators include state-of-the-art technology such as hydrostatic six-degree-of-freedom motion, general purpose computers, and CRT-based instructor's facilities. They reproduce aircraft performance in all flight regimes and, in particular, the critical landing phase. Digital flight simulators have been developed for the A-300, B727, B737, B747, DC-8, DC-9, DC-9-80, DC-10, L1011, F-28, CL-600, and the new generation A-310, B757 and B767. A wide range of simulators has also been supplied to different countries for various types of military aircraft, including tactical jet fighters, jet trainers, anti-submarine patrol aircraft, and transports.

They selectively pursue the US military flight simulator market. CAE also designs and produces simulators for helicopters such as the Agusta AB-205 and AB-212, Bell UH-1-D, Boeing-Vertol CH-47, Sikorsky CH-53, and Westland Sea King MK41. In addition to flight simulators, CAE Electronics produces training simulators for nuclear power plants. They are used to train operators to develop experience in responding to all normal, abnormal and emergency conditions as well as to learn required operating procedures and techniques. In the avionics area, CAE Electronics develops and manufactures magnetic anomaly detection (MAD) systems used in anti-submarine warfare. Their cesium magnetometer system, which has been traditionally mounted in a stinger at the rear of the aircraft, can measure changes in the earth's magnetic field as small as one part in 5 million. The company now offers an integrated MAD system for inboard use on fixed wing aircraft and helicopters.

They have developed a "JETS" joint enroute/terminal data processing and display system for air traffic control. The system is modular and the displayed information is tailorable to user requirements. They are active in the space area as they are part of a Canadian consortium, responsible for developing and manufacturing the complete Manipulator Arm system for the NASA Space Shuttle. They have designed and are manufacturing the display and control panel, plus the rotational and translation hand controls that operate the manipulator itself. They have also designed and developed the simulation subsystem which is used as a design tool to test hardware and software modules of the system.

Average Work Force: Total (CAE Electronics) = 1,700 Technical Staff = 650

Gross Sales: CAE Industries = $300M CAE Electronics = $90M

Plant Size: 300,000 sq ft

Experience: CAE Electronics customers include United Airlines, Air Canada, British Airways, KLM, Lufthansa, Swissair, TWA, FAA, Douglas Aircraft Co, Lockheed California, the Canadian Forces, NASA, US Navy, and other departments of the Canadian Government. Current R&D activities include work with the USAF (AFHRL) on a joint program - Design Project for the development of a Wide Field of View, Helmet-Mounted, Infinity Display System, incorporating Area of Interest high resolution imagery slaved to the pilots' eye movements; a recently completed study of the LAMARS Air-to-Surface visual system for the USAF; a study for the CAF for a Turret Interactive Crew Simulator; development of computer-based training (CTT) and computer-aided learning technique (CAL); and a recently completed NASA study and development of a six-degree-of-freedom hand controller.

Keywords: 1 = Aircraft; 3 = Avionics; 6 = Computers; 7 = Electronics; 8 = Energy; 15 = Radar; 18 = Security & Safety; 17 = Software Services; 20 = Space Systems; 20 = Miscellaneous; Flight Simulators = 1, 3; Magnetic Anomaly Detection = 3, 16; Data Acquisition Systems = 1, 8, 18, 20; Data Control Systems = 1, 8, 18, 20; Training Simulators = 8, 20; Air Traffic Control Systems = 20; Control Systems = 18, 20; Repair & Overhaul = 3, 7; Video Display Systems = 7; Simulation Programs = 17; Air Traffic Control Simulators = 7, 20; Computer Graphics = 17; Graphics = 17; Hydraulics = 20; Nuclear Simulation = 6, 7, 17, 20; Simulation Training Simulators = 8, 20; Air Traffic Control Simulators = 20; Control Systems = 18, 20; Repair & Overhaul = 3, 7; Video Display Systems = 7; Simulation Programs = 17; Air Traffic Control Simulators = 7, 20; Graphics = 17; Graphics = 17; Hydraulics = 20; Nuclear
• The manufacture of "hot section" components for jet engines, afterburners and exhaust systems under contract to GE, Pratt & Whitney, and Rolls Royce.

• The complete restoration of "hot section" components for jet engines, afterburner assemblies and exhaust systems.

• The manufacture of light alloy structures for major aircraft including the DHC-6 and the P3/Cp-140.

• The repair and overhaul of military and commercial fixed wing aircraft, sub and supersonic, and rotary wing aircraft.

• Wire Strike Protection system for rotary wing aircraft.

• The manufacture of CANDU reactor in-core components.

• The manufacture and design of high altitude research rockets.

Bristol's present involvement in engineered product manufacture includes - rocket engines and solid fuel propellants; electronic data instrumentation for payloads and satellites; and remote automatic inspection systems for steam generators. Bristol's services encompass mechanical, electrical, aeronautical and propulsion design and development engineering. Other services include - precision welding of high temperature, corrosion resistant materials including nickel alloys, cobalt alloys, carbon steels and other exotic material such as titanium and zirconium; vacuum brazing; vacuum heat treatment, and facilities for testing of helicopter transmission assemblies.

Bristol's past achievements include the manufacture of light alloy structures for the DHC-7 and L-1011 aircraft, and design and manufacture of electronic data instrumentation for remote site applications and vertical axis wind turbines. Bristol's proprietary products include - Black Brant (high altitude research rockets), CRV-7 (Air to Surface Rocket); WSPS (Wire Strike Protection System for helicopters); CANSCAN (Remote, Automatic Inspection System for nuclear and conventional steam generators); DCP (Electronic Data Collection for remote site application); and READAC® (Automatic Weather Station for unattended use in airport applications).

**Average Work Force:**
- Salaried = 463
- Hourly = 599
- Technical = 100

**Gross Sales:**
- N/A

**Plant Size:**
- Production = 451,000 sq ft
- Warehouse = 6,000 sq ft
- Office = 57,000 sq ft

**Equipment:** Complete facilities and equipment for metal forming, welding, machining and metal treating. Numerical Control Machining Center with equipment such as the Sundstrand S-80, S-60, and OM-2A, a Raycon NC EDM, Mazak V5 and V20 machine center, and 4 Giddings & Lewis 48" NC VTL. Also included is a PDP 11/70 computer with MDSI: "Action Center" MCAuto CAD/CAM System with six design stations. Devine autoclave - working pressure of 132 psig and temperature of 400°F max; and working area of 6 ft diameter by 18 ft long. Special facilities include a helicopter transmission test cell, non-destructive test laboratory, and an electronic test laboratory.

Rockwood Propellant Plant - produces HTPB solid propellant for sounding rockets, JATO's drogue booster motors, and small military rockets. Present annual propellant production is 1,000,000 pounds.

**Experience:** In 1981, approximately 30 percent of Bristol's sales were to the US, with over 85 percent of these sales to the US military. US business includes the manufacture of combustion and exhaust components for the J85, J79, T64, TF56 and TF39 engines, and the remanufacture of the TF30 afterburner and general component repair and overhaul.

Other customers in the US include - the Navy, NASA, Pratt & Whitney Aircraft Corp, Lockheed Aircraft Corp, Grumman Aircraft, Fairchild Hiller Corp, and General Electric.


Bristol has been approved by the Canadian Ministry of Transport for Canadian Aircraft maintenance, and the Canadian Forces for manufacturing testing and overhaul. The quality requirements of MOT and FAA and the Canadian DND 1015 or MIL-Q-9858A are met for manufacturing, repair, and overhaul.

**Keywords:** 1 = Aircraft; 2 = Armament; 7 = Electronics; 8 = Energy; 9 = Environment; 12 = Machining; 14 = Protective Equipment; 19 = Testing/Test Equipment; Airframe Components = 1; Engine Components = 1; Engine Systems = 1; Helicopters/Subsystems = 1; Hydraulics = 1; Repair & Overhaul = 1; Nuclear Reactor Components = 8; Wind Turbines = 8; Meteorological Stations/Equipment = 9; Remote Inspection Systems = 8; Metalworking = 12; Heat Treating = 12; Coating = 12; Stamping = 12; Spin Forming = 12; Titanium = 12; Tooling = 12; Die Fabrication = 12; Rockets = 2, 9; Rocket Propellant = 2, 9; Rocket Engines = 2, 9; Helicopter Wire Strike = 14; Non-Destructive Testing = 1, 19; Instrumentation = 7, 19; Transmissions = 1, 19; Gear Boxes = 1, 19; Data Collection = 7, Laboratory = 7, 19; Gas Turbine Components = 1.

**Revised:** Dec 83

**CADCAM GRAPHIC SYSTEMS Ltd**

**Code:** CGS

**Address:** 700 Industrial Avenue
Ottawa, Ontario, Canada K1G OY9

**Contact:** Mr. A H Jarvis, General Manager - (613) 526-0620

**History:** CADCAM Graphics Systems Ltd is a small Canadian owned high technology company incorporated in May 1979. There is a branch in Toronto and the company is incorporated in the US as CADCAM Graphic Systems Inc.

**Capability:** CADCAM Graphics is an engineering design group specializing in computer aided graphics design and artwork generation for printed circuit boards and/or hybrid microcircuits. They also offer consulting services to assist clients in the development of design standards/criteria to suit their special needs. Their product services include: (1) Design from schematic to color-coded layout. (2) Digitizing of color-coded layouts for single, double or multilayered boards (prepared by either the customer or CADCAM). (3) Photoplotting of the following artwork masters - component and solder side, drill graphics, solder resist mask, silk screen and assembly. (4) Numerical control drill tapes to suit either Excelion or Digital Systems format, (5) Documentation packages and, (6) Prototype and production quantities of printed circuit boards.

**Average Work Force:** Total = 20

**Gross Sales:**
- 1981 = $1.0M
- 1982 = $1.4M
- 1983 = $1.5M
Cametoid Ltd

Code: COD

Address: 1449 Hopkins Street
Whitby, Ontario, Canada L1N 2C2

Contact: Mr. D G Newman, President & General Manager
-(416) 566-3400

History: Cametoid Ltd is a Canadian owned metal finishing company specializing in high quality metal coatings for the aerospace, electronics, nuclear, and general defense industries. Cametoid was incorporated in 1950 and was originally owned by Dowty Equipment of Canada Ltd, aircraft undercarriage manufacturers. In 1963, Cametoid was bought by the Newman family of Whitby, Ontario, and is today a wholly owned subsidiary of Newman Aerospace Inc.

Capability: Cametoid has two divisions:

- **The Electroplating Division** - produces high quality electroplating of cadmium, copper, nickel, nickel-cadmium, silver, tin, and zinc; electrolless nickel coatings; chemical films on aluminum and magnesium; phosphates on steel; passivation of stainless steel; black oxide coatings on copper, steel, and stainless steel; dry film lubricants of moly disulfide and Dupont Teflon® sprayed coatings.

- **The "Vacuum Coating" Division** - established in 1982 and is one of the few facilities in the world capable of ion vapor deposition of aluminum (air-dozing™) on large parts (narrow parts up to 14 ft long, and flat parts 5 ft x 10 ft) as well as on parts as small as aircraft fasteners. This facility is supplemented by an R&D laboratory working to expand the applications of ion vapor deposition and physical vapor deposition technology to a wide variety of materials used in optics, electronics, and solar energy. Measurement abilities include photomicrography; beta-backscatter, magnetic, and eddy current thickness testing; radiography; taber abrasion, and salt spray (fog) testing. This division also houses a new processing line for anodizing, hard chromating and chromating of aluminum components up to 12 ft long x 4 ft wide.

Average Work Force:
Chemists - 2
Physicist - 1
Engineer - 1
Technologist - 1
Administrative - 5
Operators - 15

Gross Sales: $1.0-$3.0M (Annually)

Plant Size: 21,000 sq ft

Equipeqment: Cametoid employs a complete electroplating and vacuum coating facility with baking ovens, exhaust systems, and in-house water treatment plant. Also employed are two laboratories – one for process and one for research and development with associated test equipment. Certain production and test equipment is computer related.

Experience: Cametoid has more than 25 years of active subcontract experience in dealing with the aerospace, electronic, nuclear and general defense industries in Canada and the US. With most of these companies, it has been a long relationship as an approved vendor. Its principal customers include Air Canada, Bata Engineering, Bell Aerospace, Boeing, CAE Electronics, Canadair, Canadian General Electric; Cleveland Pneumatic; Computing Devices; DAF Indal; deHavilland; Department of National Defense, Devtek, Dowty Equipment; Fleet; Garrett; Grumman; Hawker Siddeley; Irvin; ITT Cannon; Kaman Aerospace; Lehigh Instruments; Litton; Magna; Martin Marietta, McDonnell Douglas; Pratt and Whitney; Rolls Royce; Sikorsky; Spar Aerospace, and Sperry. In addition, the company serves a number of precision machine shops related to the aerospace industry in Toronto, Ottawa and Montreal.

Keywords: 1 = Aircraft; 2 = Armament; 3 = Avionics; 6 = Computers; 7 = Electronics; 8 = Energy; 9 = Environment; 10 = Image Processing & Optics; 12 = Machining; 13 = Missiles; 18 = Space Systems; 19 = Testing/Test Equipment; 20 = Miscellaneous; Thickness Testing = 19; Conductivity Testing = 19; Electroplating = 1, 2, 7, 8, 12, 13, 18, 20; Chemical Films = 1, 2, 7, 8, 12, 13, 18, 20; Dry Film Lubricants = 1, 2, 7, 8, 12, 13, 18, 20; Ion Vapor Deposition = 1, 6, 9, 10, 13, 18; Ion Plating = 1, 6, 9, 10, 13, 18; Anodizing = 1, 2, 7, 8, 12, 13, 18, 20; Salt Spray (Fog) Testing = 18; Taber Abrasion Testing = 19; Metal Finishing = 20; Hydrogen Embrittlement Relief = 19, 20; Repair & Overhaul = 20; Metal Coatings = 20; Protective Coatings = 20; Multilayer Coatings = 3, 7, 10, 13, 18; Optical Coatings = 10, 18; Teflon Coatings = 1, 6, 7, 12; Materials Processing = 20; Vacuum Coating = 1, 6, 9, 10, 13, 18; Hardness Testing = 19.

Revised: Dec 83

Canada Wire & Cable Ltd

Code: CWC

Address: Corporate Office
250 Ferrand Drive
Don Mills, Ontario, Canada M3C 3J4

Contact: Mr. H O Coish, VP Corporate Affairs -(416) 424-5110

History: Canada Wire & Cable Ltd is a diversified manufacturer operating businesses across Canada and the US, with partners in associated companies overseas. The company is a subsidiary of Noranda Mines Ltd and is involved either directly or through its subsidiaries and associates in the manufacture of electrical, electronic and communication wires and cables; plastic pipe and fittings, optical fiber cables and components, magnet wire, transformers, lighting, and other products.

Canada Wire was incorporated in 1911 and began producing cables for the fledgling electrical industry. By the mid-1920s, it had expanded its product line and located sales offices and warehouses across Canada. In 1929, Canada Wire & Cable Ltd amalgamated with Standard Underground Cable and began producing a wide range of power cables. During subsequent years, the company integrated its operations by building a copper rod mill to supply basic conductor material. They expanded to a full product range in the 1950s when they established specialized product plants in many parts of Canada. Export activity grew and, during the past two decades, led to joint venture businesses in several overseas countries. More recently, Canada Wire has diversified through the development of new products and the acquisition of companies in related industries.

Capability: Canada Wire is the largest wire and cable company in Canada and is ranked by industry sources as the second largest in North America, not including its overseas associates’ operations. It is among the hundred largest Canadian companies.
• Wire and Cable Group - the largest portion of its wire and cable business is organized on the basis of six divisions and one division of Grandview Industries Ltd, each with distinct products and markets. These divisions are:

1. Power & Control Products -
   Markets: Electrical Utilities, Construction Industry
   Plants: Quebec City, Quebec; Leaside, Ontario

2. Communication Products -
   Markets: Telecommunication Utilities
   Plants: Winnipeg, Manitoba; Weyburn, Saskatchewan; Vancouver, British Columbia

3. General Products -
   Markets: Construction Industry, Industrial, Automotive, Equipment and Electronic Industries
   Plants: Fergus, Ontario; Etobicoke, Ontario; Orangeville, Ontario

4. Magnet Wire -
   Markets: Original Equipment Manufacturers
   Plants: Simcoe, Ontario; Montreal, Quebec

5. Copper Rod Products -
   Markets: Wire and Cable Manufacturers
   Plants: Montreal East, Quebec

6. Canstar Communications (Fiber Optics) -
   Markets: Telecommunications
   Plants: Scarborough, Ontario; Winnipeg, Manitoba

7. Plastic Pipe and Fittings Division -
   Grandview Industries Ltd
   Markets: Municipalities, Irrigation, Slurry Transportation
   Plants: Weyburn, Saskatchewan; Langley, British Columbia; Rexdale Ontario

In the area of development, Canada Wire continues to be an aggressive growing company. Several major investment projects have recently been completed and these include:

• Rebuilding of the Leaside Power and Control Cable Plant.
• Haxeleit-Krupp continuous cast copper rod mill in Montreal.
• Research and production facility for fiber optics in Winnipeg.

These expansion projects, in addition to further acquisitions and international investments, demonstrate Canada Wire’s determination to maintain its leadership in technology and business development.

Canada Wire & Cable Ltd subsidiaries include:

• Carol Cable Company (US) - manufacturers of wire and cable in the US. Acquired in 1981, it has eleven manufacturing plants specializing in portable cords, electronic wires and power cable, as well as associated products for the industrial, consumer, electronic, and automotive markets. Founded in 1920, Carol Cable has maintained strong growth through efficient manufacturing, prompt service, timely and innovative marketing, and increased preference for its products by industrial customers and consumers.

• Canada Wire and Cable (International) Ltd - active in joint ventures throughout the world. These partnerships developed from the past fifty years of exports and extensive overseas contacts. Although most began in the wire and cable industry, the associated companies have become diversified producing other products such as metals, transformers, lighting, and plastics. The main associated wire and cable companies include:

  1. Fadeltec (Colombia)
  2. Conductores Monterrey (Mexico)
  3. Alambres Dominicanos (Dominican Republic)
  4. Nigerchin Electrical (Nigeria)
  5. Tolloy Holdings (New Zealand)
  6. Irish Cable & Wire (Ireland)
  7. Transage Wire (Pty) (South Africa)
  8. Iconel (Venezuela)

In its joint ventures, the company provides managerial and technical expertise, as well as equity. Its engineers and technical specialists assist the associated companies to install new equipment, increase productivity, and improve product quality.

Canada Wire is represented in the USA by Canada Wire & Cable, Inc., The Bank of America Building, 5800 South Eastern Ave, Suite #370, Los Angeles, CA 90040. Phone (213) 727-5921.

Average Work Force: North America - 5,000
   International - 10,000

Gross Sales: No Data

Plant Size: No Data

Experience: Canada Wire has developed export markets in sixty countries around the world in wire and cable, copper rod, electrical, and other products. Its export operations are organized in regions and directed primarily towards markets in the Middle East, Latin America, Caribbean, the Pacific Basin and the United States.

Some of the US customers of Canada Wire and Cable are - US Government, Houston Wire, American Cordset Co, American Cable Corp. T.W. Comcorp, Phelps Dodge, and Anixter.

Keywords: 1 = Aircraft; 7 = Electronics; 10 = Image Processing & Optics; 12 = Machining; 20 = Miscellaneous; Wiring = 7; Tubing = 7; Fiber Optic Cable = 7, 20; Plastic Pipe = 7, 20; Plastic Fittings = 20; Fiber Optic Components = 7, 20; Transformers = 7; Lighting = 7, 20; Copper Rod Products = 20; Cable = 7; Magnet Wire = 7.

Revised: Dec 83

CANADAIR Ltd

Code: CDR

Address: 1800 Laurentian Blvd
   St Laurent, Quebec, Canada H4R 1K2

Mailing Address
   P. O. Box 6087, Station A
   Montreal, Quebec, Canada H3C 3G9

Contact: Mr. Gilbert S Bennett, President & CEO - (514) 744-1511

History: Canadair was incorporated in late 1944 and is owned by the Canadian Government. Other Canadian locations are the Government Liaison Office in Ottawa and a Challenger Sales Office in Calgary. US offices include Challenger Sales Offices in Westport (CT), Atlanta, Houston, and San Francisco; and other Challenger related offices located throughout the US. A Challenger Service Center is located in Hartford, CT.

Capability: Canadair has a high technology R&D capability specializing in aerodynamics, flutter analysis, composite materials, remotely piloted vehicles, fracture analysis, and
computational design techniques. Their product line includes:

- Challenger business jet aircraft
- CL-215 multi-purpose amphibious aircraft
- CL-89, CL-227, and CL-289 unmanned airborne surveillance system

They have active subcontract work on the Boeing 767, Lockheed CP-140, P-3C, McDonnell Douglas F/A-18A, F-15, and Grumman EF-111A. They specialize in machining to close tolerances (0.001 inch) with a high degree of repeatability. They have an integrated heat treating and stretch-forming system capable of treating and forming aluminum alloy sheets 40 ft x 8 ft x 0.375 in.

Their CL-89 Airborne Surveillance System (unmanned) was designed for use at the Army Division level. It is fitted with either a photographic or infrared line scanning sensor and is reusable. It is launched from a mobile zero-length launcher and recovered with a two-stage parachute system employing inflatable air bags to absorb landing shocks. This drone is stored in the arsenals of the UK, West Germany, France, and Italy.

The CL-289 is a longer updated version being developed jointly with Dornier GmbH of West Germany. This new vehicle will carry both a photographic sensor and an infrared line scan (IRLS) sensor and will cover a 150 kilometer range at speeds in excess of 700 kph. A real-time data transmission link is associated with the IRLS System. Onboard computers carry the flight instructions for both the CL-89 and CL-289.

The third model, CL-227, is an hourglass-shaped, remotely piloted vehicle still in the development stage. It is designed as a highly survivable surveillance and target acquisition system for use at medium range. It has VTOL capability and is launched and recovered from a mobile two-meter diameter platform. It can transmit real-time data.

**Average Work Force:**
- Engineers - 296
- PhD - 12
- Machinists - 300
- Others - 3957

**Gross Sales:**
- 1980 - $116.2M
- 1981 - $285.7M
- 1982 - $429.4M

**Plant Size:**
- 2,700,000 sq ft (under cover)

**Equipment:** Their special equipment includes:

- Two Cincinnati profilers; numerically-controlled. 5-axis: Each bed 212 ft long, 13 ft 4 in wide. Each bed has 3 gantries with 3 spindles each.
- One Ingersoll profiler; numerically-controlled; 3 axis: Bed 96 ft long, 17 ft 5 in wide. Single gantry with 3 spindles.
- Nine Wilson profilers; tracer-controlled; 3 axis: Some 6 spindle, some 4 spindle.
- Several Kearney and Trecker 3 and 5 axis profilers; numerically controlled.
- Two Autoclaves; one 15 ft dia, one 12 ft dia, for metal-to-metal, honeycomb and composite bonding.
- Heat-treat, stretch forming system. Electrically-heated furnace takes sheets 40 ft by 8 ft. 1000-ton stretch press takes sheets 50 ft by 8 ft and 1/2 in thick.

**Experience:** The Canadair experience over the past two years include subcontracts for vertical stabilizers for the EE-111A, components for the Lockheed P-3C and CP-140, rear fuselage section for Boeing 747SP and 767, components for the McDonnell Douglas F-15 and F/A-18A, and shipsets of components for the Lockheed C-5A. Current products include Challenger business jet, CL-215 multipurpose amphibian, three surveillance systems and subcontracts.

**Keywords:** Aircraft = 12; Machining = 17; Software Services = 19; Testing/Test Equipment = 1; Computer = 1.

**Components:**
- Extended Length = 12;
- Forging = 12;
- Heat Treating = 12;
- Metal Working = 12;
- Casting = 12;
- RPV = 1;
- Drones = 1;
- Computational Design = 17;
- Aerodynamics = 1;
- Fracture Analysis = 19;
- Flutter Analysis = 19;
- Coating = 12.

**Revised:** Dec 83

**CANADA SYSTEMS GROUP**

**Advanced Technology Systems Division**

(Formerly Digital Methods Ltd)

**Code:** CSG

**Address:** 1736 Courtwood Crescent, Ottawa, Ontario, Canada K2C 2B5

**Contact:** Mr. P. Smithers, Director of Systems Development (613) 225-1171

**History:** Canada Systems Group is a Canadian owned high technology company. Their technical experience is in the field of computer systems and programming. CSG was established in 1971 to provide computer based information services to industry and government. The large parent company has its head office in Mississauga, Ontario, with branches and division in other Canadian and US cities.

**Capability:** The Advanced Technology Systems Division's expertise lies in the areas of 1) analysis, design and specification of real time control systems, 2) analysis, design, specification and implementation of information retrieval and data base systems, 3) analysis and organization of associated manual systems, 4) project management, 5) technical support, and 6) training. The activities of the Division are mostly concerned with microcomputers.

**Average Work Force:**
- Engineers - 40
- PhD - 12
- Machinists - 300
- Others - 10

**Gross Sales:**
- 1980 - $3.5M
- 1981 - $4.0M
- 1982 - $4.0M
- 1983 - $3.0M (Projected)

**Plant Size:**
- 12,000 sq ft

**Equipment:** Machines currently used by Canada Systems Group are Hewlett Packard 2114, 2116, 21MX, Series 3000, Digital Equipment Corp (LSI-11, PDP-10, PDP-11), Data General NOVA and ECLIPSE series, Motorola 6800, and Intel 8080.

**Experience:** Canada Systems Group has extensive experience with a large number of federal and provincial government agencies and with various business and industrial organizations. Private sector contracts include some in the US and UK. Typically, less than 5% of their sales are to the US. Typical projects handled by the Division are studies, simulator systems, systems software design and implementation, computer graphics for air traffic control, satellite ground control systems (software design and program and implementation), VTOL/STOL data handling system design & implementation, computer aided graphics, and telex switching systems (software development). Other projects include computer dispatch, supervisory control, and data acquisition. The company has no past contracts with the USAF or other DOD agencies.
Keywords: 6 = Computers; 7 = Electronics; 17 = Software Services; 20 = Miscellaneous; Computer Dispatch = 6, 7, Supervisory Control = 6, 7. Data Acquisition = 6, 7. Air Traffic Control Systems = 6, 20; Graphics = 17. Real Time Graphics = 17; Telex Exchange Computer Systems = 6.

CANADIAN AIRCRAFT PRODUCTS Ltd

Code: CAP

Address: 2611 Viscount Way
Richmond, British Columbia, Canada V6Y 1M9

Contact: Mr. D.C. Cameron, President - (604) 278-9821

History: Canadian Aircraft Products Ltd was founded in 1955 to design and produce aircraft floats. The company is Canadian owned and has no other Canadian locations or US subsidiaries.

Capability: The company designs, engineers and fabricates aircraft components and other allied and support items for the aerospace industry in both aluminum and composites. They maintain a design and engineering office capable of producing products to stated performance specifications and military specifications. They specialize in the design and manufacture of aircraft structures, tools and jigs, support equipment-ground, ancillary equipment-air, cargo handling equipment, aircraft modifications, and aircraft systems.

Modifications to aircraft include the design and installation of additional fuel systems, seats, engine replacement, and structure changes. They have also conducted analyses relative to aircraft/airport compatibility.

Average Work Force: Total ~ 160

Gross Sales: 1980 ~ $8M

Plant Size: 75,000 sq ft

Equipment: Forming capability (3,000 ton rubber bed press), heat treating capability (3x4x18 ft gas-fired oven with water quench) and supporting services. NC milling machines, a composite facility that includes an oven (6x8x10 ft) and an autoclave (5x15 ft).

Experience: Canadian Aircraft Products Ltd has a long background of capability and expertise in repair, overhaul, manufacture and fabrication, as well as design and test of aircraft structures and components. They have designed, manufactured and repaired structures and components of a similar nature such as large aluminum boats, air cushion vehicles, etc. They have produced sheet metal fabricated parts for civil and military applications. One such contract was for ammunition boxes for Kaiser Aluminum. They produce wing floats for the Canadair CL-215 water bomber and the floats for the De Havilland Twin Otter aircraft. The company has built and structurally tested the complete airframe of the Trident Aircraft Ltd Trigull aircraft. Other contracts include the horizontal stabilizer and auxiliary fuel tanks for the Canadair CL-600 aircraft, control surfaces and airstair door for the De Havilland Dash 7 STOL airliner, the horn assembly for the McDonnell Douglas DC-9 Saberliner detail parts for N. A. Rockwell, and the design, engineering and production of the horizontal stabilizer, elevators and rudders for the DeHavilland Dash 8 commuter aircraft.

Keywords: 1 = Aircraft; 12 = Machining; 17 = Software Services; Airframe Components = 1; Airframe Structures = 1; Cargo Handling Equipment = 1; Systems = 1; Helicopter Subsystems = 1; Repair & Overhaul = 1; Aluminum Components = 1; Composite Components = 1; Modification = 1; Tooling = 12; Jig Fabrication = 12; Rudder Assemblies = 1; Structural Analysis = 17; Structural Design = 1; Flaps = 1; Design To Requirements = 17.

CANADIAN ASTRONAUTICS Ltd

Code: CAL

Address: 1024 Morrison Dr.
Ottawa, Ontario, Canada K2H 8K7

Contact: Dr. Michael A Stott, VP, Business Development - (613) 820-8280

History: Canadian Astronautics is a rapidly growing, wholly owned Canadian company incorporated in 1974. There are no Canadian divisions and no US subsidiaries.

CAL is primarily a systems level contractor with interests in four principal business areas - Space Hardware, Radar and Communications, Computer Systems, and Military Electronics. In addition to these development and manufacturing activities, the company performs engineering design/ study work in all four areas.

Capability: As previously mentioned, Canadian Astronautics is divided into four business areas with capabilities as follows

- **Space Hardware** - CAL has an excellent capability in development and manufacture of spacecraft units and subsystems. Particular examples include antennas, RF subsystems, electro-optical equipment, battery management systems (NiCad and NiH2), power converters (high voltage and high efficiency), and spaceworthy rad-hardened microprocessors.

- **Radar and Communications** - CAL designs and manufactures airborne SAR and SLAR equipment and has a development capability for radar of all types, particularly those involving complex signal processing. CAL additionally has capabilities in phased arrays, having developed airborne planar arrays and MSL ground antennas, along with specialized thin film microstrip components, such as precision phase shifters, corporate feeds and radiating elements. Satellite communications station upgrades/retrofits on a turnkey basis and manufacture of custom Satcom equipment is another CAL specialty.

- **Advanced Systems** - EW and ASW are the main activities of this division, but others include processors for LANDSAT-D Thematic Mapper and remote unattended navigation/communications beacons. In EW, the company has developed the Tactical Signal Simulator (TASS), which is a fully programmable dynamic scenario stimulator for ESM receiver evaluation and operator training. Technology developments include fast tuning millimeter wave VCO’s for ESM and simulator applications. In ASW, CAL has developed programmable sonobuoy processing systems and advanced processor architecture systems.

- **Commercial Systems** - The main activity of this division is the supply of Search and Rescue Satellite (SARSAT) ground stations. CAL provides a full capability station including processing channels for 121.5, 243, 406 MHz, and it is capable of remote unattended fully automatic operation. Other activities include custom software development, typically for real time signal or data processing applications. Experience is available in the normal languages, including Ada, and CAL has the capability to develop software to MIL SPEC 1679.
Average Work Force: Scientists & Engineers - 105
Others - 30

Gross Sales: 1982/83 - $ 8.0M
1983/84 - $14.0M

Plant Size: 52,000 sq ft (Including clean rooms, production area, development laboratories, antenna range, military secure area with TEMPEST shielded room)

Experience: CAL has developed an excellent reputation for performing challenging programs, in a professional, reliable manner. The company's record with respect to schedule and budgets is excellent. Their contracts have typically been divided between the Canadian Government (60%), NASA (20%) and others (20%). Canadian Government departments include Communications; National Defense; Environment; Energy, Mines and Resources; and National Research Council. Private customers include Telesat Canada, Atomic Energy of Canada, Marconi Space and Defense Systems (UK), MEL (Phillips, UK) European Space Agency, Intelsat, Bell Canada, and others. CAL has no direct contracts with the USAF, but are directly involved via the SARSAT Program. One of the four SARSAT ground stations provided to NASA is located at Scott AFB, IL. CAL can perform to military specifications.

Keywords: 5 = Communications; 6 = Computers; 7 = Electronic; 10 = Image Processing & Optics; 15 = Radar; 17 = Software Services; 18 = Space Systems; 19 = Testing/Test Equipment; Antennas = 7, 15, C3 Systems = 5; Computer Parts = 6; Navigation = 7; Solid State Devices = 7; Environmental Testing = 19; Simulators = 15; phased Array = 15; Synthetic Aperture = 15; Design to Requirement = 17; Structural Analysis = 17; Structural Design = 17; Communications = 18; Data Reduction = 18; Radar = 15, 18; Ground Stations = 18; Satellite Electronics = 18; System Studies = 18; Remote Sensing = 18; Search & Rescue = 18; Design = 6; Microprocessors = 6, 7; Test Rigs = 19; Electromechanical Design = 19; Electronic Warfare = 7; Signal Processing = 7, 15; Spacecraft Units = 18; Spacecraft Subsystems = 18; Antennas = 18; RF Subsystems = 18; Electro-Optical Equipment = 10; 18, 19; Battery Management Systems = 18; Power Converters = 18; Rad-Hardened Microprocessors = 6, 7, 18; Radar = 15; Planar Array = 15; Side-Looking Airborne Radar = 15; Tactical Signal Simulator = 7.

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CANADIAN GENERAL ELECTRIC COMPANY Ltd

Code: CGE

Address: Aerospace Operations
Industrial Benefits Program-Defense Programs
396 Attwell Drive
Rexdale, Ontario, Canada M9W 5C3

Contact: Mr. Brian Noble, Spec Industrial Benefits Program
- (416) 675-7500 X210

History: Canadian General Electric Company was incorporated in 1903 as the Marconi Wireless Telegraph Company of Canada, primarily for the purpose of operating a transatlantic communications link and a ship-to-shore communications service. The company maintained its interest in communications until the end of the 1950s. In the 1960s, products diversified to include marine radar and airborne navigation systems.


Capability: Canadian Marconi has expertise in two major fields - Electronics and Communications. The total company capability of potential interest to the USAF can best be shown by describing each of six divisions, all of which are located at the Montreal site, except for the Radar Division which is located at the Kanata, Ontario site.

Avionics Division: The Avionics Division is engaged in the development, engineering, production of aircraft navigation systems, monitoring and display systems, and integrated logistics support.

Doppler Navigation Systems - determine aircraft velocity in forward, side, and vertical axes by transmitting microwave energy to the scattered radiation picked up by a receiver. By feeding this velocity information combined with heading information, to a navigation computer, the aircraft position is calculated and displayed. Doppler Velocity computers and interactive CRT displays, launch tubes (pad and hand-held) and rocket motor casings, etc., for the US Army.

Average Work Force: 15,869 - Total

Gross Sales: 1982 - $1.6B

Plant Size: Cobourg Plant - 125,782 sq ft
St Andrews Plant - 50,000 sq ft

Experience: Canadian General Electric works with the Canadian Government, US military and many US and Canadian prime contractors (e.g., General Motors, Xerox, etc.).

Keywords: 1 = Aircraft; 2 = Armament; 12 = Machining; 20 = Miscellaneous; Composite Components = 1, 2, 20;
Injection Molding = 2, 12; Launch Tubes = 2; Rocket Nozzles = 2; Rocket Motor Casings = 2.

Revised: Dec 83

CANADIAN MARCONI COMPANY

Code: CMC

Address: 2442 Trenton Ave
Montreal, Quebec, Canada H3P 1Y9

Electronics Group
Avionics Division
Components Division
Radar Division
Data Communications Department
Communications Group
Commercial Communications Division
Special Services Division
Defense Communications Division

Contact: Mr. Jack Howlett, Vice President Admin - (514) 341-7630, X204

History: Canadian Marconi was incorporated in Montreal in 1903 as the Marconi Wireless Telegraph Company of Canada, primarily for the purpose of operating a transatlantic communications link and a ship-to-shore communications service. The company maintained its interest in communications until the end of the 1950s. In the 1960s, products diversified to include marine radar and airborne navigation systems.


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Revised: Dec 83
are available for all types of aircraft over a broad range of performance envelopes.

Systems Control and Data Acquisition Systems - the CMS-790 Modular Supervisory Control System is a new concept in microprocessor-driven display and control for energy management and process-control applications. Each display module comes complete with remote terminal equipment telemetry interface installed and tested.

Omega Navigation Systems - accept coded VLF signals from eight Omega ground stations, and by measuring the phase differences in the signal from a minimum of three stations, simultaneously produce a hyperbolic grid pattern from which the aircraft's position anywhere on the earth's surface can be determined. Several models of the receiver/computer/antenna components provide a complete range of systems suitable for worldwide navigation in military, general aviation, business, and commercial airline aircraft in both rotary and fixed wing. Options for additional use of VLF communication stations are available as are several versions of the basic Omega System for different operating models and user requirements. Extensions of the Omega System to very low cost vehicles, such as drones, are under investigation.

Navstar Global Positioning Systems - receive signals from earth-orbiting satellites that continuously transmit information on their own position, orbital parameters, and time. When completed in 1987, the total constellation will be comprised of 18 satellites in several planes mutually inclined at 55 degrees. The airborne system processes the received signals and provides positional accuracy to within 15 meters in each of three planes.

Engine Instruments - use sub-miniature lamps and fiber optics to present information, and have eliminated all dependence upon mechanical devices. In addition to the main feature of saving space in overcrowded cockpits, these instruments are extremely flexible in that sections of the parameter range can be emphasized at will, and they can be color-coded to alert the pilot to dangerous situations and provide easy readability, thus improving safety and reducing pilot workload. Digital readouts of parameters for very high resolution and redundancy can also be incorporated. A broad spectrum of applications and a variety of designs are features of this product line.

Intelligent Instruments - combine normal sensor inputs with pre-programmed and manually entered data, process them via micro-processors under software control, and display computed parameters to provide performance and analytical information. Typical examples include the Flight Advisory Computer, which calculates and displays the optimum airspeed and altitude for the present gross weight, the gross weight, and the time and fuel remaining. The Status Display System prioritizes and displays up to 110 warnings and cautions, up to 1,000 checklist items, and includes facilities for complete maintenance data logging. It features optional voice warning; automatic fault cancellation, storage, and recall; dual redundant processing and power supplies; and channel failure indication. The Data Collection Unit, which can be used in conjunction with the Status Display System, records for all scheduled and unscheduled maintenance activities by means of plug-in memory modules.

It includes a self-contained, portable microprocessor with an integral thin-film electroluminescent screen, and interchangeable dedicated and general keyboards.

Components Division: The Components Division specializes in a range of custom-built components, products, and services (all to military specification).

Printed Wiring Boards - built to customer specifications with emphasis being placed on very complex designs in multilayer boards, rigid flex and polyimide. Boards are made to military and commercial specifications with a high level of quality control. Circuit packaging (CAD), and photoplotting services are available.

Microcircuits - designed and produced at CMC include thin-film and thick-film hybrid configurations, and microwave integrated circuits usable in applications up to 24 GHz. The products include amplifiers, oscillators, mixers, filters, resistor arrays, multipliers, matching networks, as well as many versions of digital circuits, all of which can be tested to full military specifications.

Military Power Supplies - designed and produced for aircraft, ground equipment, and missile applications. In-house magnetic, PCB, machining, and power hybrid component production ensure high-quality and effective cost and schedule control.

Radar Division: The Radar Division specializes in the development, engineering, and production of surveillance radars:

Naval Surveillance Radar - the AN/SPS 503 is a light-weight S-band surveillance radar for use on ships over 300 tons. It has a double curvature parabolic antenna enclosed in a radome, a MTI signal processor, and a frequency agile transmitter.

Military Power Supplies - designed and produced for aircraft, ground equipment, and missile applications. In-house magnetic, PCB, machining, and power hybrid component production ensure high-quality and effective cost and schedule control.

Radar - Comprises the LN66Hp, 75 kW surveillance radar used on the LAMPS MkI helicopter. It has also been used in fast patrol boat fire control systems and other specialized applications. The LN66, 10 kW, is widely used by the US Navy as a type II radar on large ships and a type IV radar on small boats. The LN66SP, 3 kW, porta-
HF/SSB Radio – fully synthesized transmitters, receivers, and transceivers cover the frequency range 1.6 – 30 MHz in configurations including vehicle-mounted mobile stations and desk-top and rack-mounted fixed stations. Output powers are available from 100 Watts to 1000 Watts PEP. Optional facilities include remote controls, RTTY, low-speed data, and scramblers.

RACE (Adaptive HF/SSB) – this new product uses the HF/SSB transmitters/receivers listed above and complements them with a controller which has a real-time channel evaluation system as well as an Automatic Telephone Interconnect. There are two basic products – a single master system which can sustain one simultaneous telephone conversation, but serve up to 16 remote units – and a multiple master system which can sustain up to four simultaneous telephone conversations and serve up to 64 remote units. Telex and RTTY can be provided as optional features.

Communications Systems – the Commercial Communications Division designs and manufactures complete communication systems in the HF/UHF/VHF bands, including base stations, repeaters, mobiles, consoles, remote controls, supervisory equipment, etc. Full turnkey systems can be designed, manufactured, installed and commissioned.

Defense Communications Division: The Defense Communications Division specializes in military tactical communications.

Tactical Radio Relay – the AN/GRC-103 Radio Set operates in the 220 to 1850 MHz frequency range in four frequency bands. The radio set will accommodate frequency division multiplex (FDM) or time division multiplex (TDM) equipment. The TDM equipment may be pulse code modulation (PCM) or delta modulation (DM) multiplexers. Associated with the radio set is a test facility, the AN/GPM-95, used as a depot maintenance facility. The test facility is now available to test all four frequency bands of the radio. The AN/GRC-103 in conjunction with multiplexer equipment is configured into standard US Army systems, e.g., AN/TCR-113, AN/TCR-145.

Multiplexers – the TD-5064 is a 16-channel delta modulation multiplexer which replaces PCM equipment in TDM systems. By stacking 4 sets of the TD-5064, 63 traffic channels can be provided. The MTD-212M is a unit which combines the outputs of two 12-channel PCM multiplexers to provide a single 24-channel stream for ease of transmission and separates the two 12-channel streams at the receive end.

Tactical Switchboards – the SB-4170/TT is a microprocessor-controlled, 12-line semi-automatic, cordless field telephone switchboard. Two SB-4170s may be stacked to provide a 24-channel capability. A built-in Net Radio Interface (NRI) allows the SB-4170/TT to connect directly to a base radio without the need for a separate radio-wire integrator. This provides direct communication between the switchboard’s landline subscribers and any compatible radios in the net.

Radio Wire Integrator – the C11416/G Radio Set Control provides a capability to enable single channel net radios to be connected to the switched telepic network.

Conditioned Diphasor Adapter – this unit enables radio, multiplexer, crypto and secure orderwire units to be configured as a digital communications system.

Line Terminating Unit – this unit allows the multiplexer to be separated from its radio by a distance of up to 2 km.

Special Services Division: The Special Services Division performs a variety of services including the installation, operation, maintenance of equipment and antennas at large radiol and communications sites, repair and overhaul of all types of military electronic systems, repair, overhaul and calibration of electronic test instruments, and repair and calibration of secondary and primary standards, both mechanical and electronic. The Special Services Division has a long history of satisfactory transactions with USAF units.

Average Work Force: Engineers = 254
Technologists = 573
Others = 2054
Total = 2881

Gross Sales:
1979/80 = $107 0M
1980/81 = $123 0M
1981/82 = $144 0M
1982/83 = $198 0M

Plant Size: Montreal = 500,000 sq ft
Canada = 50,000 sq ft

Equipment: CMC has a wide variety of specialized production and test equipment including an Anechoic Antenna Test Range, Automated Test Equipment, EMI/EMC testing to 1 GHz, and environmental testing facilities to all major MIL standards. In addition, complete facilities are available for component manufacture of specialized items, and assembly of electronic components and systems to customer design or specifications.

Experience: Canadian Marconi Company has provided systems, equipment, components and services to every branch of the US DOD and the US Coast Guard over the past 22 years, meeting all military specifications satisfactorily. The products of CMC, military and commercial, are exported regularly to 94 countries world-wide. The company has been granted every Mil Spec available.


Revised: Dec 83

CANADIAN THERMOSTATS AND CONTROL DEVICES Ltd

Code: CTC

Address: 8415 Mountain Sights Ave
Montreal, Quebec, Canada H4P 2B8
Revised: CanTherm was founded in late 1977 to continue the manufacturing and research program previously carried out by the defunct Multi-State Devices Ltd. They are closely associated with Microtherm GmbH of Pforzheim, West Germany, the leading European manufacturer of bimetallc temperature control devices.

Capability: With its acquisition of MSD, CanTherm inherited an active R&D department which has continued to expand in many areas of microelectronics and thermal control. Their first order of priority was to finalize the Moxie from a laboratory prototype to a reproducible chip. They have expertise in the fields of metallurgy, vacuum system depositions (sputtering), and semiconductor production techniques as a result of their initial projects. Early on, they were awarded a two year development grant from the Canadian National Research Council to develop a thin film thermistor with tolerances ±1% at 25°C. Other specifications included maximum interchangeability and volume productibility at a market acceptable cost. The project was successfully completed within two years and the product is in the North American and European markets.

Average Work Force: Total = 12
Gross Sales: No Data
Plant Size: 5,000 sq ft (manufacturing)
Experience: CanTherm’s product market is world wide. On the North American continent, they work with the Canadian Government, industry, and have an on-going contract with the USAF.

Keywords: 4 = Chemistry; 7 = Electronics; 9 = Environment; Microelectronics = 7; Thermal Control = 7; Chips = 7; Metallurgy = 4; Vacuum Deposition = 4; Sputtering = 4; Semiconductor = 7; Thin Film = 7; Thermistor = 7; Environmental Sensor = 9; Solid State Devices = 7.

Revised: Dec 83

CARDION ELECTRONICS/DG INSTRUMENTS
(Division of General Signal Ltd)

Code: DGI

Address: Regional Road 5
RR #2
Carp, Ontario, Canada KOA 1L0

Contact: John T Dale, Marketing Manager – (613) 839-5710

History: Formerly operated under the name DG Instruments Ltd, Cardion Electronics/DGI Instruments is a Canadian owned company founded by four former employees of Leigh Instruments Ltd and incorporated in Jan 1974. DG Instruments was acquired by General Signal Ltd in February 1982. They report to Cardion Electronics, a unit of General Signal Corp, Woodbury, NY.

Capability: Cardion/DGI specializes in the design, development, test and manufacture of electronic instruments and systems for both military and commercial applications. Customers are primarily in Air Traffic Control, Avionics, Meteorological Marine, and Hydrographic Services. Systems include solid state ATIS recorder, portable VOR ground check, solid state anemometer, helicopter air data system, electronic ice measurement, submersible tide gauge, hydrographic navigator, and ships propeller RPM indicating systems.

Average Work Force: Engineers = 8
Others = 32
Gross Sales: No Data
Plant Size: 13,800 sq ft
Experience: Cardion/DGI has completed a contract with Cubic Corporation to manufacture and test electronic subsystems associated with the ACMR tactical trainer for the CF-18A. They have completed delivery of a contract to supply Canadian DND with 27 Air Control Indicators – total value $4M, and have commenced delivery of an additional five systems. Major customers in the Canadian Government include Departments of National Defense, Transport, Fisheries & Oceans, Energy, Mines & Resources; Communications, and Environment.

Keywords: 3 = Avionics; 7 = Electronics; 20 = Miscellaneous; Solid State Devices = 3, 7, 20; Recorders = 7; Air Traffic Control Simulators = 7, 20; VOR Ground Check Systems = 7; Anemometer = 7; Helicopter Air Data Systems = 3; Ice Measurement = 7; Tide Gauge = 20; Navigation = 7, 20; Ship Instruments = 7, 20; Tactical Trainer Subsystems = 20; Air Control Indicators = 7, 20; Instrumentation = 3, 7, 20.

Revised: Dec 83

CARR-TECH SERVICES Ltd

Code: CTS

Address: 450 Tapscott Road
Scarborough, Ontario, Canada M1B 1Y

Contact: Mr. R G Baillie, President – (416) 293-6400

History: Carr-Tech Services Ltd is a chartered, privately owned Canadian company with roots in the aerospace industry going back to 1947 when its founder, Mr. R J Carriere, first began servicing aircraft at Toronto Island Airport.

Capability: The company is engaged in engineering, manufacturing, repair overhaul, and field service operations involving military and commercial aircraft electronic, electrical and hydraulic accessory equipment. Other capabilities include custom designed power generation equipment for standby and prime source applications together with related electronic control, monitoring and protection equipment for the industrial, commercial transportation and agricultural markets.

Carr-Tech can also undertake subcontract programs (including custom designed or built to specification) for the manufacture of power supplies, regulators, inverters, control and annunciator panels, air and ground rotating beacon, landing lights, portable and emergency lighting equipment.

Carr-Tech Services Ltd implements a well established quality assurance program to ensure that all products and services supplied by the company are controlled to obtain the best possible quality and reliability, commensurate with economic and competitive cost considerations. The Chief Inspector of their Quality Control Department has over 25 years experience in aerospace and industrial quality control practices and procedures.

Carr-Tech’s inspection organization and facilities are approved by the Department of Transport in respect of products supplied for use in civil registered aircraft and their Quality Control operation is recognized by the Department of National Defense as meeting the requirements of DND Specifications 1015 (MIL-Q-9858A), 1016 (MIL-I-45208), 1017, and 1019. In
addition, their Quality Program standards meet or exceed CSA Standard 299.2.

**Average Work Force:**
- Engineers/Technicians: 6
- Production: 18
- Others: 16

**Gross Sales:**
- 1982: $2.0M
- 1983: $2.3M (Projected)

**Plant Size:** 27,000 sq ft

**Equipment:** Carr-Tech's production facilities are suitable for low quantity production runs and the manufacture of experimental and prototype equipment lathes, milling machines, drills, punch presses, shears, welding equipment, riveters, grinders, paint spray booth, ovens, etc.

Test instrumentation includes electrically driven test stands for generators, voltage regulators and control equipment; Bosch fuel injectors and fuel pump testers; hydraulic and fuel test stands for large capacity high pressure equipment; test stands for speed switches, tachometer generators and other instrumentation. Precision electrical and electronic measuring equipment is calibrated regularly to NRC standards.

**Experience:** Carr-Tech Services Ltd is an approved supplier of services and qualified products to such companies as Aerospalite, Air Canada, Boeing Aircraft, Canadair, deHavilland, McDonnell Douglas and Wardair, plus the Canadian Government (DND and DOT), and various provincial government departments.

**Keywords:** 1 = Aircraft; 3 = Avionics; 7 = Electronics; 8 = Energy; 9 = Environment; 14 = Protective Equipment; 16 = Security & Safety; 19 = Testing/Test Equipment; 20 = Miscellaneous; Repair & Overhaul = 1, 3, 7, 8, 14, 19; Solid State Devices = 7, 8, 14, 19; Design & Build To Requirements = 7, 8, 14, 19, 20; Standby Power
Generating Equipment = 7, 8, 9, 14, 16, 19, 20; Beverage Dispensing Systems = 1, 7; Toilet Hot Water Systems = 1, 7; Lighting Equipment = 1, 7, 8, 9, 14, 16, 20; Prime Power Generating Equipment = 7, 8, 9, 14, 16, 19, 20; Power Generating Equipment = 7, 8, 9, 14, 16, 19, 20.

**Revised:** Dec 83

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**CHICOOPEE MANUFACTURING Ltd**

**Code:** CHI

**Address:** 975 Wilson Ave Kitchener, Ontario, Canada N2C 1J1

**Contact:** Mr. David Belanger, VP Marketing & Operations - (519) 893-7575

**History:** Chiconee Manufacturing Ltd is a private, wholly owned Canadian company incorporated under the laws of Ontario in 1967.

**Capability:** The company specializes in precision machining of medium to large complex components to close tolerances from high strength steels, titanium and aluminum alloys for the aerospace and other related industries. Technical knowledge combined with state-of-the-art equipment enables the company to deliver a wide range of such quality products including aircraft structural components, landing gear components, helicopter hubs, helicopter retentions, hydraulic actuators, precision parts for Canada's space arm, and machined components for other space vehicles and equipment.

Chiconee maintains strict quality control and has approvals from most of the major aerospace companies and in addition, complies with the requirements of DND 1015, MIL-Q-9858, and CSA Z 299.3. Procedures call for first-off inspection of every manufacturing operation, as well as 100% final inspection of all critical dimensions. Reverse traceability of materials, parts and processes is guaranteed.

**Average Work Force:** 180 (Total)

**Gross Sales:** No Data

**Plant Size:** 100,000 sq ft

**Equipment:** Equipment consists of a full range of CNC and NC profile milling machines including a five-axis CNC gantry profile milling machine; a four-axis CNC travelling column machining center with automatic tool changer; hydraulic trace profile milling machines; vertical, horizontal and universal mills; CNC and conventional lathes; boring mills; drilling and grinding tools and all other necessary support equipment to produce precision custom products.

**Experience:** Present customers include: The Boeing Co., Boeing Military Airplane Co, Cleveland Pneumatic Co, DAF Indal Ltd, The deHavilland Aircraft of Canada Ltd, Ernst Leitz Canada Ltd, Fairchild Republic Ltd, Fleet Industries, Kaman

Keywords: 1 = Aircraft; 12 = Machining; 18 = Space Systems; Precision Machining = 12; Machining = 12; High Strength Steels = 12; Titanium = 12; Aluminum Alloys = 12; Structural Alloys and Components = 1, 12; Landing Gear; Components = 1, 12; Helicopter Hubs = 1, 12; Helicopter Retentions = 1, 12; Hydraulic Actuators = 1, 12; Precision Parts = 1, 12, 18; CNC Machining = 12.

Revised: Dec 83

COLLINS & MOON Ltd

Code: CAM

Address: 435 Stone Road W, Suite #215 Guelph, Ontario, Canada N1G 2X6

Contact: Mr. Tim Lehan, General Manager – (519) 836-3844

History: Collins & Moon Ltd was incorporated in Ontario in mid-1978.

Capability: Collins & Moon is a computer systems development and sales organization with emphasis on Data Base Management Systems; Software Development; Spatial Information Systems; Numerical and Statistical Analysis. Digital Terrain Analysis and Mapping; Computer Graphics; Hydrologic Analysis and Mapping; Geographic Information Systems, and Thematic Analysis, Mapping and Display.

Collins & Moon has built a library of software on some fundamental ideas about 'the management and analysis of terrain-related data. For example, a paper by Collins appearing in a 1975 Canadian Surveyor describes an algorithm that provides a complete analysis of a watershed, including the areas and volumes of all potential water storage basins and the boundaries between them. It remains unique in the field of digital elevation model analysis, and several practical simplified methods of watershed analysis have been derived from it. One notable derivative of this algorithm is an extremely fast method of contour drawing that can be applied to dense grid models of nearly one million points.

Prior to incorporation, successive version of THEMAPS were developed. THEMAPS is a program system that derives thematic maps from a variety of input sources using logical or course of their work in the hydrographic analysis area, the developed. THEMAPS is a program system that derives the- for the Ontario Department of Natural Resources. During the

Plant Size: 800 sq ft

Equipment: Equipment employed by Collins & Moon include software development connections to Ahmdahl V5 computer. DEC VAX, 11/780 computer. VMS operating system; DEC PDP 11 series, IBM 5150 and 68000 based computers; UNIX operating systems; PE 32 bit machine running UNIX; Digitalizers; Plotters – Applicon, Versatec, Calcomp, Jet-ink, and Monochromatic and Color CRTs currently supporting Tektronix 4050 series and the 4027, Ramtek 6,000 series, Norpak VDP and RDS display systems.

Experience: In the areas of data base management, spatial analysis, and geographic information systems, Collins & Moon has completed the first phase of a multi-year contract that calls for the design of a complete spatial analysis system that will include a geographic formation system that will use as major components existing relational and other data base management systems. The system being designed will be called upon to provide interactive input of spatial information, compact and convenient storage of every type of multi-dimensional spatial data, very fast retrieval of some types of data for simulation of strategic and tactical situations and a full range of graphical and CRT display systems. This work is being carried out for the Canadian Defense and Civil Institute of Environmental Medicine.

Collins & Moon has developed a highly competent system of data entry, storage, retrieval and display that contains a powerful query and analysis system that is especially suitable for cartography and thematic mapping. The principal applications to date have been to Vehicle Mobility mapping for the Canadian Forces, and the system is now being applied to environmental mapping for the US Geological Survey. The system is highly interactive and thus can be used by untrained personnel. On the other hand, it provides the framework of data input, management and display that may be effectively used by experienced scientists in carrying out extensive and complicated terrain analyses. This system accepts data in polygon or raster forms, stores it in well-designed file structures, applies a powerful querying system in logical or arithmetic algebra, provides output data in polygon or raster form (independent of the input format), and creates plot files and display data for computer driven plotters, raster plotters and raster (CRT) display systems of common types.

In the area of hydrology, Collins & Moon has completed work for the Ontario Department of Natural Resources. During the course of their work in the hydrographic analysis area, the company analyzed digital elevation models in dense grid format and the work was supportive of hydrological terrain assessment. The analysis of dense-grid digital elevation models, the methods of creating such models, are particular fields of expertise of the company. Software has been developed that carried out a complete watershed analysis from such a model, providing watershed boundaries, saddle points, runoff contributing areas, volumes and areas of water storage, flow quantities and drainage patterns, and other parameters.

Digital Elevation Model techniques have been developed and exploited for drawing contours, slope maps, maps of obstructions to vehicles, and Radar Masking (hidden ground and air space) maps. Programs have been developed for creating Digital Elevation Models from contours and characteristic lines, and a number of new algorithms for this purpose are now the subject of research. Programs have been delivered to the Canada Center for Remote Sensing that attach elevations to each of the pixels of Landsat imagery.

Collins & Moon has created and implemented programs for attaching thematic information, derived from line-drawn maps to pixels of Landsat images, and for the inverse process, converting the pixels of a processed Landsat image into polygonal format for hard copy cartography and for CRT display.
Together with their thematic mapping programs, these programs effectively unite Landsat imagery directly with classical cartography, allowing the same methods of basic data management for both.

Collins & Moon has carried out projects for the Air Operations Research Branch of the Canadian Department of National Defense and for the Defense Research Establishment (Suffield). These projects involved the development of a program to produce maps of terrain visible from a long range radar, data base systems for terrain data computation and map production and a study for the creation and implementation of software for terrain analysis and display.

**Keywords:**
- 6 = Computers
- 8 = Energy
- 9 = Environment
- 10 = Image Processing & Optics
- 15 = Radar
- 17 = Software Services
- 20 = Miscellaneous

**Experience:**
Studies undertaken on trade-offs, optimization and hardware design aspects of the microwave subsystems used in communications satellites.

**Consulting Services:**
- Research and Development
- Fin line techniques at frequencies above 20 GHz: SAW devices as signal processing components and subassemblies.

**COM DEV Ltd**

**Code:** CDL

**Address:** 155 Sheldon Drive
Cambridge, Ontario, Canada N1R 7H6

**Contact:** Mr. M V O'Donovan, President - (519) 622-2300

**History:** COM DEV was incorporated federally in 1971 and is a Canadian high technology company.

**Capability:** COM DEV designs and manufactures microwave and SAW enhanced subsystems for communications satellites, earth stations and radar systems.

**Communications Satellite Products**
- Contiguous and non-contiguous dual mode output multiplexers, group delay and amplitude equalized input multiplexers, high power waveguide and low power coax isolators; low pass harmonic reject filters; telemetry, command and preselect filters; adaptive variable power dividers and combiners; and polarization switches and beam reconfiguring subsystems.

**Earth Terminal Products**
- High power microwave components and subsystems including filters, diplexers, combiners, isolators and terminations; low-loss transmit reject filters; interdigital and coax combiner systems.

**Surface Acoustic Wave (SAW) Products**
- Advanced signal processing components and subassemblies for radar and satellite communications; e.g., filters, delay lines, convolvers, SAW oscillators and synthesizers, code and chirp waveform generators.

**Consulting Services**
- Studies undertaken on trade-offs, optimization and hardware design aspects of the microwave subsystems used in communications satellites.

**Research and Development**
- Fin line techniques at frequencies above 20 GHz: SAW devices as signal processing components and subassemblies.

**COMINCO Ltd**

**(Electronic Materials Division)**

**Code:** COM

**Address:**
- Cominco Ltd
Trail, British Columbia, Canada V1R 4L8
- Cominco Electronic Materials Inc
E 15128 Euclid Ave
Spokane, Washington 99216

**Contact:**
- (Canada) Mr H E Hirsch, Manager, Technical Research - (604) 364-4426
- (Canada) Mr R F Redden, Development Superintendent - (604) 364-4751
- (US) Mr D L Guettinger, Manager, CEMI Sales - (509) 922-8614

**History:** COMINCO Ltd was incorporated in 1906 and is 91% Canadian owned. Other Canadian locations include - a Head Office at 200 Granville St, Vancouver, British Columbia; VBC 212; Group Offices in Trail, British Columbia - Calgary, Alberta - Yellowknife, NWT; and Research Centers in Trail, British Columbia and Sheridan Park, Ontario. Other US locations (Electronic Materials) can be found in California - Chicago, Ill. - and Hartford, Conn.

**Capability:** Cominco is the world's largest producer of zinc and lead with significant output of many by-product metals and chemical fertilizers.
Electronic Materials Division Production:
- High Purity Metals - 17 difference metals each in several degrees of high purity and shapes.
- High Purity Arsenic - 49 to 79 grade arsenic in various allotropic crystal forms and shapes. Largest plant of its kind in the world.
- Semiconductors - single crystal boules and polished wafers of gallium arsenide, indium antimonide, cadmium telluride, cadmium mercury telluride, gallium antimonide, and indium arsenide, germanium and epitaxial cadmium mercury telluride.
- High Purity Metals Fabrication - alloying, casting, rolling, extrusion, stamping and machinery operations to produce semiconductor processing and packaging materials e.g., evaporation charges, sputtering targets, solder preforms, bonding wires, and ribbons. A well equipped precision tool and die shop serves both production and development.

Electronic Materials Division Development
R&D is directed toward new metal/metal compounds and semiconductor processes, product advancement, and production equipment.

Average Work Force: Whole Company - 10,797
Electronic Materials Div - 241
(Trail, British Columbia)
Engineers - 18
PhDs - 2
Machinists - 5
Others - 66
(Spokane, Washington)
Engineers - 5
PhDs - 4
Machinists - 7
Others - 134


Plant Size: Electronic Materials Division
(Trail, BC) - 80,000 sq ft
(Spokane, WA) - 80,000 sq ft

Equipment: Melbourn high pressure Czochralski Crystal Growers; custom built metal refining equipment; custom built crystal slicing; fabrication and polishing facilities; and high purity metals fabrication equipment.

Experience: Cominco has been in the electronic materials business since 1949 and has supplied materials to most major US electronic companies.

Keywords: 4 = Chemistry; 7 = Electronics;
20 = Miscellaneous; High Purity Metals = 4; Compound Semiconductor Wafers = 4, 7; Semiconductors = 4, 7;
Infrared Materials = 7; Bonding Wire & Ribbons = 20;
Sputtering Targets = 7; Solder Preforms = 7; Evaporation Charges = 4; Metallurgy = 4; Semiconductor Wafers = 4, 7.

Revised: Dec 83

COMPUTING DEVICES COMPANY

Code: CDC
Address: P. O. Box 8508
Ottawa, Ontario, Canada K1G 3M9

Contact: Mr. G M Mount, Sr Vice President - (613) 596-7105
Mr. Jack G Warner, Dir, International Marketing - (613) 596-7060

History: Computing Devices is a high technology company that has been a division of Control Data Canada Ltd since 1969. The company was established in 1948. It is involved in the manufacture and supply of advanced electronic systems. The company maintains sales representatives in over twenty-three countries.

Capability: Computing Devices' technology areas include acoustic signal processing systems for ASW applications for airborne, shore and undersea vehicles, digital ballistic computer systems for vehicle & portable installations, air navigation display systems, electronic intrusion detection systems, command & control display systems for ships, and jet engine thrust measurement systems. Specifically, the company developed, and is manufacturing an acoustic data processor (Presellectable Mainband Processor, PMP-8). This ASW system is designed for monitoring omnidirectional passive sonobuoys from aircraft. The company also has similar, but more complex, acoustic processing ASW equipment in airborne platforms with the Royal Air Force and the Royal Australian Air Force. Another system, the Standard Multi-Sensor Digital Display, is designed for the Canadian Navy use under the concept of Shipboard Integrated Processing and Display System. They have also developed and manufactured a Microprocessor Digital Computer System according to a Chrysler specification for the fire control system of the M-1 main battle tank. They have produced approximately 3000 systems at this time. Their Projected Map Display is for use in a variety of aircraft from tactical fighters and helicopters, to supersonic transports. This system has been used on the US Navy A-7 aircraft for over 8 years and has been accepted for the USAF Pavlov III Rescue Helicopter Program. They are currently involved in the shared development Ported Coaxial Cable Sensor Program with the BISSL at Electronics Systems Division (ESD). The program goal is to develop and test buried cable detection systems for outside security application. The program start date was mid-1976 and is currently in the FSED phase. Initial production deliveries for DOD requirements are scheduled for the 1983-89 time frame. The program has had many spinoffs. GUIDAR is their commercial product. They also developed a system (Thrust Computing System) to compute (from measured pressures) the gross thrust of afterburning turbojet and turbofan engines. The technology has been proven in NASA high altitude test cells on the J85, J79, TF30 and F100 engines, and on the T38/AJS-5 system on the Edwards AFB thrust stand. A maintenance application of the technology has been adopted by the USAF for its Air Training Command T-38 fleet for installed engine trimming on the flight line called Thrust Computing Support Equipment (TCSE). NASA was also using the technology in the HIMAT program. This was also a shared development program between the USAF and the Canadian Government completed in late 1978. Their design, development and production capabilities have been effectively demonstrated. They perform to military specifications. Contract manufacturing (offset business) accounts for 20% of their business. This is currently accomplished for Hughes Aircraft Company for the joint Surveillance System.

Average Work Force: Professionals - 225
Total - 800

Gross Sales: $54M (Historically)
$62M (Current)
$80M (Projected)

Plant Size: 295,000 sq ft (three buildings)
400 acres (Stittsville Research Facility)

Experience: As seen under Capability Section, CDC has experience with the US military (approx 50% of their total sales). They have considerable production capability.

Keywords: 1 = Aircraft; 3 = Avionics; 6 = Computers; 7 = Electronics; 15 = Radar; 16 = Security & Safety.
various R&D contracts into three main areas of expertise:

- Instrumentation and systems allied to the fields of electronics and a 9-decade dynamic range, without
  - Decade has been the development and manufacture of resolution of

- Canada. The primary goal of the company over the past
  - Component vector magnetometer with a

Address: 15-1750 CTF SYSTEMS Inc

Code: CTF

Revised: Dec 83

CTF SYSTEMS Inc

Contact: Dr Max B Burbank, President - (604) 941-8561

History: CTF Systems is a high technology company created in 1970 by a group of young physicists from Western Canada. The primary goal of the company over the past decade has been the development and manufacture of instrumentation and systems allied to the fields of electronics and applied physics. This goal has materialized through various R&D contracts into three main areas of expertise:

- Cryogenic & SQUID (an acronym for Superconducting Quantum Interference Device) Technology.
- Ultrasonic Non-Destructive Evaluation (NDE).
- Applied Microprocessor Technology.

Capability: CTF’s expertise is outlined below:

Cryogenic and SQUID Technology – CTF Systems has developed and/or advanced the technology through innovation in several areas of cryogenics and SQUID magnetometry. These areas include:

- Cryogenic liquid containers (Dewars) with unusual designs such as:
  - Horizontal Dewar – a mobile, random orientation liquid helium cryostat, suitable for airborne tests and designed to accommodate a 9-component gradiometer/magnetometer array using SQUID sensors.
  - Large Access Vertical Dewar – a non-magnetic, non-metallic 12 inch diameter dewar for ground testing the 9-component SQUID array.
  - Room Temperature Access Dewar – a two dewar combination with an “inverted” inner dewar to permit rock samples to be measured at room temperature inside a superconducting coil assembly.
  - Low Noise Biogradiometer Dewar – a cryostat with a 1 cm thermal gap at the lower end to allow positioning of the coil close to biomagnetic sources. Dewar tail materials, selected, and assembled so as to minimize the effect of environmental magnetic noise on the signal.

Digital SQUID Electronics – CTF is the only SQUID manufacturer presently making a digital SQUID control module capable of remote computer control of data sampling, digital filtering, and data transfer. Special features of this instrument, the DSQ-400, include a 9-decade dynamic range, a sophisticated second order digital filter with transient protection, and multichannel sampling synchronized to within 30 nanoseconds between channels. Up to 32,000 32-bit measurements per second can be recorded from each channel, and up to 16 channels controlled via one 16-line parallel computer I/O port. The DSQ-400’s digital format and synchronized sampling permit multi-channel sensing with high temporal coherence. This makes possible advanced gradiometer compensation systems and the virtual elimination of coherent noise (e.g., 60 Hz) from data with the appropriate signal processing.

Designs for Cryogenic Elements of MAGLEV – Under contract to Transport Canada, CTF Systems has been analyzing cooling systems and

SQUID Sensor Design – The SQUID is an ultra-sensitive cryogenic device which exploits two properties of superconductors: the Josephson effect and the effects in tiny superconducting junctions and the quantization of magnetic flux in closed superconducting loops. A complete CTF SQUID system consists of a superconducting flux transformer, a basic SQUID sensor; RF amplifier/detector and analog feedback circuitry; and circuitry to digitize, filter, resample and transmit data to recording or signal processing equipment. The superconducting flux transformer (which is noiseless) can enhance the basic sensor flux sensitivity by a factor of 50 or more with true DC response. By appropriate configuration of this flux transformer, the SQUID system can sense specific magnetic field vectors, or list, 2nd, or 3rd spatial gradient tensor components. A number of specialized flux transformers have been designed and constructed by CTF in recent years, including the following advanced magnetometer systems:

- Airborne Gradiometer – a 9-channel SQUID system (6 gradient tensor and 3 field vector components) suitable for mobile applications was designed and developed. Design work was guided by computer simulation to minimize intercomponent interference.

- High Sensitivity Station Magnetometer – a 3-component vector magnetometer with a resolution of 10E-10 gauss rms/SQRTHz and a 9-decade dynamic range, without range switching or external counting.

- Third Order Biogradiometer – a biomagnetic sensor/dewar combination designed to detect the third spatial gradient with a high sensitivity only to very near sources, rejecting more distant ones. Low frequency (0.3Hz) signals of the order of 10E-10 gauss from the brain and other organs are detectable in the presence of more distant magnetic noise sources many orders of magnitude higher. A publication describing the Biogradiometer and its operation is available from CTF Systems Inc.

- High Sensitivity Rock Magnetometer – a room temperature access design with sensitivity better than 10E-9 gauss-cm^3 rms/SQRTHz moment for samples up to 7mm diameter, such as small rock samples or biological magnets.
superconducting magnets for magnetic levitation transportation systems (electrodynamic MAGLEV), and has as a result generated a number of advanced designs for lightweight cryo-cooled superconducting magnets.

Ultrasonic Non-Destructive Evaluation (NDE) - CTF has been active in this field since 1975, carrying out research and development on behalf of the Canadian Department of National Defense with regard to a number of NDE problems. Projects of major importance include:

- Naval Boiler Corrosion - a 3-mode system (manual to fully automatic) has been developed for rapid, thorough scanning of boiler tubes. The Model NDE-2 Analyzer contains a microprocessor which controls mechanical probe motion, data acquisition, storage and output, and features an ultrasonic transducer yielding clean unambiguous signals in small diameter tubes. Probe range is up to 8 feet (2.5m).

- Acoustoelastic Transducer - a new phase-insensitive transducer has been developed for quality assurance applications in producing new high performance composites used in military aircraft. This new semiconductor transducer shows great promise for future routine aircraft inspection for micro-cracks and delaminations, and appears to be free of phase-related signal washout problems which plague piezoelectric transducers. Development of a production prototype is expected in the near future.

Applied Microprocessor Technology - Microprocessors have been exploited by CTF as an effective means of implementing complex measurement and control functions automatically and with minimal chance of human error. Systems which have resulted from this approach include - the NDE-2 Ultrasonic Tube Analyzer (described above); the XDC-1 (a portable dive support decompression calculator, which monitors and models various metabolic parameters using the "Kidd-Stubb" hyperbaric exposure model); several instruments based on the XDS-1; and an automated SQUID rock magnetometer (being developed for the Department of Energy, Mines & Resources) capable of measuring magnetization, anisotropy of susceptibility and homogeneity of rocks, and including automated demagnetization.

CTF is now involved in developing a computerized biomagnetic scanning system for the Departments of Transport and National Defense, which will provide the capability of monitoring temporal and spatial variations in the evoked magnetic field patterns of the brain as a function of subject fatigue, stress and other factors. This is expected to have applications in such fields as personnel (e.g. pilot, controller) evaluation and in medical imaging. CTF's software-based environmental noise reduction system will be used to maintain high instrument resolution in the otherwise overwhelming magnetic environment.

As a result of much of the work undertaken in the past decade, CTF expertise in advanced signal processing techniques has grown considerably, and is now a major factor in the company's overall capability in data acquisition and software systems design.

Average Work Force: PhDs (Physics) - 4
Engineers - 4
BSc (Physics) - 3
Technical & Other - 15

Gross Sales: 1982 - $1.1M
Plant Size: 9,600 sq ft

Equipment: CTF has a variety of general and specialized equipment and facilities necessary for electronic and cryogenic/NDT R&D. Some of the equipment/facilities are listed below:

- Computer Facility: 60 M Ultrasonics
  - PDP 11-34; Dual 5Mb hard disks; 320 Mb Winchester; RSX-11m software
  - PDP-8 E Interis micro-6100 microprocessor development system

- Electronic Equipment:
  - Signal Generators (Audio, R.F.)
  - Amplifiers (D.C., Audio, R.F.)
  - Digital Multimeters
  - Digital Counter/Timer
  - Digital Logic Analyzer
  - 10'x10'x8' RF Shielded Room
  - Spectrum Analyzer
  - Lock-in Amplifiers
  - Microvoltmeters
  - Oscilloscopes
  - Power Supplies
  - Filters, Mixers, Attenuators
  - PC Board Assembly
  - Wire Wrap Assembly

- Cryogenic Equipment:
  - Helium Leak Detector
  - 100 Liter LHe Storage Dewar (2 units)
  - 60 Liter LHe Storage Dewar
  - LHe Transfer Lines
  - Non-Metallic LHe Dewar Fabrication Facility
  - Non-Metallic LHe Test Dewars

- NDT Ultrasonic Facility:
  - Multiple Frequency Ultrasonic Generator/Signal Conditioner/Receiver
  - NDT Transducer Sensor Construction Facility
  - Test Standards

- Mechanical Equipment:
  - Equipment necessary for in-house fabrication of most required items

- General Equipment:
  - Three Axis Helmholtz Coil (2m dia)
  - Vacuum Deposition System (Fore-Pump, Diffusion Pump, Vacuum gauge to 10^-9 torr, High Current Heater Supply, High Voltage DC Sputtering Supply)
  - Chemical preparation room with fume hoods and drybox
  - Three Axis Micropositioners
  - Shielded Room Facility

- Special Test Facilities:
  - A low magnetic gradient, low magnetic noise field test facility with associated instrumentation building
  - High-order biogradiometer test and balancing facility

Equipment: CTF defense related experience has been primarily with the Canadian Department of National Defense. CTF has fulfilled more than 30 contracts with DND and with other Government agencies since 1971. CTF personnel also enjoy an active technical relationship with two local universities. Several dozen commercial systems and components have been sold to universities, governments, oil companies, hospitals, and research facilities around the world.

Keywords: 1 = Aircraft; 8 = Computers; 7 = Electronics;
16 = Security & Safety; 17 = Software Services;
19 = Testing/Test Equipment; 20 = Miscellaneous;
Cryogenics = 7, 20; Superconductors = 20; SQUID Instrumentation = 16; Magnetometers = 16;
Gradimeters = 16; Biomedical Instruments = 20;
Ultrasonics = 19; Non-Destructive Evaluation = 19;
Acoustoelastic Transducers = 1, 19, 20; Composite Evaluation = 1, 19, 20; Microprocessor = 6, 7, 20;

Revised: Dec 83

DAF INDAL Ltd

Code: DAF

Address: 3570 Hawkestone Road
Mississauga, Ontario. Canada L5C 2V8

Contact: Mr. Frank Davenport. Director of Marketing - (416) 275-5300

History: DAF was originally incorporated under the name Dominion Aluminum Fabricating Ltd in 1951. The company became a member of the Toronto based Indal Group of companies in 1968 and changed its name to DAF Indal Ltd in 1977. Indal is a diversified industrial holding company with 27 operating subsidiaries and divisions in Canada and 17 in the US.

Capability: Since its incorporation, DAF Indal has grown steadily through the development of facilities which provide a speciality range of engineered products. DAF Indal maintains a large engineering department staffed by professional engineers of many disciplines, including mechanical, electrical, structural, aerodynamics and hydraulic engineering. The company is engaged in many activities involving one or more of these disciplines, and those related to the aerospace industry area are listed below:

- **Specialty Fabrication Work** - DAF Indal has the reputation of being an acknowledged expert in the field of specialized aluminum structural fabrication work, and has been certified by the Canadian Welding Bureau as meeting the requirements of CSA Standard W47- "Aluminum Welding Qualification Code". Typical of the specialized structural design and fabrication work undertaken by DAF is a transportable ILS localizer support structure. This 112 ft long modular aluminum structure is designed to break away on impact and is now a designated fit where certain conditions prevail at Canadian airports. Other work for Transport Canada has included the design and fabrication of a 100 ft telescopic mobile monitoring tower, design of a transportable glide path monitoring antenna mast and range towers for coastal navigation. Other work performed by DAF in this field includes the design and fabrication of other antenna support towers, the fabrication of radar reflectors, radomes and space frame hangar systems.

- **Shipboard Helicopter Support Systems** - DAF is a world leader in the development and supply of shipboard helicopter support systems as employed on helicopter carrying ships operated by navies and coast guards worldwide. The helicopter recovery assist system built by DAF Indal were originally developed in conjunction with the Department of National Defense for use on board Canadian Navy vessels. Variants of the systems are now employed on vessels operated by the Navies of the US, Japan, India and Argentina - being a directed fit in many cases. These systems include any or all of the following - visual landing aids (including horizon reference system), firefighting systems, fueling systems, helicopter recovery assist and transversing systems, and telescopic hangars and hangar doors. The DAF Indal RAST (Recovery Assist, Secure and Traverse) system was selected as a key element of the US Navy’s LAMPS III program where it is intended to equip over 100 ships with this system to operate in conjunction with the new Sikorsky SH-60B Sea Hawk helicopter. DAF Indal is the originator of the unique telescopic helicopter hangar that is employed on many navy and coast guard vessels that have flight deck space limitations. Over 160 such hangars have been built and are in service with numerous agencies principally the US Navy, US Coast Guard and Canadian Coast Guard.

- **Vertical Axis Wind Turbines** - DAF Indal has been a world leader in the design and manufacture of Vertical Axis Wind Turbines for over 10 years. The DAF Indal 50 kW unit is the most technically advanced and proven VAWT in the world today. A 500 kW machine modeled on a previous design of 230 kW VAWT built by DAF Indal is now in production and is gaining acceptance as a very viable source of alternate energy. The company has also pioneered the development of a hybrid wind turbine/diesel power generation system for use in remote areas.

- **Program Management and Quality Control** - DAF Indal has developed the appropriate project management control systems to administer large military contracts and is fully familiar with all aspects of government contracting. Their quality assurance procedures are maintained in accordance with CSA Standard 2.299.2 and DND 1015 requirements (equivalent to MIL-Q-9856A) are also met. There is a resident DND inspector staff based at the DAF Indal plant and the Department of Supply and Services Canada maintains an office adjacent to the DAF Indal facility to monitor ongoing domestic and international contracts. Production scheduling, material requirements and financial analyses are all controlled by a computer based system which is capable of handling the work in progress at any one time.

**Average Work Force:** Engineering = 50  
Production = 160  
Administration = 130

**Gross Sales:** 1981 - $17M  
1982 - $38M  
1983 - $43M

Export sales represent more than 90% of DAF Indal’s annual sales of which a large percentage is for the US military, principally the US Navy.

**Plant Size:** 120,000 sq ft (Manufacturing Plant)  
30,000 sq ft (Office Complex)

The bays in the manufacturing plant have a headroom of 35’ plus and are served by overhead gantry cranes. It is anticipated that more space will be added in 1984 to meet increased requirements.

**Experience:** DAF Indal serves many industries and their customers are invariably the leaders of those industries. The majority of their sales are made to government customers, either directly or through a third party subcontract. Principal customers include Navies and Coast Guards of Canada, the US, Japan, India, other NATO countries, Latin America, Australia, and New Zealand.

**Keywords:** 1 = Aircraft; 5 = Communications;  
7 = Electronics; 8 = Energy; 12 = Machining; 15 = Radar; 20 = Miscellaneous. Shipboard Support Systems = 1;  
Hangars = 1; Helicopter Recovery Assist & Traversing Systems = 1; Antenna Support Structures = 5; Radar Reflectors = 5, 15; Control Systems = 7; Wind Turbines = 8; Specialized Fabrication = 12; Radomes = 15; Aluminium Fabrication = 12, 20.

Revised: Dec 83
DATA IMAGES Inc

Code: DII
Address: 1283 Algoma Road
Ottawa, Ontario, Canada K1B 3W7
Contact: Ms. Debbie O'Brien, Sales Office Manager – (613) 744-3773
History: Data Images was incorporated in 1979 and is Canadian owned.

Capability: Data Images Inc designs and manufactures high reliability custom LCDs. They have proven expertise in high level multiplexing and meeting extreme environmental specifications. Their R&D staff is comprised of 2 PhDs in Physics/Electronics, 1 PhD in Organic Chemistry, and 3 technical support staff.

Average Work Force: 
- Engineers – 6
- PhDs – 3
- Machinists – 3
- Mgmt/Admin – 10
- Production – 32
- Drafting – 3

Gross Sales: 
- $1.0M (Historical)
- $1.5M (Present)
- $3.0M (Forecast)

Plant Size: 
- 18,000 sq ft (Production)
- 3,000 sq ft (R&D)
- 9,000 sq ft (Admin)
- 30,000 sq ft (Total)

Experience: Data Images has experience with Sperry Flight, Bell Helicopter, the US Army (Multiplexed Multiline Cockpit Display for AH-64), Hughes Aircraft, and is also involved in military development projects with Marconi Space & Defense (UK), L M Eriksson (Sweden), Grimes (US), Plessey West Leigh (UK), and Canadian Marconi.

Keywords: 3 = Avionics; 7 = Electronics; Liquid Crystal Displays = 3, 7; Displays = 3, 7; Multiplex Displays = 3, 7; LCDs = 3, 7.

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DECADE INDUSTRIES Ltd

Code: DIU
Address: 7860 River Road
Richmond, British Columbia, Canada V6X 1X7
Contact: Mr. J A Cameron, President – (604) 278-3561

History: Decade Industries Ltd was founded in 1970 primarily as a manufacturing service company supporting the aerospace engine maintenance shops of locally based airlines.

In 1975, Decade moved to their present facilities and have since expanded their markets to include principle airlines of the US, the Pacific Rim, and the Far Eastern markets, as well as becoming a major tooling supplier directly to the aerospace engine manufacturers themselves. Their 1982 affiliation with Advanced Ground Systems Engineering Corp of Long Beach, CA, has broadened their capability in the area of aerospace engine handling and transport equipment.

Capability: Decade Industries’ machine shop facilities include two numerically computer controlled three-axis machining centers, with capacity for deep milling, precision boring, and facing with close tolerances. Conventional milling and turning equipment, and a well equipped welding and fabrication shop is also maintained by Decade Industries.

A comprehensive quality assurance program in line with DND 1015/15. The Canadian Standards Association, and the specifications of their major customers in the US, ensures a reliable production of high quality, conforming products.

Non-destructive testing and proof load testing is carried out at Decade with certificates furnished for all inspections. Proof loading capability is to 25 tons in their universal tensile loading facility.

Major manufacturing capability is presently directed at production of precision tooling for aerospace engine maintenance departments of the major airlines, and to supplying bulk contract tooling as subcontractors to the Canadian Forces and specifically to Naval programs (CF-18 Aircraft Acquisition Program, and Canadian Frigate Program – Propulsion Systems). In addition to this, Decade Industries produced precision research equipment for regional nuclear accelerator projects, and Atomic Energy Canada’s Radioisotope facilities.

Average Work Force: 
- Consultant Engineers – 2
- Resident Engineers – 1
- Mechanical Engineering Technologist – 1
- Machine Shop Personnel – 16
- Administrative & Secretarial – As Required

Gross Sales: 
- 1982 – $1.8M
- 1983 – $2.0M
- 1984 – $2.5M (Est)

Experience: 

Aero Engine Companies – General Electric, Pratt & Whitney, Garrett, and SNECMA/CFMI.

Aircraft Manufacturing Companies – Boeing, McDonnell Douglas, and Lockheed.


Keywords: 1 = Aircraft; 8 = Energy; 12 = Machining; 14 = Protective Equipment; 18 = Space Systems; 19 = Testing/Test Equipment; Precision Tooling = 1, 12; Ground Support Equipment = 1, 12; Electrical Test Equipment = 1, 19; Repair & Overhaul Equipment = 1; Radioactive Waste Containment = 8, 12, 14; Isotope Dispensing Equipment = 8, 12, 14; Pipeline Control Components = 8, 12; Camera Systems Components = 12, 18; Non-Destructive Testing = 1, 14, 18.

Revised: Dec 83

THE deHAVILLAND AIRCRAFT OF CANADA Ltd

Code: DHC
Address: Garratt Blvd
Downsview, Ontario, Canada M3K 1Y5
Contact: Mr. J W Sandford, President – (416) 633-7310

History: The deHavilland Aircraft of Canada Ltd was established in 1928 as a sales outlet, assembly plant, and maintenance facility for aircraft of the British parent company's
de Havilland also maintains an Engineering Library, Metallurgical Laboratory, an Aerodynamics Laboratory, a Structural Testing Department, a Materials Research Laboratory, Environmental Chambers, and an Engineering Computer Center. In addition, an Engineering Development Shop, housed in a separate 11,000 sq ft building, consists of 100 skilled tradesmen experienced in working directly with the Engineering staff. The Data Center is equipped with an IBM 3031AP and an IBM 4341/12. The 4341/12 is dedicated to Engineering and each has a 12 MBytes and NIC of memory. In addition, the Engineering department has a VAX 11/780 Computer used primarily for structural analysis.

Experience: Contracts for both aircraft purchases, and research & development programs have been negotiated with the USAF, NASA, DOD, Department of Interior, US Army, Alaska National Guard, Canadian Forces, Canadian National Research Council, and the Canadian Department of Transport. In addition to the above, the de Havilland product line is presently being operated in over 70 countries worldwide and on all seven continents. Previous DOD contracts include:

- 981 L20 DHC-2 Mk1 Beaver aircraft to the USAF/US Army
- 165 DHC-4 Caribou aircraft to the US Army
- CV7A Buffalo aircraft development
- SCBA Air Cushion Landing System

Keywords: 1 = Aircraft; 3 = Avionics; 12 = Machining; Aircraft Control = 1; Air Delivery Systems = 1; Airframe Components = 1; Airframe Structures = 1; Cargo Handling Equipment = 1; Cockpit Displays = 3; Composite/Fiberglass Components = 1; Data Handling = 1; Data Analysis = 1; Drones = 1; Engine Components = 1; Engine Systems = 1; Engine Controls = 1; Environmental Controls = 1; Fuel Systems = 1; Fuel Research = 1; Hydraulics = 1; Instruments = 1; Landing Gear = 1; Navigation = 1; Performance Measuring Devices = 1; Personnel Survival/Restraint = 1; Repair & Overhaul = 1; Simulators = 1; Training = 1; STOL Aircraft
Manufacture = 1; Wiring = 1; Tubing = 1; Augmentor Wing = 1; Extended length = 12.

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DEVTEK CORPORATION

Code: DEV

Address: 280 Rayette Road
Concord, Ontario, Canada L4K 2G7

Contact: Mr. H Trevor Pawson, Marketing Manager
(416) 669-4484

History: Devtek Corp is a wholly owned Canadian company founded in 1980. It was originally the Aerospace/Defense Group owned by Magna International Inc. a Toronto based high technology company. Companies affiliated with Devtek are Diemaco Inc, Hermes Electronics Ltd, Magna Electronics, Verral Metal Fabricators and West Height Manufacturing Inc. Brief descriptions of these companies are included in this report.

Capability: Devtek Corp has five modern plants, each specializing in various phases of high technology engineering and manufacturing products ranging from undersea detection devices to components for outer space projects. Having pursued markets in the aerospace/defense and commercial goods sectors, Devtek has relied on its people to develop unique, new highly efficient manufacturing techniques. This confidence has resulted in an average annual sales growth of 30% and has made Devtek one of the fastest growing international manufacturing corporations. Devtek's five companies offer a wide range of modern computer controlled machine tools, staffed with highly qualified people with unique
experience in fabricating critical components and subassemblies. A new technology center has added a unique engineering capability to the corporation's sophisticated, high precision manufacturing activities, including a CAD/CAM system. One of the Devtek companies has assembled extensive engineering and manufacturing skills for the design, development, testing, and production of systems and systems for military hardware. Another Devtek company holds a leading position in the development, design, and manufacture of hydroacoustic sensors and data analysis and transfer systems as well as HF communication equipment to meet exacting military specifications. To complement the technical staffs of the companies in the corporation, Devtek provides the support of a special Corporate Engineering Group which conducts research and development and assists with problems of a highly sophisticated, technical, technological, process, or production nature. Devtek's divisions and companies operate to the following Quality Specifications as appropriate: DND-1015, MIL-Q-9858A, DND-1016, and MIL-I-45208. The divisions are recognized by the Department of National Defense for having quality programs within their facilities meeting the requirements of DND-1015 (MIL-Q-9858A).

**Average Work Force:** 15 (All Divisions) - 780

**Gross Sales:** 1982 - $32.2M (All Divisions) 1983 - $34.2M (All Divisions)

**Plant Size:** 300,500 sq ft (All Divisions)

**Experience:** Devtek's varied clientele includes - Bell Aerospace Co, Buffalo, NY; Boeing of Canada; Bristol Aerospace Ltd, CAE Electronics Ltd; Canadair Ltd, US Army, Ft Monmouth, NJ; US Navy, Indianapolis, IN; French Navy, Paris; France; Swiss Army Signal Corps, Australian Navy; Canadian General Electric Co, Computing Devices of Canada Ltd, The deHavilland Aircraft of Canada Ltd, Dowty Equipment Ltd, Emerson Electric, St Louis, MO; Fleet Industries; General Electric Co, Winooski, VT; B F Goodrich, Troy, OH; Hughes Aircraft, Los Angeles, CA; Honeywell Inc, St Petersburg, FL; Leigh Instruments; Ernst Leitz Canada Ltd, Litton Guidance & Control Systems, Woodward Hills, CA, Litton Systems (Canada) Ltd; Luminics Research Ltd, Martin Marietta, Orlando, FL; McDonnell Douglas Corp, St Louis, MO; Motorola Inc, Tempe, AZ; Northern Telecom; Philips Electronics, Raytheon Co, Portsmouth, RI; Sanders Associates, Nashua, NH; Spar Aerospace, Sperry Unvac, Salt Lake City, UT; Department of National Defense, and others.

**Keywords:** 1 = Aircraft; 2 = Armament; 5 = Communications; 7 = Electronics; 9 = Environment; 12 = Machining; 19 = Testing/Test Equipment; 20 = Miscellaneous; Landing Gear Components = 1, 12; Alum Dip Brazed Heat Exchangers = 12, 20; Machining = 12; HF Communications = 5, 12; Antennas = 5; Sonobuoys = 20; ASW = 20; Beacons = 5; Environmental Laboratory = 19; PC Boards = 7; Weather Stations = 9; Small Arms Components = 2, 12; Repair & Overhaul = 2; Electronic Cabinets = 20; Weldments = 20.

**Revised:** Dec 83

**DIEMASTER TOOL Inc**

**Code:** DIE

**Address:** 160 Wattline Avenue East Mississauga, Ontario, Canada L4Z 1R1

**Contact:** Mr. F Hibbins, Manager, Special Projects - (416) 273-7111

**History:** Diemaster is a Canadian owned company that has been in business for 10 years.

**Capability:** Diemaster is a precision engineering/machining firm specializing in machining to aerospace, military and nuclear standards, jig boring, CNC machining, EDM machining, turning, and milling. They perform stamping operations from 16 to 500 metric tons. Diemaster also designs and fabricates production tooling, special purpose machines, jigs, fixtures, gauges, and dies. Their quality control meets CSA-Z-299 2, DND 1016 and MIL-I-45208A.

**Average Work Force:** Total - 120

**Gross Sales:** $5-$6M

**Plant Size:** 66,000 sq ft

**Equipment:** NC & CNC machines, CNC machining centers, and computing centers. Other typical equipment includes mills, grinders, borers, milling machines, drills, lathes, pantograph, presses, cutting, finishing and inspection equipment.

**Experience:** Diemaster customers include SPAR, AECI, TRW, Avco Lycoming, Sanders' Associates, Dupont, Ormond Engines, Bombardier, IBM, McDonnell Douglas, Pratt & Whitney, Xerox, Rockwell International, RCA and many more. Diemaster has well known companies. Products to these companies have included aircraft engine parts, fuel tanks, critical components for aircraft, navigation systems, components for nuclear industry, dies, gauges, test and production centers, and stampings.

**Keywords:** 12 = Machining; Precision Machining = 12; CNC Machining = 12; Boring = 20; Turning = 12; Milling = 12; Stamping = 12; Fabrication = 12; Design = 12; Die Fabrication = 12; Gauges = 12.

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**DIFFRACTO Ltd**

**Code:** CIF

**Address:** 6360 Hawthorne Drive Windsor, Ontario, Canada N8T 1J9

**Contact:** Mr. T R Pryor, President - (519) 945-6373

**History:** Diffrecto Ltd was incorporated in 1973 as an offshoot of work done at the University of Windsor. The company is Canadian controlled with a 20% interest owned by Otto Wolf AG of Cologne, Germany. An Otto Wolf subsidiary, Hommelwerke, is also the distributor of Diffrecto products in Europe. They also have a US subsidiary, Diffrecto Ltd, located at 19640 Harper, Grosse Point Woods, Michigan 48236. Most of the business of the company is conducted in the US through the US subsidiary which largely acts as a sales and service operation.

**Capability:** Diffrecto has been a pioneer in the application of electro-optical inspection equipment to the manufacturing industry, primarily automotive, but also including nuclear, turbine engine, bearings, ordnance, and the like. These electro-optical units were originally developed on a custom basis, but are increasingly becoming more and more standarized. Many are finding their way into robotic applications and a separate subsidiary is being formed to handle these applications, including both inspection and robot guidance with visual sensing capabilities.

Diffrecto currently produces a variety of standard sensor products. In addition are certain special machines, the most predominant example is the Programmable Airfoil Contouring System (PACS) for turbine blade inspection. The PACS was originally developed as a joint Canadian-US Defense Development Sharing project with the USAF (AFWAL/MLTM), General Electric, and Diffrecto. This particular project has led to the sales of several such machines to manufacturers of blades in the US and is subject of intense current interest relative to both the inspection of new and rework blades (where additional Diffrecto flaw detection equipment can be used).
combined into such machines. An offshoot of the PACS is the Laser Gear Inspection Machine. It is touted as offering a revolutionary way of quantifying gear dimensions in minimal time.

Diffracto has devoted considerable effort to R&D activities and has received support in this area from the National Research Council of Canada, and the Department of Industry, Trade and Commerce. Current projects exist in the following areas:

- Electro-optical flaw detection
- E/O sorting machine development
- High resolution sensor development (profile image and triangulation)
- Robot guidance sensor development
- Fiber optic dimensional and CMM probe development
- Electro-optical sensors for machine tool feedback

In addition to the above, there are numerous customer-sponsored projects and smaller internal projects. It should also be noted that a large percentage of their custom inspection machines delivered have substantial sensor R&D components. The company currently performs over one million dollars of R&D per year directly aimed at laser and electro-optical sensor development for measuring, inspection and robot guidance. Major applications for this type equipment within private industry and possibly within the USAF as follows:

- Inspection and automatic adaptive control of turbine blade manufacture and rework
- Inspection of turbine assemblies and components. For example, they have projects underway with General Electric for inspection of rotor shaft internal defects. Previous projects were concerned with tip clearance on rotors and for the automatic ultrasonic inspection of disks (laser/optical sensor control portion).
- Air frames and components
- Diffracto has participated to a small degree with Boeing in the ICAM sheet metal center development program. Much of the hardware needed to actually implement such a center from the inspection and robot control point of view, already exists at Diffracto. They are currently in discussions with Lockheed Georgia on this same subject.
- Structural Integrity - Diffracto has completed laser-based, miniaturized strain gage for aircraft fatigue strain history monitoring for the Canadian Department of National Defense. This gage can be used for highly stressed air frames and gives real time as well as stored data directly in digital form. It can exist in a fiber optic based version having very low weight and freedom from electrical noise.
- Manufacturing Technology - applications include the inspection of parts on flexible machining centers and the inspection of tools in the changers. A line of "RoboGage" vision based inspection machines has been developed, which are being incorporated in flexible lines.
- Ordnance - Diffracto inspection systems can be used for the inspection of ordnance. These normally high volume, high tolerance items require both dimensional and defect inspection, and are therefore ideally suited for electro-optical inspection. Some Diffracto sensing systems operate with fiber optics and can be utilized in remote areas, e.g., loaded munitions areas, etc. Sensors already exist for large caliber barrel straightness determination. Barrels bore dimensions and flaws are other areas for which sensors have been developed. Miniaturization of this technology to small caliber barrels (5.56mm to 40mm) has proved successful.

- Inspection of rivet and fastener holes in aircraft skins
- Diffracto has a bore probe system that can contour holes optically without requirement for all the channels of information needed in a capacitance probe. A unit has been provided to Grumman.
- Robot Guidance - A major project is currently underway to utilize the vision guidance system of the Canadarm used on the Space Shuttle to guide robots in plants. This project, in conjunction with the Government of Canada and a major automobile manufacturer, is expected to result in improved robots capable of much higher accuracy. A principle goal of the project is dynamic, flexible assembly and material handling. A project submission in this area applied to the F-16 has been jointly made with General Dynamics to the USAF.

Diffracto standard products include:

- Standard Laser/Electro-Optical Sensors
  - 'MAXAN' Matrix Array Computer Vision Units
  - Series S and D High Resolution Outer Diameter Sensors
  - 'LaserProbe' High Resolution Laser Triangulation Sensors
  - LaserSurf In-line Microfinish Sensors
  - Model SF and BF Surface and Bore Flaw Detection Equipment
  - K-Series Microcomputer Based Controller for Optical Sensors and Machines
  - Contact Optical Digital Bore Size Probes

- Standard Machines
  - PACS - Programmable Laser Airfoil Contour Systems
  - Laser Gear Inspection Machine
  - 'RoboSorter' Computer Vision Bolt Sorting Machine
  - 'RoboGage' Programmable Robotic Inspection Machine (vision-based)

- Computer Controlled Marking Units
  - Model 400 Laser Marker for Part Identification
  - 'Turbodet' Ink Printer

Average Work Force: Total = 100 (5 PhDs)

Gross Sales: FY 82 = $5.0M
FY 83 = $6.0M (Projected)

Plant Size: 66,000 sq ft

Experience: Diffracto has performed one contract with the USAF (AFWAL Materials Laboratory) through the Defense Development Sharing Program. They have worked with the US Army (Picatinny Arsenal) as well as with US industry, e.g., General Electric Co., Boeing Aircraft Co., Union Carbide, Uniroay, Westinghouse, Bunker-Ramo, Battelle, and others. They also work with the Canadian Department of National Defense and National Research Council of Canada.

Keywords: 1 = Aircraft, 6 = Computers, 7 = Electronics, 10 = Image Processing & Optics, 12 = Machining, 19 = Testing/Test Equipment, 20 = Miscellaneous Measurement & Control Systems = 7, 19, Laser Optics = 10, 19, Optics = 10, 19, Automated Precision Measuring = 12, 19, Precision Measuring = 12, 19, Inspection Equipment = 6, 10, Ordnance Inspection Equipment = 6, 10, Sensors = 19, Turbine Blade Inspection = 1, 7, 10, 19, Gear Inspection = 10, 19, Flaw Detection = 10, 19, Structural Integrity = 1, 10, 19, Robotics = 20, Robot Guidance = 20, Manufacturing Technology = 6, 10, 20, ICAM = 20, Machine Vision = 6, 10

Revised: Dec 83
DIPIX SYSTEMS Ltd

Code: DIP

Address: 1785 Woodward Dr
Ottawa, Ontario, Canada K2C 0P9

Contact: Mr. R Cobold, Dir of Marketing - (613) 224-5175

History: Dipix is a Canadian owned company incorporated in September of 1978. They are presently represented on a world-wide basis by various companies. US offices are at Dipix Inc. Rivers Center, 10220 Old Columbia Rd Columbia, MD 21046, Contact Mr. L Robert (301) 596-0505.

Capability: Dipix Systems Ltd has an established capability in the field of digital image processing for remote sensing and digital terrain mapping applications. The company has developed a powerful family of image analysis systems capable of processing imagery from satellite data (e.g., Landsat), digitized imagery (e.g. Photographic), cartographic (Map Digitizer), seismic, and other sources. Dipix engineers, analysts and programmers have designed many unique features into its systems. As a result, the company has been able to establish and maintain a leading market position with export sales around the world.

Central to Dipix’s highly regarded position in the image processing field, is its extensive technical and analytical experience in developing applications and utility software to address user operational needs. Dipix has an enviable in-house research and development track record. The ARIES-II Digital Image Analysis System was developed from scratch over a two year period.

Average Work Force: PhDs - 4
Masters - 6
Bachelors - 30
Others - 55

Gross Sales: FY 81 - $3.4M
FY 82 - $5.0M
FY 83 - $7.5M (Projected)

Plant Size: 60,000 sq ft (new facility - Nov 82)

Equipment: Dipix has a full range of modern test equipment including a VAX-750 DEC computer, as well as a number of Dipix ARIES-II Systems used for program and engineering development.

Experience: Dipix personnel have many years of experience in digital image analysis going back to the early 1970s. The six original founders of the company were involved in the design and building of the ground station in Italy, as well as the original Aries image analysis system for the Canadian Forestry Service. Dipix has had a close relationship with the Canada Center for Remote Sensing, where they have been contracted for both hardware and software development. At present, Dipix has in excess of fifty turnkey digital image analysis systems installed world-wide. The largest of these systems are in Indonesia, Holland, and Canada.

Keywords: 7 = Electronics, 10 = Image Processing & Optics, 17 = Software Service, 18 = Space Systems, Digital Image Analysis = 7, 10, 18, Turnkey Systems = 7, 10, 18, Software Development = 17, Hardware Development = 7, 10, 18, Transmission of Digital Imagery = 7, 10, 18, Storage of Digital Imagery = 7, 10, 18, Image Processing = 7, 10, 18

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implemented systems in the following areas - Cold Lake radar simulation program, and modifications to the Cold Lake radar tracking and telemetry recording system software, and real time data acquisition, display and control systems for New Brunswick Optical Satellite Tracking System.

Keywords: 1 = Aircraft, 5 = Communications, 6 = Computers, 7 = Electronics, 15 = Radar, 17 = Software Services, 18 = Space Systems. Consulting = 5, 6, 7, 15, 17, 18. Studies = 5, 6, 7, 15, 18. Systems = 5, 6, 7, 15, 17. Data Acquisition = 17, Data Processing = 17.


Revised: Dec 83

DOCUMENTED CIRCUITS Inc

Code: DCI

Address: P. O. Box 8, Station “A”

Kingston, Ontario, Canada K7M 6P9

Contact: Mr. D J Mercer, General Manager - (613) 389-1032

History: DCI was incorporated in June 1980 and was fully operational during January 1981. The company is Canadian owned and operates from the design and manufacturing facility located in Kingston. Sales representatives are presently located in Toronto, Montreal, Ottawa, and Cleveland, OH.

Capability: The combination of sophisticated software, state-of-the-art hardware and experienced personnel enable DCI to provide reduced turnaround times, accurate phototools and complete compatible documentation packages at competitive prices. DCI provides a total service to industry including:

- Printed circuit design utilizing a powerful interactive CAD system.
- The color coded layout method of printed circuit board design.
- Digitizing and photoplotting from customer supplied color coded layouts.
- Photoplotting output tapes from customers CAD systems.
- PCB design consultation services.
- Assembly drawings.
- Component lists.
- Auto insertion reports.
- Test fixture reports.
- N/C drill tapes in Excellon, Trudrill and Digital formats.
- Precision phototooling for component and solder sides, silk screen, solder resist and drill graphic plots.
- Magnetic tapes to drive the multiwire process.

DCI will be manufacturing and marketing computer-aided engineering and design systems for the electronics industry. Their main objectives will be to:

- Offer industry state-of-the-art computer assisted printed circuit design and documentation.
- Manufacture and market a computer-aided engineering and design software system.

DCI has the capability to work to MIL, IEEE, JIC, IPC, and ANSI standards and specifications or to customer defined parameters.

Average Work Force: Design technicians, training and applications personnel, software development and support engineers, plus an experienced management team for a total staff of 44.

Gross Sales: 1981 - $8M

1982 - $13M

1983 - $14M (Projected)

Plant Size: 17,000 sq ft

Equipment: The following equipment is employed by Documented Circuits Inc:

- Digital Equipment 2060 Computer with 512K of memory
- RP06 Disk Packs
- TU77 Magnetic Tape Drive
- LA120 Printer Terminal
- 1055 Calcomp Pen Plotter.
- Digital Equipment LP20 Line Printer
- (6) Digital Equipment VT100 Terminals
- (6) Tektronix 4014 Graphic Terminals
- (2) 8602 Talos Digitizing Tables
- (3) Gerber Scientific PC-800 Digitizing Systems
- 732B Gerber Scientific Photoplotter with a 48”x60” bed
- Gerber Scientific 4300 Controller
- (2) Digital Equipment VAX series 730 computers
- (1) Digital Equipment VAX series 750 computer
- (3) Orcatech raster graphics terminals

Phototools are produced, inspected and packaged in a controlled environment.

Experience: DCI has processed designs for companies in the telecommunications, computer, medical, aerospace, and commercial electronics fields. Some of the major accounts include - Rockwell International, Northern Telecom Ltd. Spar Aerospace, and AES Data.

Keywords: 7 = Electronics, 17 = Software Services, CAD PC Design = 17. CAD/CAE Systems Software = 7, 17

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DOUSERV GROUP INC

Code: DOU

Address: 1200 McGill College Ave, Suite #1930

Montreal, Quebec, Canada H3B 4G7

Contact: Mr. G Raymond Doucet, PEng, President - (514) 866-5836

History: The DOUSERV GROUP Inc was founded in 1974 by G Raymond Doucet as Doucel & Associates Consulting Ltd. The company evolved through acquisition and development of other firms leading to the establishment of offices in several Canadian cities and in the US. Incorporated in 1980 as DOUSERV GROUP Inc, the parent company along with its associated firms are well established in the fields of communications, energy, industry, and transportation serving various clients in government, public utilities and the private sector. The headquarters are in Montreal, Canada with field offices in St John's, Newfoundland, Halifax, Nova Scotia, Quebec City, Quebec, Montreal, Quebec, and Dallas, TX.
Capability: The DOUSERV GROUP undertakes large and small projects and is committed to provide clients with quality services for the best value in the shortest possible time. The Group comprises over 100 full-time employees and associates with highly regarded outside specialists. The professional and technical resources have access to the best available tools, equipment and documentation.

The DOUSERV GROUP organization is characterized by its flexibility to undertake projects requiring multidisciplinary teams. It brings together under common leadership the resources from its associated firms to complete a project in the most effective manner. The individual offices operated by associated firms are also uniquely qualified to pursue a distinct specialization for a specific market area. The DOUSERV GROUP organization is therefore capable of serving all client requirements.

A description of their services is the following:

- **Studies** - feasibility, technology assessment, investment, market, tariff, economic, financial, cost benefit, research and development.
- **Design** - systems design and detail specifications, quantity and cost estimating, contract documents, and bid evaluation.
- **Construction** - inspection, supervision, equipment installation, construction management, start-up operations and commissioning.
- **Management** - project management services, procurement, technical assistance, advisory services, technology management and transfer, operations and maintenance planning and quality control.

**Average Work Force:** Over 100 employees, including engineers, technicians and support staff.

**Gross Sales:**
- 1980 - $2,225,000
- 1981 - $3,244,000
- 1982 - $4,212,000
- 1983 - $3,637,000

**Plant Size:** Offices located in cities named above.

**Experience:**
- Maritime Telephone & Telegraph Co, New Brunswick Telephone Co, Governments of New Brunswick and Newfoundland, Newfoundland Telephone Co, Canadian Pacific, Department of Communications of Canada and of Quebec, Quebec Telephone, Hydro Quebec, James Bay Energy Corp.
- Southwestern Bell, International Civil Aviation Organization, and others.

**Keywords:** 5 = Communications; 6 = Computers; 8 = Energy; 14 = Protective Equipment; 18 = Space Systems; 20 = Miscellaneous; Consulting = 5, 6, 8, 14, 18, 20; Civil Engineering = 20; Project Management = 5, 6, 8, 14, 18, 20; Professional Services = 5, 6, 8, 14, 18, 20; Radio Communications = 5, Telecommunications = 5.

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**DSMA ATCON Ltd**

**Code:** DSM

**Address:** 4195 Dundas Street West
Toronto, Ontario, Canada M8X 1Y4

**Contact:** Mr. Varis Smiltnieks, Mgr, Business Development - (416) 239-3012

**History:** DSMA Atcon Ltd is the advanced engineering affiliate of Dilworth, Secord, Meagher and Associates, which began in 1952 as a high technology engineering organization and was incorporated in 1956 as Dilworth, Secord and Associates Ltd. It is a wholly owned Canadian firm controlled by its senior employees. A computer center, development laboratory, manufacturing facility, and domestic and foreign subsidiaries and affiliates complement the head office engineering resources. The company has the following branch offices:

- **DSMA Atcon Ltd - 17704-103rd Ave, Room 202,** Edmonton, Alberta T5S 1J9
- **Atcon Services Ltd - 3235 Wharton Way,** Mississauga, Ontario L4K 2B6
- **American Atcon Inc - 1105 N Market St, P.O. Box 1347,** Wilmington, DE 19899

**Capability:** DSMA Atcon Ltd is a firm comprised of engineers and advances technology consultants. Their services and fields of specialization are shown below:

- **Services** - Feasibility and conceptual studies, equipment development, systems engineering, detailed design, manufacture supervision, quality assurance and commissioning, heat transfer, stress and seismic analyses, program management, procurement services, turnkey design and supply through a constructor affiliate.

- **Fields** - Machinery design, emergency maintenance and remote handling equipment, controls systems engineering, R&D facilities, aerospace and transportation equipment, environmental studies, air pollution, toxic and hazardous products waste disposal, and nuclear, thermal solar, wind and wave energy projects.

**Average Work Force:**
- Principal = 1
- Associates = 8
- Controller = 1
- Support Staff = 50 (mechanical, electrical, aeronautical, structural, nuclear, and health physics disciplines)

**Gross Sales:** $3.0M (Annually)

**Plant Size/Equipment:** 10,000 sq ft of office space fully equipped for engineering and design. A computing facility is integrated in the design office to provide powerful stress analysis capabilities.

10,000 sq ft of laboratory space equipped to support development, design and manufacturing projects. Specialized equipment such as a small wind tunnel, a shaker table, and dynamometer rig are used to extend the engineering capabilities of the design office.

An engineering office in Edmonton serves clients in western Canada with its associated firm, Alatcon Services Ltd, undertaking design and supply projects. American Atcon Inc of Wilmington, Delaware, serves clients in the US.

**Experience:** Typical projects include:
- Space shuttle RMS Component Engineering, Test Equipment Design and Supply
- Toxic Gas Dispersion Systems - Requirements, Design, Procurement, Commissioning
- Program Management of Canadian Electric Vehicle Demonstration and Evaluation
- Medical and Physics Accelerator Facilities - Feasibility, Concepts, Design
- Wind, Wave and Solar Energy R&D Programs and Facilities
- Nuclear Industry, Environmental Assessment, Engineering and Decontamination
EBSCO INDUSTRIES

Code: EBC

Address: P. O. Box 9420
7851 Alderbridge Way
Richmond, British Columbia, Canada V6X 2A4

Contact: Mr. Helmut Eppich, Chairman & Ch Executive Officer - (604) 278-5578

History: Ebco Industries Ltd is a Canadian owned company formed in 1936 as a small tool and die shop in Vancouver. The company has had a compounded growth rate of 50% per year since that date and now it is a multi-million dollar concern comprising twelve companies. This highly diversified organization, including all subsidiaries and affiliates, has a wide range of expertise that includes all aspects of machining & fabricating, electro-plating, electronic data entry & processing equipment, electronic R&D, data processing, furniture, general special construction, custom wheels & automotive accessories, real estate, upholstery, and stoves. This profile will concentrate only on their machining capability which can vary from a 20 minute grinding or polishing job to an 18 month multi-million dollar custom 50 ft dia atomic cyclotron.

Capability: Ebco Industries is a multi-faceted corporation with a major investment in the machining and fabrication business. Their skills and facilities include:

- Design of Off-Road Transportation Equipment and Transportable Power Supplies
- Data Acquisition and Control System for a Petro-Chemical Extraction Plant
- Stress Analysis of Aircraft Structures & Nuclear Equipment Code Verification
- Design and Development of Heat Transfer Apparatus for Steel Mills
- Design of Nuclear Power Plant Equipment, Apparatus, Systems
- Special Industrial Air Handling and Ventilation Design and Development
- Remote Handling Systems Concepts and Design for Fusion and Fusion Facilities
- Remote Maintenance and Repair Equipment Development, Design and Construction
- Test Rigs for Aircraft Components, Satellites and Nuclear Service Equipment
- Test and Research Facilities, Environmental Chambers, Wind-Wave Flumes, Particle Accelerators, Engine Test Stands, Hydrogen Fuel Test Facilities, Astronomical Observatories

* Design of Off-Road Transportation Equipment and Transportable Power Supplies
* Data Acquisition and Control System for a Petro-Chemical Extraction Plant
* Stress Analysis of Aircraft Structures & Nuclear Equipment Code Verification
* Design and Development of Heat Transfer Apparatus for Steel Mills
* Design of Nuclear Power Plant Equipment, Apparatus, Systems
* Special Industrial Air Handling and Ventilation Design and Development
* Remote Handling Systems Concepts and Design for Fusion and Fusion Facilities
* Remote Maintenance and Repair Equipment Development, Design and Construction
* Test Rigs for Aircraft Components, Satellites and Nuclear Service Equipment
* Test and Research Facilities, Environmental Chambers, Wind-Wave Flumes, Particle Accelerators, Engine Test Stands, Hydrogen Fuel Test Facilities, Astronomical Observatories


EBCO

Average Work Force: Total = 500

Gross Sales: Year ending Sep 83
$20 5M (Ebco Industries Ltd)
$39 6M (Ebco Industries Ltd plus Subsidiaries)

Plant Size: 211.022 sq ft on 13 Acres (additional 52 acres for future development)

Equipment: Facilities: Crane capacity - maximum lift 150 tons, 40 ft under hook (in shops), maximum lift 70 tons, 36 ft under hook (in yard). Door Size maximum 24 x 24 ft. and Shipping facilities - road, rail and water loading capacity. Ebco's equipment list is too voluminous to itemize in this profile, however, the following is a brief summary - punch presses ranging from 15 to 250 tons, overhead cranes ranging from 5 to 80 tons, mobile cranes up to 7.5 tons; cutting equipment - Linde 4 & 8 head with tracers, plasma arc machine, ironworker; sheet metal and plate shears, and Stress Relief Furnace 50 ft. 20 ft wide. 16 ft high, maximum temperature 1000°C and maximum load 100 tons.

Other equipment includes welding manipulators, boring mills, planers, lathes, milling machines, drills, forming presses, plate rollers, welding equipment, planer mills, CNC machines with software preparation and programming system, and various inspection and quality control equipment

Experience: Ebco's clients include - Boeing Co (MX transporter trailer for USAF and CNC - machined components for jet/foil vessel for USN). Hooker Chemical Co (Electrolytic cathode cells for Chlorine plants). DeHavilland Aircraft (CNC - machined aluminum components for Dash 7 and Dash 8 aircraft). University of British Columbia (56 ft vacuum tank and resonators for the Meson Facility TRIUMF Project). Robbins Co (underground tunnel boring machines to 32 ft dia).
Lockheed Petroleum Services Ltd (wellhead cellars for subsea oil well drilling and exploration), plus many other companies and a variety of manufactured items.

**Keywords:** 12 = Machining, Extended Length Machining = 12, Metalworking = 12, Heat Treating = 12, Coating Specialized = 12, Precision Machining = 12, Stamping = 12, Tooling Fabrication = 12, Die Fabrication = 12, Titanium = 12, Mechanical Assembly = 12, Hydraulic Assembly = 12, Repair Capability = 12

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**ENCHEM DEVELOPMENT Inc**

**Code:** ENC

**Address:** 509 - 2024 Fullerton Avenue
North Vancouver, BC, Canada V7P 3G4

**Contact:** Dr Gerald B Porter, President – (604) 922-3844

**History:** The company was established in Nov 80 for scientific research and development in chemical energy and related fields of chemistry.

**Capability:** The company’s expertise resides in Dr Porter. Until his resignation in Aug 81, Dr Porter was a Full Professor of Chemistry at the University of British Columbia. His basic research program in photochemistry there during the past 25 years has resulted in over 60 scientific publications. This work is being continued on a part-time basis, funded by the Natural Science and Engineering Council of Canada and Enchem.

Laboratory facilities are rented from Simon Fraser University and UBC in the greater Vancouver area. Research and development will be undertaken in applications of photochemistry, and in conversion of chemicals to other forms of energy and vice versa.

**Average Work Force:** Professionals – 1
Technicians – 1

**Gross Sales:** 1982 – $50,000
1983 – $60,000

**Equipment:** All laboratory equipment of the Department of Chemistry at Simon Fraser University and UBC is available to Enchem. This includes mass spectrometers, NMR, visible-uv spectrometers. Analytical services by Canadian Microanalytical and equipment construction by Sciema Technical Services, both in the Vancouver area.

**Experience:** The company has a current contract with the Canadian Federal Government for solar energy developmental and work for analytical work on plastics. Dr Porter’s experience is in inorganic photochemistry and photophysics, spectroscopy and kinetics, using lasers of various types and highly sensitive detection systems. He is a cooperative user of a picosecond laser facility in Montreal at Concordia University. Enchem is also involved in a project on cyanide/gold mining.

**Keywords:** 4 = Chemistry, 8 = Energy, 11 = Lasers; 20 = Miscellaneous, Inorganic = 4, Photochemistry = 4, 8, 11, Photophysics = 8, 11, Energy Conversion = 8, Thermodynamics = 4, Studies = 4, 8, 20, Research = 4, 8, 20, Spectroscopy = 4, 8, 11, 20, Kinetics = 4, 11, Analytical Chemistry = 4

**Revised:** Dec 83

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**ENHEAT Inc**

**(Aircraft Division)**

**Code:** ENH

**Address:** 1 Lusby St
Amherst, Nova Scotia, Canada B4H 3Y7

**Contact:** Mr D I Sweetapple, VP & Gen Manager – (902) 667-3315

**History:** Enheat Inc, Aircraft Division, is a high technology aircraft component manufacturing, repair and overhaul facility founded in 1952 by Enamel & Heating Products Ltd of Sackville, New Brunswick, Canada. It was originally owned by Rhodes & Curry Ltd, an Amherst based company, who sold it to Canadian Car & Foundry Ltd of Montreal, Quebec. These companies manufactured railway wheels and cars for over 60 years prior to the Second World War.

Canadian Car & Foundry started an aircraft plant in 1940. Until the end of the war in 1945, the Canadian Anson was manufactured as well as many other types and makes of aircraft. Enamel & Heating Products Ltd changed its name to Enheat Ltd in 1972 and Enheat Inc in 1980.

**Capability:** Enheat Inc, Aircraft Division, is a high technology aircraft component manufacturing and repair & overhaul facility.

**Average Work Force:** Engineers – 2
Quality Control – 11

**Gross Sales:** 1980 – $ 8.64M
1981 – $11.05M
1982 – $ 7.84M
1983 – $ 7.00M

**Equipment:** Enheat Inc employs the following equipment: Auto-clave, drying ovens, temperature controlled layup room, process room, paint shop, brakes, presses, routers, rolls, sheet, drop hammers, stretch forming machines, lathe, millers, planers, jig borers, and grinders, dimplers, miscellaneous small and hand tools.

**Experience:** Enheat has 31 years of experience with major aircraft companies of North America. Present customers include: Canadian Department of National Defense, Boeing Airplane Co, Lockheed California Co, McDonnell Douglas Aircraft Co, Grumman Aerospace Co, Fleet Industries Ltd, The deHavilland Aircraft of Canada Ltd, and Canadian Ltd.

**Keywords:** 1 = Aircraft, 12 = Machining, 20 = Miscellaneous, Bonded Components (Metal) = 1, 12, 20, Bonded Components (Composite) = 1, 20, Repair & Overhaul = 1, Airframe Components = 1, Aircraft Components = 1

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**ENVIRONMENTAL APPLICATIONS GROUP Ltd**

**Code:** EAG

**Address:** 114 Avenue Road
Toronto, Ontario, Canada M5R 2H4

**Contact:** Mr. Richard J Kolomeychuk, Vice President – (416) 968-3684
History: The Environmental Applications Gp Ltd was incorporated in 1977 to provide multidisciplinary environmental services to industry and government. It is entirely Canadian owned by four principals, with its sole office in Toronto.

Capability: The company was formed as a consulting firm with two major divisions - Atmospheric, and Life Sciences. The Atmospheric Division engages in R&D in pure and applied meteorology, climatology, cloud physics, air quality, and air-sea interaction. Scientific expertise includes numerical modelling of atmospheric phenomena, experimental design and field studies, instrumentation, data analyses, and environmental assessment.

Average Work Force: PhDs - 3
MD - 1 (Part-time)
MSS - 3
BSs - 3
Others - 4

Gross Sales: 1978 - $0.25M
1979 - $0.32M
1980 - $0.45M
1981 - $0.70M
1982 - $0.50M
1983 - $0.56M

Plant Size: 3,250 sq ft (Office Space)
750 sq ft (Laboratory/Workshop)

Equipment: Special equipment and facilities include the following:
- Atmospheric - tethersonde (altitude to 1 Km) and airsonde (altitude to 25 Km) systems utilizing radiotelemetry and optical theodolites for boundary layer and upper air measurements, and remote meteorological base station.
- Air Quality - high-volume particulate samplers, and SO$_2$ gas analyzers.
- Remote Field Facilities - winterized trailer, tents, snowmobiles, and electrical generator for a long term remote field camp capable of Arctic operations.
- Laboratory - equipped for physical, chemical, microbial, and biological analyses, and includes an atomic absorption spectrophotometer.
- Data Processing - includes an in-house Wang 2200 VP mini computer with access via timesharing to DEC, IBM, and CDC mainframes.


Typical Projects of Environmental Applications Gp Ltd include:
- Toxic Organic Emissions Study
- Atmospheric Loadings and Emissions Studies
- Upper Atmospheric Experiments
- National Emissions Inventories - Natural Alkaline Particulate, Organic Compounds, Sulfur, Nitrogen and Mercury Compounds; and Great Lakes Atmospheric Deposition Model.
- Natural Gas Pipeline Associated Studies
- Meteorological Studies using Tethered Balloons
- Air Quality Studies - remote and urban

Keywords: 8 = Energy, 9 = Environment, Meteorology = 9
Microclimateology = 9, Radar Meteorology = 9, Satellite Meteorology = 9, Climatology = 9, Air Quality = 9, Pollution Monitoring = 9, Environmental Assessment = 9, Dispersion Modelling = 9, Long Range Transport = 9, Boundary Layer = 9, Upper Air = 9, Cloud Physics = 9, Cloud Dynamics = 9, Weather Modification = 9, Solar Energy = 8, Wind Energy = 8, Acoustics = 9, Iceing = 9.

Revised: Dec 83

EPIC DATA SALES Ltd

Code: EDS

Address: 7280 River Road
Richmond, British Columbia, Canada V6X 1X5

Contact: Mr. Norman A. Cafik, General Manager - (604) 273-9146

History: Epic Data Sales Ltd is a member of the Ebco group of companies (See Ebco Industries Ltd). They are a Canadian owned company incorporated in mid-1974. The large diversification of capability and products associated with Ebco Industries caused many problems in labor and material tracking. They looked for an automated system that would solve these problems and discovered there was no system available that would perform these functions at a reasonable price. They developed their own data collection system and Epic Data Sales Ltd was formed.

Capability: Epic Data Sales Ltd develops and manufactures data collection systems based on microprocessor technology. Their terminals and controllers are designed using solid state components. This enables them to keep down cost while maintaining reliability. The user terminals on the factory floor, the office, or other environments are simple and straightforward to use.

Each Multi-Function Terminal (MFT) model may be upgraded to provide new input devices (e.g., magnetic stripe reader), special interfaces (e.g., weight scale), or peripherals (e.g., CRTs or printers). In almost every case, adding capabilities to a system does not obsolete equipment already purchased. In addition to their MFT terminals, they have developed Single Function Terminals (SFT) and Environmentally Sealed Portable Terminals (ESPT). Their first SFTs collect data solely via a barcode wand. They are planning a single function barcode slot reader and a single function magnetic stripe reader terminal. The ESPT is a battery operated data collection terminal that can be used in hostile, harsh, remote environments where any other method of data collection is impractical. Epic’s controller, the System Control Unit (SCU), controls terminal polling, sequencing, editing, transaction assembly, output to host or off-line storage, and time of day generation. A recent announcement is the capability to program the controller’s sequencing, prompting and editing functions at the host computer, and down-loading the terminal setting to the SCU. Epic has also developed a terminal control unit that will be able to perform validation via table lookups from a Winchester disk, a minicomputer and turnkey software package (e.g. time and attendance, job costing, and library application programs).

Epic’s field of expertise lies in adapting microprocessor technology, both hardware and software, to the broad context of data collection. Specifically, engineering provides support to customers of standard products and in addition, have experience in project management of custom designs.

The capabilities of the assembly group include - PCB component insertion, wave soldering and board cleaning, terminal assembly, cable fabrication, and metalized foil label making. The Manufacturing Test Group performs board and terminal burn-in and test. Self Test Program (STP) prongs are utilized during the terminal burn-in process to check out and monitor
terminal functions. Customer orders are fully configured in-house and go through a full systems test prior to shipping. Multi-stage quality monitoring is provided by an independent QA/QC Production Engineering group. This group is also responsible for field installations. Epic Data's manufacturing facility is augmented by its parent company, Ebco Industries Ltd. Ebco provides capabilities in the areas of metal fabrication, painting, and tool & die making.

**Average Work Force:** Total - 110

**Gross Sales:**
- 1980 - $3.9M
- 1981 - $1.8M
- 1982 - $3.5M
- 1983 - $7.2M

**Plant Size:** 14,500 sq ft

**Equipment:** Epic Data's equipment list includes - Wave solder machine (Aqueous Flux), Aqueous PCB Washer and Contaminant Monitor, PCB dry and bake chamber; component prep machines; semi-automatic IC inserter; metalized foil processing equipment; automatic short checker; cable tester, power supply tester; PCB burn-in rack; walk-in terminal burn-in room; drill presses, flat cable press; crimp terminal machines, and miscellaneous meters, scopes, and debugging aids.

**Experience:** Epic Data is touted as a world leader in the manufacture and design of data collection equipment. They have major clients throughout the world and their equipment is frequently recommended for use by such major computer companies as Xerox, Tandem, Digital Equipment Corp., and Sperry Univac. Epic Data customers include -- General Electric, Monsanto, General Motors, Motorola, Mexican Government, Hughes Aircraft, Lockheed, Martin Marietta, City and County of San Francisco, Canadian Government, and others.

**Keywords:** 6 = Computers; 7 = Electronics; 17 = Software Services; 19 = Testing/Test Equipment; Solid State Devices = 7; Design to Requirements = 17; Data Collection Systems = 7; Terminals = 7; Portable Terminals = 7; Controller = 7; System Controllers = 7; Microprocessor Technology = 6, 7; PC Boards = 7; Component/System Testing = 7, 19.

**Revised:** Dec 83

**EPITEK ELECTRONICS Ltd**

**Code:** EEL

**Address:** 100 Schneider Road
Kanata, Ontario, Canada K2K 1Y2

**Contact:** Mr. Lee Lockwood, Sales Manager - (613) 592-2240

**History:** Epitek Electronics was incorporated in 1969 with a US subsidiary, Epitek Electronics Inc, located in Ogdensburg, NY. The latter is a distribution center only. The company specializes in the design, development and production of thick film hybrid circuits and networks for the electronics industry. Epitek Electronics is a division of Epitek International Inc.

**Capability:** The Epitek custom design expertise is directed primarily towards the following market areas - (1) Computer Communications (terminator networks, modem hybrids, tone squelch hybrids), (2) Telecommunications (line matching networks, RF hybrids), (3) Instrumentation (ladder networks, input alternators, voltage dividers), and (4) Military Devices (oscillator hybrids, trimmable resistor networks, Codec hybrids). Their standard product line includes audio amplifiers, active filters, telephony hybrids, and SIP/DIP resistor and resistor-capacitor networks. Epitek strives for quality control and can design to meet MIL-M-38510, MIL-STD-883 and MIL-R-83401. Epitek has a thin film production facility in operation at its Kanata plant. They intend to develop expertise in solar cell and chip resistor line technology in the near future.

Approximately 5% of their budget is directed towards internal R&D. The company has a facility security clearance. They have had DND 1015 (MIL-S-9858) facility approval in effect since July 1983.

**Average Work Force:**
- PhDs - 4
- Engineers - 5
- Others - 200

**Gross Sales:** $6.5M (Current)

**Plant Size:** 32,000 sq ft

**Equipment:** Epitek's manufacturing facility is equipped with all the standard production and test equipment to insure quality production. Special equipment includes two YAG laser trimmers and CO2 ceramic laser scriber.

**Experience:** Epitek's sales are divided - 60% to the US and 40% to Canada. They have no direct sales to the US military, but about $3M to the DOD through US primes. The indirect DOD sales are in the areas of mines and sonobuoys. Epitek is interested in doing business with the USAF.

**Keywords:** 5 = Communications; 6 = Computers; 7 = Electronics; Solid State Devices = 5, 6, 7. Custom Circuits = 5, 6, 7. Microcircuits = 5, 6, 7. Hybrid Circuits = 5, 6, 7; Instrumentation = 7.

**Historical Data:**
- (1) Telecommunication = 7.
- (2) Military Devices = 7.
- (3) Hybrid Fabrication = 5, 6, 7.
- Thick Film Hybrid = 5, 6, 7.

**Revised:** Dec 83

**ERNST LEITZ CANADA Ltd**

**Code:** ELC

**Address:** 328 Ellen St
Midland, Ontario, Canada L4R 2H2

**Contact:** Mr. David G Stephenson, Mgr, Special Products Sales - (705) 526-5401

**History:** Leitz Canada was established in Midland, Ontario in 1952 as a subsidiary of Ernst Leitz Wetzlar GmbH, West Germany. At that time, the company commenced operations with twelve personnel and since then, the company has expanded through internal growth in three major business areas:

- Photography
- Custom commercial optical assemblies and systems
- Military optical assemblies and instruments

**Capability:** Ernst Leitz Canada is a well integrated firm specializing in the design and manufacture of complex precision opto-mechanical and electro-optical components and assemblies. From a comprehensive suite of computerized optical design and CAD programs in the engineering departments, to complete opto-mechanical testing capabilities, Leitz is equipped with the most modern equipment to undertake both large volume production and prototype quantities for conventional, state-of-the-art and research programs. Full machining capabilities, surface treatment, optical grinding and polishing of spherical, aspherical and plano optics, in glass, metal and infrared materials, microprocessor controlled coating facilities, and optical measurement and testing apparatus enable Leitz to undertake the fabrication, assembly and test of this complex optical equipment. New developments are underway in weight reduction techniques for missile seeker systems using plastics as well as fabrication and coating of a variety of infrared optical materials for military applications.

**Average Work Force:**
- Professionals = 50
- Total = 475
**EXPLOSAF E AMERICA Inc**

**Code:** EXP

**Address:** 230 New Toronto St
Toronto, Ontario, Canada M8V 2E8

**Contact:** Mr. Paul B Malloy, Military Sales - (416) 255-9193

**History:** Explosafe America Inc was formed in 1973 to handle the design, research & development, manufacture, and sale of the "Explosafe" Engineered Explosion Prevention System. Under the guidance of its engineering and technical staff, the "Explosafe" system underwent all the development, qualification testing, and evaluation cycles attendant to obtaining the USAF Wright Aeronautical Laboratories product approval documented in Report #AFWAL-TR-80-2043, and subsequently supported by specification MIL-B-87162 (USAF) with vendor sourcing as identified in Qualified Products Listing OPL 87162-1 issued in Apr 82.

**Capability:** "Explosafe" is a practical method of preventing containers of volatile liquids and gases (i.e., gasoline, naphtha, diesel, liquid petroleum gas (LPG), benzene) from explosion resulting from electrostatic discharge, fire bombing, gunfire, or post crash ignition, etc. The "Explosafe" system is based on a matrix of aluminum foil, slit and expanded to form a mesh of hexagonal openings. When layered, the mesh results in an open-cell, cut and shaped into modules for incorporation into any sized container. By installing "Explosafe", the container's interior is transformed into a honeycomb of small cells or compartments. In the event of ignition, the "Explosafe" system acts as a heat dissipator, modifies flame propagation, and prevents explosion. Explosafe salient features include:

- Displaces maximum one percent of fuel capacity for any given volume
- System is passive therefore offers permanent life time installation capability – low life cycle cost
- Dissipates static electricity
- Does not sustain fire and does not emit toxic fumes
- Designed in modular form, facilitates retrofit in old or new fuel tank installations
- Provides radical reduction of fuel slosh and facilitates elimination of fuel baffles
- Facilitates reduction of tank stress and failure

**Average Work Force:** Total - 35

**Gross Sales:** 1981 - $38 5M

**Plant Size:** 30,000 sq ft

**Equipment:** Explosafe's modern facility is equipped with machinery of proprietary design to slit, expand, fanfold, stitch, and shape modular kits of "Explosafe" for all fuel tank shapes and sizes.

**Experience:** Through the past five years, Explosafe has participated with the Canadian Government/USAF evaluation of the aircraft fuel tank ullage explosion prevention system of "Explosafe". This effort has resulted in test/evaluation competition as documented in report #AFWAL-TR-80-2043. This has subsequently substantiated by US Government specification MIL-B-87162 and borne out by Qualified Products Listing OPL-87162-1.

Through prototype and production contracts, Explosafe has been included in the following vehicles – FMC – M113, LVTP-7A1; Cadillac Gage – ‘Peacekeeper’; Bombardier – Canadian Armed Forces two and one half ton military vehicle; Navy Sea Fox, and numerous others.

**Keywords:** 1 = Aircraft, 14 = Protective Equipment, 16 = Security & Safety, 20 = Miscellaneous. Explosion Suppression Systems = 1, 14, 16, 20. Explosafe = 1, 14, 16, 20.

**Revised:** Dec 83

**EXP RO CHEMICAL PRODUCTS Inc**

**Code:** ECP

**Address:** P. O. Box 5520
Valleyfield, Quebec, Canada J6S 4V9

**Contact:** Mr. J A MacGregor, Director of Marketing - (514) 371-5520

**History:** Expro Chemical Products Inc (formerly Valleyfield Chemical Products Corp) was started in 1940 and has been operating continuously ever since. The complex has undergone two multi-million dollar modernization programs – the first in 1950-1952 and the second in 1977-1978. It was incorporated under the former name in 1977. The company changed ownership on 15 March 1982. Because of the new...
minority share interest held by OSI Ltd, the company will have access to Nobel's Explosive Company, Ardeer, Scotland. The latter company has extensive capability for primary research.

**Capability:** Expro is a fully integrated commercial and military propellant and explosives complex. It has its own capability to produce nitric acid, nitroglycerine, nitrocellulose, propellants, and RDX. Nitrocellulose is produced by the batch process, utilizing wood pulp of high alpha cellulose content and nitric acid. It also has the capability to produce nitrocellulose from cotton linters. Present plant capacity for nitrocellulose production is 12 million pounds per year, with the capability to expand to 40 million pounds annually should the need arise.

Expro uses the in-house produced nitrocellulose in the manufacture of single-base, double-base and triple-base propellants. The former are primarily used in small arms munitions, military or sporting, in medium caliber military ammunition, and large caliber weapons in multi-perforated form. The double-base product is used mainly for small caliber guns. The plant produces its own nitroglycerine, using the Biazzi process, for the manufacture of the double and triple base propellants. Nitroglycerine for triple-base propellant manufacture is purchased.

Expro produces RDX by the Bachmann Process. It is manufactured to military specifications in various granulations as required. The RDX is mixed with TNT to produce cyclotol. Other products include Composition B, Compositions A-3 & A-4, and Compositions C-4 & A-5. Demolition Block MS-A1 and M112 is also manufactured at the company's facilities.

**Average Work Force:** Total = 800

**Gross Sales:** No Data

**Plant Size:** 1,100 acre site

**Experience:** Though its prime client continues to be the Canadian Department of National Defense, Expro is one of the two accredited suppliers of propellant for the US Air Force GAU/BA weapon system. With respect to the GAU-B system, they supply Honeywell with both propellant and high explosive (Comp A-4) and Aerojet with Comp A-4. Other major clients in the US include Olin Corp (Nitrocellulose for ball propellant), and E. I. DuPont de Nemours (propellant). HE distribution in US is by direct sales. Expro has received orders for its propellants and explosives from the Netherlands, Belgium, Portugal, Italy, France, Greece, Turkey, Brazil and Venezuela.


**Revised:** Dec 83

**FAG BEARINGS Ltd**

**Code:** FAG

**Address:** 801 Ontario St
Stratford, Ontario, Canada N5A 6T2

**Contact:** Mr. John Tsaltas, Customer Service, Sales - (519) 271-3230

**History:** FAG Bearing Ltd has been in business since 1883 (Germany). The company is incorporated under the laws of the Dominion of Canada. Branch offices are located in Vancouver, Edmonton, Sudbury, Toronto, Hamilton, Montreal, and Truro. A US affiliate, FAG Bearings Corp. is located in Stamford, Conn.

**Capability:** FAG Bearings Ltd is involved in the manufacturing of precision ground anti-friction bearings including instrument & miniature bearings, waterpump shaft assemblies, and separate aircraft bearing assemblies.

**Average Work Force:** Engineering = 14
Production = 443
Admin & others (Stratford) = 151
Total = 606

**Gross Sales:** No Data

**Plant Size:** Manufacturing = 200,000 sq ft
Warehouse = 75,000 sq ft

**Equipment:** FAG Bearings has complete facilities to manufacture precision ground anti-friction bearings from raw materials (bar stock or tubing). Tolerances to ABEC-9. Aircraft bearing production started in 1961 (heat treating, grinding, assembly, etc). They have well equipped heat treating facilities, a metallurgical laboratory, bearing testing facilities (life, noise, torque, etc), complete Clean Room (Class IV) assembly for instrument bearings, and separate aircraft assembly. FAG Bearings also has:

- Material Control Laboratory - Microscope (mag 1250x), Leitz Vickers Micro Hardness Tester, Rockwell Hardness Tester, and Eddy Current and Ultrasonic Devices
- Heat Treating Furnaces - Vacuum (computer controlled), Batch with Endothermic Generators, continuous type (Nitrogen/Methane), Induction, Salt, and Carburizers (pack & gas)
- Deep Freeze
- Mass Spectrometer - Leak Detector
- Infrared Analyzers

**Experience:** FAG Bearing has experience with many US and Canadian companies: Garrett (Airesearch) in Phoenix, AR, Bendix Corp at various locations, GE in Wilmington, MA, Litton Industries at various locations, McDonnell Douglas in Grand Rapids, MI, Sperry at various locations, Varian Assoc in Beverly, MA, Canadian Marconi in Montreal, Que, Spar Aerospace in Toronto, Ont; DISC Defense Ind Supply Center in Philadelphia, PA, Dept of National Defense in Downview, Ont, and US Army Aviation in Texarkana, TX. Final destinations of some contracts include numerous US Air Force Bases.

**Keywords:** 1 = Aircraft, 12 = Machining, 20 = Miscellaneous, Bearings = 1, 12, 20. Precision Bearings = 1, 12, 20, Anti-Friction Bearings = 1, 12, 20, Waterpump Shaft Assemblies = 12, 20, Instrument Bearings = 12, 20, Miniature Bearings = 12, 20.

**Revised:** Dec 83

**FIELD AVIATION COMPANY Ltd**

**Code:** FAC

**Address:** Field Aviation Co Ltd
Toronto International Airport
Box 6023
Toronto AMF. Ontario, Canada L5P 1B9
Field Aviation West Ltd
Calgary International Airport
Box 3186, Station B
Calgary, Alberta, Canada T2M 4L7

General Manufacturing Inc
2571 Northwest 4th Court
Fort Lauderdale, FL 33311

*Field Aviation Co Ltd
Standard Life Building
275 Slater St, Suite #320
Ottawa, Ontario, Canada K1P 5H9

Contact: *Mr. C H Wilkinson, Mgr, Gov't/Industry Relations
- (613) 236-9577

History: Field Aviation started in Canadian general aviation in 1947 in Oshawa, Ontario. They moved to Toronto International Airport in 1960, established a western facility in Calgary, Alberta in 1952, and expanded into precision machining with the purchase of General Manufacturing Inc in Ft Lauderdale in 1980. The company is one of the Hunting Group of Companies, a widely diversified group with headquarters in London, England and operations world-wide in many different segments of the manufacturing and service sectors.

Capability: Field Aviation provides a full range of aircraft sales, modification, repair and overhaul services to general aviation, regional airlines, corporate aviation departments and governments. They are the exclusive Beechcraft distributor for Canada, and stock a considerable supply of Beechcraft spare parts at both their Toronto and Calgary facilities.

Field West has a top quality aircraft painting facility that will accommodate aircraft up to Boeing 737 size.

Field Aviation also has complete overhaul jigs for the deHavilland Twin Otter and the full line of commercial Bell helicopters. Recently, they have been engaged in major conversion of a number of Gulfstream G1 aircraft to commuter airliners. They have manufactured a wide range of standard and custom aircraft seats with emphasis on the Twin Otter and CASA 212. Specific capabilities include magnafluxing, NDT, electrical re-harnessing, hydraulic overhaul, customization/modification, and limited engine overhaul. Work is approved by Canadian Ministry of Transport, FAA and Department of National Defense standards.

Custom design of aerial survey installations and aerial spray or water bombing systems has been a Field Aviation specialty for many years. Both fixed and rotary wing aircraft have been fitted with custom designed systems and are currently flying world-wide. Field Aviation has often been called to assess crash damage and undertake recovery/salvage operations in remote parts of the world varying from the Canadian Arctic to the mountains of South America or the Far East.

Specialized expertise exists for repair, overhaul and modification of: Aero Commander; Beechcraft; Bell 125 B, Bell 204 B, Cessna, Piper, PA-58, deHavilland, DHC-2, DHC-3, DHC-4, DHC-6, and DHC-7; Douglas DC-3, DC-4, and DC-6; Fairchild F27; Gates Learjet; HS748; Hughes 369; Lockheed Electra; MU-2B; Piper, Pilatus PC-6; Scottish Aviation Twin Pioneer; and Short SC-7 and SD3-30.

Average Work Force:
Engineers - 2
Technologists/Design Spec - 8
Others - 260

Gross Sales:
1981 - $42M
1982 - $53.5M
1983 - $46M

Plant Size:
175,000 sq ft (Toronto)
232,000 sq ft (Calgary)

20,000 sq ft (Ft Lauderdale, FL)

Equipment: Toronto - Refueling, ground power and other services for most military, general aviation and corporate aircraft, and in-house or ready access to all associated aviation shop facilities. Calgary - Refueling, etc., as above, major aircraft overhaul shops, assembled overhaul jigs (mainly Twin Otter and Bell helicopters); hydraulic test facility; NDT; specialized aircraft salvage equipment; and 737 size paint shop. Ft Lauderdale Assorted NC and CNC machining equipment, specializing in complex large turbine aircraft engine components (P&W & GE).

Experience: Field Aviation's current customers include - Canadian Department of National Defense; Canadian Department of Transport; US Navy; British Army; Royal Canadian Mounted Police; numerous regional airlines (world-wide); numerous other corporations; and P&W & GE.

Keywords: 1 = Aircraft, 19 = Testing/Test Equipment;
20 Miscellaneous, Fixed Based Operations = 1, Repair & Overhaul = 1, Modification = 1, Aerial Survey Systems = 1, Aerial Spray/Water Bombing = 1, 20; Non-Destructive Testing = 19, Hydraulics = 1, 19, 20, Seat Manufacture = 1, 20; Spares Supply = 1, 20; Survey Systems = 1.

Revised: Dec 83

FITTINGS (1980) Inc

Code: FIT

Address: 135 Bruce St
Oshawa, Ontario, Canada L1H 1R1

Contact: Mr. T A Santos, President - (416) 723-3433

History: Fittings Ltd was formed in 1901 to provide a variety of quality castings. The company changed its' name to Fittings (1980) Inc to reflect a change in management.

Capability: The company furnishes complete support for total casting projects from function concept to designing, material selection, and final finishing. Providing both malleable and pearlitic iron castings, from ounces to pounds, their main production runs are for castings from 1 to 10 pounds. Working to ASTM standards and using a tool and gauge calibrating system traceable to the National Bureau of Standards, they emphasize complete quality control procedures for all phases of their operation. They have the capability to coin Victaulic-style iron fittings for pipe-ends to +.010, thus eliminating the formerly used expensive machining processes.

Average Work Force:
Production = 211
Engineering = 2
Quality Control = 10

Gross Sales:
1980 = $10M
1981 = No Data

Plant Size:
200,000 sq ft (165,000 sq ft devoted to manufacturing)

Equipment: Molding equipment: 8 automated matchplate machines, 3 turntables, and 3 roto-lift machines with conveyor lines. Sand facilities: 3 automatic batch sand mixers and automatic moisture control, Melting facilities: 3 coreless induction furnaces with 13.5 ton capacity each, Annealing facilities: 3 continuous, 30-hour cycle protective atmosphere ovens, and Space straightening facilities: 5, 300 & 500 ton hydraulic presses.

Experience: Fittings (1980) Inc has had wide experience dealing with US firms which include - Rockwell International, Massey-Ferguson, Chrysler, Dresser Industries, Cast Metal Industries, and others.

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Keywords: 12 = Machining; Precision Casting = 1.2

Revised: Dec 83

FLEET INDUSTRIES
(A Division of Ronyx Corporation Ltd)

Code: FLT

Address: P. O. Box 400
Fort Erie, Ontario, Canada L2A 5N3

Contact: Mr. H B MacRitchie, Marketing Manager – (416) 366-4435

History: Fleet Industries began operations in Canada in 1930 as Fleet Aircraft of Canada Ltd. Ronyx Corp Ltd, Box 125, Ft. Erie, Ontario L2A 3M6, has two divisions – Fleet Industries (manufacturing), and Ronark Developments (real estate division).

Capability: Fleet Industries manufactures major components for the prime Canadian and US manufacturers of commercial and military aircraft, helicopters, satellites, and radar and sonar systems. Fleet was established in Canada in 1930 to design and manufacture aircraft for the world’s civilian, transport, and military markets. Between 1930-1950, almost 4,000 complete aircraft were built at Fleet and flown from the company’s 2,400-ft on-property runway.

Today the company concentrates its efforts on the production of major components. Fleet has enclosed facilities of approximately 500,000 sq ft, and about 650 employees. Assembly and test methods meet the latest requirements of both civil and military authorities in Canada and the US. Fleet’s ability to produce quality products on schedule and at competitive prices has won a high reputation for the company in both commercial and defense work. In 1982, Fleet’s sales were more than $35M including new programs for Raytheon Aegis and Pave Paws radar programs.

Aircraft:

- Boeing – 707 fin and rudder; 727 aft engine fairing.
- 747 SP wing-to-body fairing structure. Boeing E3A TF33 engine nacelles; and 757 APU doors.
- Canadair – Challenger CL600 rudder assembly.
- deHavilland – DHC-5 bonded components. DHC-6 bonded components. DHC-7 bonded components and engine nacelles. DHC-7 wing leading edges, ailerons; and DHC-8 bonded wing and fuselage panels, inboard and outboard flap assy.
- Grumman – A6 inboard and outboard flaps, and bonded honeycomb assemblies.
- Lockheed – L-1011 main landing gear doors (aft dorsal structure & aft engine cowlings), and CP140/P3C flight station.
- McDonnell-Douglas – A4E speed brakes and flaps. F18A graphite avionics doors; and DC-9 flaps and ailerons (Canada).
- Sikorsky Aircraft – Black Hawk UH60A Medevac kits, and blade sub-assemblies.

Radar:

- General Electric – ASR welded antennas.
- Lockheed Electronics – Gun fire control system antennas and cabinets.

Raytheon – Phased array antennas “Pave Paws” & “Cobra Judy”, AEGIS.

Sperry – Gun fire control system antenna and cabinet.

Satellite:

- Spar Aerospace – Bonded panels/structures. Anik C, SBS, Anik D, and Westar, spun/despun assemblies for BrasilSAT.

Sonar:

- Dept of Supply & Services – Retractable fixed hull mounted, towed bodies, VDS systems and faired tow cables, and repair and overhaul.
- EDO Corp – Transducer structure.
- General Electric – Heat exchangers.
- Westinghouse Canada Ltd – Retractable fixed hull mounted, towed bodies, VDS systems and faired tow cables.
- Raytheon – Variable depth sonar (VDS) hoist system.

Average Work Force: Total – 650

Gross Sales: 1982 – $35.9M

Plant Size: 500,000 sq ft

Equipment: Fleet Industries’ equipment includes Kearney & Trecker, Sundstrand and Cincinnati numerically controlled equipment, autoclaves, mills, lathes, presses, furnaces and other special equipment associated with aerospace manufacturers. New bonding facility includes 10’ x 31’ autoclave, water jet cutting, 5-axis NC core cutting and C-scan inspection equipment.

Experience: In 1982, from sales of over $35M, some 90% was exported to the US. Commercial sales accounted for 53% with 47% military.

Facilities and skills have been developed to produce a diversified list of mechanical structures which include radar, sonar, air cushion vehicles, and other defense and commercial assemblies. In the bonding field, Fleet Industries manufactures a wide range of structural components such as antennas, space satellites, electronic cabinets and other specialized items requiring composite technology.

The list of Fleet’s customers reads like a “who’s who” of the aerospace industry. Boeing, de Havilland, General Electric, Grumman, Hughes, Lockheed, McDonnell Douglas, Raytheon, Sikorsky, Westinghouse, and many others have placed their confidence in the ability of Fleet Industries to produce quality components.

Fleet Industries’ Quality Assurance Program meets the requirements of both Canadian Government specification DND-1015 and US Mil Spec MIL-Q-9858A. The average ratio of inspection to direct labor is 1:10. To insure that production of components meets contractual requirements, the Quality Assurance department reviews and defines product quality with the engineering department; collaborates in the review of specifications; generates quality assurance procedures; reviews quality problems; and effects corrective action and reports on departmental quality performance. Standard mechanical inspection techniques are supplemented by magnanux, fluorescent penetrant, radiography.
FOOTTIT MITCHELL AND ASSOCIATES

Code: FMA
Address: 77 Metcalfe St. Suite #808
Ottawa, Ontario, Canada K1P 5L6

Contact: Mr. J. C. Bond, Senior Consultant – (613) 563-0236

History: Foundation Instruments Inc is a high-technology company that performs design and development of communications equipment and systems. The primary area of expertise is in fiber optic communications equipment and systems. Other areas of expertise and demonstrated capability are in custom design of energy use, monitoring and control instruments, and in industrial process control, including the use of computer or micro-computer technology.

Company capabilities are both varied and wide-ranged because of their extensive research and development background. A company that performs design and development of communications equipment and systems. The primary area of expertise is in fiber optic communications equipment and systems. Other areas of expertise and demonstrated capability are in custom design of energy use, monitoring and control instruments, and in industrial process control, including the use of computer or micro-computer technology.

Foundation Instruments Inc has experience with government relations = 1, 3, 7, 18, Systems Planning = 1, 3, 7, 18.

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FOOT TIT MITCHELL AND ASSOCIATES

Code: FMA
Address: 24 Colonnade Road
Nepean, Ontario, Canada K2E 7J6

Contact: Mr. Attila J Szanto, President – (613) 226-4000

History: Foundation Instruments Inc has experience with government relations = 1, 3, 7, 18, Systems Planning = 1, 3, 7, 18.

Revised: Dec 83

FOUNDATION INSTRUMENTS Inc

Code: FII
Address: 24 Colonnade Road
Nepean, Ontario, Canada K2E 7J6

Contact: Mr. Attila J Szanto, President – (613) 226-4000

History: Foundation Instruments Inc is a corporation specializing in research, development and manufacturing for the communications industry, primarily in the area of fiber optics. They have distributors around the world and a plant in New York State.

Capability: Foundation Instruments Inc is a high-technology company that performs design and development of communications equipment and systems. The primary area of expertise is in fiber optic communications equipment and systems. Other areas of expertise and demonstrated capability are in custom design of energy use, monitoring and control instruments, and in industrial process control, including the use of computer or micro-computer technology.

Company capabilities are both varied and wide-ranging because of their extensive research and development background. The company product line reflects the capability and includes portable microphone mixers for broadcast use, a sub-miniature time-date generator for video systems, military secure voice switchboard, telemetry and data acquisition systems, seismic recording equipment, broadband video switchers (100 MHz), and fiber optic communications equipment, systems and components.

The research capabilities with respect to fiber optic systems are best related by referring to systems that have been or are currently being designed by Foundation Instruments personnel. These projects include fiber optic transmission system, 20 MHz baseband analog with broadcast video performance, 100 Mbit/s digital link, bi-directional low speed (56 Kbit/s) data links, and special fiber optic system for a shipboard communications simulator. Secure data circuits using fiber optics, subscriber and central office terminals for telephone systems, T1 and T3 rate long haul fiber optic communications, tactical fiber optic communications systems and fiber optic performance measurement instruments, are also products which Foundation Instruments Inc is designing.

Foundation Instruments’ capabilities are being expanded to include multi-channel fiber optic communications systems, microprocessor based instrumentation development, clean room facilities, environmental test facility and optical device handling and assembly.

Average Work Force: Engineers = 22
Production = 13
Admin = 5

Gross Sales: 1980 = $1M
1981 = $2.4M
1982 = $1.5M
1983 = $2.0M

Plant Size: 20,000 sq ft planned for new facility by Jan 1984

Experience: Foundation Instruments Inc has experience with government and commercial corporations, several of which are listed below:

- Department of National Defense
- Atomic Energy Canada Ltd (AECL)
- Northern Telecom

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Communications Systems

IBM
Hewlett-Packard
US Army Corps of Engineers
US Air Force
Ontario Hydro
Dome Petroleum
Quebec Hydro
National Research Council
Texas Gulf

Keywords: 5 = Communications, 6 = Computers, 7 = Electronics, 8 = Energy, 9 = Environment, 11 = Lasers, 15 = Radar, 18 = Space Systems, 19 = Testing/Test Equipment, Analog = 5, Fiber Optics = 5, 7, Video Systems = 5, Telemetry = 5, 19, Digital = 5, Wideband = 5, Switching = 5, Secure = 5, Telephone = 5, Receivers = 5, Transmitters = 5, Modems = 5, Tactical = 5, Microprocessors = 6, Programming = 6, Instrumentation = 6, 9, 19, Applications = 6, Data Analysis = 6, 9, 19, Data Acquisition = 6, 9, 19, Data Handling = 6, 9, 19, Data Processing = 6, 9, 19, Real Time = 6, Process Control = 6, LEDs = 7, Avalanche Detectors = 7, Laser Diodes = 7, 11, Seismic Sensors = 7, 9, Fusion Splicers = 7, Power Measurement = 7, PCB = 7, Design = 7, 19, Development = 19, Manufacturing = 7, Systems = 7, Components = 7, Wind = 8, Automatic Weather Station = 9, Moisture Content = 9, Air Infiltration = 9, Communications = 11, Phased Array = 15, Ground Stations = 18, Laboratory = 19.

Revised: Dec 83

GARRETT MANUFACTURING Ltd

Code: GML

Address: 255 Attwell Drive
Rexdale, Ontario, Canada M9W 5B8

Contact: Mr. W. Atkinson, New Tech Sales Mgr
(416) 675-1411

History: Garrett Manufacturing Ltd (GML) is a wholly owned subsidiary of the US-based Garrett Corporation. The Garrett Corporation, Wheelabrator-Frye Inc., United Oil Products, and Amplex are the major components of the Signal Companies, one of the 100 largest US corporations with 1982 sales of $6,670M.

A Garrett office was established in Canada in 1952 to provide sales and services support for Garrett products in Canada. One year later, the company established a repair and overhaul facility near Toronto International Airport and added an engineering department to support this endeavor.

Throughout the 1950s, Garrett expanded its engineering department, added a production department and began the design and manufacture of ground equipment for the Canadian aircraft industry. In 1961, Garrett Manufacturing Ltd assumed a world product mandate for design, development and production of electronic temperature controls. These controls are a major subsystem of the Garrett environmental control systems that fly on over 70% of the commercial and military aircraft in the western world.

Garrett Manufacturing Ltd now supplies a broad mix of custom designed products and services to the world aerospace industry. Garrett's aerospace products include aircraft cabin, cockpit and compartment temperature controls, window heat controls, airflow sensing and control systems, engine speed sensors, radio communication equipment for personnel and air traffic control applications: specialized cockpit displays, ground test equipment for aircraft data systems, and custom thick- and thin-film hybrid microcircuit. GML also provides precision electronic instrumentation for CANDU nuclear reactors. GML is the Canadian repair and overhaul base for other Garrett products used in Canada. In addition, GML assembles and tests electronic equipment on a "build to print" basis, in support of support procurement requirements.

Capability: The company is actively engaged in research and development in control systems, RF communications, and analog and digital circuit design, to support existing products and create new opportunities. Material and process research and development is carried out in support of hybrid microcircuit technology. Environmental and EM testing to military aerospace standards is performed in Garrett's government approved test facilities.

A single standard quality control system conforming to DND 1015 and meeting the requirements of MIL-Q-9858 and NATO AQAP 1 is employed by the company. DND maintains a resident detachment in the plant which will on request, provide reciprocal inspection services for the US DOD and other NATO governments.

All of the major airframe manufacturers in the US have surveyed and approved GML's facility and control systems as being acceptable for the manufacture of both military and commercial aircraft equipment.

Garrett products include:

Microcircuits - GML's microelectronic products are produced in a fully integrated facility dedicated to research, development, production and support for military, military and aerospace industries. GML's microcircuit facility is equipped with the latest equipment and techniques and is employed by the company. DND maintains a resident detachment at the plant which will on request provide reciprocal inspection services for the US DOD and other NATO governments.

Temperature Control Systems - GML's temperature control systems usually consist of electronic control boxes, temperature and/or airflow sensors, and temperature selectors. The most recent designs, featuring microcomputer-based digital electronics for improved performance and reliability, are in production for Boeing's 757/767 programs. Garrett temperature controls are used in cabin, cockpit and compartment air conditioning systems, wing anti-ice temperature control systems, window heat control systems, and some liquid coolant systems. In addition to the Boeing 757/767, Garrett systems are in use on A300, A310, DC-9, DC-10, 727, 737, 747, F-14, F-15, F-16, F-18, Viggen, EF-114A, Gulfstream III/IV, Challenger, HS-125, IAI 1121/1125, Saberliner, Learjet 54/55, HU-25A Guardian, SRR, and Hughes AAH. Most of the major commercial, military and business aircraft in the western world use Garrett temperature control systems.

Communications Systems - Emergency Locator Beacons developed by GML are used throughout the world in military, commercial and general aviation applications. These low power transmitters automatically provide an emergency homing signal to assist search aircraft to locate an aircraft in distress. Personal Locator Beacons and Survival Radio Sets for military users permit two-way voice communication with search aircraft as well as providing an emergency homing signal. VHF/AM Single Channel Transmitters and Receivers are produced for civil and military aviation. Garrett has produced over 500,000 air traffic control communications. Installed at air traffic facilities, this station ground equipment offers many performance and maintenance features not previously available.

Peripheral Vision Display - The PVD is a subliminal attitude change indicator for cockpit work-load reduction and pilot disorientation prevention. It operates on the principle that orientation information is sensed primarily by a person's peripheral vision system and is processed subconsciously by dedicated areas of the brain. The system is now in production for military applications.
Major System/Subcontract Manufacturing – the “Major System” aspect of this activity offers opportunities to foreign suppliers seeking to sell systems/equipment to the Canadian Government by utilizing Canadian manufacturing and systems engineering facilities and capabilities. Through licensing, teaming, joint venture agreements and by direct involvement through technology transfer, shared joint development, advanced R&D, the Canadian Offset/Industrial Benefits requirements of major procurements can be accomplished. Our Subcontract Manufacturing “build-to-print” service enables our customers to meet demanding delivery schedules, by employing GML’s experienced manufacturing groups and facilities including aerospace standard quality assurance and modern Automatic Test Equipment. These services, backed up by a high-technology team, employing the latest in design and manufacturing techniques provide more effective co-operation in major procurement programs.

Repair and Overhaul/Customer Support – GML’s customer support/repair and overhaul facility is unique in Canada. It is the only facility outside of Air Canada’s Montreal base and CP Air’s Vancouver facility that has the capability to simulate conditions for testing airborne air conditioning rotating machines and high temperature valves. These facilities are also equipped to repair and overhaul gas turbine auxiliary power units, actuators, starters, central air data computers, other aircraft systems, and turbochargers for tractor, truck and automotive applications.

Average Work Force: Engineering – 175
Production – 525
Qual Ins/Customer Support – 100
Others – 100

Gross Sales: 1982 – $62M
Forecast growth pattern: 10 to 12%

Plant Size: Administration Building – 64,000 sq ft
Engineering Facility – 33,000 sq ft
Main Production Plant – 75,000 sq ft
Microcircuit Plant – 21,000 sq ft
Customer Support Plant – 34,000 sq ft

Experience: GML customers are world-wide and include both the commercial and military sectors.

Keywords: 1 = Aircraft, 3 = Avionics

Revised: Dec 83

GEAC CANADA Ltd

Code: GEA

Address: 466 Tremblay Road
Ottawa, Ontario, Canada K1G 3R1
Contact: Mr. G Legault – District Mgr. Government Accounts
- (613) 746-9791

History: GEAC was founded in 1971 on the principle of providing a total solution, both hardware and software. GEAC’s first computers were based on HP process, IS and in 1977, GEAC released its first GEAC made computer – “8000 System.” Since then, GEAC has released the “6000 and 2000” systems and in November 1983, its biggest system to date – the “9000”. The “9000” is a large capacity multiprocessor system to compete with the non-stop tandem type systems. GEAC has also developed a number of communications and cluster controllers, plus a variety of special purpose terminals.

GEAC has also developed some major software which it actively markets today:

- Integrated Library Systems
- Integrated Office Systems
- Online Financial Systems (Banking)
- Signature Capture Systems

Capability: GEAC capabilities include custom software and hardware development for large online data bases that support large quantities of terminals with excellent response time with complete redundancy at the host level.

Average Work Force:
Manufacturing – 200
Engineering – 70
Assembly – 90
Management & Administration – 40
Product Development & Software – 200
Support & Services – 150
Administrative Support – 110
Sales and Marketing – 40

Gross Sales: 1981 – $24 OM
1982 – $35 OM
1983 – $48 OM

Plant Size: 44,000 sq ft
(Head Office – Software Development)
52,000 sq ft
(Hardware Manufacturing)

Equipment: GEAC employs GEAC Computer Systems “2000 through 9000” ranging from $40K to $500K. Also employed are communications and cluster controllers, specialized terminals, and local area networks (LANs).

Experience: GEAC has experience in several areas including Communications, hardware/software/product engineering, software development, large networks (PBX, LAN’s, X 25, X 75), large databases, transaction oriented systems, financial systems, and library systems. Financial systems have been installed at the Bank of America and the Bank of New York. Library systems have been installed at Yale and Princeton universities, USC, Westpoint Academy, and with the US 7th Army (Europe).

Keywords: 5 = Communications, 6 = Computers
17 = Software Services, Communications = 5, 6, 17
Hardware Design = 6, Hardware Engineering = 6
Software Design = 17, Software Engineering = 17
PBX = 5, Local Area Network = 5, Networking = 5
Terminal Controllers = 5, 6, Computers = 6, Terminals = 5
6, Video Disks = 17, Diskettes = 17, Printers = 5
Protocols = 6, Library Systems = 17, Integrated Office Systems = 5, 6, 17, Manufacturing = 6, Customization = 5
6, 17, Software Maintenance = 17, Hardware Maintenance = 6, Microcomputers = 6

Revised: Dec 83
GENERAL ALUMINUM FORGINGS Inc

Code: GAF

Address: 122 Paquin Road
Winnipeg, Manitoba, Canada R2J 3V4

Contact: Mr. John S Glover, Vice President, Forging Ops -(204) 222-3201

History: General Aluminum Forgings Inc was established in 1979 by Sterlake Enterprises Ltd (the parent company). An initial plant in Huntington Beach, CA, serving as a pilot company for Winnipeg, began production in Mar 80, and is now at full production. Construction for the Winnipeg plant began in the fall of 1980 and was completed in Jun 81. Production began in Jun 82.

Capability: General Aluminum Forgings manufactures precision, no draft, seamless aluminum forgings as well as conventional forgings ranging in size up to 75 lbs or 175 square inches plan view surface area. The company covers all aspects of the production from die design to final inspection of the finished part. These parts are used primarily in the aerospace industry including both commercial and defense aircraft production, missiles and space vehicles, but because of the characteristics of precision aluminum forgings, which include strength, lightness and greater resistance to corrosion, their application to other industries is on the increase.

Average Work Force: Administration = 30
Production = 55

Gross Sales:
1981 = $2.5M
1982 = $3.5M
1983 = $5.5M
1984 = $6.75M (Projected)

Plant Size: 33,000 sq ft (design capability for additional 56,000 sq ft)

Equipment: General Aluminum Forgings maintains 300 - 3500 ton hydraulic presses


Keywords: 1 = Aircraft, 12 = Machining, 13 = Missiles, 18 = Space Systems, 20 = Miscellaneous, Forgings = 1, 12, 13, 18, 20, Aluminum Forgings = 1, 12, 13, 18, 20, Seamless Aluminum Forgings = 1, 12, 13, 18, 20, Die Design = 12, Conventional Forgings = 1, 12, 13, 18, 20

Revised: Dec 83

GENERAL MOTORS OF CANADA Ltd

Diesel Division

Code: GMC

Address: P O Box 5160
1991 Oxford St East
London, Ontario, Canada N6A 4N5

Contact: Mr. W L Clangett, Sales Manager, Defense Products - (519) 452-5184

History: Diesel Division. General Motors of Canada Ltd was established in 1949 for the manufacture of Diesel-electric locomotives. Diesel Division is a division of General Motors of Canada Ltd, which is wholly owned subsidiary of General Motors Corporation.

Capability: Diesel Division is primarily involved in the engineering and manufacture of Diesel-electric locomotives, off-highway mining haulers, transit buses and military vehicles. They have advanced skills and techniques in shearing, forming, fabricating and welding of large and complex steel components.

Average Work Force: Engineers = 150
Others = 1850

Gross Sales: 1983 = $358M (Model Year)

Plant Size: 1,400,000 sq ft (Spread over 4 major plants)

Experience: In 1982 Diesel Division won the competitive Light Armored Vehicle competition - a joint US Marine Corps/US Army program to deliver a base quantity of 969 eight-wheeled combat vehicles carrying a two-man 25 mm turret. The contract has options for a number of mission role vehicles including Maintenance Recovery, Logistics, Mortar, Command and Control and Anti-Tank. Prototypes of these vehicles have been delivered to the Marine Corps for test and evaluation. The Baseline Light Armored Vehicle (LAV) has been selected for evaluation by the USAF mounting a General Electric 30 mm turret for the role of airfield defense (Mobile Weapon System).

The LAV25 has been type classified (M1047) Standard A by the US Army. The first production vehicle was delivered in October, 1983.

In the Fall of 1982, Diesel Division completed the delivery of 491 6x6 armored vehicles to the Canadian Armed Forces. They were supplied in three variants - a Personnel Carrier, a Fire Support Vehicle and a Maintenance Recovery Vehicle.

Diesel Division has also been under contract with the US Navy for a design study for a hybrid Mobile Protected Weapon System. In addition, they have also participated in the MX Missile Carrier Program through Delco Electronics and bid on the US Army Infantry Fighting Vehicle Second Source Program.

More than 3200 locomotives have been delivered to 32 domestic customers and over 1000 locomotives have been exported to 22 railways in 17 countries. More than 10,000 transit buses have been produced by the division for customers in Canada and the US.

Diesel Division has the world product mandate for the design, engineering and manufacturing of TITAN haulers and has built for eight countries more than 325 of a 170 ton capacity hauler called the 33-15. Another hauler in the line is the 33-19, which with a carrying capacity of 350 tons, is the world's largest dump truck.


Revised: Dec 83
GLOBAL THERMOELECTRIC POWER SYSTEMS Ltd

Code: GTP
Address: P.O. Box 400
Bassano, Alberta, Canada T0J 0B0
Contact: Mr. Donald W. Peterson, President - (403) 641-3512

History: Global is a privately held Canadian company that was incorporated in 1975. The Global operation, originating employees, equipment, and thermoelectric science & technology, was originally a major part of the Thermoelectric Division of 3M Company of St. Paul, Minnesota. All facilities are at the above Canadian location.

Capability: The Global corporate mission is the commercial application of mature, field-proven remote power technology, coupled with an ongoing commitment to research & development of promising remote power technologies. They are regarded as a complete manufacturing and marketing organization, and as a result of the above mission, are engaged in extensive R&D of thermoelectrics, combustion, and electronics. Their Bassano headquarters accommodates both administrative and production facilities, as well as an engineering department, research & development laboratories.

Global's product is a line of high reliability thermoelectric power systems for remote unattended stations requiring 10 to 1000 watts continuously. They have provided the Sandia Laboratories with power systems for SALT-type monitoring in the USSR systems that not only provide the required power but cannot be undetectably tampered with. This latter property results from the fact that the Global power systems have no moving parts and generally do not malfunction. Their production capacity is about 16 generators per week. Manufacturing of the thermoelectric generators is accomplished through various stages of mechanical and electronic assembly, back-filing, lead checking, and basic machining. Their shop capabilities can easily hold tolerances to the required ±.001 inch. The high technology semiconductor thermoelectric materials and hermetically-sealed thermopile power units are manufactured entirely on site. This is predominate for reasons of quality control and due to the highly specialized skills and equipment required. They are apparently the world's sole commercial source for sintered, doped lead-leadfluoride thermoelectric elements meeting the US Government's standard for 3M-type ES1101 characteristics. It is interesting to note that Global thermoelectric generators have powered telemetry transmissions back to earth during Apollo moon missions. Their systems are performing today in some 40 countries, accumulating a total of well beyond 15,000 years of reliable operations.

Recognize that while thermoelectricians is a relatively mature technology, the development of remote power in general is still in its infancy. The company is therefore striving for the development of lower cost and more widely applicable power sources incorporating proven thermoelectric technology with newly developing manufacturing techniques. Their applied research is directed toward the fields of solid state physics, heat transfer & storage, and gas & fluid dynamics, while development is actively underway in combustion technology, thermoelectric metallurgy, piezoelectric ultrasonic atomization, electronic & electrical engineering, and new burner systems. An additional goal is to improve their attainable weight to power ratio by a factor of 2. Their current units range from about one pound per watt for convection cooled units to 0.2 pound per watt for forced convection cooled units. Recent ongoing experiments were in the areas of fuel atomization and increasing the combustion characteristics of diesel fuel. This R&D has led to the production of 60 units for Nippon Electric Co. of Japan delivered to Madagascar. These are convection cooled units using primarily Bunker C-Type fuel.

Global has recently been funded by the Alberta Government to a level of approximately $2M in 1982. This level of funding is expected to continue for the next five to six years. The goal is to lower the production cost of thermoelectric generators, thereby lowering the cost per watt of electrical power produced. The Canadian Government has assisted Global in obtaining $800,000 in new CNC Automated Machinery and in the $1.2M development of a lightweight portable 100 watt generator for the US military use on the battle field. The Canadian Department of National Defense is buying $6.5M of the 100 watt prototypes.

Average Work Force: PhDs - 1
Engineers - 21
Others - 58

Gross Sales: $2 OM (Historical)
$4.7M(Current - 1982)
$5 OM (Projected - 1983)
$2.5M (Funded R&D - 1983)

Plant Size: 77,000 sq ft

Equipment: Because of the special requirements associated with the manufacturing of long life, hermetically sealed semiconductor thermopiles, Global has special equipment instruments such as a helium mass spectrometer TIG & MIG welding equipment, induction heater for preparation of special alloys, vacuum & back filling equipment, an extensive line of automated CNC equipment and two 8 & x 8 environmental chambers capable of military specification testing.

Experience: Global's power systems market is in the areas of telecommunication (radio repeater sites), cathodic protection telemetry, supervisory control & signals and navigation & positioning. Customers include US EPA, US Army, Exxon Corp (US), Mountain Bell (Boise, Idaho), Continental Telephone of the West, (Phoenix, AZ), Texas Instruments, Teledyne (B藝tech Amoco Pipeline Co (New Mexico), Nippon Electric Co, ARAMCO/PETROMIN (Saudi Arabia), Algeria Post & Telegraph (Algeria), Abu Dhabi National Oil Co., Shell Canada, MarFeb Corp (Canada), Offshore Navigation Canada Ltd, NIPCO (Nigeria), and the Petroleum (Canada). As can be seen, Global has worldwide experience with major organizations. They are currently working with the US Army and indirectly with the USAF (ASD) through the USA. They are interested in working directly with the USAF and appear to have considerable technology and experience to offer. They are very R&D oriented in addition to offering a reliable product line.

Keywords: A = Chemistry, B = Communications
This section presents in alphabetical order all keywords previously documented in the company profiles of Section II. The keywords are listed in the left-hand column of the pages that follow. The subject categories, to which the keywords apply are listed in the middle column. The numerical code for these categories is explained as follows:

1. Aircraft 11. Lasers
2. Armament 12. Machining
3. Avionics 13. Missiles
5. Communications 15. Radar
7. Electronics 17. Software Services
10. Image Processing & Optics 20. Miscellaneous

The right-hand column of the company keyword index presents the three letter code for the company concerned. The reader is referred to Section IV of this report for an index of these company codes.

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GODFREY HOWDEN INC

Code: GHI
Address: 480 Montreal-Toronto Blvd
Lachine, Quebec, Canada H8S 1B8
Contact: Mr. L. C. Gillespie, Vice President - (514) 637-1122

History: Godfrey Howden Inc is a member of the Howden Group of companies and is a wholly owned subsidiary of Howden Group Pte which is located in Glasgow, Scotland. It was established initially at the present address in 1947 to provide a sales and service facility for aircraft environmental control equipment manufactured by the then UK parent company, Godfrey Eng Co Ltd. The company became a member of the Howden Group in 1968 and expanded manufacturing and service support capabilities.

Capability: Godfrey Howden Inc is a major source for the design, development and manufacture of aircraft ground support equipment for the Canadian Armed Forces. Special expertise has been acquired in the field of hydraulic, pneumatic and refrigeration ground support equipment. The company also maintains a sophisticated facility providing full repair and overhaul support for a wide range of military and commercial aircraft components associated primarily with pressurization and environmental control systems. All inplant processes are subject to quality control surveillance and defect preventive procedures which meet the requirements of the most stringent Canadian, US and NATO specifications.

Average Work Force: Engineers - 4
Technicians - 8
Others - 68

Gross Sales: 1980 - $4.8M
1981 - $5.4M
1982 - $5.8M
1983 - $5.8M (Projected)

Plant Size: 33,000 sq ft

Equipment: Equipment and procedures used in the Godfrey Howden production facilities are categorized as follows: Chucking, Lathes, Milling, Drilling Machines, Grinders, Metal Forming, Special Equipment, Variable Speed Rigs, Leakage Test, Vacuum Test, Turbine Test, Altitude Test, High Pressure Air Test, Hydraulic Test, Rig, Power Supply, Rig, Electrical Power Sources, Balancing, and Speed Measuring. A detailed list can be provided upon request.

Experience: Supplier of specialized equipment and services to the Canadian Government, Beech Aircraft Co, Grumman Aerospace, and major US and Canadian commercial air carriers for over twenty-five years.

Keywords: Aircraft, Environment, Machining, Testing/Test Equipment, Miscellaneous, Repair & Overhaul

Revised: Dec. 83

Haley Industries Ltd

Code: HAL
Address: Haley, Ontario, Canada
KOJ 1Y0

Contact: Mr. H W Murray, Vice President, Marketing - (613) 432-8841

History: Haley Industries Ltd is an aluminum and magnesium aerospace sand casting foundry. The company was originally formed by the Canadian Government in 1952. In 1968, the facility was purchased by private interests. Plant expansions/modernizations took place in 1969 and 1974. In 1981, the company went public in order to finance a further $7M modernization program. In 1982, a major research and development effort was initiated to produce premium sand castings.

Capability: Haley Industries provides aerospace quality light alloy sand castings to an international customer base. Their castings are used in fixed wing and rotary wing aircraft for both military and civil applications. They specialize in producing complex gearbox and transmission castings in both aluminum and magnesium including constant speed drive housings (CSD), auxiliary power unit housings (APU), airframe mounted auxiliary drive system housings (AMADS), main propulsion engine gearbox housings and main transmission and tail rotor housings for helicopters. In order to supply lubricating oil to the gears in these various housings, Haley developed a sand pipe core process enabling them to cast internal oil passageways in the walls of the casting. Haley Industries' premium quality casting area permits them to produce castings with superior mechanical properties and excellent radiographic qualities. If required, this also gives them the ability to cast thinner walls with a fine surface finish.

The company is completely self-sufficient for all foundry operations. They have in-house capability for pattern making, heat treat, destructive and non-destructive testing, dimensional inspection, sand testing, spectrographic analysis and tensile testing with high temperature capabilities. The extensive use of computers and microprocessors throughout the foundry has enabled Haley to retain its prominent position in the international aerospace foundry industry.

Average Work Force: Staff - 100
Hourly - 250
Engineers - 14

Gross Sales: 1980 - $20,506,973
1981 - $24,516,402
1982 - $23,249,149
1983 - $19,177,685

Plant Size: 120,000 sq ft

Equipment: Haley Industries has the most modern foundry equipment available to meet or surpass the exacting aerospace material and design engineering requirements. Specific brochures will be furnished upon request.

Experience: Haley Industries has 31 years in operation serving the following customers – Garrett Turbine Engine Co, Avco Lycoming, Boeing Vertol, Bell Helicopter, Detroit Diesel Allison, General Electric – Engine Group, Hispano-Suiza (France), Klockner-Humboldt-Deutz (Germany), Kamian Aerospace, Litton Precision, Motoren-Und Turbinen-Union (Germany), Pratt & Whitney Aircraft (Hartford, Conn), Pratt & Whitney Aircraft of Canada Ltd, Sikorsky Aircraft, Sperry Aerospace, Sundstrand Aviation, Westinghouse, and Westland Helicopter (England).
HAMMOND MANUFACTURING
COMPANY LTD

Code: HMC
Address: Corporate Office
394 Edinburgh Road
Guelph, Ontario, Canada N1H 1E5

Electronic Transformer Division
95 Curtis Drive
Guelph, Ontario, Canada N1K 1E1

Contact: Mrs. Janice Husson, Marketing Services Manager
- (519) 822-2560

History: Hammond Manufacturing Company Ltd was formed in 1927. There are presently three divisions - Electronic Transformer Division, Electrical Transformer Division, and Cabinetry Division. The company has been manufacturing custom designed high voltage transformers since 1940 for functions such as radar, dielectric testing, HV power supplies, medical electronics, modulation transformers, electrostatic speakers, and electronic air cleaners. They have design and manufacturing capability for single and three phase units.

Capability: The company is involved in the manufacture of a wide range of magnetic devices for the electrical/electronic industry. Specific areas are outlined below:

- **High Voltage Design and Fabrication** - High voltage transformers are designed, wound, assembled, and tested at the Electronic Transformer Division (Guelph). Fabrication of sheet metal cases and special mechanical mountings are manufactured by the Cabinetry Division (Guelph). The company has been manufacturing custom designed high voltage transformers since 1940 for functions such as radar, dielectric testing, HV power supplies, medical electronics, modulation transformers, electrostatic speakers, and electronic air cleaners. They have design and manufacturing capability for single and three phase units.

- **High Voltage Testing** - The Electronic Transformer Division has in-house test capabilities up to 50 KV RMS, 60 Hz dielectric testing, Corona testing at 60 Hz to 400 Hz per MIL-T-27 specification. Specialized test equipment is available for testing at the Electrical Transformer Division - dielectric up to 80 KV RMS, up to 200 KV DC (high impedance loading), and up to 175 KV impulse. Test equipment is of commercial and custom manufacture.

- **Case Design** - Case design for containing special transformers and fabrication is available to withstand pressure due to liquid expansion. Includes water cooling.

- **Leak detection per MIL-T-27**.

- **Vacuum processing** - Available for silicone and mineral transformer oils as well as mineral and epoxy varnishes and potting compounds. Compounds.

- **Oil filling available** - At present, there is no gas filling of high voltage transformers.

- **Low Voltage Transformers** - Power, trigger, Audio High Frequency, pulse, and reactors are designed and fabricated at Electrical Transformer Division - power transformers ranging from micro-watt devices up to kilowatt level in single, two and three phase configurations at frequencies ranging from 10 Hz to 150 KHz. Physical characteristics range from standard EI laminations through C core, wound core toroidal pot core etc., in materials of silicone steel, nickel alloy metal ferrite, powdered iron and air core transformers and reactors.

- **Current and Pulse Capabilities** - Electronic Transformer Division, current to 10A, pulse to 10KV and Electrical Transformer Division, current up to 50.000A.

- **Military requirements** - Designed to meet MIL-T-27 available with certificate of conformance. The company inspection system is established to Department of National Defense specification DND 1015, equivalent to MIL-I-45208, they are presently in the second stage of applying for recognition of a Quality Program to DND 1015, equivalent to AQAP-1 NATO Quality Control Systems Requirement for Industry and Military Specification MIL-Q-9556A Quality Program Requirements.

- **Source surveillance and government source inspection available by DND Canadian Forces Technical Service Depot 302** (Guelph).

**Average Work Force: Corporate (Total) - 1100**
Electronic Division - 130

**Gross Sales:**
1979 - Corporate/$28.3M
Electronic Division/$2.9M
1980 - Corporate/$33.7M
Electronic Division/$3.1M
1981 - Corporate/$44.0M
Electronic Division/$4.3M
1982 - Corporate/$50.0M
Electronic Division/$6.0M

**Plant Size:**
Electronic Division - 20,000 sq ft
Electrical/Cabinetry Division - 175,000 sq ft
Other Manufacturing Plants - 50,000 sq ft
Warehouse Facilities - 100,000 sq ft

**Equipment:**
Electronic Transformer Division - (Winding) multiple/gang coil winders, unit coil winders, toroidal coil winders, bobbin coil winders, RF choke winders, Automated stacking/laminating machines, vacuum impregnating/potting encapsulating/casting tanks, (Ovens) Baking and curing ovens, (Environmental) Heat, altitude, cold plans for 1982 include a complete environmental lab, including shock, vibration, salt spray, humidity, etc.

**Experience:**
Hammond Manufacturing has been involved with military projects since 1939. They are presently supplying magnetics to Canadian and US manufacturers of the power supply for the gun turret fire control computer for the M-1 Main Battle Tank. Hammond Manufacturing also supplies magnetics for the Canadian Challenger Aircraft, Atomic Energy of Canada Ltd "THERAC" Series of Linear Accelerators, Satcom Communications Stations for NATO, Garrett Manufacturing, Collins Radio, Varian Canada, Bell Canada, Canadair, deHavilland Aircraft, Canadian General Electric, ITT, Computing Devices Company, National Research Council of Canada, Department of National Defense, Department of Supply & Services, Sperry Univac, Raytheon Canada, Atomic Energy of Canada, Ward Beck Systems, McCurdy Radio, McCurdy Communications, Litton Systems, and universities and research groups.

**Keywords:** 7 = Electronics, 12 = Machining, 15 = Radar, 19 = Testing/Test Equipment, Magnetic Devices, 7, High Voltage Transformers = 7, 15, 19, Sheet Metal Cases = 7, 12, Mechanical Mounts = 7, 12, Dielectric Testing = 7, 19, 12.

Revised: Dec 83

HANDS FIREWORKS Inc

Code: HFI
Address: 221 Nipissing Road
Milton, Ontario, Canada L9T 1R3
Contact: Mr. R A Brown. President – (416) 878-2831
Mr. D E Crabtree, Vice President – (613) 224-8753

History: Hands Fireworks Inc was established in 1873 for the purpose of making domestic display fireworks. Early in World War II, the company converted completely to the manufacture of military pyrotechnics which have been a major product ever since. Hands Fireworks Inc became the major pyrotechnics and fireworks producer in Canada. During WW II, a wide range of pyrotechnics were manufactured for most of the allied countries and included such items as US BM 81 Flare, the 4.5 inch Reconnaissance Flare, 2 inch parachute illuminating Flares, Verey Pistol Cartridges of all types, and smoke signals.

In 1977, the company was purchased by Lorcon Inc and operated as a division, Hand Chemical Industries. Recently, the operations became an independent Canadian company and now operates as Hands Fireworks Inc.

Capability: Hands Fireworks Inc operates from three plants – one at Milton, Ontario (near Toronto), the main plant at Papineauville, Quebec (between Ottawa and Montreal), and a new plant at Edwardsburgh (50 miles south of Ottawa). The new plant also includes a R&D facility, Environmental Testing Laboratory, Quality Control Laboratory, and the company’s central distribution warehouse. The production plants are typical for this industry, being constructed of fire resistant materials and consisting of many individual buildings thereby keeping the amount of explosive, flammable, dangerous or toxic materials and the number of operators involved to a minimum.

Each specific operation or storage area has been carefully analyzed for degree of hazard and is designed to minimize these hazards by steel or reinforced concrete walls, protective steel guards, remote control of operation, special protective devices such as explosive activated fire extinguishing equipment, protective screens between buildings, special electrical wiring, etc. The process, materials, quantities of explosive, type of protection, etc., are licensed yearly by the Federal Department of Energy, Mines and Resources, followed up by frequent plant inspections by this department throughout the year.

The Milton facility includes one laboratory/test building, one office building, two explosive storage magazines, and one raw materials storage building. The Papineauville facility includes one laboratory/test building, one office building, 50 process buildings, 9 explosive storage magazines and 32 raw material storage buildings. The Thurso facility includes one laboratory/test building.

The fireworks line is completely integrated starting with the basic raw materials, paper, and chemicals, and converting them into spiral wound paper tubes from 1/4 to 3 inch inside diameter, mixing the chemicals, pressing, drying, labelling and packaging. The plastic components which hold the delay charges and bursting charges are purchased from outside sources, but are produced from company molds. The smokeless and black powders used are purchased from outside sources.

Average Work Force: Professionals – 10
Others – 120

Gross Sales: 1983 – $4.5M

Plant Size: 100,000 sq ft (Total at all locations – 120 Buildings)

Experience: Hands Fireworks Inc has worked very closely with the Department of National Defense (DND) and various Canadian Design and Development facilities such as the National Research Council, the Defense Research Establishments in Valcartier, Quebec and Suffield, Alberta, and the Chief Inspector of Explosives of the Department of Energy, Mines and Resources. Development work has been done for the Department of Agriculture. Some major projects have included:

- The design and development of the Grenade, Hand Smoke (HC), and C1A1
- The design and development of the Smoke Pot, SC39 and SC390. This long burning (11 to 18 minutes), high volume smoke pot has recently been tested by the DOD at Dugway, Utah.
- The design and development of the Disperser Chemical Groundburst, and Disperser Chemical Airburst, both of which are currently being used by DND
- Design and development of a complete line of NBC Training Simulators with assorted chemical charges
- The manufacture of the igniter for the Black Brant Rocket
- The design, development and production of the Signal, Illumination 1 1/2 inch (plastic case) Red, Yellow, Green, etc., currently in service with the Canadian Forces.
- The design, development and manufacture of the Silver Rainmaker shell which was used successfully to produce rainfall to fill reservoirs for irrigation.
- The design, development and production of the 2 minute Smoke Pot Orange
- The design and development of self-scuttling Marine Marker (Manual)

Keywords: 2 = Armament, 4 = Chemical, Chemical Airburst Simulators = 2, 4, Smoke Pots = 2, 4, Markers = 2, 4, Spotting Changes = 2, 4, Grenades Smoke = 2, 4, Hand Grenades Smoke = 2, 4, Signal Cartridges = 2, 4, Illumination Signals = 2, 4, Practice Bomb Signal Cartridges = 2, 4, Orange Smoke = 2, 4, Red Signal = 2, 4, Yellow Signal = 2, 4, Green Signal = 2, 4, Ignitors = 2, 4, Rocket Ignitors = 2, 4, Chemical Groundburst Simulators = 2, 4, High Volume Smoke Pot = 2, 4, HC Smoke = 2, 4, Pyrotechnics = 2, 4, Flares = 2, 4, Chemical Dispersers = 2, 4, Ammunition Smoke = 2, 4, Ordnance = 2, 4

Revised: Dec 83

HAWKER SIDDELEY CANADA Inc
(Orenda Division)

Code: HSC
Address: Box 6001
Toronto AMF. Ontario, Canada L5P 1B3
Contact: Mr. E Lyn Davies, Mgr. Sales & Contracts – (416) 677-3250
History: Hawker Siddeley Canada Inc is a Canadian public company, listed on the Stock Exchanges in Montreal, Toronto and Vancouver. The head office is in Toronto and the company normally employs about 7,000 people in divisions across Canada, in the UK, and in the US. The company is engaged mainly in engineering and manufacture of heavy industrial products for domestic and export markets. The Orenda Division was established in 1946 to design, develop and manufacture jet engines for Canadian lighter aircraft. Orenda has built several thousand gas turbine engines of both its own design and under license for General Electric. They have designed and built the Lance Missile Launcher, conducted nuclear development work, and built parts for the Candu nuclear reactor, and designed and built industrial gas turbines for use in oil pipeline operations and for emergency power units.

Capability: The Hawker Siddeley Orenda Division's capabilities are outlined below:

Manufacturing: The Orenda Division is now a sub-contract manufacturer of major components for aircraft and industrial gas turbines. The facility includes a large machine shop, an extensive sheet metal fabricating shop, a heat treating department; quality assurance to MIL-Q-9858, and a comprehensive non-destructive testing department.

Repair & Overhaul: Orenda Division has contracts for the repair and overhaul of aircraft gas turbine engines J79, J85-15, J85Can40, and was recently awarded a contract for the repair and overhaul of the F404. Also overhauled and repaired are industrial gas turbine engines. The plant has facilities for testing all these engines.

Publications: The Graphics Department prepares and prints manuals to Department of Defense standards as well as commercial graphics work.

Laboratory: The laboratory is fully qualified by the Department of National Defense and performs chemical-metallurgical and mechanical testing, and analysis in support of other departments and also for other customers.

Average Work Force: Technica-staff - 70
Total - 700 - 800


Plant Size: 440,000 sq ft
117,000 sq ft adjacent space immediately available

Equipment: Machine Shop facilities include Turning up to 12 ft dia. NC & CNC machining centers, and EDM broaches. NC programming uses access to GE and Sundstrand time-sharing computers. Sheet metal fabricating has mechanical and hydraulic presses to 600 tons; fusion and resistance welding, and facilities for forming, shaping and joining. There is an environmental room with control of temperature, humidity and dust. Heat treating has atmospheric, inert gas and vacuum furnaces, and plating and coating facilities. Non-destructive testing includes fluorescent penetrant, magnetic particle, x-ray and ultrasonic equipment. Assembly has dynamic rotor balancing machines, gas turbine engine test cells, and facilities for testing fuel systems.

Experience: Orenda Division's customers for aeronautical parts and gas turbine repair and overhaul have included Pratt & Whitney, General Electric, Avco Lycoming, McDonnell Douglas, Rolls Royce, Lucas Aerospace, Canadian Department of National Defense, NAMSA, and the Air Forces of the Netherlands, Norway, Belgium, Pakistan, and Italy. Nuclear reactor component design and manufacture was performed for Atomic Energy of Canada.

Keywords: 1 = Aircraft, 5 = Communications, 8 = Energy, 12 = Machining, 19 = Testing/Test Equipment, Airframe Components = 1, Engine Components = 1, Engine Systems = 1, Engine Overhaul & Repair = 1, Metalworking = 12, Heat Treating = 12, Coating = 12, Stamping = 12, Forming = 12, Welding = 1, Gas Turbine Components = 1, Non-Destructive Testing = 1, Nuclear Reactor Components = 8, Laboratories = 19, Engine Testing = 19, Fabrizations = 1, Manuals = 5, Plating = 12

Revised: Dec 83

HERMES ELECTRONICS Ltd

Code: HEL

Address: 40 Atlantic St
Dartmouth, Nova Scotia, Canada B2Y 4A1

Contact: Mr N R Wood Marketing & Admin Mgr - (902) 466-7491

History: Hermes is the successor of the Canadian branch of EMI Electronics of the UK. It was established in 1949 and has specialized in anti-submarine warfare equipment, certain areas of HF Communications, and ocean/environmental data systems products.

Capability: The company's products include:

Sonobuoys and Bathythermograph Buoys - production types include AN/SSQ-41A, AN/SSQ-41B, AN/SSQ-36, AN/SSQ-53B, AN/SSQ 525 VLA, and AN/SSQ 527B

Ionospheric Sounding Equipment - vertical and oblique sounding equipment is manufactured and is in service on a worldwide basis. The AN/FPT-11 transmitters, AN/UQR-2 receivers, and their commercial counterparts represent the last generation of this equipment.

HF Antennas - a unique active broadband aperiodic loop array is produced. Various configurations of this system are in service in twenty-three countries and fifty-four agencies of various governments.

Moored and Drifting Data Buoy Systems - buoy vehicles for the collection, recording and retransmission of oceanographic, meteorological, and environmental data have been developed and systems engineered for government, institutional, and industrial users. Hermes developed the Canadian Ocean Data Systems Buoys for the Canadian Government in 1975.

Environmental Data Systems - ice stations and automatic weather stations have been developed and manufactured for industrial and government users.

Average Work Force: 400 (including 75 engineers, technicians, draftsmen and engineering support staff)

Gross Sales: No Data

Plant Size: 137,600 sq ft

Equipment: Hermes has a fully equipped environmental testing laboratory as well as a comprehensive manufacturing facility. Their environmental lab & R&D is one of the largest in Eastern Canada and contains vibration equipment, humidity and temperature chambers, shock and tensile testers, and high pressure testing tanks. The equipment meets the requirements of MIL-ST-610 for Environmental Test Methods. This is the prime military standard which establishes uniform environmental test methods for determining the resistance of equipment to the effects of natural or induced environments.
peculiar to military operations. Hermes cannot conduct testing for fungus and sand & dust, but arrangements can be made to have these carried out at other approved laboratories. The manufacturing facility has a chemical process capability, manufactures printed circuit boards, and can plate, paint, weld, stamp, magnetically form and machine. The plant is equipped to manufacture electronic and mechanical components and equipment as prototypes or in quantity production.

The company's quality control and inspection department has developed and implemented a complete quality assurance program, which ensures quality and compliance to customers specifications, often to military standard. A calibration and standards room is maintained and supervised by quality control and inspection. This facility checks all company instruments to ensure their accuracy by using standards with certified values. These are traced to N.H.C. and N.B.S., and are checked at regular intervals to ensure their accuracy. A quality assurance manual in accordance with DND 1015 and with MIL-G-9658A defines the QA operations of the company.

Experience: Hermes is a large scale producer of sonobuoys for the Canadian and US Governments, as well as other governments. They are presently completing a major order of AN/FPT-11 transmitters for the US Navy.


Revised: Dec 83

HEROUX Inc

Code: HER

Address: 755 Thurber
Longueuil, Quebec, Canada J4H 3N1

Contact: Mr. Emile L Desnoyers, Marketing Director - (514) 679-5450

History: Heroux Inc was founded in 1942 and is a wholly owned division of Bombardier Inc.

Capability: Heroux is a fully integrated company involved in the manufacture, assembly and the testing of aircraft landing gears and hydraulic systems for the military and commercial markets. They also operate a landing gear and hydraulic repair and overhaul facility. This latter R&O facility handles such aircraft as the 707, 727, 737, DC8, DC9, DC10, L-1011, C130, KC135, P3 and the DHC-5 & DHC-6. They have complete onsite electroplating facilities.

Average Work Force: Total - 400

Gross Sales: $15M/Year

Plant Size: 250,000 sq ft

Equipment: All necessary equipment for the manufacture, repair and testing of landing gear and hydraulic systems

Experience: The company is involved in all major markets in North America, England, Europe and South America on both military and commercial bases. Major customers include the US Air Force, Canadian Forces, Air Canada, Canadair de Havilland, McDonnell Douglas, Boeing, Lockheed, Grumman and other airlines (British Caledonian, Britannia, Avianca and Aero Peru)

Keywords: 1 = Aircraft, Hydraulics = 1, Landing Gears = 1, Repair & Overhaul = 1

Revised: Dec 83

I. M. P. GROUP Ltd

Aerospace Division

Code: IMP

Address: Head Office
7037 Mumford Road
Halifax, Nova Scotia, Canada B3L 2J1

(Mailing) P.O. Box 1014
Dartmouth, Nova Scotia, Canada B2Y 4J3

Contact: Mr. H L Connor, Marketing Director - (902) 861-2250, X277

History: The company, Industrial Marine Products, was formed in 1967 to purchase the assets of a group of Nova Scotia companies which had been manufacturing foundry and steel fabricated products since 1865. During the next few years, they expanded into the commercial fishing gear and marine equipment areas. and expanded operations into other locations in eastern Canada and the US. In the early 1970s, the company acquired the facilities, equipment, operational management and work force of a major aircraft company in the Halifax area, and thus, expanded into aircraft overhaul and repair, and aerospace manufacturing areas. The current operating divisions of IMP Group are:

Aerospace Manufacturing
Aerospace Engineering Services
Aircraft Repair and Overhaul
General Aviation Services
Foundry
Steel Fabrication & Machine Shop
Tool and Plastics
Marine
Offshore Services
Hotel
Properties and Investments
Research and Development

Capability: IMP Group's capabilities are described in the eight divisions listed below

Aerospace Manufacturing Division - manufactures electronic wiring assemblies for various aircraft and electronics industries. Aerospace metal components are also manufactured.

Aerospace Engineering Services Division - offers integrated services for the other aerospace divisions that include repair schemes, corrosion control, weight and balance, modification development, systems installation design, aeronautical engineering, aircraft maintenance, stress analyses, fatigue studies, structural design, electrical and avionics engineering, systems interface design, electromagnetic compatibility testing, systems ground and flight testing, configuration and modification program control, and maintenance and technical publications for military aircraft.

Aircraft Repair and Overhaul Division - as the major fixed and rotary wing maintenance facility in eastern Canada, it offers repair and overhaul programs for military and commercial aircraft, as well as a full range of equipment modification.

General Aviation Services Division - offers aircraft servicing maintenance, hangarage, crew and passenger lounges for large and small commercial aircraft.

Foundry Division - equipped to produce cast iron, steel and steel alloy castings up to 2-tons with both cupola and electric induction furnaces.
Steel Fabrication and Machine Shop Division – essentially a custom shop; it is serviced by four 5-ton overhead cranes. Typical products include components for fishing trawlers from steel, stainless steel and aluminum, and a whole range of products, repairs and modifications for offshore oil industries.

Tool and Plastics Division – manufactures molded plastic parts using the injection molding technique.

Research and Development Division – the primary function is to identify and develop new products and processes related to the continued expansion of the IMP Group and the technical excellence of its products.

Other Divisions of IMP Group have no apparent relevance to USAF requirements and are therefore, not further defined in this section.

**Average Work Force:** No Data

**Gross Sales:** IMP Group Ltd – $50M
Aerospace Manufacturing Div – $2.5M
Aerospace Repair & Overhaul Div – $3.0M

**Plant Size:** Aircraft Repair & Overhaul Div – 60,000 sq ft (2 hangars)
Steel Fabrication & Machine Shop – 14,000 sq ft
No data on other facilities

**Experience:** IMP Group’s aerospace clients include the US Navy (P3 aircraft), Canadian Department of National Defense, Canadian, USAF, and McDonnell Douglas Canada. They are hopeful of participating in the CF-18 Program.

**Keywords:** 1 = Aircraft; 3 = Avionics; 12 = Machining; 17 = Software Services; 19 = Testing/Test Equipment; 23 = System Ground Testing; 26 = Helicopter R&O; 33 = Systems Interface Design; 37 = Electronics; 38 = Systems Interface Engineering; 39 = Corrosion; 43 = Weight & Balance; 45 = Machining; 46 = Machining; 49 = Maintenance; 50 = Modification; 51 = Structural Design; 52 = Electrical Engineering; 53 = Systems Interface Design; 54 = Systems Interface Engineering; 55 = Systems Ground Testing; 58 = Plant Size; 60 = Weight & Balance; 61 = Machining; 62 = Machining; 63 = Maintenance; 64 = Modification; 65 = Structural Design; 66 = Electrical Engineering; 67 = Systems Interface Design; 68 = Systems Interface Engineering; 69 = Systems Ground Testing; 70 = Plant Size; 71 = Weight & Balance; 72 = Machining; 73 = Maintenance; 74 = Modification; 75 = Structural Design; 76 = Electrical Engineering; 77 = Systems Interface Design; 78 = Systems Interface Engineering; 79 = Systems Ground Testing; 80 = Plant Size; 81 = Weight & Balance; 82 = Machining; 83 = Maintenance; 84 = Modification; 85 = Structural Design; 86 = Electrical Engineering; 87 = Systems Interface Design; 88 = Systems Interface Engineering; 89 = Systems Ground Testing; 90 = Plant Size; 91 = Weight & Balance; 92 = Machining; 93 = Maintenance; 94 = Modification; 95 = Structural Design; 96 = Electrical Engineering; 97 = Systems Interface Design; 98 = Systems Interface Engineering; 99 = Systems Ground Testing

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**INNOTECH AVIATION Ltd**

**Code:** INA

**Address:** Head Office
455 Michel Jasmin
Dorval, Quebec, Canada H9P 1C2

**Contact:** Mr Douglas M McGregor. VP Marketing & Sales - (514) 636-4155

**History:** Innotech Aviation Ltd was incorporated in 1955 as Timmins Aviation Ltd. In 1967, the latter was acquired by Atlantic Aviation Corp of Wilmington, Delaware, resulting in a further name change to Atlantic Aviation of Canada Ltd. The present name came into being in 1974 when a group of the company’s Canadian executives together with Innovac Investments Ltd purchased the shares held by Atlantic Aviation Corp. The company has offices and aircraft service facilities in six Canadian cities from coast to coast; including Vancouver, Calgary, Toronto, Ottawa, Montreal and St Johns.

**Capability:** The current operating divisions of Innotech Aviation Ltd include Aircraft Sales and Brokerage, Aircraft Management Services and Charter Operations, Aircraft Ground Services, and Technical Services. This profile describes the only the Technical Services Division which consists of:

**Engineering & Design** – A full range of aerospace-related engineering services are offered which include repair schemes, corrosion control, weight and balance, systems installation design, aeronautical engineering aircraft maintenance, modification development, structural design, electrical and avionics engineering, systems interface design, systems ground and flight testing, and custom designed aircraft interiors for commercial and military aircraft including air evacuation, hospital interiors, maintenance and technical publications for a wide range of commercial and military aircraft.

**Aircraft Repair & Overhaul** – The department’s maintenance and service capabilities cover light single and twin engine aircraft, through to multi-engine turbo-props, turbo jets, and helicopters for civilian and military customers, as well as a full range of equipment modifications and non-destructive testing.

**Modification** – This department specializes in sheet metal, work aircraft welding, aircraft painting, cabinet making and upholstery of aircraft interiors and furnishings.

**Quality Assurance** – Innotech’s quality assurance personnel hold Canadian Ministry of Transport (MOT) and the Department of National Defense Shop approvals (DOT). All aircraft inspectors are licensed by MOT, and have through agreements between Canada and other countries, can approve work done for customers from outside Canada.

**Average Work Force:** Total – 490 (all locations)

**Gross Sales:** No Data

**Plant Size:** 500,000 sq ft (all locations)

**Experience:** Innotech Aviation Ltd customers include the US Coast Guard (Falcon Aircraft), Canadian Department of National Defense (and other departments of the Canadian Government), Canadian de Havilland Aircraft of Canada, Falcon Jet, and many others.

**Keywords:** 1 = Aircraft; 3 = Avionics; 12 = Machining; 17 = Software Services; 19 = Testing/Test Equipment; 23 = System Ground Testing; 26 = Helicopter R&O; 33 = Systems Interface Design; 37 = Electronics; 38 = Systems Interface Engineering; 39 = Corrosion; 43 = Weight & Balance; 45 = Machining; 46 = Machining; 49 = Maintenance; 50 = Modification; 51 = Structural Design; 52 = Electrical Engineering; 53 = Systems Interface Design; 54 = Systems Interface Engineering; 55 = Systems Ground Testing; 58 = Plant Size; 60 = Weight & Balance; 61 = Machining; 62 = Machining; 63 = Maintenance; 64 = Modification; 65 = Structural Design; 66 = Electrical Engineering; 67 = Systems Interface Design; 68 = Systems Interface Engineering; 69 = Systems Ground Testing; 70 = Plant Size; 71 = Weight & Balance; 72 = Machining; 73 = Maintenance; 74 = Modification; 75 = Structural Design; 76 = Electrical Engineering; 77 = Systems Interface Design; 78 = Systems Interface Engineering; 79 = Systems Ground Testing; 80 = Plant Size; 81 = Weight & Balance; 82 = Machining; 83 = Maintenance; 84 = Modification; 85 = Structural Design; 86 = Electrical Engineering; 87 = Systems Interface Design; 88 = Systems Interface Engineering; 89 = Systems Ground Testing; 90 = Plant Size; 91 = Weight & Balance; 92 = Machining; 93 = Maintenance; 94 = Modification; 95 = Structural Design; 96 = Electrical Engineering; 97 = Systems Interface Design; 98 = Systems Interface Engineering; 99 = Systems Ground Testing

**Revised:** Dec 83

**INRAD INDUSTRIAL RESEARCH & DEVELOPMENT Ltd**

**Code:** INR

**Address:** #7 – 1329 Niakwa Road
Winnipeg, Manitoba, Canada R2J 3T4

**Contact:** Mr Edward A Speers, President - (204) 255-7279

**History:** Inrad is a wholly owned Canadian company incorporated in 1975. There are no other Canadian locations. An affiliate company, Speers McGonigal (1980) Ltd., custom packager and plastic fabrication is located at the same site.

**Capability:** The Inrad group is interested in new product development, particularly in the plastics, petroleum, chemi-
A new material, porous titania glass, is available in research and durable life support systems, and aircraft, automobile (back and one in Canada, but also in the United States). This material can be molded as required. Based on this technology, a portable hydrogen "sniffer" has been developed. The resistance of the detector changes on exposure to as little as 0.05 ppm of hydrogen in air. This instrument serves as an alarm for use near hydrogen producers such as batteries, hydrogen furnaces, and fuel cells. They are researching a humidity detector.

Other capabilities include precision machining and engraving, plastic fabrication (vacuum forming) custom packaging, and skin and blister packaging.

Average Work Force: PhDs - 2
Engineer - 1
Physicist - 1
Chemist - 1
Others - 7/15

Gross Sales: Annual - $1.0M
Plant Size: 18,000 sq ft

Experience: Irvin Industries has worked with the Canadian Department of National Defense, the National Research Council, Atomic Energy of Canada Ltd., universities, and with private industry. They have low sales to the US. They have been in contact with USAF primarily in the area of rare earth magnets.

Keywords: 4 = Chemistry, 7 = Electronics, 8 = Energy, 9 = Environment, 12 = Machining, 20 = Miscellaneous, Rare Earth Magnets = 4, Photocatalyst = 4, Alternate Fuels Research = 4, Geophysics = 7, Environmental Sensors = 7, Solid State Devices = 7, Solar = 8, Trace Gas Detection = 9, Titania Glass = 4, Porous Titania Glass = 4, Hydrogen Production = 4, Water/Hydrogen Conversion = 4, Hydrogen = 4, Hazardous Gas Detection = 4, Hazardous Gas Alarm System = 9, Hydrogen Gas Detection = 9, Injection Molding = 12, Precision Machining = 12, Precision Engraving = 12, Custom Packaging = 20, Blister Packaging = 20

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IRVIN INDUSTRIES CANADA Ltd

Code: IIC

Address: 479 Central Ave
Fort Erie, Ontario, Canada L2A 3T9

Contact: Mr. John Swanigan, President - (416) 671-6510

History: Irvin Industries was incorporated in Canada in 1925 and is a subsidiary of Irvin Industries Inc of New York. The parent company not only operates many facilities in the US and one in Canada, but also in the UK, Italy, and Sweden.

Capability: Irvin Industries produces personnel parachutes (back & seat-type for ejection seats, military search and rescue units, paratroopers & military freefall), precision opening release systems, aerial delivery systems, inflatable life support systems, and aircraft, automobile & industrial restraint systems. Irvin has also designed and manufactured special purpose parachutes including sophisticated recovery systems for supersonic jet transports, and multi-use high-reliability & patented deceleration systems for lighter aircraft.

Irvin's Production Department is equipped with more than 350 sewing machines capable of efficiently stitching the latest natural and man-made fabrics, tapes and webbings. Additionally, an environmentally-controlled facility equipped with modern environmental test chambers, jigs and fixtures to enable the company to produce highly dependable and durable life support equipment.

A further enhancement to Irvin's capabilities in the inflatable products line has been realized through the firm's recent acquisition of the latest in frequency stabilized electronic heat sealing equipment. This advanced state-of-the-art production equipment now permits both prototype development and large scale manufacture of an extended range of inflatable products including - life rafts, inflatable boats, life vests and jackets, impact attenuation bags, air mattresses, anti-g suits, cooling suits, and partial pressure vests. Heat sealing techniques are likewise being applied to make product improvements upon Irvin's existing line of inflatables produced previously by conventional means.

Irvin's Quality Control Program has been designed to conform with the requirements of the Canadian Armed Forces standards as defined in DND Spec 1015, whose equivalent US Department of Defense standards are MIL-O-9658 and MIL-I-45208. The quality audits conducted by independently assigned specialists, as well as full-time in-house quality assurance representatives assigned by the Department of National Defense, provides for the surveillance of Irvin's quality control program. Irvin Industries Canada Ltd has been listed by the military as an "approved" company since Dec 1938.

Irvin's Engineering Department is responsible for all projects from the proposal stage to production. This encompasses design, development, static testing, aero & dynamic testing, drawing approval, preparation of procedures & specifications, and approval of the first-off specimen. Preliminary design work is facilitated by an in-house computer which is capable of simulating tests, thereby avoiding extensive trial & error testing. They also maintain Drafting and Customer Service/ Product Support Departments.

Irvin products include space vehicle recovery, drone recovery, missile recovery, deceleration (for high performance aircraft) systems, personnel parachute systems, special purpose parachutes - precision opening & release systems, air cargo delivery systems, and other miscellaneous items such as harnesses, belts, protective clothing, special suits/clothing, life rafts, and survival kits.

Average Work Force: Total - 125

Gross Sales: 1980 - $5 13M
1981 - $5 81M
1982 - $5 95M

Plant Size: 39,000 sq ft

Experience: Irvin's customers include the USAF/AIM Parachute Program - joint USAF/Canadian program and the deceleration parachute for the F-105). The Canadian DND / Canadian Air Force, and many other off-shore customers (primarily military).

Keywords: 1 = Aircraft, 13 = Missiles, 14 = Protective Equipment, 18 = Space Systems, 20 = Miscellaneous Air Delivery Systems = 1, Personnel Survival Equipment = 14, Personnel Restraint Equipment = 14, 20
Parachutes = 1, 14. Precision Opening Release
Systems = 1. Inflatable Life Support Systems = 1, 14
Special Purpose Parachutes = 1, 14. Recovery
Systems = 1, 13, 18. Deceleration Systems = 1. Drone
Protective Clothing = 14. Survival Kits = 14

Revised: Dec 83

ITT CANNON ELECTRIC CANADA
(A Division of ITT Industries of
Canada Ltd)

Code: ITT
Address: 4 Cannon Court
Whitby, Ontario, Canada L1N 5V6
Contact: Mr. Bruce D. Valiilie, Manager of Marketing and
Sales - (416) 668-8881

History: The company commenced operation in Canada in
1942 as Cannon Electric Company Ltd. The parent company
Cannon Electric Company (Los Angeles), was eventually pur-
chased by ITT Corporation and the Canadian company
became a wholly owned ITT subsidiary. In 1956, the company
name was changed to its present name, and in 1967 the
company began operation as a Division of ITT Canada Ltd
The company maintains Sales Offices in Montreal and
Vancouver.

Capability: ITT Cannon Electric Canada is engaged in R&D
manufacture and sales of electrical & electric connectors,
cable harnesses, and interconnect devices for the hostile
environment market. Cannon connectors are used in virtually
every passenger jet aircraft in the free world, deep in the earth &
the oceans, in space, in nuclear reactors, and in oil & gas drilling
rigs - in other words, in the hostile environment.

Their manufacturing capability features both manufacturing
& industrial engineering, tool design (plastic & metallic
components), machining fabrication & assembly operations,
machine & model shops, molding facilities, and electroplating
They have world-wide market responsibility and engineering
design cognizance over a) battery power connectors, b) fire-
wall connectors, c) waterproof connectors, d) high
temperature connectors, e) outlet series, f) aircraft firewall
connectors, g) circular nuclear series, h) weatherproof series,
i) Canadian design specials, j) environmental rack & panel
dra series, k) cable TV-CATV connectors. l) geophysical-
seismic, m) cryogenic connector series, and n) sonar-
underwater tow connectors

Product development has led to a variety of new and/or
improved connectors. These include: a) a new series with proven
results at elevated temperatures for nuclear applications, b) a
connector to meet MIL-C-28840 for seaboard applications
(OPL). c) a connector (MS5015/3400D series) being used by
the US Navy on new equipment as well as for retrofit.
replacement & all power applications. d) the MIL-C-83723 series III
connector designed for high performance aero applications.
the the "Downhole" connector designed for high pressure
usage (hermetically sealed). f) the MR series connector -
rugged, heavy duty & waterproof (designed to withstand
severe environmental conditions). g) a geophysical hermaph-
drodc connector designed for the seismic exploration
industry, and h) a connector to meet MIL-C-38999 III K

Average Work Force: Not Specified

Gross Sales: 1980 - $18M
1981 - No Data
1982 - No Data

Plant Size: Production - 55,000 sq ft
Office - 15,000 sq ft

Experience: It is sufficient to say that Cannon connectors are
designed to the specification of the electronic industry and
meet the requirements of the Canadian Department of
National Defense, the US DoD, Canadian Ministry of Trans-
port, and the Canadian Standards Association. Cannon plugs
are used worldwide.

Keywords: 1 = Aircraft. 7 = Electronics. 9 = Environment.
Wiring = 1. 7. 20. Cable = 1. 7. 20. Harnesses = 1. 7. 20

Revised: Dec 83

IVI Inc

Code: IVI
Address: P. O. Box 790
Courcellette Quebec Canada G0A 1R0
Contact: Lt Gen JJ Paradis Dir. International Marketing
(614) 282-1396
Mr. T. Tessier. Contracts Mgr. Military Products
(614) 844-3711

History: IVI Inc (Valcartier) carries on a tradition in the manu-
facture of small arms ammunition that dates back to 1956,
when the Quebec arsenals were established within the walls
of the city. It was incorporated as Valcartier Industries Inc in
1956, later changed to IVI Inc and is located on a 500 acre
site at Val Belair, Quebec 15 miles outside of Quebec City.
IVI Inc. a wholly owned subsidiary of the SNC Group is
Canadian owned.

Capability: IVI Inc is a manufacturer of high quality small
arms ammunition both military and commercial. It is the only
Canadian small arms ammunition manufacturer and supplier
to the Canadian Forces. They operate their own foundry and
produce brass, lead and guiding metals required for the
manufacture of ammunition. Valcartier ammunition conforms
to NATO specifications. Their plant is equipped with its own
water wells, water treatment plant and industrial waste treat-
ment plant.

IVI Inc manufactures various small arms ammunition such as
the NATO 7.62mm round. All dies, punches, tool holders and
other tools are produced in-house. The precision tooling is
used for both sporting and military small arms ammunition

IVI maintains high quality control standards through rigid and
numerous destructive and non-destructive inspection checks
following the various stages in the manufacturing process.
For example, during the production of the 7.62mm round,
there are fifteen separate inspections, beginning with a test
for impurities in the base metals after melting, right on through
to a final inspection before packaging the finished rounds.
They have a functioning Proofs House and ranges for proof
firing of all products

IVI Inc has recently started an R&D department whose aim
is to improve present products and techniques and to provide
ammunition research facilities capable of responding to mili-
tary requirements. The department is equipped with a manu-
facturing capability, testing facilities, measuring devices and
indoor and outdoor ranges.

Average Work Force: 1000 +

Gross Sales: Annual - $45M

Plant Size: Manufacturing - 500,000 sq ft
Warehouse - 84,000 sq ft
Total Acreage - 500

Experience: IVI is the sole supplier of small arms ammun-
ition to the Canadian Forces. They export small arms ammu-
nution to more than 20 countries, including the U.S., Norway, Belgium, Kenya and Indonesia.

Keywords: 2 = Armament; 19 = Testing/Test Equipment; Ordnance = 2; Ammunition = 2; Small Caliber = 2; Research = 2; Manufacturing = 2; Testing Ranges = 2; 19

Revised: Dec 83

JATEL COMMUNICATIONS SYSTEMS LTD

Code: JAT
Address: 39 Leacock Way
Kanata, Ontario Canada K2K 1T1
Contact: Mr. J. Ebrahim, President - (613) 592-4331

History: Jatel Communications Systems Ltd was founded in 1976 and is 100% Canadian owned.

Capability: Jatel activities include consulting, systems studies and applied research associated with telecommunications. As a result of successful endeavors in the aforementioned, they initiated and brought to fruition, a research and development program that resulted in the development and production of their RX-32 Communication Switching System. This system is scheduled to undergo field trials with the Canadian Department of National Defense for air traffic control applications. The RX-32 system is a solid state time division multiplex switching network. It has a stored program and is microprocessor controlled.

Jatel areas of scientific specialization include design and manufacture of customized telecommunications systems for both civilian and military applications. Typical applications include air traffic control communications, Coast Guard Ship-to-Shore communications and police radio dispatch communication systems.

Average Work Force: Professionals - 8
Gross Sales: 1983 - $703,000
Plant Size: 1,500 sq ft
Experience: Jatel customers include the Canadian Departments of National Defense and Transport.

Keywords: 5 = Communications; 7 = Electronics; Switching = 5, 7; Telephone = 5, 7; Radio = 5, 7; Solid State Devices = 5, 7; Consulting = 5, 7; Research and Development = 5, 7; Air Traffic Control Communications System = 5

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KOSS MACHINE & TOOL CO

Code: KOS
Address: 1765 Shawson Dr., Units 7 & 8
Mississauga, Ontario, Canada L4W 1N8
Contact: Mr. Dragomir Cagic, President - (416) 678-7236

History: Kosst Machine & Tool Co was started in 1975 as a general machine shop and incorporated in 1976. The company ventured into defense and aircraft industry associated work in 1978 which today comprises 80% of their work. The company is a division of '333 111 Ontario Ltd.

Capability: Kosst Machine is involved in milling and lathe operations primarily involved with defense and aerospace related work. The CNC milling operation has a working travel of up to 20x40 inches and a vertical space up to 29.75 inches. Tolerances can be held to 0.0003 inch. A new Makino machine center is operational. It exhibits X, Y, Z axis lengths of 75.5, 27.5, and 23.6 inches respectively.

Lathe operations are carried out with both CNC and conventional machines with maximum swing of 24 inches, maximum cross travel of 9.75 inches, and a maximum machining length of 21.5 inches. A quality assurance manual (quality level to DND 1016/MIL-I-45208) has been prepared.

Average Work Force: Machinists - 10
Quality Control - 1
Production Control - 1
Administrative - 2

Gross Sales: 1982 - $750,000
Plant Size: 6,000 sq ft
Equipment: Kosst equipment includes CNC machines, vertical milling machines, engine lathes, turret lathes, and other assorted equipment associated with machining operations. Kosst has milling machines, engine lathes, turret lathes, tooling and injection molding equipment. Kosst has manufactured parts for the automotive, aerospace, and defense industries.

Keywords: 12= Machining, Precision Machining = 12; Tooling = 12; Injection Molding Tools = 12

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LEIGH INSTRUMENTS LTD

Code: LEI
Address: 2680 Queensview Drive
Ottawa, Ontario Canada K2B 8J9
Contact: Mr. Don Lougheed, Director of Marketing - (613) 820-9720

History: Leigh Instruments is a high technology electronics company engaged in the systems engineering development, and manufacture of equipment, products, and systems primarily for the aerospace, government, and military markets. Leigh was founded in 1961 and is a publicly held Canadian owned company. Approximately 50% of sales are for the export market. Leigh's engineering and aerospace operations described under capabilities has engineering facilities in Ottawa, together with the company's marketing and executive offices, and has a production facility in Carleton Place, Ontario, thirty miles west. Other facilities include the Frequency Control Division in Toronto, which manufactures crystals, crystal filters, and high environment glass-to-metal hermetic seals, a postal equipment plant in Waterloo, Ontario, and a plant in the UK near Heathrow Airport which supplies some products as well as support and repair and overhaul services to Leigh's European customers.

Capability: Leigh's aerospace and engineering systems operations supplies a range of products, systems and services to the aerospace, military and government sector. The company is organized into three product groups, two of which (Aerospace and Marine & Land) do business in this area. The Marketing Department services all three business areas and the Engineering Department, organized on discipline lines, supports the business areas on a project/program team basis. The marketing department services, 372 specialists are maintained to service specific technology areas.

The company developed initially as a flight recorder crash locator systems company, building on a patent for a unique deployable crash position indicator.
The aerospace product group has developed its business base to include products and experience in areas such as: 

- Helicopter CFIs for mechanical strain recorder systems and helicopter icing detection systems. In the latter instance, for example, Leigh won a US Army AISLS/Advanced Icing Severity Level Indicating System R&D contract as a result of its experience.

- The company has, over thirty years, developed its capability also in the area of data processing and display systems applications, communication switching systems, and radio-based surveillance and display systems as both a prime contractor and system integrator.

**Average Work Force:** 500 (Ottawa & Carleton Place approximation)

**Gross Sales:** $33 million (Year ending June 30)

**Plant Size:** 102,000 sq ft (Ottawa & Carleton Place, Ontario)

**Equipment:** Leigh's production facility is qualified to DND 1010 requirements incorporated ML-Q-859B and has a resident DND inspection department. The plant has a fully integrated production facility including machine shop with both CNC and conventional, mechanical and electrical inspection facilities. Electrical and electromechanical assembly and specialized tool fabrication production facilities. Electrical assembly facilities include component preparation, semi-automatic insertion, chip processing, conformal coating, semi-automatic wire wrap and harness shop. Test facilities include production test stations, test equipment calibration facilities and a large RF anechoic chamber. The plant includes an education and training facility and a number of different types of AGREE production environments, test chambers. The education and training facility includes a number of AGREE production development stations and a large anechoic RF test chamber.

**Experience:** Leigh's instruments have been used in the test equipment for customers, world-wide, including military and commercial programs. Leigh has supplied electronic equipment for the DND project, including military, commercial, and aerospace programs.

**History:** LITTON SYSTEMS CANADA Ltd. is a leader in the design, development, manufacturing and marketing of precision electronic equipment for military and commercial use. The company has been a major supplier of electronic and mechanical components to the Canadian Forces since the late 1960s. The company has expanded and improved its test equipment and test facilities over the years to meet the requirements of aerospace applications and current programs. The company has also made a number of improvements, and at the time of this report, a number of advanced systems are under development. The company has made a number of improvements, and at the time of this report, a number of advanced systems are under development. The company has made a number of improvements, and at the time of this report, a number of advanced systems are under development.

**Contact:** 

- **Code:** SL
- **Address:** 35 Church Drive
  - Bedwell Ontario Canada M1J 4L7
- **Phone:** 905-332-3322

**Revised:** Dec 85

**LITTON SYSTEMS CANADA Ltd**

**Mechanical Systems Group:** USAF and others

- **Helicopter Icing Detection Systems:** USAF, Canadian Forces, North Sea Airlines, AISLS/R&D, Contractor for US Army
- **Helicopter CFI Systems:** USAF, North Sea Airlines, Contractor for US Army
- **Other CFI Systems:** US Navy, Contractor for Canada in USA and Europe

**Avionics Production:** Support and manufacture production avionics subsystems for CFIs, AMS and a SOC I, in USA, and Europe

**Keywords:**

- **Communications:** Aerospace Security Systems
- **Radar Systems:** Antenna and test
- **Data Processing:** Test Management, Flight Data
- **Contact:** H. C. Prichard, Director
- **Intercom/Design:** M. J. Boon, Senior Engineer
- **Manuf. Control:** E. S. F. Hobson, Senior Engineer
- **Data Reduction:**

**Revised:** Dec 85

**LITTON SYSTEMS CANADA Ltd**

**Code:** SL

**Address:** 35 Church Drive

**Bedwell Ontario Canada M1J 4L7**

**Contact:** M. A. Bowe, Director Marketing - Aircraft Division

**History:** LITTON SYSTEMS CANADA Ltd. is a major supplier of electronic equipment for military and commercial programs. The company has expanded and improved its test equipment and test facilities over the years to meet the requirements of aerospace applications and current programs. The company has made a number of improvements, and at the time of this report, a number of advanced systems are under development. The company has made a number of improvements, and at the time of this report, a number of advanced systems are under development. The company has made a number of improvements, and at the time of this report, a number of advanced systems are under development.

**Capability:** LITTON SYSTEMS CANADA Ltd. is a leader in the design, development, manufacturing and marketing of precision electronic equipment for military and commercial use. The company has been a major supplier of electronic and mechanical components to the Canadian Forces since the late 1960s. The company has expanded and improved its test equipment and test facilities over the years to meet the requirements of aerospace applications and current programs. The company has made a number of improvements, and at the time of this report, a number of advanced systems are under development. The company has made a number of improvements, and at the time of this report, a number of advanced systems are under development.

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number of commercial and military customers as depot test stations. The LATS is currently being expanded to accommodate the testing requirements of the F-18 Expanded Lightening Test Set (ELTS) for their depot test stations to support their new fighter programs.

In June 1967, the company began broadening the scope of the projects it pursued and competed for and won the contract for the supply of CCS-240 Command and Control System for the Canadian DDH-280 class destroyers. This program established the in-house capability for advanced systems engineering, software development, and display manufacture. A key part of this program was the creation of a Program Generation Center which led to the development of simulation programs and the subsequent marketing by the company of its line of ISIS Civilian Air Traffic Control Simulators and NIS Ground Control Intercept Military Simulators. Other systems engineering capabilities have been exploited on a variety of programs such as the DOT Regional Air Traffic Simulators, the Air Navigator Procedures Trainer for the B-2 and the Sea King Helicopter Tactical Simulator.

The expertise acquired in Systems Engineering was also responsible for the design and development of Liton Integrated Security Systems. These computer-based systems combine complete perimeter detection, surveillance, access control and radio communication to provide the necessary level of protection. The company has obtained contracts for these systems for implementation in Maximum Security Penitentiaries and Nuclear Power Generating Stations.

Previous in-depth experience in the development of software in both the military and systems engineering fields made LSL the logical choice for the contract to develop the Data Interpretation and Analysis Center for the Maritime Command of the Canadian Forces. The DIAC correlates current and historical data enhancing mission planning and control.

In order to ensure that its products and areas of expertise stay abreast of the current technology, LSL is committed to a high investment in research and development. Recently, this effort, combined with assistance from the joint Canadian-US development contract, resulted in the next-generation aircraft cockpit displays. LSL has developed a solid-state, modular, flat panel display system using light emitting diode technology for use in the military environment. This system has recently been selected by General Dynamics for implementation in the F-16 aircraft.

Another successful R&D program that has also progressed to production is the Initial Reference Flight Inspection System (IRFIS). IRFIS is a self-contained, accurate and terminal navigational calibration system that performs calibration of Category I, II and III Instrument Landing Systems with higher accuracy and lower operating costs than other systems currently in use.

LSL's expertise in the development of specialized systems supported the award of the contract for the Automatic Data Link Plotting System (ADLPS). ADLPS is designed to meet the performance specification issued by the Canadian Navy as a retrofit system for a number of different interface and installation requirements. ADLPS is a complex, light weight, shipboard, computer-assisted, real-time, command control and tactical data communications system which can be fully integrated with existing shipboard systems.

Another example of the successful implementation of R&D and systems engineering is the Ligor family of Airborne Search Radar Systems. Ligor entered the field in 1972 when, in conjunction with the Air Division of Caledon-Hamilton, developed and demonstrated electromagnetic systems for fixed installation in the Canadian Forces CH-146 Sea King Helicopters. Since that time, a number of different systems have emerged with a vast capability. The Ligor SAR has been a flying height and the new system is being flown in the U.S. and other countries around the world, continuing to evolve and improve systems in ASW capabilities.

LSL has recognized that an electronic system manager is a national priority, and has taken the necessary steps to equip the company with the organization and skilled management, technical personnel and state-of-the-art computer facilities to undertake the management of complex electronic and avionic programs.

**Average Work Force:**
- Engineers: 600
- Tech. Staff: 500
- Other: 300

**Gross Sales:**
- 1971: $126M
- 1972: $156M
- 1973: $186M

**Plant Size:**
- Approx. 500,000 sq ft

**Keywords:**
- Aircraft
- Computers
- Electronics
- Radar
- Security & Safety
- Software
- Testing & Equipment
- Military
- Commercial
- Data Analysis
- Electronics
- Optoelectronics
- Solid State Devices
- Fiber Optics
- Simulators
- Repair & Overhaul
- Military
- Civilian
- Air Traffic Control
- Maritime

**Revised:** Dec 75

**LUMONICS Inc**

**Code:** LUM

**Address:** 105 Shaver Road
Kanata, Ontario, Canada K1C 4A4

**Contact:** Mr. Roger Savage, Dir. Mktg. & Sales Products - West S. A.

**History:** Luminics Inc is a Canadian-owned manufacturing company incorporated in 1964 with subsidiaries in the U.S. and the U.K. that specializes in a range of Nd YAG and Nd:Glass laser-based instruments. The company has expanded its product line and services to include many applications in the medical and industrial markets. It has specialized in the development and production of laser systems for medical and industrial applications. The company's expertise in the field of laser technology has been recognized by numerous awards and accolades, with its products being used in a variety of industries. The company continues to invest in research and development to stay at the forefront of laser technology. The company has a large and skilled workforce, and its products are used in a wide range of applications, from medical procedures to industrial manufacturing. The company's commitment to excellence and innovation has earned it a reputation as a leader in the laser industry.

**Engineering:**
- Luminics specializes in laser-based instruments for medical procedures, including CO2 lasers used for ablative procedures. The company has a range of products and systems that are used in medical applications, including the treatment of various diseases and conditions. Luminics has been manufacturing laser systems for scientific research since 1978 and has continued to grow its product line over the past 25 years.

**Average Work Force:**
- Scientists & Engineers: 40
- Other: 50 (in Canada)
- Others: 30 (in the U.K.)
- Others: 20 (in Canada)
- Others: 80 (in the U.S.)
Lasers

Keywords: Gas Lasers

Experience: They have not undertaken any USAF-sponsored R&D and carry out extensive in-house R&D for the Canadian Government.

Plant Size: 50,000 sq ft (Canada)

Experience: Lumonics is interested in working with the USAF and has done so in the past in the form of providing standard lasers. They have not undertaken any USAF-sponsored R&D. They carry out extensive in-house R&D for the Canadian Government.

Gross Sales: 1978/79 = $4.5 M
1998 = $7 M
1982 = $11 M
(with JK Lasers, approx $15 M)
1983-1998 = $19 M


Revised: Dec 83

MACDONALD DETTWILER & ASSOCIATES Ltd

Code: MDA

Address: 3751 Shell Road
Richmond, British Columbia, Canada V6X 2Z9

Contact: Dr Marshall N Prentice, Sales Manager - (604) 278-3411

History: MDA is a privately owned Canadian company formed in 1969 with a single plant in Vancouver, BC.

Availability: MDA is a leading supplier of digital systems in the fields of remote sensing from air and space, image data processing, and satellite flight operations. It is a high technology firm whose main areas of business are: (1) remote sensing satellite processing systems (especially for the NASA Landsat series), (2) meteorological satellite processing systems for all the major satellites, (3) synthetic aperture radar (SAR) digital processors for airborne and spaceborne sensors, (4) aviation systems for flight operations support, (5) high speed film image recorders, and (6) electro-optical imaging scanners.

MDA supplies complete ground stations for the reception and processing of data from polar orbiting and geostationary meteorological satellites. Their systems include a design capability which permits extended interactive analysis of the meteorological satellite data, and provides for the overlay of conventional measured and forecast meteorological parameters on imagery to enhance its usefulness in forecasting.

MDA designs and manufactures digital processors for both airborne and space borne SARs. Their developmental designs are based on computer software and on high speed electronic hardware. This allows them to supply small fast units for aircraft and larger ground based systems, which can be designed to process satellite generated radar data. Their IRIS product is a complete airborne SAR system with dual frequency transmit and receive and the capability of image storage, downlink, or real-time hard copy on the aircraft.

MDA's flight operations digital equipment is used by the commercial aviation industry. Their major project is a Flight Operations Computer System (FOCUS) which automatically plans all scheduled and charter flights for an airline. FOCUS can minimize fuel consumption by calculating the optimal
flight path and flying altitude based on the forecast weather conditions. FOCUS files the flight plan with the air traffic control authorities and in turn monitors the progress of the flight.

The MDA FIRE 240 laser film image recorder exhibits high resolution, high geometric accuracy and high throughput. It is rugged, light-weight, and allows for unattended operation. A color version has been produced with similar high resolution and high speed.

The airborne imaging scanner produced by MDA is a lightweight, multispectral, pushbroom scanner with real-time data processing and high radiometric sensitivity. It contains no mechanical components and allows selection of spectral bands by means of interchangeable optical filters.

**Average Work Force:**
- Elect Eng – 60
- Data Processing – 70
- Systems Engs – 20
- Scientists – 15
- Admin – 95
- TOTAL – 260

**Gross Sales:**
- 1983 – $24M (50% exported outside North America) (growth rate 25% per year)

**Plant Size:**
- 69,613 sq ft

**Equipment:**
- MDA’s equipment includes Digital Electronic Assembly & Test Facility; General Purpose Computer Facility; and Systems Integration Rooms.

**Experience:**
MDA had served as prime contractor on large scale systems for Swedish Space Corp, Australia, National Research Council (Thailand), Indonesian Space Agency, German Space Agency, European Space Agency, Swissair Transport Co Ltd, Canada Center for Remote Sensing, and Atmospheric Environment Service Canada. They have served as subcontractor to Bendix, TRW Systems, General Electric Co., Jet Propulsion Laboratories, NASA, Messerschmitt-Bolkow-Blohm (W Germany), National Space Development Agency of Japan, and Hitachi.

**Keywords:** 1 = Aircraft, 6 = Computers, 7 = Electronics, 9 = Environment, 10 = Image Processing & Optics, 11 = Lasers, 15 = Radar, 18 = Space Systems, LandSat = 18, Image Processing = 9, 10, 15, 18, SAR = 1, 15, 18, Remote Sensing = 1, 18, Image Recorder = 1, 7, 10, 18, Flight Operations = 1, 6, Digital = 1, 7, 15, 18, Ground Stations = 18, Software Systems = 1, 7, 15, 18, Data Handling = 1, 10, 18, Meteorological Satellite Processing Systems = 9, 10, 18, Weather Forecasting Systems = 9, 18, Synthetic Aperture Radar = 1, 15, 18, Weather Image Processor = 9, 10, 18, Interactive Analysis = 9, 10, 18, Laser Film Image Recorder = 1, 7, 10, 11, 18

**Revised:**
- Dec 83

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**E. S. MANTIS RESEARCH CORP**

**Code:**
- ESM

**Address:**
- 370 East Esplanade
  North Vancouver, British Columbia, Canada V7L 1A4

**Contact:**
- Mr. E. Sitnam, President – (604) 929-5245

**History:**
A Canadian owned company, incorporated in April 1976.

**Capability:**
E.S. Mantis Research Corp is engaged in the design, development and manufacture of solar collectors. They have developed a relatively small, lightweight collector that is touted as highly efficient. The unit produces working fluids up to 149°C (300°F) in a short time period without tracking the sun. The unit can readily be incorporated into systems for water and space heating, air conditioning, desalination, and generation of electricity. They will be producing a semi-parabolic, high temperature solar collector in early March 1984.

**Average Work Force:**
- Professionals – 3
- Labor Force – 12

**Gross Sales:**
- No Data

**Plant Size:**
- 12,000 sq ft

**Experience:**
- No Data

**Keywords:**
- 8 = Energy, Solar Collectors = 8, Solar Systems = 8

**Revised:**
- Dec 83

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**MARS AERIAL REMOTE SENSING Ltd**

**Code:**
- MAR

**Address:**
- 938-2nd Avenue N W
  Calgary, Alberta, Canada T2N 0E6

**Contact:**
- Dr Frank G Bercha, President – (403) 270-3006

**History:**
The company was incorporated in 1980 in Calgary, Alberta, and currently has a branch office in Ottawa, Ontario, St Johns, Newfoundland, and Phoenix, Arizona. The company is 100% Canadian owned. It is affiliated with F G Bercha and Associates Ltd, a Canadian consulting company.

**Capability:**
The company specializes in providing an integrated remote-sensing service. It owns and operates a Gulf Stream G-1 aircraft equipped with a side-looking airborne radar of the APS-94D type, as well as an assortment of other sensors including RC-8 cameras, multispectral camera, thermal scanner, and magnetometer. The side-looking radar is of aerospace technology caliber and includes both analog and digital output. It is capable of storing the digital output for subsequent digital interpretation. The hardware system is the only one of its type in the world. As such, MARS possesses a unique capability in terms of hardware. In addition, the MARS approach to integrated remote sensing providing a useful information product has made it well known for its capability in solving information related remote-sensing problems through judicious design, execution, interpretation and analysis of remote-sensing program images.

**Average Work Force:**
- Total – 20 (including executive, engineering staff, aircrew, mechanics, radar engineers, sensor technicians and support staff)

**Gross Sales:**
- 1980/1982 – $3.0M (Per Annum)

**Plant Size:**
- Office Space – 2,500 sq ft
- Industrial Space – 3,000 sq ft
- Additional space is leased for aircraft maintenance, electronic shops and general operations

**Equipment:**
- Grumman G-1 aircraft with APS/94D SLAR, RC-8 and I/S MS cameras, and TIR scanner constitute a unique commercial multi-sensor package

**Experience:**
The company has carried out work for most of the major US oil companies, including Exxon, ARCO, Amoco, Mobil, Chevron, Soho, and Philips, as well as selected projects for Burlington Northern and a number of mining companies. Its principal clients in Canada constitute the Government, Dome Petroleum, Petro-Canada, and Gulf Canada Resources.
**McDONNELL DOUGLAS CANADA Ltd**

**Code:** MDC

**Address:** Box 6013
Toronto AMF, Ontario, Canada L5P 1B7

**Contact:** Mr. Garret G. Ackerson, VP & General Manager - 677-4341

**History:** McDonnell Douglas Canada Ltd (MDCAN), a wholly owned subsidiary of McDonnell Douglas Corp., St. Louis, MO was federally chartered in July 64 to manufacture aircraft and other aerospace products. The plant and head offices are located adjoining the Toronto International Airport.

**Capability:** MDCAN is a fully-integrated high-technology manufacturer of aircraft structural components for both commercial and military jet aircraft. Capabilities include design assistance for major components and full management and implementation of tooling concepts, and design and manufacture for McDonnell Douglas DC-8, DC-9/MD-80, and DC-10/KC-10 aircraft. On these programs, MDCAN has taken on total project management responsibility including material and subcontract management. MDCAN has been a pioneer in manufacturing methods and equipment development, including substantial application of numerically controlled machines. Extensive work also has been done in the area of bonded metal components, automated machine-controlled drilling and riveting and milling of spars of extended length components.

MDCAN is a leader in the design and implementation of integrated computer assisted Management Systems in the ongoing development of Information Resource Management.

**Average Work Force:** Engineers - 66
Machinists - 827
Tool Makers - 215
Others - 2,992

**Gross Sales:**
1981 - $226.5M
1982 - $150.5M

**Plant Size:** 1,780,000 sq ft

**Equipment:** MDCAN's equipment is progressively updated to state-of-the-art with the result that MDCAN is a leader in computer aided manufacturing in the Canadian aircraft industry. The equipment used at MDCAN is tied into a well-equipped aircraft manufacturing facility producing large sophisticated airframe components such as MD-80 and KC-10 wings. Special equipment includes:
- Automated Hydraulic Powered Riveters - five 100' long machines; two 50' long machines
- Numerical Control Equipment - 51 mills and profilers, 2 lathes, 1 coordinate measuring machine, 1 digitizer plotter, and 2 tube benders
- Computing Equipment - 2 IBM 4311(2), 2 DEC DDP11/70, 1 DEC VAX, and 2 Perkin Elmer 3250
- Hydraulic Presses - 6 vertical and stretch form, up to 300 tons

Other facilities include the Engineering Laboratory, heat treat, paint and process, and mechanized penetrant inspection units up to 100 feet in length.

**Experience:** Since 1965, MDCAN has produced major fuselage structures for the DC-8 and major wing and fuselage structures for all commercial and military versions of the DC-9/MD-80 family. MDCAN was also active in the design and development of the DC-10, leading to the design and manufacture beginning in 1968 of detail and assembly tooling for the DC-10 wing. Production deliveries of DC-10/KC-10 components have continued uninterrupted since 1970, including several versions, both commercial and military. Tooling and production of F/A-18 structural components was begun in 1982.

**Keywords:** 1 = Aircraft, 12 = Machining, Components = 1, Structures = 1, Composite Fiberglass Components = 1, Fuel Systems = 1, Hydraulics = 1, Wiring = 1, Tubing = 1, Bonded Components = 1, Bonded Honeycomb Components = 1, Extended Length = 12, Forging = 12, Heat Treat = 12, Metalworking = 12, Coating = 12, Tooling Design & Fabrication = 1, 12

**MENASCO CANADA Ltd**

**Code:** MCL

**Address:** 1495 Cote Vertu Road
St. Laurent Montreal, Quebec, Canada H4R 1R3

**Contact:** Mr. Eric Eriksson, VP Marketing - 514-332-3330

**History:** Menasco is a wholly owned subsidiary of Menasco Inc (US) and was organized in 1971.

**Capability:** Menasco designs, develops, tests, and manufactures fixed-wing aircraft and helicopter landing gear systems. Also included in this capability are electro-hydraulic and hydro-mechanical systems related to primary and secondary flight controls, fly-by-wire electro-hydraulic flight controls, ground steering, including steer-by-wire aircraft hydraulic systems, variable wing and wing sweep actuation and machining of aircraft and helicopter components. They meet contractor and quality control standards as specified by FAA, DOT, MIL-O-9858A, NPC-200, and DND 1015. Physical and environmental testing is accomplished with among other facilities, three drop test towers which can also measure landing gear shimmy and steering characteristics. Brochures available upon request.

**Average Work Force:** Engineers - 35
Manufacturing - 448
Others - 175

**Gross Sales:** No Data

**Plant Size:** 208,000 sq ft

**Equipment:** Complete physical and environmental testing laboratory for landing gear, flight controls and actuating devices, including facilities for vibration, structural, stress survey, fatigue testing, and full complement of NC equipment and a computerized production control system.

**Experience:** Menasco Canada has produced equipment for the following manufacturers and aircraft - Boeing (727, 737, 757, CH-47), Bell (YAH-63, XV-15), Canadair (CL-41, CL-84), McDonnell Douglas (DC-10, Short Bros (SD-30), Sikorsky (CH-53), Program and facilities have been approved by major military prime contractors and government agencies in the US and Canada.

**Keywords:** 1 = Aircraft, 12 = Machining, Landing Gear Components = 1, 12, Landing Gears = 1, Helicopter Systems = 1, Flight Control Systems = 1, Control Systems = 1, Hydraulics = 1, Ground Steering
MICROTEL PACIFIC RESEARCH Ltd

Code: MPR
Address: 8999 Nelson Way
Burnaby, British Columbia, Canada V5A 4B5
Contact: Mr. Mal Phillips, Custom IC Manager - (604) 294-1471

History: Microtei Pacific Research Ltd is the wholly owned research and development subsidiary of AEL Microtel Ltd. The headquarters building of MPR is located in the Discovery Park Complex at Simon Fraser University on Burnaby Mountain near Vancouver, BC. In addition to the modern facilities available within the headquarters building, employees have open access to many of the services provided by Simon Fraser University. A branch office, whose staff are engaged primarily in telecommunications related planning studies and standards activities, is also maintained in Ottawa.

Capability: MPR's primary role as an R&D facility is to develop telecommunications, switching, transmission, and terminal equipment products for manufacture and marketing by its parent. However, the company also performs advanced studies to the areas of network planning, new services development, and product planning for its parent and under contract to BC Tel, the Trans Canada Telephone System, and other organizations. An important aspect of the development activities is the design and development of custom large scale integrated circuits, thick and thin film hybrids, polylithic crystal filters and other critical components. The Pacific Microsystems Center, a division of MPR, offers component design and development services to outside manufacturers. The principal areas of research and development are summarized below:

- Digital Switching Systems
- Subscriber Terminal Equipment including apartment entry systems (Enterphone), modems, and telephone sets
- Satellite Communication Systems
- Microwave Radios
- Frequency Division Multiplex Modulation Equipment
- Pulse Code Modulation Systems
- Power Supplies
- Business Information Systems including a variety of Termox terminals and converters
- Supervisory and Control Systems
- Systems Studies including network, services and product planning and human factors research
- Microelectronics and Component Design and Development
- Cellular Mobile Radio Control Systems
- Subscriber (Telephone) Data Communications
- Support Activities: such as computer services, model shop, library services, component evaluation and test

Average Work Force: Professionals - 272
Gross Sales: No Data
Plant Size: 95,000 sq ft (Systems Design Area)
5,000 sq ft (Clean Room Area)
Experience: Experience has been primarily with its parent company, AEL Microtel Ltd.

MICHEL COMMUNICATIONS SYSTEMS Ltd

Code: MCS
Address: 300 Legget Drive
Kanata, Ontario, Canada K2K 1Y5
Contact: Mr. Peter Rossiter, VP Engineering - (613) 592-3020
Mr. Bob Lyons, VP Advanced Systems - (613) 592-3020

History: Miller is a high technology company founded in 1974 with no US subsidiaries. It was originally formed as a systems engineering company specializing in the planning design and implementation of a wide range of communication systems.

Capability: MCS is involved in areas where voice and data signals are transmitted, detected, processed, measured, jammed or secured. The company is organized into five divisions, three of which are engaged in electronic warfare. The divisional activity is broken down as follows:

- EW Division - Radar ESM and Microwave Systems
- Telemetry Division - High-speed A/G Data Links
- Satcom Division - Studies in error correction, digital transmission techniques and system architecture
- Signal Processing - Digital modems and navigation systems development

The company has four basic products available: Analog Voice Security Devices, Low Rate TDMA Air-to-Ground Telemetry Links, and a family of software simulation programs for Satellite Transmission Planning.

Average Work Force: Engineers/Computer Scientists - 40
Others - 20

Gross Sales: 1983 - $3.2M
Plant Size: MCS is housed in a modern 15,000 sq ft plant (expandable to 40,000 sq ft on current site). The plant is well
Keywords: 5 = Communications, 7 = Electronics, 15 = Radar, 17 = Testing/Test Equipment; Ground Stations; 18 = Space Systems, 19 = Navigation; 7, 18 = Radio Communications = 5, 18, HF Communications = 5, Data Acquisition = 18, Data Processing = 18, Communications = 5, Test Equipment = 19, Test Instrumentation = 19, Signal Processing = 15, Satellite Communications = 5, 18, Adaptive Receivers = 5, Modems = 5, 7, 17, 18, Digital Modems = 5, Signal Identification Systems = 5, Electronic Warfare = 5, 7, Telecommunications = 5, Terminals = 5, 7, 18, Synthesizers = 5, HF Modems = 5, 7, 17, 18, HF Adaptive Antenna Arrays = 5, 7, Spread Spectrum Modems = 5, 7, 15, 18, Digital Communications = 18, SCPC = 5, 18, DAMA = 5, 18, TDMA = 5, 18, SSMA = 5, 18, Voice Privacy Communications = 5, Jamming = 5, Repair & Overhaul = 7, Build To Print = 7, System Design = 5, 18, Spectrum Analysis = 18, UHF Telemetry Transmitters = 5

Revised: Dec 83

MONITEQ Ltd

Code: MON

Address: 630 Rivermede Road
Concord, Ontario, Canada L4K 2H7

Contact: Dr. T.V. Ward, Vice President, Operations - (416) 669-5334

History: Moniteq Ltd is a fast growing, innovative high technology company whose instruments and services encompass the field of environmental monitoring and remote sensing. Over a six year period, Moniteq has grown to an organization of 45 people consisting of highly skilled scientists and engineers with expertise in optical physics, electronics and data processing, plus a full support staff. Moniteq is structured into three complementary divisions — Instrumentation, Applications and Manufacturing.

Capability: Moniteq's Instrumentation Division is responsible for the development of electro-optical instruments from initial concept to final commercial design. Applications of these instruments involve the many aspects of monitoring trace environmental gases, industrial process gases and remote sensing of the earth's resources.

The Applications Division offers services for the processing and interpretation of remotely sensed data from aircraft and satellites.

The Manufacturing Division manufactures and markets commercial instruments which have been developed by Moniteq. This product line is continually expanding with new developments in air pollutant monitoring, remote sensing, and industrial process measurement. Moniteq's products include:

- Air Quality Monitors
- Visible and Infrared Remote Sensors
- Visible and Infrared Spectroradiometers
- Water Quality & Depth Mapping
- Environmental Data Processing

Moniteq also provides consulting services for the implementation of remote sensing programs and air quality network management programs.

Average Work Force: PhDs - 6, Engineers - 10, Others - 20

Gross Sales: 1980 - $1,1M
1981 - $1,4M
1982 - $1,7M
1983 - $2,3M (Projected)

Plant Size: 8,100 sq ft

Equipment: Moniteq's equipment includes — Instrument research and development laboratory including Moniteq developed vacuum system, drafting office, machine shop including lathes and milling machines, optical clean room, computer room with a PDP 11/24, data reduction room, and custom manufacturing.

Experience: Moniteq's present and past customers include:

Government:
- Canada Center for Remote Sensing, Sensor Development - Ottawa, Ontario
- Atmospheric Environment Service - Downsview, Ontario
- Environmental Protection Service - Ottawa, Ontario
- Environmental Protection Service - Halifex, Nova Scotia
- Canada Center for Inland Waters - Burlington, Ontario
- Air Resources Branch, MOE - Toronto, Ontario
- Department of Fisheries and Environment, DPAT - Program - Ottawa, Ontario
- Defense Research Establishment - Ottawa, Ontario
- National Research Council - Ottawa, Ontario
- Laboratory Services Branch, MOE - Rexdale, Ontario

Industry:
- Environmental Data Corp - Monrovia, CA
- The Steel Co of Canada - Hamilton, Ontario
- Ontario Hydro - Toronto, Ontario
- Texaco Canada Inc - Nanticoke, Ontario
- Environcon Ltd - Toronto, Ontario
- Rayrock Mines Ltd - Toronto, Ontario
- Alberta Research Council - Edmonton, Alberta
- Health Survey Consultants (Canada) Ltd - London, Ontario
- Environment Ecology Inc - Buffalo, NY
- Shell Canada Ltd - Sarnia, Ontario
- Polysar Ltd - Sarnia, Ontario
- Alcan Ltd - Arvida, Ontario
- Wilco - London, Ontario
- Canadian Electrical Association - Montreal, Quebec

In addition, Moniteq personnel have carried out development programs for many private and government organizations in Canada, the US and Europe. A partial list includes:

Communications Research Center - Ottawa, Ontario
- Bedford Institute of Oceanography - Bedford, Nova Scotia
- Defense Research Establishment - Ottawa, Ontario
- Forest Fire Research Institute - Ottawa, Ontario
- NASA - Langley, VA
- NASA - Cleveland, OH
- NASA - Goddard Space Flight Center, MD
- Environmental Protection Agency - North Carolina
- Environmental Protection Agency - Las Vegas, Nevada
- Texaco Exploration Ltd - Calgary, Alberta
- Noranda Ltd - Toronto, Ontario
- Central Electricity Generating Board - England
- TRW Sensor Development - CA

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Keywords: 9 = Environment, 10 = Image Processing & Optics, 17 = Software Services, 20 = Miscellaneous, Pollution Monitoring = 9, Hazardous Gas Detection = 9, Spectral Measuring Devices = 9, Oceanographic Instruments = 9, Water Depth & Quality & Bottom Type Mapping = 10, Airborne Imagery = 10, StarTracker = 10, Data Acquisition = 17, Data Reduction = 17, Quantitative Interpretation of Airborne & Satellite Imagery = 17, VUV Light Sources = 20.

Revised: Dec 83

MPB TECHNOLOGIES Inc

Code: MPB

Address: 1725 N Service Road, Trans Canada Highway Dorval, Quebec, Canada H9P 1J1

Contact: Dr M P Bachynski, President - (514) 683-1490

History: MPB is a Canadian owned high technology company that was incorporated in 1976. It is a spin-off from RCA Ltd. There are no other locations in Canada and no US subsidiaries.

Capability: MPB occupies a modern 18,000 sq ft facility which includes a library, central computer room, machine shop, laboratories and production area. They are fully facilitated to conduct experimental, theoretical, and developmental work in a variety of fields. These include lasers, electromagnetics and radars, digital electronics, and instrumentation.

Laser work includes the design and development of CO₂ continuous wave lasers (1-20 watt range, >10,000 hours lifetime, sealed off) and CO₂ waveguide lasers with wide band width and good tunability (sealed off, 10,000 hours lifetime). They have a capability with iodine lasers in conjunction with mode locking experiments, and have conducted laser spectroscopic studies. They have also been involved with heterodyne detection techniques in conjunction with optical fiber hydrophones that can measure 1/500 of a fringe (phase shift: 360/500°). A program is in place for the development of far infrared lasers, a FIR heterodyne receiver breadboard, and the construction of advanced FIR detector packages including reflector mounts. They are involved in a program on the application of lasers to satellite communications (MILSATCOM) and are developing a laser communications test bed and propagation measurement facility for a Canadian Government laboratory.

In the area of electromagnetics and radar technology, MPB has carried out research with synthetic pulse radar for airborne measurement of sea-ice thickness, and in the area of radar/chaff interaction and target enhancement. They have been involved with communications analysis (cross polarization effects, earth and satellite communications), and oil spill detection using electromagnetic techniques and antenna research (wide-band VLF antennas). The company recently delivered an airborne C-band scatterometer for measurements of ice surface roughness. The company is involved in projects related to target augmentation and to deployment of chaff including the NATO MACE Trials.

In the digital electronics area, MPB has expertise in electronic graphics, displays, training systems, and graphic composition. They have also been involved with special purpose communication terminals (transcontinental feix operator communications) and special purpose data recorders (based on microprocessor technology).

In the area of instrumentation, MPB is involved with a Space Shuttle experiment (wave injection facility), where their main responsibility is the software for the control electronics, the system test equipment, the plasma simulator, and various systems engineering tasks. Other projects include hazardous gas detection, the Canadian Varennes Tokamak (data acquisition, preionization, diagnostic instrumentation - probes, lasers, microwave interferometry), and software development (controls and on-line data analysis).

MPB products include the VISTA 80 Graphics System, a versatile character generating system which utilizes a standard keyboard for message composition, and a magnetic diskette system for bulk storage of messages. The system is based on microprocessor technology. Primary use is for presenting alphanumeric information in news, weather, sports & election programs, and for titling & credits. The company recently introduced their VISTA 90 electronic graphics and composition system for applications to business and science. The system permits the composition of picture quality graphics by various input devices and hard copy through a choice of 35mm slides, printer, or video tape. Their laser communications system is capable of video, multiple voice channel, or high bit rate digital transmission. The system has a video signal to voice ratio greater than 60 dB and is immune to RF interference. They have made major sales to the US of their sealed-off CO₂ lasers that are long lived (greater than 38,000 hours) and have power ranges from 3 to 12 watts TEM⁻⁰ and 1 to 18 watts multimode. Suggested uses are optical communications, atmospheric research, spectroscopy, far infrared laser excitation, materials processing, surgery, etc. MPB has recently introduced a number of new laser products which include a 60 watt cw CO₂ laser, a low voltage mirror translator with control electronics and a low-cost closed-loop cooler for use with the family of CO₂ lasers. Their final product is a High Intensity Light Source. It is a long (450mm) self-starting vortex stabilized arc discharge. It has a continuous radiation spectrum, can be started instantaneously and can deliver a hundred times more light output than a high power mercury arc lamp light-head of comparable dimensions.

Average Work Force: PhDs - 18, Engs - 16, Others - 14

Gross Sales:
1979 - $1.3M
1980 - $1.5M
1981 - $2.0M
1982 - $2.7M
1983 - $3.5M

Plant Size: 18,000 sq ft

Experience: MPB's typical clients include the Canadian Government (Dept of National Defence, Communications Research Center, National Research Council), AFOSR, CBC, SPAR Aerospace Ltd, Telesat Corp, Teleglobe Canada, plus others. Recent US customers have included the Department of Energy (Nevada Div), Hughes Aircraft, RCA Astroelectronics, and National Oceans & Atmospheric Administration.


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MUIRHEAD SYSTEMS Ltd

Code: MSL
Address: 50 Galaxy Blvd, Unit #4
          Rexdale, Ontario, Canada M9W 4Y5
Contact: Mr J B Crompton, General Manager -
         (416) 675-7450

History: Muirhead Systems is a wholly owned subsidiary of the
UK based company, Muirhead plc. The Canadian subsid-
iary was founded in Canada in 1954. The company has a
sister subsidiary located in Mountainside, NJ.

Capability: Muirhead Systems has a world product mandate
to design and manufacture computer based image process-
ing systems for applications primarily in meteorological satel-
Elite Imagery, newspaper wirephoto and law enforcement.

Muirhead has developed and design expertise in both
software and hardware for image processing, data manage-
ment, video display and graphical data distribution. These
systems are currently in service with the Atmospheric Environ-
ment Service Canada, the Canadian Coast Guard and the
Department of National Defense for their weather forecasting
facilities.

Average Work Force: Graduate Engineers - 5
                     Technologists - 5
                     Others - 10

Gross Sales: 1981 - $1.4 M
             1982 - $2.2 M
             1983 - $2.2 M
             1984 - $2.4 M (Projected)

Plant Size: 7,000 sq ft

Equipment: Muirhead employs digital electronics design and
assembly facilities, microcomputer software development
systems, and in-house DEC computer systems.

Experience: Muirhead’s customer base includes the Atmo-
ospheric Environment Service and several other meteorologi-
cal agencies around the world. Their military customer base
includes the USAF - who has recently taken delivery of a com-
puter interface for processing of GOES Satellite Imagery. Cu-
tomers for relevant products include - Atmospheric Environ-
ment Service, Department of National Defense. Canadian
Coast Guard, Ministry of Defense (UK) Meteorological. New
Zealand Meteorological Department. Danish Meteorological
Institute. USAF (Vandenburg AFB, CA). World Meteorologi-
Arabian Meteorological Department (via International Aerad)'

Keywords: 6 = Computers. 7 = Electronics.
           9 = Environment. 15 = Radar. 17 = Software Services.
           18 = Space Systems. 20 = Miscellaneous. Image
           Graphical Data Distribution Systems = 6. 8. 15. Data
           Forecasting Systems = 7. 9. 17. 18. Radar Rain
           Forecasting = 7. 9. 17. 18. Design To Requirements = 7.
           Revised: Dec 83

MYRIAS RESEARCH Corp

Contact: Dr J R Savage, Dir of Applications Research -
         (403) 432-1758

History: Myrias Research Corp is a Canadian owned corpo-
ratio established in 1982 to design, manufacture and sell
computer hardware and software for high-speed parallel com-
puting. It is a subsidiary of Chon Corporation, an Edmonton
based software company which produces and markets the
only full language checkout compiler for Algol 68

Capability: In the third quarter of 1984, Myrias Research Corp
will introduce the Myrias 4000, a very high speed parallel com-
puter. The minimal configuration has over 4000 microproces-
sors (Motorola 68000 s) and 512 Mbytes of memory. It is from
2 to well over 10 times faster than a Cray 1. For many defense
applications such as transonic shock and multidimensional
flows, and scalar problems such as ray tracing (for sonar
analysis), the higher speed range is applicable. For problems
which can be done in fixed point arithmetic such as signal
processing and flight simulation, the Myrias 4000 is up to 50
times faster than a Cray 1. The Myrias 4000 has the first truly
expandable computer architecture. Up to 16 times the mini-
mal configuration can be configured to meet much higher
speed and larger memory requirements. The Myrias 4000 has
a very high bandwidth for handling real-time data and signal
processing.

Component failures within the Myrias 4000 system are han-
dled by high-level recovery strategies. The failure recovery
mechanism ensures the system will not go down. Because
the failure recovery is based on distributed hardware and soft-
ware components (which can be physically distributed since
fiber optic communication links are used), the Myrias 4000
can survive hits in a combat situation.

Muirhead parallel Fortran makes the Myrias 4000 very easy to
program, especially compared to vector machines such as
the Cray and Cyber 205. Existing programs can be run with
little or no modification. The Myrias 4000 is physically small
and consumes little power, so no elaborate cooling system
or other expensive support is required. The architecture of
the Myrias 4000 enables system performance to be improved
as the microprocessors on which it is based become faster
and more capable.

Average Work Force: PhD - 2
                    MSc - 2
                    Engineers - 2
                    Others - 10 (Presently expanding)

Gross Sales: No Data

Plant Size: 10,000 sq ft (under construction)

Equipment: Complete digital electronics laboratory and
facilities. In-house and time-shared computer systems include
VAX and AMDahl.

Experience: Present customers of Chon Corp are mainly univer-
sities in Europe. Japan, Canada and the US

Keywords: 1 = Aircraft. 2 = Armament. 3 = Avionics.
           4 = Chemistry. 5 = Communications. 6 = Computers.
           7 = Electronics. 8 = Energy. 9 = Environment. 10 = Image
           Processing & Optics. 13 = Missiles. 15 = Radar.
           Aerodynamic Simulations = 1. 3. 13. Flight Simulation = 3
           Air Traffic Control = 3. 5. Combat Control = 5. 6. 7. Flame
           Advection = 2. 4. Vulnerability Analysis = 1. 2. 4. 13. 18.
           Ballistics = 2. 13. Sonar Analysis = 10. 20. Seismic
           SAR Processing = 10. 15. 18. Cryptography = 5. 20.
           Cartography Processing & Database = 10. 13. VLSI
           Simulation = 6. 7. Predictive Process Control = 1. 2. 18.
           20. Distributed Processing = 1. 5. 18. 20. Rational Drug

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NORTHERN AIRBORNE TECHNOLOGY Ltd

Code: NAT
Address: 1839 1st Ave.
Prince George, British Columbia.
Canada V2L 2Y8

Contact: Mr. W Shawee, President - (604) 562-2332

Capability: Northern Airborne Technology Ltd has R&D expertise in avionics, flight recorders, computer systems (airborne), lighted panels (LED/fiber optics), and visual information devices. Their avionics products include external, internal airborne sound systems, communication systems (intercomm., audio, cont.), and custom avionics control & interface systems.

Average Work Force: Management - 3
Engineering - 4
Production - 6
Field Support Staff - 2

Gross Sales:
1980 - $0 12M (6 months)
1981 - $0 76M
1982/83 - $0 85M
1983/84 - $2 20M (forecast)
1984/85 - $4 30M (forecast)

Plant Size: 6,800 sq ft

Equipment: Northern Airborne Technology Ltd's equipment include machine shop (metal and plastic), engraving shop, artwork studio, photo lab/photo fabrication lab, ship/size wiring business security system (intercomm., audio cont.), and custom avionics control & interface systems.

Experience: Listed below are clients of Northern Airborne Technology Ltd and status of their projects:

**Client: Wulfsberg Electronics, Quebec Provincial Police.**
- Current projects:
  - A modular, ultra-flexible audio system and interface circuitry demonstrated.

**Client: National Research Council Target.**
- Current projects:
  - Work progressed on the HSA70 Helicopter stress analyzer.

**Client: Hughes Helicopters.**
- Current projects:
  - Design of remote control system for the Canadian Coast Guard SAR Hovercraft.

Keywords: 1 = Aircraft, 3 = Avionics
5 = Communications, 6 = Computers, 10 = Image Processing & Optics, 12 = Machining, 14 = Protective Equipment, 20 = Miscellaneous. Analyzer = 1, 14.
Fiber Optics Illumination = 1. Intercommunication Systems = 5. Lighted Panels = 1. 10. LEDs = 10.

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NORTHWEST INDUSTRIES Ltd

Code: NWI
Address: 9864 P.O. Box

Edmonton International Airport
Edmonton, Alberta, Canada T5J 2T2

Contact: Mr. F A (Floyd) Maybee. Operations VP - (403) 955-6300

History: Northwest Industries Ltd, incorporated in 1943, is a subsidiary of CAE Industries Ltd. Toronto, Ontario, Canada

Capability: Northwest Industries Ltd has the experienced personnel and facilities at the Edmonton International and Municipal Airports, to accommodate complete overhaul.
repair and modification of military and civil operators' aircraft. Extensive ground handling and testing equipment supported by an up-to-date technical publications library insures a turn-around with minimum of ground time. NWI's Mobile Repair Parties are equipped to service operator's fleets of aircraft off-site at any location with full technical support. The company is equipped to service the latest in radar, avionics and aircraft electronic equipment.

The manufacturing facility is capable of manufacturing aircraft components ranging from the floor assemblies and bulkheads of the wide body Lockheed L-1011 Tristar, the complete empennage of the Scottish Aviation Jetstream, and the center wings and tail pylon of the Boeing 707 to composite fiberglass epoxy conditioned air ducts for the Lockheed L-1011, electronic component racks and miniaturized circuitry for Hughes Aircraft company and sophisticated mechanical cable assemblies incorporated in the Spar Aerospace remote manipulator arm of the Columbia Space Shuttle.

**Average Work Force:** Engineering - 15
P Eng (2)
Quality Control - 25
Production - 250
Admin & Other - 210

**Gross Sales:** $18M

**Plant Size:**
- Edmonton Municipal Airport - 250,000 sq ft
- Edmonton International Airport - 50,000 sq ft

**Equipment:** Test and Inspection Equipment - avionics electronics, electrical hydraulics and mechanical test equipment, NDT radiographic, and ultrasonic and X-ray equipment.

Production Equipment - three axis, three spindle NC milling machines (25ft x 8ft), autoclave (6ft dia x 18ft), precision jig boring machine (96 in x 48 in table), drop hammer table (63 x 36'), rubber pad hydraulic forming press table (76 in x 76 in), hydraulic stretch wrap forming machine (20 tons), precision tube bender up to 3 1/2" OD capacity, cable (Kipling Complex, plus other test sites) x 76 in), hydraulic stretch wrap forming machine (20 tons), precision tube bender up to 3 1/2" OD capacity, cable swaging,splicing and proof loading, and heat treatment, cadmium plating, and anodizing.

A complete 60 page listing of equipment is available from Northwest Industries Ltd on request.

**Experience:** Northwest Industries Ltd customers include, Government of Canada Department of National Defense, United States Air Force, Spar Aerospace, Lockheed California Co, Hughes Aircraft Co and other major aircraft manufacturers and operators. The company holds Canadian Department of National Defense Approval No. 686-1/44, Canadian Ministry of Transport Approval No. 3/57 and US Federal Manufacturers Code No. 35598.

**Keywords:** 1 = Aircraft, 3 = Avionics, 7 = Electronics, 12 = Machining, 19 = Testing/Test Equipment, 20 = Miscellaneous, Structural Modification = 1, Repair & Overhaul = 1, 3, 7, Non Destructive Testing = 19, X-Ray = 19, Installations & Servicing = 3, 7, Instrument Repair = 1, Instrument Servicing = 1, Structural Components Manufacturing = 1, Flight Deck Fuses, Surface Manufacture = 1, Tooling = 12, Die Fabrication = 12, Sheet Metal Fabrication = 12, Fiber Glass Composite Components Manufacturing = 1, Wiring Harness Fabrication = 1, Control Cables Fabrication = 1, Component Fabrication = 1, 7, Tubing Assembly Fabrication = 1, Technical Publications Production = 1, 3, 7, Technical Writing = 20, Hydraulics = 19, Technical Illustration = 20.

**Revised:** Dec 83

**ONTARIO HYDRO**

(Research Division)

**Code:** OHR

**Address:** 800 Kipling Avenue
Toronto, Ontario, Canada M8Z 5S4

**Contact:** Dr A McMillan, Research Proposal Officer - (416) 231-4111, X6055

**History:** Ontario Hydro was established by Provincial Legislation in 1906 and has the authority to generate, buy and distribute electricity throughout Ontario. The Research Division which occupies the Dobson Research Laboratory, was founded in the 1920s and is one of the oldest and largest utility research laboratories on this continent. Ontario Hydro is a financially self-sustaining Crown Corporation that derives no revenue from taxes.

**Capability:** The Research Division of Ontario Hydro is a fully integrated facility with a broad range of capabilities in research, development and testing. Extensive experience with solving utility-related problems has produced a staff with expertise in such areas as materials science, high voltage science and engineering, concrete technology, organic and inorganic chemistry, biology and geotechnical engineering to name a few. The keyword list gives a more detailed account of the Division's areas of expertise. Many of the techniques and skills developed at the Research Division, while developed in support of the utility, are applicable in other areas.

**Equipment:** The following is a list of the major physical facilities. The Research Division also has various sophisticated test and measurement instruments in general use in its laboratories.

- **Electrical/Electronic** - High Voltage Laboratory, High Current laboratory, Industrial Processes Laboratory (high frequency power, impulse power, high temperature plasma), Electronics Development Laboratory, Mobile Cable Fault Location Laboratory, Mobile High Potential Test Facility, SF6 Substation (fuel scale), and Battery Laboratory.
- **Mechanical/Metallurgical/Structural** - Pump Test Complex (full-scale primary Heat Transfer Pump Test Set up to 12,500 hp), Seismic Qualifying Laboratory, Anoxic Chamber, Conductor Stress-Strain Laboratory, Heavy Mechanical Test laboratory, Non-destructive Evaluation Laboratory, Welding Laboratory, and Conductor Dynamics Full Scale Test Facility.
- **Chemical** - Analytical Chemistry Laboratory, Radioactive Materials Laboratory, Scanning Electron Microscopes, Surface Analysis Facility, Oil Laboratory, and Combustion Test Facility.
- **Environmental** - Mobile Environmental Monitoring Facility, Environmental Chamber, LIDAR, other Laser Systems, and Micrometeorological instrumentation.
- **Civil** - Soil and Concrete Analysis Laboratory.

**Experience:** In the past, the Research Division has won many research and development contracts from the Canadian Electrical Association, the Electric Power Research Institute, the Canadian Federal Government, and other public and private organizations, both domestic and foreign.
Equipment: Optical science & detectors, high voltage pulse techniques, solid state electronics, laser devices, and sensors & transducers. Past year activities include new product development and manufacturing as well as contract research on special ultra-high speed photodetectors, ultra-high speed diode laser light sources, tunable infrared diode lasers, and a line of industrial electro-optical process monitors & controllers. The company has introduced an average of at least four products per year. Current research projects include ultra-fast photodetectors, ultra-fast laser diode sources, industrial monitors & controllers, a fiber optic data link, high voltage pulse measurements, an electronic streak camera, high-speed optical switches, fiber-based liquid sensors and infrared sources, and detectors based on lead salt materials.

Average Work Force: Scientists, Engrs. & Techs. - 19
Others - 2

Gross Sales: 1981 - $0.8M
1982 - $1.1M
1983 - $1.3M

Plant Size: ~1,000 sq ft

Equipment: OEI’s capability consists of a machine shop, assembly room, dark room, & circuit etching, electronics test & optics test areas, stock room, and shipping & receiving rooms. Five persons are currently assigned to manufacturing. Their R&D facility consists of lasers, optics, electronics & optics design, electronic assembly areas, a chemistry laboratory, materials processing room, areas of microscope &
spectral analysis, vacuum work & measurement, and a high voltage shielded room. Also included are special rooms for 'surface work' machining and modeling, and a library. The research staff consists of 7 Pds, 3 Mech Engrs, 1 MSc, 2 Ph's, and 1 Beng.

Much equipment includes high vacuum evaporator, electron microscope, evapotropic electrical and optical facilities, spectrophotometer, ellipsometer, diffusion furnace, vacuum furnace, optical microscopes, multiple beam interferometer, electron microscopes, and other associated instruments.

Experience: Optotek has experience with the US Air Force and NASA. They are interested in continuing their business with the DOD and NASA. Past contracts have been in the LED materials, devices, and displays areas. Principal programs with the US Air Force have been the Multimode Matrix LED Display, the Video Flat Panel LED Display, and the development of Multicolor LED Displays. The USN programs include manufacturing technology for advanced solid-state data presentation displays and a planned production program involving the RF-4 and P-3 reconnaissance systems.

Keywords: 1 = Displays; 2 = Electronics; 3 = Image Processing & Optics; 4 = Lasers; 5 = Infrared; 6 = Fiber Optics; 7 = Optical Communications; 8 = Electro-Optics; 9 = High Voltage Pulse Techniques; 10 = Solid State Devices; 11 = Sensors; 12 = Transducers; 13 = Photodetectors; 14 = Laser Light Sources; 15 = Laser Diode Sources; 16 = Measurement Systems; 17 = Data Links; 18 = Infrared Diode Lasers; 19 = Optical Switches; 20 = IR Sources; 21 = IR Detectors; 22 = Liquid Sensors; 23 = Liquid Crystals; 24 = Electro-optic Technology; 25 = Flat Panel Displays; 26 = Multicolor LED Displays; 27 = Data Annotation displays; 28 = Electronic Test Equipment.

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PACERLABS Ltd

Code: PAC

Address: 1496 Bedford Highway
Bedford Tower, Suite 200
Bedford, Nova Scotia Canada B4A 1E5

Contact: Mr. Stephen E. Rice, Technical Director -
902-838-7033

History: Pacerlabs Canada Ltd was originally a wholly-owned subsidiary of PACER Systems Inc. operating in Ottawa through the Systems Sciences and Engineering Division of Port Washington, Penn. During the 1970s, Pacerlabs completed several tasks for the Department of National Defense (DND) on the CM-12A Sea King Modernization Program as well as major effort involving software design, specification and development, and evaluation. It was for the Canadian Forces Data Communication and Analysis Center (DFAC) the land-based command, control and support element of the Aurora weapon system.

In May 1980, IMP Group Ltd conducted negotiations with Pacer in concert with DND and the Department of Industry, Trade and Commerce, acquiring a controlling interest. The company was renamed Pacerlabs Ltd and the corporate registry moved to Nova Scotia where operations began in October 1981.

Capability: Pacerlabs provides a wide range of professional services to support National Defense Headquarters and IMP Group Aerospace Division in Mission and Weapon Systems Evaluations. Operational Training System and Documentation Development. Pacerlabs principle activity includes the following military systems and software engineering:

- Software Design Documentation and Quality Assurance
- Independent Verification and Validation
- Computer Program Performance, Design and Test Specifications
- Specialist Weapon System Software Support and Maintenance Analyses
- Operational Training System and Documentation Development
- Future Systems Studies
Average Work Force: 9
Gross Sales: $1,711
Plant Size: 9,000 sq ft

**Equipment:** Pacemic has facilities for handling and storing material up to including NATO Secret, in accordance with Supply and Services Canada - Security Branch requirements.

A Tempo-bounded WANG multiplication word processing system is available for classified document and report preparation. It is supported by numerous integrated terminals, extensive hard disk storage and two high quality printers in their WANG Office Information System. Additionally, Pacemic utilizes a DEC microcomputer for mathematical analysis of design applications, as required. Pacemic maintains a drafting, graphics and reproduction capability appropriate to quality document and report preparation.

**Experience:** Pacemic's major activities are as follows:


- **CF-18 Hornet Engine Aircraft System:** In-Service technical evaluation of proposal for automatic-Canadian software support facilities and support system software support preparation of a comprehensive Statement of Requirements for a CF-18 Weapons System Software Support Facility to include software support and software evaluation service of Contractor Agents.


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**PATLON AIRCRAFT & INDUSTRIES Ltd**

**Code:** PAI

**Address:** 9531 Fairview Barr
Burnaby, British Columbia
Canada V5H 1J1

**Contact:** Mr. P. M. Martin, Executive Vice President (Daytime)

**History:** Patlon Aircraft & Industries Ltd has been in business for over 30 years and is 100% Canadian-owned. It is located at 9531 Fairview Road, Burnaby, British Columbia. Patlon Aircraft & Industries Ltd is the leading manufacturer of commercial and military aviation equipment in Canada. The company is a world-class manufacturer of high-quality aviation equipment, including aircraft components and systems. Patlon maintains offices and facilities in major cities across Canada and has a strong presence in the commercial aviation sector.

**Capability:** Patlon is an engineering services and manufacturing company specializing in the design, development, and production of aviation equipment, systems, and components. Patlon is a trusted supplier of high-quality aviation equipment to the aerospace industry, with a focus on innovation and excellence in product development. The company is committed to meeting the needs of its customers and ensuring the safety, reliability, and efficiency of its products. Patlon maintains a strong presence in the commercial aviation industry, providing a wide range of products and services to meet the needs of the aerospace sector.

fied materials and equipment with qualified products from multiple sources, usually at a lower cost. Paton has been particularly successful in this area with the Canadian military airframe and engine repair and overhaul depots.

Its selling procedure includes meeting with management, procurement, engineering, sales, service, and manufacturing personnel, depending upon the product and customer requirements. With its knowledge of the industry and personnel involved, it has the opportunity of discussing projects at the drawing board stage, and in many cases has been successful in having its equipment specified.

To summarize, Paton provides both spare support service as well as product support at the original equipment manufacturer level.

Average Work Force: Management - 4
Support Staff - 4
Sales - 10

Gross Sales: No Data

Plant Size: 6,000 sq ft (Toronto, Canada) 2,500 sq ft (Miami, FL)

Equipment: Paton is equipped with all the required communications equipment to conduct business around the world.

Experience: Paton provides the service mentioned above to several other countries. The list of foreign countries which it has sold to includes Germany, Turkey, Australia, Indonesia, the US, and virtually all South and Central American countries. The Miami office of Paton, which was opened in January 1980, has vastly improved Paton's ability to service both the South and Central American countries.

Keywords: Aircraft, Parts, Library, Airplane Parts

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PERLEY TECHNOLOGIES CORPORATION

Code: PTC
Address: 35 Monday Drive
Constance Bay, Ontario, Canada K0A 3M0

Contact: Mr. Daniel R. Perley, President - (613) 832-2500

History: PTC is a highly specialized systems consulting firm offering expertise in three areas - workplace technology, computer simulation and emergency planning. The company was founded in 1983 by Daniel R. Perley, who, during the past several years, has managed more than 20 projects in these areas ranging from feasibility and implementation studies through design, system implementation and installation. These projects were performed for private and public sector clients in Canada and the US. In addition, Mr. Perley has managed several hardware development projects in the avionics and computer-assisted learning areas. PTC is supported by employee principals, consultants and support staff, as well as by consultants and resources of associated firms in closely related fields.

PTC provides a conceptual, but thoroughly practical approach to meeting client requirements, drawing on a variety of disciplines and specialties. The firm offers its services in Canada, the US and overseas, and in Ottawa, Toronto, and New York. The firm is also represented by local agents in South America, Europe, the Middle East and the Pacific Rim countries

Capability: The simulation experience of Perley Technologies Corp, transportation management and policy
- Marine and aviation operations
- Surface transportation and policy
- Intermodal transport modeling
- Transportation and emergency planning
- Communications systems
- Emergency planning and civil defense
- Industrial emergency planning

In various other application areas, PTC consultants can quickly assess the feasibility and desirability of using simulations for training, research, system design and planning purposes. Such assessments include not only an estimation of the cost and quantitative benefits of the construction and use of a specific simulation, but also a detailed qualitative information as well.

The company is also the sole Canadian firm offering an extensive range of capabilities in the application of computer systems technology to emergency planning and defense, based on a proven record of project success. Specific capabilities include:

- Feasibility and implementation studies of training database, command and control, warning and emergency planning systems
- Evaluation of existing systems and procedures
- Public participation coordination for emergency plan creation or revision
- Creation or revision of computer systems and emergency procedures for use on industrial and military sites
- Base warning system design, implementation, and operation

Average Work Force: Consultant Level Personnel - 6
Associate & Staff Support - As required

Gross Sales: No Data

Equipment: PTC employs in-house computing resources, including Digital and IBM computer systems and executive workstations.

Experience: PTC's clients include various Canadian and foreign government agencies in the transportation, communications, and defense fields, as well as emergency planning

Keywords: Aircraft, Parts, Library, Aircraft Parts

Reference Library:

February 1980:...
PHOTOCHEMICAL RESEARCH ASSOCIATES Inc

Code: PRA
Address: 45 Meg Drive
London, Ontario, Canada N6E 2V2
Contact: Dr R C Miller, Director of Marketing – (519) 686-2950

History: Photochemical Research was incorporated in mid-1976. It is a Canadian owned high technology company with a US sales office located in Oak Ridge, Tennessee.

Capability: PRA is involved in the design, development and manufacture of electro-optical instrumentation systems; specifically in light generation, detection and analysis. Their present product lines consist of luminescence decay systems for the reliable measurement of short lived fluorescence life times; pulsed light sources with pulse widths from picoseconds to seconds and spectral ranges from the VUV to the IR; CW light sources and a line of optical building blocks; Photon Counting Systems for low light level detection; a line of long-life Helium/Neon lasers; low power Argon ion lasers; and Nitrogen and Dye lasers. PRA is currently developing third generation spectroscopic analysis instrumentation. The latter is nearing market readiness.

In addition to manufacturing standard products, they operate research and laboratory facilities for custom manufacturing, contract research, and consulting. PRA operates on an international basis through offices in Canada and the US, as well as through distributor networks in Europe and the Far East.

Average Work Force: Scientists/Engineers – 25
Others – 55

Gross Sales: No Data

Plant Size: 22,500 sq ft

Experience: PRA has sold their off-the-shelf products to a variety of academic, industrial, and government research facilities including – Lawrence Livermore Laboratories, Oak Ridge National Laboratories, Los Alamos Scientific Laboratories, Solar Energy Research Institute, Exxon Research, Bell laboratories, Western Electric, Eastman Kodak, and Wright-Patterson AFB, OH.

Keywords: 7 = Electronics; 10 = Image Processing & Optics; 11 = Lasers; 19 = Testing/Test Equipment; 20 = Miscellaneous; 50 = Electro-Optical Instrumentation = 7, 10, 19; Light Generation = 7; Light Detection = 7; Light Analysis = 7; Luminescence Decay Systems = 7; Pulsed Light Sources = 7; Continuous Wave Light Sources = 7; Optical Building Blocks = 7, 10; Photon Counting Systems = 7; Helium Neon Lasers = 11; Contract Research = 7, 10, 11; Spectroscopic Analysis Instrumentation = 7, 19, 20; Low Power Argon Ion Lasers = 11; Nitrogen Lasers = 11; Dye Lasers = 11.

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PHOTOVAC Inc

Address: 134 Doncaster Ave
Unit 2
Thornhill, Ontario, Canada L3T 1L3

Contact: Dr Richard C Leveson, President – (416) 881-8225

History: Incorporated in 1975, Canadian owned. Their US subsidiary, Photovac International Inc, is located in Long Island, NY.

Capability: Photovac’s distinctive competence is in the ability to: (a) design and manufacture instrumentation for the detection and analysis of gaseous and vapporous contaminants in air, and in other gases, at extremely low concentration levels (parts per billion); and (b) to apply this instrumentation, together with technical knowledge, to specific R&D projects. This competence is broadly based in research, product development, systems engineering, and computer design (from scratch); and software development capabilities as these relate separately or in combination to photoionization gas chromatography technology. Photovac’s particular technology strength is based on a newly-developed, ultra-sensitive photoionization system which overcomes problems previously experienced with this technique.

Average Work Force: Phds – 2
Engineers – 4
Research Scientists – 7
Technicians – 8

Gross Sales: 1980 – $250,000
1981 – $400,000
1982 – $1.0M
1983 – $2.0M (Projected)

Plant Size: 7,000 sq ft (Plus 1,000 sq ft in Long Island, NY)

Equipment: Photovac Inc’s equipment capability is described below:

• Instrumentation for air and gas analysis of contaminants with sub part-per-billion detection capability.

• Available in field portable format including computer interpretation.

• Available for system installation to carry out multi-point, continuous, high-speed surveillance of air quality.

• Speciality equipment for investigating short wavelength, ultraviolet phenomena, specially related to gas analysis applications – vacuum UV monochrometer system and mass spectrometer.

• Machine shop capability.

Experience: Photovac Inc has had experience with:

• Development of ultra-sensitive (sub ppb) detector for military applications (AGARD Proceedings #309 “Toxic Hazards in Aviation”, B15-1, Sep 80).

• General Electric – continuous surveillance of arsine and phosphine in new Research Triangle Park facility.

• Research on preconcentration for ion mobility spectrometer relating to detection of explosive vapors in air at trace levels (Canadian Department of National Defense).

• Anticipated contract (sole source) from NASA for development of specialized breath analysis system for future Space Shuttle flight.

• Miscellaneous semi-formal projects and special assignments for EPA (US), Cal OSHA, USDA, USGas Research Institute.
Keywords: 9 = Environment; 19 = Testing/Test Equipment; Gas Chromatography = 9; Air Analysis = 9; Gas Analysis = 9; Instrumentation (Air/Gas) = 19.

Revised: Dec 83

PRATT & WHITNEY CANADA Ltd

Code: PWC

Address: P. O. Box 10
Longueuil, Quebec, Canada J4K 4X9

Contact: Mr. S Monaghan, Chief R&D Support – (514) 647-7557

History: Established in 1928 as a Canadian center for the overhaul of Pratt & Whitney Aircraft radial piston engines. Pratt & Whitney Canada Ltd (P&W) took over full responsibility for this function prior to moving into small gas turbine development and production. They are a wholly owned subsidiary of the Pratt & Whitney Aircraft Group, a division of United Technologies Corporation.

Capability: P&W has the mandate to develop and produce all small gas turbine engines typically for general aviation, commuter and paramilitary use. Their primary business areas are:
- Small gas turbine engine development
- Small gas turbine engine production
- Small gas turbine engine oriented research

The development of gas turbine engines at P&W started in the late 1950s with the early PT6. This turboprop engine was introduced to the commercial market in 1963. The military designation for this engine is the T74-CP-701. In 1979, the development started on the PW100 turboprop engine. This fuel efficient engine is used primarily in commuter and short-haul aircraft.

The JT15D turbosfan engine was introduced in 1967. It is the power plant of the Cessna Citation corporate jet, as well as the Aerospatiale Corvette and the Mitsubishi Diamond 1 aircraft. P&W has also developed a twin turboshift engine for helicopter use. These are designated the PT6T-3 and -6 series (military designation is T400-CP-400-WV-402).

By 1982, the company had delivered 23,000 engines for the world market.

Average Work Force: Company Total – 6,660
R&D Center – 1,840

Gross Sales: 1979 – $463M
1980 – $605M
1981 – $770M

Plant Size: 1,809,640 sq ft (Total area)

Experience: P&W has had experience with the following organizations:

United States Air Force – (1) Research on High DN Value Roller Bearings – a program to determine the influence of geometric variable etc., on small high speed roller bearings (carried out as a shared development program); and (2) Alternate Fuels Combustion Research – an experimental study of the effects of alternate jet fuels on small gas turbine combustion systems (carried out as a shared development program).

United States Army – (1) Subcontractor in Cooled Radial Turbine Program to Pratt & Whitney, Government Products Division (GPD) (1960-1970). Pratt & Whitney Canada Ltd was responsible for the Aerodynamic design and participated in the structural analysis and mechanical design of the turbine; (2) Consultant to P&W, GPD, on ST9 1500 horsepower demonstrator program for new US Army helicopter engine; first stage was scaled P&W research rotor and second stage was centrifugal compressor (1966-1969); (3) Consultant to P&W, GPD, for the demonstration of a 10:1 Pressure Ratio single centrifugal compressor – P&W provided data from previous in-house demonstrations of 10:1 Pressure Ratio Compressors carried in 1967 & 1970 (1970-1972); and (4) P&W is currently contracted with the US Army at Ft Eustis for an advanced 15:1 Pressure Ratio Single Centrifugal Compressor.

United States Navy – (1) P&W was a subcontractor to P&W, Commercial Products Division (CPD), on a demonstration of a regenerative, small turboprop engine based on the PT6 – P&W designed the regenerator, while P&W designed the ducting, organized hardware fabrication, and demonstrated the concept (1964-1966). (2) P&W won a contract to provide a twinned helicopter engine (T440-CP-400-WV-402) to the US Navy for Bell Aerospace helicopters where 1032 units have been supplied – also 2218 units in a civil version (PT6T36) have been produced to date – development of the engine is a continuous process and P&W are performing component improvements through a US Navy contract (1969); and (3) P&W has also performed as a subcontractor to P&W, CPD, on a demonstration of single crystal turbine blades for gas turbine operation.

Environmental Protection Agency – (1) P&W carried out a combustion research program for small, single can, highly loaded combustors for automotive application with good performance and low emissions (1973-1974); (2) P&W was subcontractor to United Technologies Research Center (UTRC) on a study of the automotive application of gas turbines carried out a series of cycle studies and supported experimental work on combustion (early 1970s); and (3) P&W also supported the Environmental Protection Agency (EPA) (Triangle Park) on studies of the carcinogenic effect of small gas turbine emissions (1977-1978).

National Aeronautic Space Administration (NASA) – (1) P&W was subcontractor to P&W, CPD, on a turboshaft core noise program carried out on a NASA owned P&W JT15D engine – P&W designed and fabricated an alternate fan core stator to increase the axial spacing between rotor and stator, and the number of stator vanes (1977); (2) P&W was subcontractor to P&W, CPD, on a program of nose cone telemetry for NASA Lewis Research Center as applied to a NASA JT15D turboshaft – P&W designed and fabricated a transmitter to operate within the nose of a JT15D to study the difference between ground and flight noise measurements (1975-1980); (3) P&W was also subcontractor to P&W, CPD, on a program to supply NASA Langley with copies of the telemetry units from item #2 for flight use with stringent manufacturing requirements (1979-1980); and (4) P&W was also subcontractor to United Technologies Research Center on a Compressor test program – all combustor hardware was designed and fabricated by P&W while United Technologies Research Center assembled the rig and carried out all testing (1980-1981).

Keywords: 1 = Aircraft; 4 = Chemistry; 8 = Energy; 9 = Environment; 19 = Testing/Test Equipment; Small Gas Turbine Engines = 1; Engines = 1; Turbine Engines = 1; Engine Components = 1; Engine Systems = 1; Fuel Systems Research = 1; Repair & Overhaul = 1; Alternate Fuels Research = 1; Roller Bearings = 1; Combustion Research = 1; 4; Fuels Research = 1; 4; Helicopter Systems = 1; Auxiliary Power Units = 8; Engine
PRESENTEY ENGINEERING PRODUCTS Ltd

Code: PEP
Address: 2784 Fenton Road
Ottawa, Ontario, Canada K1G 3N3
Contact: Mr. R Senayek, Chief Engineer – (613) 822-1251

History: Presentey is a Canadian company incorporated in 1958 with no other Canadian branches or US subsidiaries.

Capability: Presentey engages as a prime contractor in a wide variety of activities including research, development, production, and consulting for both the military and private sectors. Over the years, the company has designed and produced an assortment of hardware items that include airborne voice recorders and ground based reproducers for the CF-104 aircraft, transmitter teleypewriter controls for shipboard use, low drift DC amplifiers, multi-channel memory/loop tape recorders for high performance jet aircraft, 14 channel FM/AM data recorder for high altitude research, magnetometers, proton magnetometers, dust monitoring systems, rocket subcom mutator, an ASW sonobuoy antenna, plus other items. They designed and produced the first Canadian air pollution monitor which is installed at various locations in the Ottawa, Toronto and Montreal areas.

Presentey was awarded all the contracts of a bankrupt electronics firm by the Canadian Government. All those contracts were successfully completed. At least two USAF contracts, transistorized missile check cards and radar target simulators, were part of that deal.

Recent projects include the design and development of the signal patch panel systems for the latest Canadian destroyers and a 64-channel A/D converter/recorder system. They have also been active in the fields of airborne photogrammetry, navigation aids and airborne photography film annotation systems. Another in-house product is a brushless DC motor. It is a low cost, high quality, long life, self-contained compact unit to be used in new equipment designs as well as a replacement for brush type motors in existing equipment. Applications include magnetic tape recorders, reels and capstan drives, film transports in cameras, airborne instruments, chart recorders, printers, blowers and various operations in hostile environments. The company is reasonably self-sufficient. They are equipped to carry out electronics work as well as to design and machine parts, tools, jigs and dies for production of parts, stampings and molds. Production equipment is available for electronics and mechanical operations. They also have the capability to design silicone elastomer molds and have made considerable progress in epoxies processing.

Average Work Force: Total – 21
Gross Sales: 1980 – $1.0M
1981 – $1.5M
Plant Size: 10,000 sq ft

Equipment: The company maintains a manufacturing capability in the electronics and mechanical areas. They are equipped with a machine shop for normal operations. They can carry out heat treating, stamping, tool and die cutting, oxygen acetylene and electrical welding, and sheet metal operations. Limited environmental and vibration testing can be carried out.

Experience: Presentey has worked with the Canadian military and has had contracts with the USAF (AFLC). Currently they are under contract with the Canadian Forces to produce their brushless DC motor, and also to develop a brushless blower motor for use in land vehicles and in unattended locations. They have also developed a UHF power amplifier for backpack radios in vehicle configuration. They are under contract with the Department of Transport to build 40 transmis sion units to measure light transmissivity at airports. They are also building similar devices for the Canadian DND.

Keywords: Aircraft; Communications; Electronics; Environment; Radar; Security & Safety; Testing/Test Equipment; Miscellaneous; Voice Recorders; Voice Reproducers; Ground Based Reproducers; Transmitter Teleypewriter Controls; Amplifiers; Tape Recorders; Data Recorder Systems; Magnetometers; Proton Magnetometers; Pollution Sensing; Antennas; Rocket Subcom mutators; Converter/Recorders Systems; Photogrammetry; Film Annotation Systems; Motors; Brushless DC Motors; Flight Data Recorders; Simulators; Magnetic Anomaly Detection; Test Equipment & Instrumentation; Environmental Analysis; Navigation; Target Simulators; Power Supplies; Flight Data Recorders; Instruments; Transmitters.

Revised: Dec 83

PRIOR DATA SCIENCES Ltd

Code: PDS
Address: Bell Mews Plaza – Nepean
39 Highway 7
Ottawa, Ontario, Canada K1H 8R2
Contact: Larry E Hanlan, Manager, Military Systems – (613) 820-7235

History: PRIOR Data Sciences Ltd was founded in early 1977 and has experienced steady growth to its current level of 40 employees (Nov 83). The company is Canadian owned and is located in both Ottawa (Headquarters) and Toronto. There are no US subsidiaries.

Capability: PRIOR has capabilities in:

- "Turnkey" computer systems development for real-time applications
- All phases of software project development and life cycle support
- Software engineering consultation and contact support services
- Software product development and sales

Computer systems development may range from microprocessors to mainframes. In the industrial field, PRIOR has considerable experience with the DEC PDP-11 family of computers, the RSX-11M, RT-11 and UNIX operating systems, and the Pascal and C programming languages. In the military field, PRIOR has significant expertise with the UYK-20 and associated computers, and the CMS-2 and ADA programming languages. They have assumed responsibilities as a software subcontractor, and as a turnkey system developer.

Prior has participated in all phases of software project development. This experience includes:

- Research and Development
- Feasibility studies and requirements analysis
- Systems analysis, systems specification, and hardware procurement
- Proposal preparation and evaluation

Revised: Dec 83
In the use of solid state ringing and power conversion in the
68000.

Gross Sales: 1981 - $1.4M
1982 - $1.9M
1983 - $2.2M

Plant Size: 5,000 sq ft (Ottawa)
2,000 sq ft (Toronto)

Equipment: DEC PDP-11/44, Perkin-Elmer 7/32, and WICAT

Experience: PRIOR has participated in the following military
application areas, Command and Control, Anti-submarine
Warfare (ASW), Communications, Surveillance, Graphics, and
Simulation.

PRIOR has worked directly for DND or as a subcontractor
on many of DND's recent major projects. These include NFA,
CPF, AURORA, ADLIPS, CANNEWS and SHINCOM. PRIOR has
successfully teamed with other members of Canadian
industry such as Leigh Instruments, Litton Systems Canada
Ltd, and Westinghouse.

In the area of military research and development, PRIOR has
had a continuing involvement with projects at the Defense
Research Establishment Ottawa and the Communications
Research Center. These projects have been concerned
with radar, direction finding, electronic warfare, counter-
measures, analysis, navigation, graphics and simulation.

PRIOR's three major real-time application areas are the Mili-
tary, Air Traffic Control, and Supervisory Control and Data
Acquisition.

Sixty percent of the company's work is military-related. There
has been no direct contact with the US military. All experience
to date has been either with the Canadian Department of
National Defense or as a subcontractor on a DND sponsored
project.

Keywords: 5 = Communications; 6 = Computers;
15 = Radar; 17 = Software Services, Turnkey Computer
Systems Development = 6, Project Development = 17; Life
Cycle Support = 20; Engineering Consultation = 6, 17;
Feasibility Studies = 17; Requirements Analysis = 17;
Projects Analysis = 17; Systems Design = 17; System
Analysis System Design = 17; System Integration = 17; System
Design = 17; Module Design = 17; Hardware
Procurement = 6, 17; C3 Systems = 5, 6, 15, 17;
Surveillance = 6, 17; Graphics = 6, 17; Simulation = 6, 17;
Consulting = 6, 17; Electronic Warfare = 6, 17; Radar = 6,
15, 17; Communications = 5, 6, 17; Computer Design = 6,
17; Air Traffic Control = 6, 17; Supervisory Control = 6, 17;
Data Acquisition = 6, 17; ASW = 6, 17; Computer
Graphics = 6, 17; Computer Simulation = 6, 17;
Real-Time = 6, 17; Research & Development = 17;
Software = 17; Software Development = 17.

Revised: Dec 83

PYLON ELECTRONIC
DEVELOPMENT CO Ltd

Code: PED

Address: 147 Colonnade Road
Ottawa, Ontario, Canada K2E 7L9

Contact: Mr. E Pinnell, President - (613) 226-7920

History: The Pylon organization celebrated its first 25 years of
business on 21 Mar 80. Within two years of incorporation
under Federal Charter in 1955, a development project was
begun for the use of transistors in telephone equipment. By
the end of 1957, the company was manufacturing solid state
20Hz Ringing Generators. Previously this was done by rotary
machinery at high cost and with attending maintenance prob-
lems. The concept of a solid state “generator” stuck with
the product. By 1959, Pylon was producing both static DC
generators and static AC generators. These are frequently
called DC-DC Converters or DC-AC Converters. As Pylon were
the first to manufacture these devices, the name most com-
monly used by domestic phone companies was “Pylons”,
regardless of the type of equipment.

The use of solid state ringing and power conversion in the
US came several years later. Telcos were quick to see the
advantage of using one central office battery and the con-
version method with redundancy for high reliability. In Canada,
Pylon is the major supplier of DC-DC Converters and ringing
machines.

With the acquisition of Armtrol Ltd in 1970, Pylon entered into
the manufacture of solid state switching equipment. A line
of trunk concentrators of CAMA application and ROTS
apparatus were introduced.

Manufacture of digital equipment began in 1965 with systems
involving photoelectric badge readers. The first system for-
med the basis of data gathering systems for the Post Office.
Pylon has supplied a vast range of specialized data equip-
ment to customers in North America and overseas. Pylon
offers a complete engineering support team from the system
concept through to the end product.

In 1977, the company expanded by opening a division in
Ottawa which specialized in the manufacture and develop-
ment of instrumentation and Geophysical/Nuclear Measure-
ment Systems. The Toronto division was opened in the fall
of 1979.

In 1980 due to the growth of the Pylon market, it was decided
to build a new development plant in Ottawa and to relocate
the Pylon Head Office on completion of this facility. Eighteen
months later, this objective was realized.

The company holds 18 Canadian, 12 US, and 3 miscellaneous
patents. Approximately 25% of all telecommunication equip-
ment, and over 80% of the geophysical/nuclear equipment
is exported.

Capability: Montreal Branch - Telco Products, Ringing Gen-
erators, Ringing Talk Signal Supplies, UPS Systems, CO
Power Plants, Custom Transit Cases.

Toronto Branch - Telecommunications Equipment, Custom
Instrumentation.

Ottawa Head Office - Manufactures an instrument line of
Time Code Generators, Distribution Amplifiers and Large
Numerical Displays, the Nuclear Group produces calibrated
Radar and Thoron gas generators, Alpha detection and con-
tamination monitoring equipment, an R&D group is currently
working on improved beta detection and ionizing radiation.

Average Work Force: Scientists/Engineers - 30
Others - 100

Gross Sales: $4 to $5M

Projected Sales
(2 year period) - $6 to $5M

Plant Size: Montreal - 18,000 sq ft
Toronto - 5,000 sq ft
Ottawa - 18,000 sq ft
Experience: Canada – Department of National Defense, National Environmental Agencies, National Research Council, Atomic Energy Control Board, Energy Mines & Resources, Bell Canada, Telesat, Trans Canada Tele System, Canadian Broadcasting Corp, and CNCP Telecom; US – Danray Inc, Harris Corp, CBS, NBC, and ABC; and Other Countries – South America, Central America, UK, West Germany, Austria, Italy, Greece, China, Philippines, and Australia.

Keywords: 5 = Communications; 7 = Electronics; 9 = Environment; 19 = Testing/Test Equipment; Nuclear Sensors = 9, 19; Geophysical Sensors = 9, 19; Nuclear Instrumentation = 9, 19; Analysis = 9; Simulation = 9; Power Supplies = 7; Telephone = 5; Voltage Transformers = 7; Voltage Regulators = 7; PC Board Design = 7; PC Board Fabrication = 7.

Revised: Dec 83

QUESTOR SURVEYS Ltd

Code: QSL

Address: 6380 Viscount Road
Mississauga, Ontario, Canada L4V 1H3

Contact: Mr. P G Lazenby, Chairman – (416) 676-9880

History: Originally a one aircraft operations section of a mining company, the company split in 1961 and formed a Contract Survey Services Division. During this period, the company operated one owned aircraft and three leased aircraft. In 1970, they began expanding operations, and in 1979 acquired the geophysics division of Northway Survey Corporation. During this period, they specialized in the use and development of the Barringer INPUT electromagnetic system. They are Canadian owned and have no subsidiaries.

Capability: Questor specializes in all state-of-the-art airborne sensing for base metal, uranium and oil. In addition to the Barringer INPUT system (Time-Domain electromagnetics), they also are capable of acquiring and analyzing data from airborne standard & high sensitivity magnetics, and standard & multi-channel spectrometry. They also design and build very high sensitivity magnetometers along with their associated data acquisition systems. Their aircraft fleet includes – two Skyvans, three Trislanders, three DC-3s and an Aero Commander. The INPUT systems generate a pulsed signal from a vertical dipole. The primary field induces eddy currents in conductive targets and there currents produce secondary fields. These secondary fields are then sensed. Through analysis of these secondary field anomalies, sulfide and graphite conducting pockets have been identified to a depth of 300 meters. Standard and high-sensitivity magnetometry provide detailed magnetic contour maps. Corrections for aircraft attitudes & maneuvers, and the use of precision clocks, etc., enable Questor to improve the normal high standard government contour maps by a factor of four in geologic resolution.

Gamma ray spectrometers are used to identify potential uranium deposits as well as for geologic mapping and identification of man-made radio-active wastes. Data reduction for all types of sensors/sstimations is provided by the company’s specially developed algorithms and provides a variety of outputs depending on the users’ needs.

Questor has recently organized an internal Research Division. They are presently working to improve the various sensors used by Questor to increase penetration, sensitivity and flexibility, and the new Division has recently developed a helicopter version of INPUT and vertical magnetic gradiometer system.

Average Work Force: PhD – 1
Prof Eng – 3
BSc – 10
Technicians – 15
Others – 91

Gross Sales: 1980 – $6M
1981 – $8M
1982 – No Data
1983 – No Data

Plant Size: 22,000 sq ft (plus rental hangar space)

Experience: Questor’s clients include 49 different countries around the world for one or more of their surveys. Their surveys have led to the discovery of fourteen base metals, precious metals, or uranium deposits in a variety of geologic environments. In Canada, customers have included – Noranda Mines, Falconbridge Mines, Inco, Imperial Oil, Shell Oil, and Gulf Oil. They are interested in conducting research for the USAS.

Keywords: 1 = Aircraft; 8 = Energy; 9 = Environment; 17 = Software Services; 20 = Miscellaneous; Remote Sensing = 1, 8, 9, 20; Sensors = 8, 9, 20; Pollution = 8, 9; Software = 17; Mapping = 8, 9; Data Acquisition = 1, 8, 9, 20; Data Reduction = 1, 8, 9, 20; Data Analysis = 1, 8, 9, 20; Magnetometers = 8, 9; Helicopter Magnetic Gradiometer = 1, 8, 9; Magnetic Gradiometer = 1, 8, 9.

Revised: Dec 83

RAYLO CHEMICALS Ltd

Code: RAY

Address: 8045 Argyll Road
Edmonton, Alberta, Canada T6C 4A9

Contact: Dr J F Prescott, Technical Manager – (403) 465-7937

History: Raylo Chemicals Ltd was incorporated in 1966 and became a wholly owned subsidiary of Terochem Laboratories Ltd, a private Canadian corporation, in 1981. Raylo has no US subsidiaries.

Capability: Raylo Chemicals specializes in contract research, custom synthesis, and sales of manufactured products. Areas of expertise include bench scale pilot plant design & operation; Synthetic chemistry (natural products, pharmaceuticals & hydrocarbon chemistry); high pressure & temperature reactions; polymer chemistry (synthesis of novel monomers and their polymers, characterization and chemical stability testing); and non-routine analysis. A major contract activity is polymer chemistry applied stable high-strength polymers for composites, elastomers, water soluble polymers, flocculation studies, and electrolyte cell separators. Other principal projects include supercritical gas technology applied to coal liquefaction & analyses of heavy oil, and development of physical & physicochemical data in support of various commercial industrial processes.

Raylo Chemicals offers custom manufacture of complex chemicals and polymers from a few grams to several thousand kilograms, including process design and development. Raylo routinely handles highly reactive solid, liquid, and gaseous reagents, and can operate under vacuum and inert atmospheres. The following reactions are performed regularly:

- Hydrogenation
- Hydrolysis
- Metal Hydride Reduction
- Optical Resolution
- Condensation
- Alkylation
- Acylation
Raylo Chemicals products include specialty polymers and other fine chemicals for high technology industries. Over 150 compounds are currently in production and for many of these, Raylo is the sole or principal world manufacturer.

Average Work Force: PhDs - 8
Technicians & Operators - 11
Others - 5

Gross Sales: 1980 - $1.2M
1981 - $1.4M
1982 - $2.5M
1983 - $2.7M

Plant Size: 10,000 sq ft
6,000 sq ft (Laboratory + Library)

Equipment: Raylo Chemicals has well equipped laboratories with the following instruments - 60 MHz proton magnetic resonance spectrometer; infrared and ultraviolet spectrophotomters; high performance liquid chromatography, equipped with a variable wavelength ultraviolet detector with stop-flow capability; gas chromatograph, both packed column and capillary column, with FID and TCD detectors; size exclusion chromatography system with differential refractometer; and other up to date chemical, biochemical and physical equipment.

Under an established arrangement with the University of Alberta, high resolution instruments such as Fourier Transform Infrared Spectrometer; Fourier Transform (100, 200 and 400 MHz) and Carbon-13 magnetic resonance spectrometers, and low and high resolution mass spectrometers are available to Raylo's research staff. Raylo also has access to and experience in using a low angle laser scattering photometer (KMX-6), particularly useful for determination of absolute molecular weight and molecular weight distribution polymers.

Raylo's plant equipment includes multi-purpose glass and stainless steel, jacketed, stirred reactors in the 10-600 gallon range and a broad selection of separation equipment.

Experience: The company has produced 77 patents and 35 publications. Raylo's clients are government, universities, and industry in the US, Canada, Europe and Japan.

Keywords: 4: Chemistry; Chemical Processing = 4; Contract Research = 4; Custom Synthesis = 4; Physical Chemistry = 4; Polymer Chemistry = 4; Monomers = 4; Non-Routine Analysis = 4; Supercritical Gas Technology = 4; Process Development = 4; Product Characterization = 4; Research = 4; Research & Development = 4.

Revised: Dec 83

RAYSHIELD Ltd

Code: RSL

Address: 2630 Royal Windsor Dr, Unit #4
Mississauga, Ontario, Canada L5J 1K7

Contact: Mr E R Webster, Sales Manager - (416) 822-6100

History: Rayshield is a wholly owned Canadian company incorporated in 1968 with no US subsidiaries.

Capability: Rayshield Ltd specializes in the construction of prefabricated RF shielded enclosures, and MIG welded rooms which are completely adaptable to all sizes and shapes of architectural spaces. The prefabricated system was developed to provide a quality-controlled technique for constructing shielding under adverse field conditions that would ensure a dependable performance. Manually operated doors require a very minimum of effort and are available as single, double and custom units. "Hands-Off" or automatic powered door operators are also available. Performance is tailored to meet requirements. Complete installation and turnkey services including testing and certification are available. A complete line of accessories - vent panels, waveguide penetration, lighting, work benches, and connector panels are available. Power signal and communication line filters are available for all applications including tempest. Rayshield provides guaranteed performance installation, testing, and servicing. A line of RF shielded cabinets is also manufactured by Rayshield.

Average Work Force: Engineering = 4
Manufacturing = 15
Others = 5

Gross Sales: $1.0-$2.0M (Historical)
$2.5M (Present)
$3.0M (Forecast)

Plant Size: 10,000 sq ft

Equipment: Rayshield's Manufacturing Division is equipped with a laminating press to manufacture shielded panels, drill presses, cut-off saws, welders, and other equipment to enable them to manufacture all components of shielded enclosures. Test equipment includes generation and measurement from 20 Hz to 26 GHz.

Experience: Rayshield has been providing RF & EMP shielding to major Governments and companies in North America, Europe and the Middle East for over fifteen years.

Keywords: 14 = Protective Equipment; 19 = Testing/Test Equipment, RF Shielding = 14, EMP Shielding = 14, Anechoic Chambers = 19, Shielded Cabinets & Wireways = 14, Shielding = 14.

Revised: Dec 83

RMS INDUSTRIAL CONTROLS Inc

Code: RMS

Address: 1100 Lansdowne St
Port Coquitlam, British Columbia, Canada V3B 5E2

7538 Bath Road
Mississauga, Ontario, Canada L4T 1L2

Contact: Mr Harry Dunstan, President - (416) 673-1319
(Toronto)
Mr Peter Boorman, Vice President - (604) 464-2315
(Vancouver)

History: RMS Industrial Controls Inc was incorporated in 1976. The company has displayed steady growth in each succeeding year and has excelled in the field of specialized electronics engineering.

Capability: RMS particularly excels in the development of telemetry systems, using as transmission mediums both conventional wire and radio. They have developed their own series of unique radio modems to offer the user reliable and secure data radio communications. The company has developed and now manufactures its own unique direct synthesized UHF radio. This radio is rugged and capable of operating in harsh environments. The radio features unusual stability and has been designed to require minimal servicing.

RMS has also developed telemetry and control systems for use in offshore and undersea equipment. As much of this equipment is intended for use in critical conditions, emphasis has been placed on refinement and ruggedness of design. This equipment is used in the control of undersea vehicles and remotely operated manipulators.
Radio remote control of both on-off and analog types is manufactured by RMS for use in the resource, construction, and manufacturing industries. All signalling is digitally encoded and offers excellent security of control.

RMS offers unique capabilities in research and development involving new and unusual applications. The company has demonstrated the ability to solve problems using state-of-the-art techniques. This capability is provided to the user in a coordinated manner, from evaluation to development, and then to production and implementation.

_avgavarage Work Force: Total ~ 45 (Engineers 35% +)

Gross Sales: FY 1981/1982 - $ 1.9M

Next 3 Years - 40-60% increase per year (forecast)

Plant Size: 11,000 sq ft (Vancouver)

2,000 sq ft (Toronto)

Service Facilities - Houston, TX

Experience: RMS has been involved in the continuing development of sophisticated control equipment for unmanned and manned submersible vehicles used in offshore oil industry and offshore environments. Projects have been completed for the Canadian Defense Research Establishment (Pacific), and for the US Navy. RMS has successfully developed and put into production a sophisticated state-of-the-art synthesized UHF transceiver which is in a wide variety of demanding applications. The company has also developed and put into production radio controls for a variety of applications from simple on-off commands to high resolution analog controls.

Keywords: 5 = Communications; 20 = Miscellaneous; Telemetry = 5; Data Communications = 5 Modems = 5; UHF Radios = 5; SCADA Equipment = 5, 20; Radio Controls = 20; Automatic Vehicles Monitoring (AVM) = 5, 20; Computer Aided Dispatch (CAD) = 5; Remote Piloted Vehicles (RPV) = 20; Radio Modems = 5, Wire Modems = 5; Digital = 5, 20; Analog = 5, 20.

Revised: Dec 83

ROLLS-ROYCE (CANADA) Ltd

Code: ROC

Address: 9500 Cote de Liesse Road

Montreal, Quebec, Canada H4Y 1B7

Contact: Mr. R. Zanette, Marketing Manager - (514) 631-3541

History: Rolls-Royce Canada was founded in 1952 for the production and support of Nene engines powering the Canadian Armed Forces' T-33 trainer aircraft built by Canadair. From that specialized beginning, Rolls-Royce Canada has continually grown and diversified. Still expanding today, Rolls-Royce Canada is a modern broadly-based aero and industrial engine facility. The company is a wholly owned subsidiary of Rolls-Royce Ltd.

Capability: Repair and overhaul has always been and will continue to be the backbone of Rolls-Royce Canada's business. The company has the ability to overhaul the following engines:

Military - Nene; GE T64; R 1820; T56; and DDA 570K.

Civil - Spey; Dart; Viper; and Tyne.

Industrial - Avon; RB211; Spey; DDA 501; and DDA 570K.

A repair engineering group works closely with prime manufacturers and the repair industry to develop and apply new repair techniques and processes. Repairs are carried out in accordance with the original manufacturer's specifications. In addition, Rolls-Royce Canada has developed more than 3000 repair schemes on its own in an effort to increase component lives and to reduce overhaul costs.

A manufacturing facility with state-of-the-art machine tools is currently machining light alloy castings and hard, high temperature steels. The range of materials the center can handle includes titanium and speciality steels, as well as

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Rolls-Royce Canada is the world source for the Industrial Spey and Industrial RB211 gas generators. These aero derivative gas turbines are manufactured to aerospace standards. The company has developed and manufactures the off-engine Equipment; 20

**Average Work Force:** Salaried – 270

Hourly – 515

Management – 48

**Gross Sales:** No Data

**Plant Size:**

- 100,000 sq ft (Manufacturing)
- 15,000 sq ft (Engine Assembly)
- 150,000 sq ft (Engine Overhaul and Common Support Shops)
- 170,000 sq ft (Offices & Warehouses)

**Equipment:** The repair shop contains a wide range of general purpose machine tools to enable turning, milling, jig boring, grinding, and electrical discharge machining to be carried out on a wide range of materials. Welding capabilities include TIG weld, metallic arc resistance, needle arc, torch brazing and vacuum, on all gas high temperature brazing. Heat treatment includes argon or hydrogen controlled atmosphere, low and high temperature vacuum heat and aluminizing. Metal spray capabilities are thermal spray (powder and wire) including 

**Machinery:**

- 05 gun and plasma spray; erosion or wear resistant hard coatings; abrasive coatings; thermal barrier (ceramic) coatings and anti-corrosion coatings. Processing capabilities are – non-metallic coatings-rubber wear away and PL95, nickel, chrome, silver, cadmium, copper, SerMetal processing, tin, lead-tin and Tribomet wear resistant coatings; soft anodizing, alodine dichromate surface treatment and phosphating; vapor blasting, dry blasting and shot peening; electrolyte nickel plating, and aeroflot surface superfinish. Balance includes static/vertical and dynamic/horizontal.

Rolls-Royce Canada operates four diverse engine test facilities capable of testing a wide range of equipment encompassing piston engines, turboprops and turbosfans. The company designs and engineers all supporting systems (starting, fuel, lubrication, cooling), equipment (cradles, carts, tooling), safety controls (interlocks, alarms, trips) and instrumentation.

The laboratory presently holds DND approval number 020-2/56 to act as a chemical, metallurgical and mechanical test establishment and offers a wide range of services encompassing tensile testing, hardness testing, metallography, electronic and instrumentation testing and, radiographic and ultrasonic testing.

The manufacturing facility machining capability includes OM2A four-axis, OM80 five-axis, 4-axis CNC jig mill, 3-axis NC jig mill, 2-axis NC mill, Horizontal Cincimatric, Vertical Cintmatic, 48-inch x 36-inch x 72-inch Webster and Bennett VTLs with Tracer, Swedturn CNC Chucker, various lathes and drills. Inspection function supported by Brown and Sharpe Valida
tor Co-ordinate measuring machine and 1,000mm Horstman Rotary/Tilting Table.

**Experience:** Rolls-Royce Canada is highly export-oriented – over 70% of the company’s business is with non-Canadian customers. Although 80% of the customer base is within the continental Americas, Rolls-Royce Canada customers now originate in the Middle and Far East, Europe and approvals can be carried out in accordance with D48-001-24SF-001. Quality approval conforms with the following specifications – MIL-O-9559A, MIL-45208, MIL-C-45467, DAR 7-103-S; DOT approval no. 1/58, DND 1015/10/17/19; and CAA A1/2423/47.

Experience is offered in the field of fixture design for the manufacture of complex aero engine components, where accuracy and quality are of paramount importance. Some programs include machining and finishing of industrial RB211 and Spey engine casings; production of AGT 1500 nozzle assemblies for Avco Lycoming, and hot section machining work for marine and aero Tyne engine components.

**Keywords:** 1 = Aircraft; 12 = Machining; 19 = Testing/Test Equipment; 20 = Miscellaneous; Aluminum

**Components:** 1; Augmentor Wing = 1; Calibration = 19; Castings = 12; CNC Machining = 12; Combustion Research = 19; Component Fabrication = 12; Component Parts = 12; Computer Design/Computer Manufacture = 12; Corrosion Control = 19; Engine Components = 1, 12, 19; Engine Research = 1, 19; Heat Treating = 12; Life Cycle Support = 20; Magnesium = 12; Metal Plating = 12; Non-Destructive Testing = 19; Precision Machining = 12; Repair & Overhaul = 1, 20; Research & Development = 20; Titanium = 12; Tooling Fabrication = 12; Turbine Blade Inspection = 1, 19; Welding = 12; Turbine Engines = 1, 12, 20.

**SCI-TEC INSTRUMENTS Inc**

**Code:** STI

**Address:** 1526 Fletcher Road

Saskatoon, Saskatchewan, Canada S7M 5M1

**Contact:** Mr. Richard B Firth, Mgr, Marketing & Contracts – (306) 934-0101

**History:** Sci-Tec Instruments Inc is a Canadian owned high technology electronics company incorporated in 1981. There are no other Canadian or US facilities.

**Capability:** Sci-Tec Instruments was established to design, manufacture and market high quality scientific and industrial instrumentation and electronic systems. They can offer a broad range of capabilities in data acquisition, microprocessors, communication, remote sensing, remote control systems, as well as electronic system engineering and instrumentation from the conceptual stage through to delivery of a finished product. Along with the capability of machining components for their products, in-house machining experiences have included a range of intricate, close tolerance machining in satellite low noise amplifier housings, rocket payload extend/retract mechanisms, payload booms and payload prototyping.

The management objectives for the company comprises of continued market penetration for their three main products and diversifying its operations to include US Government solicited contracts in areas of research and development, payload or subcontract opportunities in the scientific and industrial electronics fields.

**Average Work Force:** Scientists and Engineers – 4

Others – 11

**Gross Sales:** 1982 – $0.6M

1983 – $0.75M (Projected)

1984 – $2.0M (Projected)

**Plant Size:** 7,200 sq ft

**Equipment:** Sci-Tec Instruments employs the following equipment:

- **Electronics – Microprocessor development system for development and test of software and hardware. Lab test equipment for the R&D and production testing of**
products and prototypes. Optical assembly and alignment facility which includes a laminar air flow bench, lasers and optical benches. Drafting facilities for mechanical, electronic and printed circuit boards.

Machining - CNC Mill/Precision engine lathe and other machining shop facilities to manufacture precision components.

Experience: Sci-Tec's main experience has been its research and development, manufacturing and marketing involvement with its three main products. The "Brewer Ozone Spectrophotometer" was jointly developed by Sci-Tec and the Canadian Government. The Brewer is a highly sophisticated instrument capable of monitoring ozone (O₃) and sulfur dioxide (SO₂) atmospheric overburdens and vertical concentration profiles. In addition, this instrument is presently being used in monitoring the horizontal irradiance in the ultraviolet and has been further developed to provide automatic azimuth and elevation tracking with additional features allowing for unattended operation. The Brewer is sold world wide to various governments, universities and scientific organizations.

The "Cosmos Tracking System" was developed to meet demand for a two-axis, microcomputer controlled point/tracking system. Applications for this device include pointing specialized scientific or industrial instruments at celestial objects and tracking as it moves through the objects' trajectory. Because of the medium load capability (100 lbs maximum), they expect the market to expand in the near future to cover a wide range of industrial, space and military applications.

An exclusive manufacturing and marketing license was secured for the "High Line Data Acquisition System" (HILDA). This instrument is the foremost system for measuring vibration on high voltage (730 kv) transmission lines. The ability of the system to provide remote, unattended measurements over a long time frame is expected to increase utility and maintenance/installation groups' demand for this instrument.

Keywords: 5 = Communications; 7 = Electronics; 9 = Environment; 10 = Image Processing & Optics; 12 = Machining; 17 = Software Services; 18 = Space Systems; 19 = Testing Equipment; 20 = Miscellaneous; PCM Encoders = 5, 7, 18; Telescope Systems = 5, 7, 17, 18; Data Acquisition Systems = 7, 17, 18, 20; Microprocessor Circuits & Software = 5, 7, 17, 18, 19, 20; Remote Sensing = 5, 7, 9, 17, 18; System Design & Engineering = 5, 7, 9, 10, 17, 18, 19, 20; Instrumentation = 7, 9, 10, 12, 17, 18, 19, 20; Remote Control Systems = 5, 7, 10, 17, 18.

Revised: Dec 83

SCIEX
(Division of MDS Health Group Ltd (MDS))

Code: SCI

Address: 55 Glen Cameron Road, Unit 202
Thornhill, Ontario, Canada L3T 1P2

Contact: Dr. N M Reid, Marketing VP - (416) 881-4646

History: Sciex was incorporated in 1970 under provincial charter (Ontario). In late 1981, Sciex amalgamated with MDS Health Group Ltd, a Canadian controlled public corporation. In early 1982, an associate company to MDS Ltd, Sciex Inc., was established in Amherst, New York, and will be conducting marketing operations in the US.

Capability: Sciex is engaged in the design, R&D, manufacturing, servicing, and marketing of trace chemical analysis systems, sample inlet systems, ionization modules, and custom designed application software for the industrial, environmental and military markets. The company currently has the world's leading Atmospheric Pressure Chemical Ionization (APCI) research capability. The Trace Chemical Analysis systems, TAGA® 3000 and TAGA® 6000 MS/MS, and the Elemental Analyzer, ELAN® ICP/MS, are the main products of the company. Both TAGA® systems can be fully mobile and are up to 1000 times more sensitive and 1000 times faster than other available systems. The TAGA® 3000 is primarily used for targeted compound analysis, while the TAGA® 6000 MS/MS is used for rapid mixture analysis and structure elucidation, and in many cases avoiding the preparative steps and time delays of chromatographic separation. The ELAN® system is an exceptionally sensitive instrument used for elemental analysis and the determination of isotopic ratios of elements.

Average Work Force: Engineers - 7
Ph.Ds - 12
Systems Analysts - 7
Others - 54

Gross Sales: Confidential

Plant Size: 22,000 sq ft

Equipment: Facilities are geared to specific applications requiring rapid measurement, monitoring or investigation of specific trace compounds in complex matrices. Sciex equipment includes:

- Three fully computerized atmospheric pressure ionization mass spectrometers - laboratory based and mobile. The TAGA® 3000 is a single quadrupole MS system. The TAGA® 6000 MS/MS is a triple quadrupole mass spectrometer. Unique features include - detection of compounds at sub-picogram or low parts per trillion level, minimal memory effects which facilitate high sample throughput, high ion transmission, cryogenic pumping, and gas dynamically confined C/P target with collision energies to 150 eV. Total system control, data display and manipulation are achieved via the PDP-11/03 or PDP-11/23 DEC computers, with RT-11 (single user) or RSX-11M (multi-user) operating systems. The appropriate peripheral terminal, graphic and hardcopy capabilities are integrated with the system.

- With the mobile unit, trace compounds at any accessible site can be detected, identified and their concentrations measured. The extent of environmental air contamination can be plotted throughout an area rapidly to pinpoint sources of contamination.

- Elemental Analysis Laboratory, equipped with the computerized ELAN® instrument and preparative wet chemistry laboratory. The ELAN® is a hybrid instrument incorporating an Inductively Coupled Plasma source interfaced to a computer-controlled mass spectrometer. The ELAN® permits the determination of elemental composition at the part-per-billion level in complex sample matrices as well as the measurement of isotopic ratios.

- Good design capability and reliability backed up by a team of skilled professionals able to provide application-oriented hardware, software and methodology development.

- In-depth customer training and comprehensive documentation.

- Toxic Chemical Laboratory capable of handling hazardous and carcinogenic compounds.

- Analytical facilities - expertise in the field of gas chromatographic column technology enables preparation of both packed and open tubular capillary columns.
Organic Laboratory.

- Electronic Circuitry Development Laboratory.

- Product testing facilities – experienced in testing vacuum systems involving cryogenics and ultra high vacuum.

- Effective working arrangement with the Aerospace Institute Laboratory of the University of Toronto. Work is carried out in this laboratory on fundamental questions pertinent to TAGA® and ELAN® developments.

**Experience:** Sciex sales of TAGA® 3000 and TAGA® 6000 MS/MS systems on an international basis include IBM, Xerox Corp., US Customs, National Research Council of Canada, Battelle (Edgewood Arsenal), Defense Research Establishment Valcartier, Defense Research Establishment Suffield, General Electric/New York State Environment, Ministry of Environment (Ontario), Ministry of Defense (UK), US Army Natick laboratories, and TRC Advanced Analytics.

Since the introduction of the ELAN® in March 1983, sales have been confirmed to the University of Alberta, National Research Council of Canada, XRAL Ltd, Geological Survey of Canada, Geological Survey of Ontario, Agriculture Canada, Ontario Ministry of the Environment, Eagle Picher Ltd (US), and the US Geological Survey (Denver).

The company has developed methods for real-time detection of explosives, illicit drugs, and CW agents in the parts-per-trillion range. In addition, Sciex has participated in special consulting studies including those dealing with pre-collected sampling systems in the field or workspace.

The company received the 1978 Canada Enterprise Award. In 1980, Sciex received an IR-100 Award for developing the TAGA® 3000 as one of the 100 most significant technical products in 1979.

**Keywords:** 4 = Chemistry; 6 = Computers; 7 = Electronics; 9 = Environment; 16 = Security & Safety; 20 = Miscellaneous; Mass Spectrometry = 4, 9, 16; Research & Development = 6, 7, 10; Ion Physics = 9, 20; Ion Molecule Chemistry = 4; Contract Research = 4, 7, 9; Computer Design = 6; Fluid Dynamics = 20; Vacuum Technology = 20; Ultra-Trace Analysis = 4, 9, 20; Electronics Design = 7; Instruments = 4; Testing = 9; Mobile & Laboratory Based Analytical Services = 4, 9, 20; Product Characterization = 4; Quality Assurance = 20; Professional Services = 4, 6, 7, 9, 16, 20; Toxic Agent Detection = 9, 16; CW Agent Detection = 9, 16, 20; Explosives Detection = 16; Drugs Detection = 20; Trace Gas Detection = 9; Chemical Agent Detection = 9, 16, 20.

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**SCINTREX Ltd**

**Code:** SCX

**Address:** 222 Snidercroft Road
Concord, Ontario, Canada L4K 1B5

**Contact:** Dr. H. Seigel, President - (416) 669-2280

**History:** Scintrex Ltd began as Sharpe Instruments Ltd in 1947 and was incorporated as Scintrex Ltd, a public Canadian owned company, in 1967.

Scintrex Defense Products Division is a supplier to the US DOD of high sensitivity portable (Mark 22) magnetometers for explosive ordnance detection. In addition, it supplies area radiation monitors (AN-GDO-3) for the determination and transmission of the level of nuclear radiation around strategic locations. Similar military-specific radiation monitors are being developed for mobile applications (ship and aircraft installations). An explosives vapor detector (bomb sniffer) has been developed in conjunction with the National Research Council of Canada and will be available in 1984 for defense against acts of terrorism. The potential application of laser-based, active remote sensing methods to certain defense problems is now being investigated.

**Capability:** The Contract Instrumentation Division of Scintrex began developing monitoring instrumentation in 1974 for CANDU nuclear power plants. Since then, the company has manufactured tritium monitors, reactivity control logic cabinets, shut-off rod logic modules, high radiation hand-held monitors and logic panels for safety shut-down systems. CANDU reactor operators in Ontario, Quebec, New Brunswick, Korea, and Argentina use this equipment.

The Exploration and Analytical Equipment Division of Scintrex is a major part of its business. It includes the design, development, and manufacture of geophysical and geochemical instruments for the mining industry, and analytical instruments for chemical laboratories. Over the years, geophysics has become the key exploration tool for discovering new mineral deposits. The steady depletion of surface ore bodies and consequent need to detect buried deposits have produced a growing dependence on geophysical methods. Scintrex is a leader in the design, development, and manufacture of mining exploration equipment. Its products, services, and skills have contributed directly to numerous major mineral discoveries in different parts of the world. Out of this experience, there is an expertise in developing portable analytical equipment for remote, on-site chemical analyses.

The Systems Engineering Group of Scintrex is highly experienced in the installation of sensing systems in aircraft, helicopters, and vehicles for mobile applications. Many magnetic, electromagnetic, radiometric, and laser installations have been made, operated and serviced.

**Average Work Force:**
- Electronic Engineers - 14
- Mechanical Engineers - 2
- Chemists - 4
- Geophysicists - 4
- Physicists - 4
- Technicians - 50
- Machinists - 20
- Sales, Office Staff & Others - 101

**Gross Sales:** 1979 - $9.0M
1980 - $11.2M
1981 - $12.5M
1982 - $14.8M
1983 - $9.1M

**Plant Size:** 46,000 sq ft (additional 20,000 sq ft projected)

**Experience:** Scintrex Ltd has had experience with the US Army and Navy (contracted to build nuclear radiation monitoring systems and explosive ordnance detectors); Ontario Hydro (contracted to supply hand-held radiation dosimeters for nuclear power plants); and other CANDU reactor users (contracted to build a variety of radiation monitoring devices).

**Keywords:** 4 = Chemistry; 7 = Electronics; 8 = Energy; 9 = Environment; 14 = Protective Equipment; Radiation Monitoring Systems = 9, 14; Dosimeters = 9, 14; Tritium Monitors = 9, 14; Gamma Ray Monitors = 9, 14; Beta Ray Monitors = 9, 14; Geophysical Equipment = 8; Electromagnetics = 7, 8; Magnetic = 8; Gravity = 8; Geochemical Equipment = 8; Atomic Absorption Spectrophotometers = 4, 9; Ultraviolet Fluorescence Systems = 4; 9; Toxic Gas Detectors = 9; Hazardous Gas Detectors = 9; Remote Sensing = 9; Ordinance Detectors = 4, 9, 14; Trace Gas Detection = 9.

Revised: Dec 83
SEAGOLD INDUSTRIES Corp

Code: SEA

Address: 4008 Myrtle St
Burnaby, British Columbia, Canada V5C 4G2

Contact: Mr. John L Richardson, President and CEO – (604) 437-4445
Mr. John C Bowyer, Controller & Manager of Admin – (604) 437-4445

History: Seagold was formed in 1978 to carry out research related to reverse osmosis desalination. TDC Technology Development Corp acquired controlling interest in Seagold Industries Corp in 1979. The company began commercial production in 1981.

Capability: Seagold manufactures a full line of reverse osmosis desalinators from a hand operated unit for emergency use in life rafts, to motorized desalination systems for making up to 100,000 gallons of fresh water per day from sea water or brackish water.

Average Work Force: Engineers – 7-10
Others – 5-10

Gross Sales: 1982/1983 – $0.7M
1983/1984 – $1.5M (Projected)

Gross Sales: No Data

Plant Size: 7,500 sq ft

Equipment: Precision machine shop, Recirculating seawater test-bed system, and Analytical laboratory.

Experience: Seagold Industries Corp has supplied a broad range of units for various applications to various commercial, governmental and individual customers worldwide. These customers include the US Army (MERADCOM), US Navy, Canadian Coast Guard & Canadian Navy.

Keywords: Environment = 9,
Security & Safety = 16,
Reverse Osmosis = 9,
Desalination = 9,
Evaporators = 9,
Distillers = 9,
Pumps = 9,
Seawater = 9,
Water Makers = 9.

Revised: Dec 83

SED SYSTEMS Inc

Code: SED

Address: P.O. Box 1464
Saskatoon, Saskatchewan, Canada S7K 3P7

Contact: Mr. D. H. Kjosness, Vice President – (306) 244-0976

History: SED Systems Inc is a high technology systems engineering and production company located in Saskatoon, Saskatchewan, Canada. They evolved from the Space Engineering Division of the University of Saskatchewan. Originally, their activities consisted of the design and construction of rocket payloads for upper atmospheric research. Since their incorporation as a private company, SED has pursued a development policy which has led them increasingly into commercial markets with innovative products derived from aerospace technology. SED was incorporated in 1972.

Capability: SED supplies products and services to three principal markets – aerospace, communications, and agricultural instrumentation. They are organized along functional lines as follows:

- Advanced Systems Engineering Division (i.e. projects)
- Products Division

SED also has a wholly owned research subsidiary, SED Research Ltd. These groups are coordinated by a centralized corporate office. The major products and services offered in each area are:

- Projects: Communications systems engineering, custom satellite communications earth stations, complete satellite telemetry tracking and command earth stations, satellite ground control equipment, customized telemetry and tracking systems, sounding rocket payloads, and scientific instrumentation for use on the space shuttle.

- Products: TV satellite (cable, quality) receivers, TVRO systems and other microwave components, sub-systems for satellite earth stations, and agricultural instrumentation.

Diversification is one of SED’s major strengths. A careful assessment of the range of the company’s products and services demonstrates that they are based on a relatively narrow range of technologies that have been developed in depth. The specific technologies are highly complementary which allows the penetration of highly diversified markets with innovative products resulting from knowledge acquired in other fields. Complementary technologies have also strengthened SED by permitting staff mobility in response to market fluctuations and to facilitate employee development.

Average Work Force: Professional – 90
Technical – 210

Gross Sales: No Data

Plant Size: 76,000 sq ft

Equipment: SED has a variety of specialized facilities including – precision machine shop and chassis fabrication facility, metal finishing and painting shop, computer systems, earth stations and payload integration facilities, microwave clean room, and a medium volume PCB production facility.

Experience: SED experience in the space and defense areas include:

Space:

- Payloads – Sounding rocket and balloon payloads (1965-present) (produced over 60, Canadian National Research Council); and Firewheel sub-satellite (1980 launch on Ariane), NRC (Max Planck Institute – Germany).

- Mission Planning and Support – Communications Technology Satellite – CGS or Hermes (1970-1976) [planned attitude acquisition phase, designed ground control station and developed software, Canadian Department of Communication (DOC)].


- Communications Earth Terminals – A wide variety of over 200 terminals including low cost 4 and 12 GHz TV receive only, and 2 way fixed and transportable terminals (4/6 and 12/14 GHz (1974-present)).

Defense:


Satellite Control Centers – SARSAT Canadian Mission Control Center (1981-1982) (installed at Trenton, Ontario as part of Canada’s contribution to the international Search and Rescue Satellite (SARSAT) Program, provides control and monitoring capability for the entire Canadian SARST system, Department of National Defense).


Communications Systems – Project Eureka (1981-1983) (designed, developed and installed a full, 2-way satellite communications ground system in Ottawa and Eureka to provide a data link for the DND (Project Hurricane), and Telesat Canada).

SED is the system designer and the system integration manager for the external and miscellaneous interior communications systems, and the meteorological systems for the six new Canadian Patrol Frigates for PARAMAX Electronics (a subsidiary of Sperry) (1983-Present).

Keywords: 5 = Communications, 6 = Computers, 7 = Electronics, 9 = Environment, 15 = Radar, 17 = Software Services, 18 = Space Systems, Ground Stations = 7, Telephone Communications = 5, 15, Design to Requirements = 17, Simulations Programs = 17, Communications Systems = 18, Instrumentation = 18, Systems Studies = 18, Satellite Communications Ground Stations = 18, Satellite Telemetry Tracking Stations = 18, Ground Control Equipment = 18, Payload Design = 18, Payload Test Services = 18, Computer Systems = 6, Digital Switches = 15, Aerial Target Tracking System = 1.

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SHARP SPECIAL SYSTEMS (Ottawa)
I.P. SHARP ASSOCIATES Ltd

Code: IPS

Address: 265 Carling Ave, Suite #600
Ottawa, Ontario, Canada K1S 2E1

Contact: Mr. W W Bradbury, Mgr, Special Systems (Ottawa) – (613) 236-9942

History: I.P. Sharp Associates Ltd is a Canadian owned company incorporated in 1964. The corporate headquarters is located in Toronto. Sharp Special Systems is a division of I.P. Sharp that began operation in 1973. All of the company’s minicomputer-related activities are amalgamated in this division. Wholly owned subsidiaries of this Canadian company are located in Australia, Austria, Belgium, Denmark, France, the Far East, Germany, Italy, Mexico, The Netherlands, Norway, Sweden, Switzerland, the UK, and the US. The company has twelve Canadian locations in six provinces. There are nineteen US locations in twelve states and Washington, DC.

Capability: I.P. Sharp is a computer software company specializing in – (1) Provision of timesharing service called SHARP APL; (2) Development of software to handle projects ranging from large database applications to small real-time monitor and control systems; and (3) Research and development of software tools to aid in the production of trusted systems.

SHARP APL is offered in both interactive and batch modes and can be used at your own premises, using a variety of terminals, via a telephone connection. Each user has 265 kilobyte work-space that may contain both functions and data. Any number of work-spaces may be stored on disk for later retrieval. The file system is based on the principles of shared direct access and total security.

Development of turnkey computer systems now represents the major portion of the Special Systems activities. However, they continue to offer a wide range of services, including:

- Project Management
- Facilities Management
- Feasibility Studies
- System Specification and Design
- Hardware Evaluation, Selection and Acquisition
- Design and Selection of Communications Facilities
- System Operational Audits
- Contract Programming
- Complete Turnkey systems

Average Work Force: Total – 400 (Professionals plus Support Staff)

Gross Sales:
1980 – $24M
1981 – $35M
1982 – $50M

Plant Size: 10,000 sq ft (Special Systems Office Space – all locations)

Equipment: Amdahl 480V8, 1 x IBM 3081-D, 2 x VAX 11/750, 1 x VAX 11/780, and n x PDP 11/34

Experience: I.P. Sharp has experience in the following areas

Timesharing – Using SHARP APL, many multi-national companies and governments access private and public data bases in Socio/Economic, Financial, Commodities, Airline Schedules, and Natural Resources


Real-Time Information Display – Operational Information Display System for airports administered by Canadian Ministry of Transport; MAX-PAK, a micro film information system developed for Illinois State Police, Aviation Communication Measurement System, an airborne communications monitor for Canadian Ministry of Transport; Schipol Airport Information System for the Amsterdam airport; and Computer Aided Dispatch and Records Entry for Police and Fire Departments.

Communications – The SHARPNET, designed and built by I.P. Sharp Associates Ltd to facilitate access to SHARP APL, and X.25 compatible front-end processors and Network Interface Machines for Canadian Department of National Defense.

SHERRITT GORDON MINES Ltd

Code: SGM

Address: Fort Saskatchewan, Alberta, Canada T8L 2P2

Contact: Mr. Herbert Veltman, Dir, Sherritt Research Center

History: Sherritt is a highly diversified company with a US subsidiary located in Portland, Oregon (Sherritt Fertilizers Inc.). Sherritt was incorporated in 1927 as a mining company. In 1954, their processing plant at Fort Saskatchewan was opened. Located at this latter site is the Sherritt Research Center which is their R&D arm.

Capability: Besides mining copper, zinc & precious metals, and refining nickel & cobalt, Sherritt Gordon carries out R&D at their Research Center in the area of powder metallurgy. Also at Ft Saskatchewan, Sherritt has their Fabricated Metal Products Division which manufactures a wide range of secondary products based on Sherritt’s raw materials and technology. These products include a wide range of special powders and composite powders, dispersion strengthened nickel, magnetic alloys and wear resistant materials. Sherritt is active in developing dispersion strengthened alloys and abradable seals for turbine engines. They have recently expanded their research activities to include rare earth cobalt magnets, wear resistant materials, and ultra fine metal powders.

During 1983, Sherritt’s research and development work continued in three areas and several new products reached commercial production – notably composite powders for turbine seals, and wear resistant materials for the mining industry.

Average Work Force: Total (Research) – 91
PhDs – 13
MSs – 3
BSs – 21
Others – 54

Gross Sales: (R&D Only)
1980 – $3.5M
1981 – $2.8M
1982 – $2.8M
1983 – $4.5M

Equipment: Sherritt’s Research Center is well equipped for process research in hydrometallurgy and product research. This includes autoclaves, solvent extraction and ion exchange equipment, standard chemical laboratory equipment, and an analytical laboratory. Also included are powder presses, sintering furnaces, rolling mills, vacuum induction melting equipment, and flame & plasma spray guns. Physical testing equipment includes tensile testing, stress rupture, wear resistance, metallography, transmission and scanning electron microscopes, electron microprobe, and x-ray diffraction.

Experience: A large portion of Sherritt’s total metal sales go to the US which includes fabricated metal products, such as dispersion strengthened nickel and composite powders for turbine engines. The products, which may be used in military aircraft, are sold to engine manufacturers. Sherritt is interested in doing business with the USAF when the research area is consistent with their research objectives. Research and development projects have been carried under USAF contracts in the late 1960s and early 1970s. These contracts were in the area of dispersion strengthened nickel-chromium alloys. The research specifically dealt with improved oxidation resistance and mechanical properties.

Keywords: 1 = Aircraft; 4 = Chemistry; 12 = Machining; 20 = Miscellaneous; Engine Components = 1, Engine Systems = 1; Powder Metallurgy = 4, 12, Precision Casting = 12; Speciality Alloys = 4, 12; Dispersion Strength Alloys = 1, 4, 12; Alloys = 1, 4, 12; Abradable Seals = 1, 4, 12; Rare Earth Magnets = 20, Wear Resistant Materials = 1, 4, 12; Continuous Casting = 12; Cobalt-Samarium Magnets = 20, Thermal Spraying = 1, 4; Magnets = 20, Casting = 12, Ultra Fine Metal Powders = 4, Metal Powders = 4.

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SIMMONDS PRECISION CANADA Ltd

Code: SPC

Address: 2752 Slough St Mississauga, Ontario, Canada L4T 1G3

Contact: Mr. Andrew Byrne, GM, Product Support Center

History: Simmonds Precision Canada Ltd is a wholly owned subsidiary of Simmonds Precision Products Inc of Tarrytown, NY. The company has been in Canada since 1947 and has been at the current location since 1975.

Capability: Simmonds Precision Canada Ltd is the repair and overhaul center for most Simmonds products in Canada. This includes fuel quantity gauging systems, ignition exciters, torque indicators and, in 1984, actuators.

Average Work Force: Engineer – 1
Others – 4

Gross Sales: No Data

Plant Size: 5,000 sq ft

Equipment: Test equipment for electronic and electromechanical equipment.

Experience: Present customers include most Canadian airlines, many Canadian business aircraft operators, and Canadian Departments of Supply & Services and National Defense.

Keywords: 3 = Avionics; 7 = Electronics; 19 = Testing/Test Equipment; Repair & Overhaul = 3, 7; Instrument Repair = 3, 7; Fault Diagnosis = 3, 7, Testing/Test Equipment = 19.

Revised: Dec 83
SIMTRON Ltd

Code: SIM
Address: 494 The Queensway, Unit #1
Peterborough, Ontario, Canada K9J 7L9
Contact: Mr. W Czechowski - Contracts - (705) 743-6903

History: Simtron Ltd was formed in 1976 to design, manufacture and service electronic products for the communications, air, maritime and ground transportation markets. In 1982, Simtron Ltd was acquired by Dowty Equipment of Canada Ltd.

Capability: Simtron's activities are divided into three major areas:

- Aerospace: The design and manufacture of aircraft subsystems and black boxes. This is typified by the microprocessor-based “steer-by-wire” equipment presently in production for the standard equipment on the Canadair Challenger 601, and the deHavilland Dash 8 aircraft. Simtron is approved to DND-1016 levels which have direct equivalency to MIL-Q-9858.
- Multiplex Alarm Systems: Simtron has developed a data acquisition system called Multiplex 490 alarm system that represents a major improvement over existing equipment in the market place. Systems are now installed and working in several major Canadian locations. Ongoing R&D and development activities are proceeding on this equipment.
- Build to Print: Simtron is engaged in building-to-print for a number of large corporations. Built products include printed circuit board assembly, wire harnessing, cabinet assembly, test equipment and testing. The in-house engineering capability enables Simtron to offer redesign and substitution services on subcontract work.

Average Work Force: R&D - 3
Engineers - 2
Technicians - 1
Production - 59
Others - 9

Gross Sales:
1980 - $0.69M
1981 - $0.81M
1982 - $1.24M
1983 - $2.50M

Plant Size:
10,000 sq ft (capability to expand to 25,000 sq ft)

Experience: See Capability Section

Keywords: Aircraft; Electronics; Test Equipment; Landing Gear; Steering Systems; Steer By Wire Systems; Data Acquisition; Build To Print; PC Board Fabrication; Test Equipment; Specialized Test Equipment; Wiring Harness Fabrication; Cabinets; Cabinet Testing

SLACAN
Division of Slater Steel Industries Ltd

Code: SLA
Address: 681 King St W
Hamilton, Ontario, Canada L8N 3E7

Contact: Mr. Wendell MacDonald, Manager: OEM Sales - (416) 528-8888

History: Slacan was incorporated in the Province of Ontario in 1962.

Capability: Slacan is an operating division of Slater Steel Industries Ltd with its head office and manufacturing facilities located in Hamilton, Ontario. They are the largest Pole Line Hardware manufacturer in Canada, providing more than 2,000 different items for the electrical, transmission and communications markets. The division's product lines are engineering oriented. They claim a reputation for excellence of design, high quality of manufacture, and long service in the field. Their business areas of interest are - aluminum castings, steel forgings, and steel stampings. They operate under quality control levels outlined in CSA Z299.3 and under Military Specifications MIL-C-6021, Class 2A, Grade B and D for castings. Specific capabilities are outlined below.

- Aluminum Castings - permanent mold up to 50 pounds; sand mold up to 150 pounds; Feron, Co., and shell cores; and material poured 125, 135, 234, 432, 6377, A1mag 35, B226, A357, etc. Reference: All aluminum castings for the ballistic fire control computer developed by Computing Devices for the US Army M-1 main battle tank.

- Stamping/Steel - a total of 85 units comprised of open back inclines to 135 ton capacity, straight sided single action presses to 200 ton capacity, double acting deep draw to 300 ton punch and 200 ton blank holder capacity, hydraulic brakes to 400 ton capacity with 14 ft bed including 2 ft horn. The above equipped with air clutches, brakes and cushions.

Average Work Force: Total - 250

Gross Sales: No Data

Plant Size: 190,000 sq ft (manufacturing area)

Equipment: Slacan maintains the following equipment:

- Forging Equipment: Four board hammers up to 2,000 pounds capacity; One electro-hydraulic hammer 4,000 pounds capacity; One forging press 700 tons capacity. Three hot headers 2\* capacity; One hot header 1\* capacity; and various trim presses and furnaces.

- Finishing Equipment: Machining limited, however, includes milling, turning, drilling, threading and tapping. Other facilities include welding, cleaning, painting, hot dip galvanizing, heat treating (Steel and Aluminum), and tool engineering.

Experience: No specific information was given on experience except for Slacan's work with Computing Devices Co (Aluminum castings for the ballistic fire control computer for the M-1 main battle Tank). Customers include private industries in the US and Canada.

Keywords: Machining, Castings, Stamping, Steel, Forgings, Tooling.

SPARTON OF CANADA Ltd

Code: SOC
Address: P.O. Box 5125, Terminal A
100 Elm St.
London, Ontario, Canada N6A 4N2
**Contact:** Mr. Lawrence R Staszak, President & General Mgr  
- (519) 455-6320

**History:** Sparten, incorporated under Federal charter in 1930, is a wholly owned subsidiary of Sparten Corp, Jackson, MI.

**Capability:** Sparten specializes in the development, engineering, and manufacture of specialized electronic products for the military, industrial, and Original Equipment Manufacturer (OEM) markets. Their R&D activities include development of a directional command active sonobuoy, new improved low noise passive sonobuoys, line array sonobuoys, depth-compensated ring shell acoustic projectors, and switch-mode electronic power supplies.

Sparten’s Engineering Department staff covers professional disciplines of electrical/electronic engineering, mechanical engineering, physics, hydro-dynamics, and hydroacoustics. They are experienced in the preparation and management of engineering projects from proposal through to implementation (development, specifications, testing, and production).

Sparten of Canada Ltd is a qualified producer meeting the requirements of DND 1015 and US MIL-Q-9858A Quality Assurance Programs. There is a resident military QC detachment on the premises. Sparten is cleared by DSS Industrial Security for projects up to SECRET classification. Current product lines are active and passive sonobuoys for military customers, and switch mode and linear power supplies for large and small computer systems.

**Average Work Force:**  
Production: 150/200  
Engineering Dept:  
PhD - 2  
MSc - 5  
BSc - 10  
Tech - 18  
Others - 7

**Gross Sales:** No Data

**Plant Size:** 170,000 sq ft

**Equipment:** Sparten’s engineering facilities include fully equipped laboratories, hydrodynamic test tank, RF shielded rooms, computer terminal access to a wide range of engineering software including FFE, SPICE and OSCAR, and two IBM 370 systems and two Perkin Elmer Corporate computers.

**Experience:** Sparten is a supplier of passive sonobuoys to the Canadian Government; Range Only (RO) active sonobuoys (AN/SSQ-47B/522) to the Canadian Government, to the US Navy, and to other overseas users; OEM supplier of various types of regulated power supplies to Canadian manufacturers; responsible for the development of the Canadian Command Active Sonobuoy System for the Canadian Government; is now in advanced development of the Directional Canadian Command Active Sonobuoy (DICANCAS) for the Canadian Government; and is also manufacturing heavy duty depth compensated underwater Ring Shell Sound Projectors. Applications for the latter device are anti-submarine warfare (ASW) crew training, dipping sonar, and scientific investigations of ocean sound propagation characteristics or sound detection systems.

**Keywords:** 6 = Computers; 7 = Electronics; 20 = Miscellaneous; Sonobuoys = 7; 20; Hydrophones = 7; 20; Power Supplies = 6; 7; Active Sonobuoys = 7; 20; Passive Sonobuoys = 7; 20; Command Active Sonobuoys = 7; 20; Underwater Ring Shell Sound Projectors = 7; 20; Acoustic Sensing = 7; Environmental Sensors = 7; Geophysics = 7; ASW = 20.

**Revised:** Dec 83

**SPAR AEROSPACE Ltd**

**Code:** SPA

**Address:**  
Executive Offices  
Royal Bank Plaza, South Tower  
P. O. Box 83  
Toronto, Ontario, Canada M5J 2J2

**Corporate Office**  
6303 Airport Road, Suite #403  
Mississauga, Ontario, Canada L4V 1R8

*Government Relations Office*  
77 Metcalfe St, Suite #200  
Ottawa, Ontario, Canada K1P 5L6

**Satellite and Aerospace Systems Division**  
Communications Systems Division  
21025 Trans-Canada Highway  
Ste-Anne-de-Bellevue, Quebec, Canada  
H9X 3R2

**Remote Manipulator Systems Division**  
1700 Ormont Drive  
Weston, Ontario, Canada M9L 2W7

**Defense Systems Division**  
4100 Weston Road (Location)  
Weston, Ontario, Canada M9L 1W7  
P. O. Box 13050 (Mailing)  
Kanata, Ontario, Canada K2K 1X3

**Gears & Transmissions Division**  
Aviation Services Division  
825 Caledonia Road  
Toronto, Ontario, Canada M6B 3X8

**The Copter Shop**  
1190 McTavish Road, Northeast  
Calgary, Alberta, Canada T2E 7G6

**Subsidiaries:**  
Astro Research Corporation  
6390 Cindy Land  
Carpinteria, California 93013

Northway-Gestalt Corporation  
1450 O'Connor Drive  
Toronto, Ontario, Canada M4B 2V2

**Contact:** Mr. B R Machum, Dir. Gov't Relations & Mkg  
Support = (613) 563-0230

**History:** Spar commenced operations as a public company in January 1968, following the acquisition of the Special Products and Applied Research (SPAR) Division of The de Havilland Aircraft of Canada Ltd. The company developed by internal growth and through acquisitions including:

- 1969 – The assets of York Gears Ltd
- 1972 – Astro Research Corporation of California
- 1977 – The assets of the Government and Commercial Systems Division of RCA Ltd and certain assets of the space electronics manufacturing unit of Northern Telecom Ltd
- 1978 – The Copter Shop of Calgary, Alberta, Canada
- 1980 – Northway-Gestalt Corporation

**Capability:** Spar Aerospace Ltd is a Canadian owned company engaged in the design, development, manufacture and servicing of systems and products for the space, communications, defense, gears and transmissions, aviation and mapping markets. The company employs about 600 engineers and technicians, one of the largest technological groups in the private sector in Canada.
In sixteen years of growth, Spar has gained international recognition as a diversified technology company and has achieved financial stability by balancing the steady sales base of its gears and transmissions and aviation services operations with businesses serving the fast-growing markets of space and communications. Spar’s areas of expertise are outlined below:

- **Space** – Spar’s facility in Ste-Anne-de-Bellevue near Montreal is the principal supplier in Canada and a major international manufacturer of satellite communications systems, including satellites and satellite subsystems.

  Spar and its predecessor companies have contributed to the design and manufacture of 50 satellites and subsystems, including the fabrication of structures and payloads for all the Canadian and many international satellites. The company’s contract from Telesat Canada in 1979 to supply two 24-channel Anik D communications satellites was the first such prime contract to be granted to a Canadian company. Anik D1 was successfully launched in August 1982 and Anik D2 is scheduled for launching in 1984.

  In 1982, Spar was awarded a prime contract to provide two satellites and a related ground control system for EMBRAER’s Patrol Frigate, the Brazilian government-owned telecommunications company. The project known as Sistema Brasileiro de Telecomunicacoes por Satellite (SBTS) is scheduled to be completed in 1985. This is the largest satellite contract won by Spar and will be the first domestic communications satellite system in Latin America. In addition, Spar is working on the following major communications satellite projects – Intelsat VI, G-STAR, Olympus, and MSAT.

  A major project being completed at Spar is the production of the Remote Manipulator Systems (RMSs) for the US Space Transportation System. This contract awarded in 1979 calls for the delivery of three systems to the National Aeronautics and Space Administration (NASA) through 1984. Canadarm, the original RMS, was successfully tested for the first time on the Space Shuttle “Columbia” in November 1981 and continues to perform flawlessly on space flights. It was produced in Canada under the agreement between the National Research Council of Canada (NRCC) and NASA. Spar was the prime contractor to NRCC for the design, development and manufacture of this flight system.

  Since 1980, Spar has been working on a contract from Ontario Hydro to design a remote manipulator and control system to replace and repair fuel tubes in nuclear reactors. In addition, Spar, Ontario Hydro and the Canadian Fusion Fuels Technology Program are engaged in the concept definition stage of a project to apply remote manipulator technology to the Tokamak fusion reactor project in Princeton, NJ.

  Spar’s subsidiary Astro Research Corporation, designs and develops lightweight deployable structures for space and ground applications. These include the patented STEM antenna product line and Astromast deployable structures used in many spacecraft to deploy antennas, experiments and solar arrays.

- **Communications** – Spar designs and manufactures satellite earth stations and related projects. The development of its newest product – Division Multiple Access/ Digital Speech Interpolation (DSI) equipment was largely completed during 1983 and the first terminal will be delivered to Teleglot in 1984. The system is now being offered in international markets.

  SPARCOM, the company’s Telephony satellite earth terminal developed in cooperation with the Department of Communications, offers unique advantages to users in remote locations and in private networks. The company is working on a SPARCOM and FM-SCPC program with Maritime Telegraph and Telephone and Newfoundland Telephone to improve communications with oil rigs operating off the east coast of Canada.

  Spar has signed a multi-year joint development and technology transfer program with the People’s Republic of China.

- **Defense** – Spar develops electro-optical defense products, builds electronic assemblies for satellites, and manufactures combat equipment for the Canadian Armed Forces. It also provides technical support to the Forces, particularly systems engineers. Facilities include a manufacturing plant, optical, electronics and systems laboratories, and a dedicated computer for developing military software and the real-time processing and display of complex optical data.

  Spar is a leader in the field of remote heat sensing technology, having worked for 16 years to develop the unique ANISAR infrared surveillance system for the passive detection of ships, missiles and aircraft for defense and navigation purposes. Following successful trials of the system by the Canadian and US Navies, a project agreement was signed by the two governments in 1983 to undertake, on a joint basis, the final development of this equipment.

  Spar has been selected by Hollandse Signaalapparaten B.V., the Netherlands, to manufacture and support fire control or other equipment that may be selected for the new Canadian Patrol Frigate.

- **Gears and Transmissions** – Spar is an industry leader in the production of high precision aerospace gears and transmissions. The company manufactures and assembles lightweight, high-speed, high-torque power transmission systems and equipment for gas turbine engines and fixed and rotary wing aircraft. This facility also manufactures, assembles and tests the joints of the RMS.

  In 1982, Spar signed an initial contract with Sikorsky Aircraft to produce the main, intermediate and tail gearboxes for the Sikorsky H-60 series helicopter. Under the agreement, Sikorsky has options to purchase additional hardware which, if fully exercised, will provide Spar with more than a dozen years of gear production. As well, the company manufactures the tail rotor, intermediate gearboxes and main rotor shafts for the Sikorsky S-76 commercial helicopter.

  In 1983, General Electric Company awarded Spar six contracts for follow-on production of accessory gearboxes and other components for engines that power transport helicopters and turboprop and turboprop aircraft. Spar produces accessory gearboxes for General Electric’s J85-21 turbojet engine (used in the F-5E/F aircraft), the T700 turboshaft engine (used in the Black Hawk, Sea Hawk, Advanced Attack, and Bell 214ST helicopters), and the CT7 turboprop engine variants. Engine gearboxes are supplied for General Electric’s new J79-17X engine development program, the CF6-80 commercial transport engine and for the CFM56 turbofan engine, a joint project of General Electric and SNECMA of France. Gearbox components are also manufactured for Avco Lycoming’s T53, T55, and ALF 502 engines.

  The company fabricates the transmission and components for the Boeing Vertol CH-46 helicopter, transmission gears for the Westland Lynx helicopter (UK) and gear box components for the Puma helicopter made by Aerospatiale of France.

- **Aviation** – Spar repairs and services aircraft components, sells aviation products and accessories, and overhauls helicopters.

  Services cover engine and flight instruments, components of electrical, oxygen, navigational and autopilot systems, constant speed drives, accessory gearboxes, and components for flight control and hydraulic systems. Customers are military and commercial operators in Canada, the US, Mexico, and Central and South America. A large part of Spar’s business is with 17 aircraft equipment manufacturers in North America and Europe, which have appointed the company as a Canadian warranty and service station for their products.
For helicopters, Spar provides an authorized customer service facility for Bell, Aerospatiale, and Hughes. Services include the sale of parts and accessories, the repair and overhaul of engines, including natural resources and man-made features, and producing, through remote sensing techniques, conventional graphic maps. In addition, the company provides digital mapping services, gathering information in digital form from aerial photos and maps to provide a database for land information systems. Half of Northway-Gestalt’s services and products are sold to the government for project design, resource evaluation and land use studies and the balance to private enterprise, such as engineering, natural resources, forestry and surveying companies.

**Average Work Force:**

- Engineers & Technicians – 600
- Others – 1400

**Gross Sales:**

- 1980 – $128M
- 1981 – $123M
- 1982 – $178M

**Keywords:**

- 1 = Aircraft
- 3 = Avionics
- 5 = Communications
- 6 = Computers
- 7 = Electronics
- 8 = Energy
- 9 = Environment
- 10 = Image Processing & Optics
- 12 = Machining
- 18 = Space Systems
- 19 = Testing/Test Equipment
- 20 = Miscellaneous

**Communications:**

- 16 = Digital Mapping
- 18 = Computer Produced Maps
- 20 = Digital Imaging

**Instrumentation:**

- 7, 10, 20 = Lift Cycle Support
- 1 = 20
- 19 = Mapping
- 8, 9 = Mechanical Arms
- 18, 20 = Remote Sensing
- 15, 20 = Repair & Overhaul
- 5, 7, 18 = Satellite Subsystems
- 5, 7 = Structures
- 5, 7, 10, 18 = Transmissions

**Revised:** Dec 83

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**SPERRY COMPUTER SYSTEMS**

**Division of Sperry Canada Inc**

**Code:** SUD

**Address:** 200 Saulteaux Crescent

Winnipeg, Manitoba, Canada R3J 3W3

**Contact:** Mr. G R Smith, Dir. Canadian Operations – (204) 888-4222

**History:**

Sperry’s Winnipeg Manufacturing Plant was established in 1977 as the first facility of the Defense Systems Division of Sperry to be located outside the Continental US. The establishment of this plant was a direct result of the procurement policy of the Canadian Department of National Defense as it related to the CP-140 Aurora Patrol Aircraft. The company operates exclusively at the Tier 3 level of the industry. The initial plant charter was to assemble components for the Sperry CP-140 Computer which is the heart of the sophisticated computer technology developed for submarine detection. This computer is also deployed on the US Navy P3C and S3A Aircraft.

A Systems Engineering and Marketing facility was established in Ottawa in December 1980 to assist in the integration of the Engineering Systems requirements for the Canadian Patrol Frigate Program with hardware design, software development, manufacturing, and system integration efforts in Winnipeg.

**Capability:**

The charter of the Winnipeg Plant has expanded from assembly to complete design, software development, testing, and system integration of its own product line. Presently, the Winnipeg plant is engaged in assembly and test of coil wound products, core memory arrays, power supplies, magnetic tape transports, maintenance consoles, switches, printed circuit assemblies, harnesses, and the start up of a product mandated Microcomputer.

The rapid expansion of their areas of endeavor required a new facility which started operation in April 1981. The new plant has the latest in high technology manufacturing, test and office facilities, and is certified by the Department of National Defense as a manufacturer and repair facility of electronic equipment. The final test area contains environmental chambers that meet the complete range of military specifications and are large enough to accommodate entire computer and avionics systems. Random vibration capabilities will be installed to meet the workmanship screening required on all new Canadian and international avionics military procurements. Sperry recently started development of the AN/JYC-501 (V SHINPADS (Shipboard Integrated Processing & Display System)), a product conceived by the Canadian Forces for use on the new Canadian Patrol Frigates.

**Average Work Force:**

- Engineers – 39
- Manufacturing – 141
- Administrative – 23

**Gross Sales:**

- 1980 – $1.5M
- 1981 – $5.0M
- 1982 – $10.0M
- 1983 – $10.0M
- 1984 – $15.0M (Projected)

**Plant Size:**

- 40,000 sq ft (Winnipeg Facility)
- 5,000 sq ft (Ottawa Facility)

**Equipment:**

Sperry employs such equipment as Environmental Test Chamber, Random Vibration, Automated Card and Boarding Systems, Flow Solder, Component Lead Formers, Semi-Auto Dip Insertion, and Static Controlled Work Stations.

**Experience:**

Sperry Defense Systems is a major supplier of high technology, reliable and ruggedized information handling products and systems. Customers include the US military, US industry, and International military procurements.

**Keywords:**

- 1 = Aircraft
- 6 = Computers
- 7 = Electronics
- 15 = Radar
- 17 = Software Services
- 20 = Miscellaneous
- 21 = Cockpit Displays
- 7 = Computer Parts
- 6 = Measurement & Control Systems
- 7 = Multi-Layered Board Assemblies
- 7 = Pre-Wired Board Assemblies
- 7 = PC Board Design
- 7 = PC Board Fabrication
- 7 = Power Supplies
- 7 = Repair & Overhaul
- 7 = Video Display Systems
- 7 = Surveillance/Navigation
- 7 = Core Wound Products
- 7 = Core Memory Arrays
- 7 = Magnetic Tape Transports
- 7 = Maintenance Consoles
- 7 = Harnesses
- 7 = Switches
- 7 = Information Handling Products
- 7 = Navigation
- 7 = Microcomputer
- 6 = Software Services
- 17 = Integrated Processing & Display Systems
- 17, 20

**Revised:** Dec 83

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**SPERRY Inc**

**(Electronic Systems)**

**Code:** SPE

**Address:** Highway 17, P. O. Box 1300

Rockland, Ontario, Canada K0A 3A0

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Contact: Mr. David Tate, Dir. Marketing – (613) 446-6011

History: Sperry Inc is a wholly owned subsidiary of Sperry Corp of the US. They started design, development and manufacturing in Canada in 1951.


Sperry is also engaged in the logistic support, modification and repair & overhaul of airborne radar and all types of avionic systems including air data computers, flight directors and gyro.

Sperry’s Air Traffic Control Systems are fitted at all control towers in Canada. The Horizon Reference Systems are fitted on all helicopter carrying Canadian destroyers, and are presently in quantity production for the US for use on the LAMPS III Program.

Sperry’s facilities are approved under Canadian National Defense Quality Assurance, and staff resources permit Sperry to cover the broad areas of Integrated Logistic Support (ILS) systems management, software design, reliability and maintainability analysis, configuration control and training.

Average Work Force: Engineers – 20
Assembly – 120
Quality Assurance – 15
Field Service & Support – 30
 Others – 100
TOTAL – 285

Gross Sales: 1980 – $10.6M (US Dollars)
1981 – $12.4M
1982 – $16.7M
1983 – $16.4M (Projected)

Plant Size: 89,000 sq ft
53,000 sq ft (added in 1981)

Equipment: Complete electronic assembly including semi-automatic printed wiring assembly capability. In-house computer systems include Sperry (Univac) and “Sperry Link”.

Experience: Sperry’s present customers include: The Canadian Government – National Defense, Ministry of Transport (Air), Ministry of Transport (Coast Guard), and Royal Canadian Mounted Police; the US Government – DOD (Navair); and other local industry – other US units of Sperry, Canadian National Telecommunications, Aeritalia (Italy), and Canadian Aircraft operators including CP Air. Sperry is interested in doing business with the US Coast Guard.

Keywords: 3 = Avionics; 5 = Communications;
7 = Electronics; 15 = Radar; 20 = Miscellaneous; Horizon Reference Systems = 20; Air Traffic Control Systems = 5, 7, 20; Time Division Multiplexers = 5, 7; Multiplexers = 5, 7; Repair & Overhaul = 3, 15; Integrated Logics Support = 3, 20; Marine Diesel Simulators = 20; Marine Simulators = 20.

Revised: Dec 83

SPILSBURY COMMUNICATIONS Ltd

Code: SCS
Address: 120 East Cordova St
Vancouver, British Columbia, Canada V6A 1L1
Contact: Mr. R E Macpherson, International Sales Manager – (604) 684-4131

History: Spilsbury is a Canadian owned company incorporated in 1941. A branch office is located in Halifax, Nova Scotia. There are no US subsidiaries.

Capability: Spilsbury specializes in radiotelephone equipment, antennas, and navigational aids for long range frontier and coastal marine communications. The company develops and manufactures HF single sideband radio communication equipment for land and marine use, fixed and mobile. They are also concerned with the overall concept of providing a system of communications rather than with the manufacture of specific units. One of the major areas of innovation in this field has been the design of a unique series of antennas which increases the effective communicating power of a radio by ten to fifteen times over a conventional installation. These Spilsbury, center-loaded, variable tuned, HF, whip, antennas are used in portable, mobile and fixed service on land, sea and air. In addition to the above, Spilsbury manufactures VHF/FM radiotelephone equipment for mobile and fixed station land or marine use. Other specialized equipment includes low frequency non-directional beacon systems for medium range aeronautical or marine navigation installations.

Average Work Force: Professional (Technical) – 16
General Assembly – 20
Others – 29

Gross Sales: 1981 – $4.0M
1982 – $4.6M
1983 – $4.2M (Projected)

Plant Size: 18,000 sq ft

Experience: Spilsbury equipment is used in over 50 countries including the US.

Keywords: 5 = Communications; Radiotelephone Equipment = 5; Antennas = 5; Navigational Aids = 5; HF Radios = 5; Single Sideband Radios = 5; Fixed = 5; Mobile = 5; Communications Systems = 5; HF Whip Antennas = 5; Variable Tuned Antennas = 5; Center-Loaded Antennas = 5; VHF/FM = 5; Beacon Systems = 5; Low Frequency Beacon Systems = 5; Non-Directional Beacon Systems = 5; Antennas = 5.

Revised: Dec 83

STANDARD AERO Ltd

Code: SAL
Address: 33 Allen Dyne Road
Winnipeg International Airport
Winnipeg, Manitoba, Canada R2Y 2G6

Contact: Mr. H T Goldie, Dir of Marketing & Sales – (204) 775-9711

History: Standard Aero is Canada's largest overhauler of aircraft engines. The company is a wholly owned subsidiary of Federal Industries Ltd, a Canadian holding company. It was started in 1935 as an overhauler of reciprocating engines. Since 1960, it was been involved in the overhaul of turbine engines.

Capability: Standard Aero Ltd is involved in the overhaul of both piston and turbine aircraft engines. The company is an authorized Service Center for Allison Gas Turbine Operations, (Allison 250 and T56/501) and for the Lycoming T53, T55, and T5502 engines. In addition, the company overhauls the GE T56, the Garrett 85 Series APU'S, and all associated engine accessories.

Standard Aero is an authorized distributor and overhauler for Continental and Lycoming piston engines as well as overhaul-
ing the Pratt & Whitney R985, R1340, and R800 series radial engines. Piston engine related accessories are also overhauled.

The company overhauls the above mentioned engines for commercial operators, the Canadian Armed Forces and as such, has a complete engineering, quality control and parts remanufacturing operation. A complete field service capability is also provided to the companies worldwide customer base. Standard Aero Ltd has a complete test facility for both piston and turbine engines.

**Average Work Force:**
- Engineers = 31
- Mechanics = 131
- Others = 489

**Gross Sales:**
- 1980 = $61,282
- 1981 = $74,232
- 1982 = $64,231
- 1983 = $62,224 (Projected)

**Plant Size:** 265,000,000 sq ft

**Equipment:** Complete in-house machining operation including metal and plasma spray, turning, grinding and EDM equipment.

**Experience:** The company provides service to the Canadian Government, most helicopter operators in Canada, as well as those fixed wing operators using the Allison 501 engine. The company also deals with customers around the world and has service centers in England, Italy and Singapore.

**Keywords:** Aircraft, Machining, Testing/Test Equipment, Repair/Overhaul, Engine Overhaul, Aircraft Engine Overhaul.

**Revised:** Dec 83

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**SYSTEMHOUSE Ltd**

**Code:** SYS

**Address:**
Royal Bank Center
99 Bank St, 3rd Floor
Ottawa, Ontario, Canada K1P 6B9

**Contact:** Mr. John Owens, Mgr, Corporate Communications
- (613) 236-9734

**History:** Systemhouse is a public Canadian company incorporated in mid-1974. The head office is located in downtown Ottawa while branch offices are located across Canada (Vancouver, Edmonton, Calgary, Regina, Winnipeg, Toronto, London, Montreal, and Halifax) and in the US (Boston, Chicago, Los Angeles, San Francisco), with the US subsidiary located at 1655 North Fort Myer Drive, Arlington, VA - telephone: (703) 276-0500.

**Capability:** In the areas of consulting and custom system development, Systemhouse has a broad range of clients in the public and private sectors. Not constrained to any manufacturers' equipment, the Services Division provides solutions on a range of mini, micro, and mainframe systems. Areas of concentration are - financial management systems, social services management systems, health care, videotex (Tekion), office automation, building energy management, interactive data base, computer communications, and distributed processing.

Systemhouse began the development of proprietary products in 1977, and currently offers packaged solutions in the areas of distribution (order entry and processing, sales analysis, budgeting and general accounting), manufacturing (order entry, sales analysis, inventory control, materials management, job scheduling, and materials processing), health care (financial management, and control of all functions related to the pre-admission, discharge and transfer activities of patients), information management (on-line data entry, correction and retrieval), photogrammetry & cartography (applicable to topographic maps and nautical charts, with an interactive graphics capability and wide range of peripherals) and computer assisted drafting for use by architectural and engineering firms. The company also markets its Resource Analysis and Mapping System (RAMS) which manages and graphically displays information relating to a region's natural resources, public utilities or physical ownership.

Of recent note, the company is undertaking a $4M project to develop and install an office automation system which will automate departments and administrative functions for the Department of National Defense Headquarters in Ottawa and regional offices of DND in Quebec City, Quebec. The result of this project will be a software-based transportable OA system expected to be commercially available to large North American corporations and government departments by early summer of 1984.

**Average Work Force:** 750 employees (80% professional)

**Gross Sales:**
- 1981 = $30.5M
- 1982 = $39.0M
- 1983 = $52.0M (Projected)

**Experience:** Systemhouse clientele includes US Federal Government, US Navy, US Army, State of Alaska, State of North Dakota, Canadian Federal and Provincial Governments, the Australian Government, and private industry. Approximately 25% of the sales are to the US.

**Keywords:** Communications, Computers, Energy, Image Processing & Optics, Software Services, Miscellaneous, Turnkey Systems, Videotex (Tekion), Photogrammetry, Cartography, Office Automation, Financial, Computer Systems, Controller, Energy Management, Data Base, Drafting.

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**TARGA ELECTRONICS SYSTEMS Inc**

**Code:** TES

**Address:**
P.O. Box 8485, 3101B Hawthorne Road
Ottawa, Ontario, Canada K1G 3H9

**Contact:** Mr. Les Horn, Sales Manager
- (613) 731-9941

**History:** Targa Electronics Systems Inc is a Canadian company founded in 1981.

**Capability:** Targa Electronics is the manufacturer of ruggedized, solid-state mass storage systems. Targa products provide small, low powered, mass memory recording systems for hostile environments. By eliminating the use of mechanically rotated memory and substituting solid-state technology (e.g., bubble technology, E2 PROM, CMOS RAM, etc), Targa is able to meet the demands of applications where the quality and value of data is of paramount importance. Their equipment is ideally suited to handle either the rigors of field work (land, air and marine mobile), or the factory floor environment, while offering the convenience of small removable media cartridges of large capacity.

Targa offers three systems to meet different requirements:

The DR-series data recorders are self-contained bench-top or rack-mounted data storage systems with a variety of interfaces, software protocols and options.
The FDE-series solidrive emulators are solid-state memory units that are compatible in every respect with standard floppy disk drives.

The OEM-series interface units are suitable as low cost data storage components for integration into systems.

All systems come with removable memory cartridges that allow convenient transport of data. They are available in 128 kbyte and 256 kbyte versions now. A compatible 1 Mbyte version will be available in mid-1984.

Targa is also able to supply custom designs where the requirements are not met by the existing range of products.

Average Work Force:

- Engineering: 4
- Manufacturing: 3
- Others: 4

Gross Sales:

- 1982: $300K
- 1983: $1.22M (Projected)

Plant Size: 2,500 sq ft

Equipment: In-house computer systems include DEC, Hyperion, and Hewlett-Packard. Test equipment includes circuit emulation oscilloscopes, etc.

Experience: Targa products are presently used by automobile manufacturers in mobile onboard vehicle tests, by the Canadian Government for both airborne and shipborne survey work, by portable computer manufacturers for ruggedized peripheral mass storage, and by offshore technology companies in support of oil well drilling control systems.

Keywords:

- Computers = 6
- Electronics = 7
- Miscellaneous = 20
- Mass Storage Systems = 6, 7, 20
- Harsh Environment Equipment = 6, 7, 20
- Ruggedized Mass Storage Systems = 6, 7, 20
- Removable Media Mass Storage Systems = 6, 7, 20
- Solid State Memory = 6, 7, 20
- Data Recorders = 6, 7, 20
- Data Loggers = 6, 7, 20
- Floppy Disk Emulators = 6, 7, 20
- Peripheral Mass Storage = 6, 7, 20

Revised: Dec 83

**TEKLOGIX Inc**

Code: TEK

Address: 1199 Fewster Dr
Mississauga, Ontario, Canada L4W 2A9

Contact: Mr. J. R. Coutts, President - (416) 625-5673

History: Incorporated in 1967, Teklogix Inc is Canadian owned, privately held and all shares are owned by active participants. The company was formed to provide special hardware and software for minicomputer users and has evolved with this industry.

Capability: Special hardware and software systems for process control, material handling, machine control, plant and warehouse control, and digital data communications systems. Products include digital radio links for remote control of cranes and locomotives, radio linked mobile data terminals for use aboard forklift trucks, etc. Primary capabilities are in systems design and engineering, development, production and related R&D. Normal Spec Level - CSA level 4. Mil Spec capability in selected areas.

Average Work Force: 30 (Including Engineers, Mathematicians, Programmers, Technicians, Production, and Support Staff)

Gross Sales: $1.8M (FY 83)

Plant Size: 12,000 sq ft (additional 8,000 sq ft available)

Equipment: Normal electronic lab and production equipment, including communication test sets. In-house data processing equipment used for systems design, development, and support include PDP11/34, PDP11/05 (two), PDP11/23, PDP8 and all normal peripheral equipment.

Experience: Sort and conveyor control systems for the Canada Post office in Calgary, Toronto, Montreal and Halifax; Steel plant control systems for LASCO (Canada), Irish Steel Ltd (Cork, Ireland), Chaparral Steel (Midlothian, Texas), and Raritan River Steel Co (New Jersey); area paging control system for Bell telephone; digital radio link systems for the Steel Company of Canada, Aluminum Company of Canada, and Boeing Aircraft; warehouse and material handling systems for Kellogg-Salada, Dylex and Dominion Stores; Warehouse automation systems for Digital Equipment Corp (Phoenix), Defense Logistics Agency (Richmond), and the Liquor Control Board of Ontario.

Keywords:

- Computers = 5
- Communications = 6
- Software Services = 20
- Miscellaneous = 17
- Automation = 20
- Hardware = 5, 6
- Software = 6
- Process Control = 17
- Digital = 5
- Mobile Data Design = 5, 6, 17
- Development = 5, 6, 17, 20

Revised: Dec 83

**TRACKER INDUSTRIES Ltd**

Code: TIL

Address:

- 246 Jane St
  Toronto, Ontario, Canada M6S 3Z1

(Mailing Address)

- P. O. Box 1094, Station A
  Toronto, Ontario, Canada M5W 1G6

Contact: Mr. Lou Fedyna, President - (416) 762-8744, 364-2943

History: Tracker Industries was incorporated in 1974. It is a wholly owned Canadian company with no other Canadian locations.

Capability: Tracker is engaged in custom design/prototyping/manufacturer of analog/digital/microprocessor circuits and systems. Specifically, the company R&D areas include microprocessor/microcomputer applications, engineering, evaluation and specification.

Real-time control programming using assembly and high-level languages has been implemented for use in office and plant automation, data communications, data acquisition, process control, and local area networks.

Software experience - UNIX, CP/M, and real-time multi-user/multi-tasking operating systems.

Hardware designs - Fiber-optics local area network, modems, multiplexers, data interface devices, analog and digital input/output control circuits, microcomputers, and hand-held portable data terminals.

Present activity (1983/84) - ~8000/VM/UNIX/ADAVersados applications, fiber-optics data control links, and vehicular microcomputer applications.

Average Work Force:

- Engineers: 3
- Others: 2

Gross Sales: $0.25M

Plant Size: 2,000 sq ft (expandable to 3,000 sq ft)

Experience: Tracker Industries' clients include General Motors of Canada, Bell Canada, other corporations, universities, and the Federal & Provincial governments. Products...
include data communication networks, data terminals, microcomputers, local area networks (interfacing, systems design), and fiber-optics modems.

**Keywords:** 5 = Communications; 7 = Electronics; 17 = Software Services; Consulting = 7; Solid State Devices = 7; Microprocessors = 7; Interfacing = 5; Network Systems = 5; Programming = 17; Environmental Programming = 17; Avionics Programming = 17; Data Communications = 17; Data Acquisition = 17; Monitoring Systems = 17; Control Systems = 17; Data Terminals = 17; Systems Design = 5, 7; Telephone Communications = 5; Design to Requirements = 17; Transportation Control Systems = 17; Analog = 5, 7; Digital = 5, 7.

**Revised:** Dec 83

**UDT INDUSTRIES Inc**

**Code:** UDT

**Address:** 2125 East, St-Catherine East
Montreal, Quebec, Canada H2K 2H9

**Contact:** Mr. Alberto Stagnaro, Purchasing Agent – (514) 526-9454

**History:** UDT was incorporated in 1942 under the name of Universal Die & Tool. Name was changed to UDT Industries Inc in 1975 to reflect more accurately their machine shop business. The company is Canadian owned and there are no other Canadian or US subsidiaries.

**Capability:** UDT’s major product is machined parts ranging from light-medium to hard core items, such as fittings, splicing plates, hinges, bulkheads, slat-tracks, spars, dog legs, spar caps, leg assemblies, etc., made from plate stock, forgings, extrusions, aluminum alloys, steels, titanium, etc. CNC and conventional equipment are utilized.

Aluminum alloys heat treating electrical air furnace is part of UDT’s capability. 5 ft diameter by 18 ft high, it is continuously performing quench & age hardening of major structural parts for McDonnell Douglas & Lockheed Aircraft from AL-AL 7075 T 411 & 2014 T 411 condition F to T6 or T73 condition. UDT works to MIL-O-9858A and DND 1016. Tolerances are maintained as per customer’s requirements.

**Average Work Force:**
- Engineers: 1
- Inspectors: 5
- Machinists: 40
- Programmers: 3
- Others: 24

**Gross Sales:**
- 1979 - $3.6M
- 1980 - $4.4M
- 1981 - $3.8M

**Plant Size:** 81,000 sq ft

**Equipment:** NC equipment includes vertical machining centers, horizontal machining center, vertical profiling milling machines, vertical profiler bed type (3 & 4 axis).

**Experience:** UDT’s customers include McDonnell Douglas Canada Ltd (DC 9 & DC 10), Canadair (from T33 to Challenger), Enheat, dkeivilland Aircraft, Fleet Industries (Lockheed Product), NATO, USAF, CCC, DND; Rohr, Research & Development Canada (Propulsion Pod), ITT Giffilin (Antenna Radar), McDonnell Douglas Corporation – St Louis (F-18), and Grumman Aerospace.

**Keywords:** 12 = Machining; Precision Machining = 12; Metalworking = 12; Heat Treating = 12; Specialized Coating = 12; Coating = 12; Parts = 12.

**Revised:** Dec 83

**ULTRA LASERTECH Inc**

**Code:** ULI

**Address:** 6415-2 Viscount Road
Mississauga, Ontario, Canada L4V 1K8

**Contact:** Dr R A Crane, Director, Science & Technology – (418) 677-8091

**History:** Ultra Lasertech is a small high technology company incorporated in 1979 with a laser technology base and licensing derived from RCA. There are no other Canadian divisions and no US subsidiaries.

**Capability:** Ultra Lasertech is engaged in the design and manufacture of custom CO₂ lasers and wave guide lasers. They are involved in R&D associated with laser photoacoustics, laser spectroscopy, and laser communications & radar. Other areas of expertise include remote sensing, pollution detection, ultra high power laser modeling and design, and laser applications. Their product line includes sealed, continuous wave, isotopic CO₂ lasers; tuneable CO₂ lasers; a CO₂ laser optoacoustic detector; industrial type sealed CO₂ lasers; laser power supplies; and mirror mounts.

**Average Work Force:** Total – 7 full-time

**Gross Sales:** 1980 – $300K
1981 – $422K
1982 – $320K

**Plant Size:** 3,000 sq ft (R&D Laboratories)
1,000 sq ft (Production Facility)

**Experience:** Since their start in 1979, Ultra Lasertech has been engaged in the development of a laser optoacoustic gas analyzer, a commercial laser cavity enclosure, and an industrial CO₂ laser. Other projects have included determining the laser optoacoustic signatures of PCBs, developing a tuneable sealed ¹³C₀₂ laser system, a sealed ¹⁴C₀₂ laser tube, and a balanced dual spectrophone chamber and measuring water vapor absorption at isotopic CO₂ laser wavelengths. Their optoacoustic trace gas analyzer is being designed specifically to measure nitric acid vapor, although it is applicable to a large number of contaminants of environmental concern. Their analyzer is being designed to detect the acidic vapor down to the lower limit of less than 1 ppb for field operational use. The present status is detection at 10 ppb. Other gases studied during development include several freons, sulfur hexafluoride, ethylene, ammonia, butane, some explosives, PCBs, Jet A fuel, and several other hydrocarbons. It is anticipated this technique will be suitable for detection of hydrazine.

**Keywords:** 9 = Environment; 11 = Lasers; 15 = Radar; CO₂ Lasers = 11; Waveguide Lasers = 11; Photoacoustics = 11; Spectroscopy = 11; Communications = 11; Remote Sensing = 9; Pollution Detection = 9; Ultra High Power Modeling = 11; Ultra High Power Design = 11; Applications = 11; Sealed CO₂ = 11; Continuous Wave CO₂ = 11; Tuneable CO₂ = 11; Isotopic CO₂ = 11; CO₂ Optoacoustic Detector = 11; Mirror Mounts = 11; Optoacoustic Trace Gas Analyzer = 9, 11; Cavity Enclosure = 11; Trace Gas Detection = 9; Toxic Gas Detection = 9; Power Supplies = 11; Hazardous Gas Detection = 9; Modeling = 11; Design = 11; Radar = 15; Lasers = 11, 15.

**Revised:** Dec 83

**URBAN TRANSPORTATION DEVELOPMENT CORP Ltd**

**Code:** UTD
Address: 2 St Clair Ave W
Toronto, Ontario, Canada M4V 1L7

Contact: Ms Debra Bennett, Information Officer – (416) 961-9599

History: The Urban Transportation Development Corp Ltd (UTDC) was established in 1973 to design, develop and market new transit equipment and systems. Other locations include offices in Vancouver, British Columbia; Kingston, Ontario; Thunder Bay, Ontario; Detroit, MI; San Francisco, CA; and London, England.

Capability: As mentioned above UTDC’s main objective is to develop new, rail-based transit systems. Some of their vehicles/systems are described below:

Intermediate Capacity Transit System – an automated system that has the capability of transporting in excess of 25,000 people per hour.

Canadian Light Rail Vehicle – a single ended, 4 axle rigid vehicle capable of operating singly or in trains of up to six units. Propulsion by two, 220-HP motors, each driving two axles (440 HP per car). Solid state chopper control with blended, regenerative braking.

Articulated Light Rail Vehicle – a 6-axle version of the CLRV (above).

All UTDC research and development in the ground transportation area is carried out at their Kingston facility by UTDC Research and Development Ltd. All projects are product delivery programs, and all exploitation of technology advances and designs already acquired, are carried out by Metro Canada Ltd. This division delivers all transit systems and related hardware products.

Average Work Force: 700 employees (All locations)

Gross Sales: No Data

Plant Size: 40,000 sq ft (Kingston, Ontario location)

Equipment: Training facilities, propulsion development laboratories, transit test track, SELTRAC-Vehicle command control and communication system, and energy test lab.

Experience: Major customers include – Toronto Transit Commission, BC Transit; Southeastern Michigan Transportation Authority; Santa Clara County Transit District; San Francisco Municipal Railway; Transport Canada; Royal Commission on Electric Power Planning; Ontario Northland Railroad; California Department of Transportation; Department of Transportation (US); and MBTA-Massachusetts Bay Transportation Authority.

Some major projects include:

SCCTD ALRV – 30 Articulated LRVs for San Jose, CA.

Vancouver ALRT – a turnkey rapid transit system from the Sea Bus Terminal to New Westminster – to open in 1986.

Detroit CATS – a turnkey rapid transit system running as a downtown loop – to open in 1985.

Scarborough RT – 24 vehicles for an extension to the existing rapid transit system running in Metro-Toronto.

Steerable Truck Retrofit Design – a preliminary design to modify an existing heavy rail transit truck to make it steerable for the US DOT.

Transit Management Advisory Services – a study (including recommendations) of San Francisco Municipal Railway Maintenance Procedures, and the implementation of improvements for the city of San Francisco.

LRT Training Program – an Operations Training Program for San Francisco’s new underground light rail transit service for the city of San Francisco.

Transportation Advisory Services – evaluate and recommend ways and means to upgrade rail commuter services between San Francisco and San Jose for the California DOT.

Santa Clara County Life Cycle Costing Demonstration Project – a demonstration and validation of life cycle cost procurement methodology for the purchase of transit coaches for Santa Clara County, California.

Canadian Light Rail Vehicles – design, develop and delivery of 191 Light Rail Vehicles for the Toronto Transit Commission.


Composite Flywheel Materials – a development program for the design and testing of composite materials for flywheels for the National Research Council of Canada.

Rotary Powered Steerable Rail Truck – preliminary design of a steerable rail truck with AC rotary propulsion for Transport Canada.

Keywords: 20 = Miscellaneous, Ground Transportation = 20, Transit Systems = 20, Trucks = 20.

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VAC-AERO INTERNATIONAL Inc

Code: VAI

Address: 1371 Speers RoadOakville, Ontario, Canada L6L 2X5

Contact: Mr. Ross E Pritchard, President – (416) 827-4171

History: VAC-AERO is a Canadian owned, high technology company offering heat treating, brazing, electron beam welding, and repair and coating services to the aerospace, airline, avionics, electronics and other key industries throughout the US and Canada. In addition, VAC-AERO designs, manufactures and sells specialized heat treating and vacuum furnaces to these industries.

VAC-AERO was originally founded in 1959 in Oakville, Ontario, and a Montreal Division was established in 1967 to meet the growing demand for its services from Quebec area customers.

Capabilities: VAC-AERO holds processing approvals from all major aerospace manufacturers for the following services:

- Thermal processing of OEM components:
  - Vacuum heat treatment of high strength steels - Landing gear components, structural airframe parts
  - Vacuum heat treatment - Turbine parts, shafts, turbine blades, casings, nuclear components
  - Vacuum Brazing - Turbine nozzles, compressor stators, afterburner casings, combustion cowls, wave guides, aluminum cold wall assemblies and heat exchangers, nuclear parts
  - Electron beam welding - Turbine assemblies, electronic components
Plasma spray coating - Combustion liners, fan and stator casings, miscellaneous parts.

Repair and overhaul of jet engine components

VAC-AERO is approved by Transport Canada and various aerospace companies for a variety of repairs using plasma spray, vacuum brazing, tungsten arc and electron beam welding.

Specific components repaired include - compressor stators, turbine vanes and nozzles, combustion chambers, shafts and miscellaneous components.

Manufacture of new parts to print:

VAC-AERO can also manufacture brazed and electron beam welded assemblies to customer specifications and drawings. They specialize in components such as aluminum vacuum brazed heat sinks and cold wall assemblies for radar and avionics equipment.

VAC-AERO offers a complete line of cold wall vacuum furnaces ranging from small laboratory models to large bottom loading production units. They have supplied these furnaces to a wide variety of customers in the aerospace, nuclear and other high technology industries.

In addition, they can supply ancillary furnace equipment such as high temperature molybdenum fixtures, water recirculating units, and work handling systems. They also offer complete turnkey installation services, extensive operator training programs and post sale preventive maintenance service.

Average Work Force: Engineers - 6

Gross Sales: 1980 - $3.5M
1981 - $3.8M
1982 - $3.9M
1983 - $3.6M

Plant Size: 17,740 sq ft (Oakville Division)
9,250 sq ft (Montreal Division)

Equipment:

Vacuum oil quenching furnaces capable of hardening part sizes to 72 in. dia x 84 in. high. Vacuum brazing and heat treating furnaces suitable for temperatures to 2700°F and ultra high vacuum levels to 1x10^-6 torr.

Electron beam welding chamber size of 36 in. deep x 36 in. high x 52 in. wide can be extended to accommodate shafts and similar parts to 72 in. long.

Plasma coating equipment including Metco 3M, 45kW and Metco 7M, 80kW plasma guns.

In-house facilities for repair and overhaul including lathes, vertical mills, grinders, and EDM equipment for machining.

Complete metallurgical laboratory in addition to normal dimensional checking equipment, complements quality control capabilities.

Experience: Present customers include numerous companies in the aircraft, avionics, electronics and nuclear power generation industries. VAC-AERO holds current processing approvals from the following companies - Canadian Forces: Boeing Aircraft Co: Canadair. The deHavilland Aircraft of Canada Ltd; McDonnell Douglas Aircraft Co; General Dynamics; Grumman Aircraft; Pratt & Whitney Aircraft, Hartford, CT, Pratt & Whitney Canada; General Electric, Burlington, VT and Lynn, MA; Garrett Airsearch Mfg; Litton Systems (Canada); Litton Systems (USA); Hawker Siddeley Canada, Orenda Division, Menasco Canada Ltee, Menasco, Burbank, CA; Spar Aerospace. Bristol Aerospace Ltd; McDonnell Douglas, Cleveland Pneumatic, Bell Aerospace. Fort Worth, TX; Sikorsky Aircraft; Stratford, CT; DAF Indal Ltd.; Fleet Industries, Kaman Aerospace. Bloomfield, CT, and Avco Lycoming, Stratford, CT.

Keywords: 1 = Aircraft, 3 = Avionics, 7 = Electronics, 8 = Energy, 12 = Machining, 15 = Radar, 20 = Miscellaneous, Vacuum Brazing = 1, 3, 7, 8, Repair & Overhaul = 1, 12, Electron Beam Welding = 1, 3, 7, 8, 20, Plasma Spray Coating = 1, 8, 20, Vacuum Furnaces = 1, 3, 7, 8, 20, Brazed Aluminum Heat Sinks = 3, 7, 15

Revised: Dec 83

VALCOM Ltd

Code: VAL

Address: P. O. Box 603
Guelph. Ontario. Canada N1H 6L3

Contact: Mr. Paul R MacPherson, President - (519) 824-3220

History: Valcom is a Canadian company founded in 1957. It custom designs, manufactures and markets electronic communication systems and components. By attracting skilled radio frequency (RF), digital and software engineers, they have developed the expertise to compete successfully in both the military and commercial segments of the international marketplace.

Capability: In addition to the above, Valcom extended its services to include a repair and overhaul facility to refurbish land, tactical and shipboard communications equipment for the Canadian Department of National Defense (DND) in 1972. This facility was expanded in 1980 with the signing of a contract with Atmospheric Environment Service of Canada (AES) for overhaul meteorological test gear. Valcom's diversification into areas which utilize the firm's assembly and engineering skills continued in 1982 when it became the Canadian licensee for Radiosonde Meteorological instruments.

Valcom's general areas of expertise are categorized below:

- **Systems Engineering** - Valcom's management believes that the firm's distinctive competence lies in its ability to design complex equipment that will withstand the rigors of military use for many years. As an example, their engineers have designed one and ten kilowatt coupler control units which in combination with their whip antennas, interface efficiently with various transmitters. Valcom's 1 kW coupler system is fully automatic. It operates in the 2 to 30 MHz frequency range and features a non volatile amorphous memory. A military configuration of this system is now in service with the Canadian Navy. Valcom's 10 kW coupler is designed for high power transmission applications such as maritime control and ground to air stations. This system, when interfaced with a 10 kW transmitter and Valcom's 54 ft whip antenna, can be controlled manually or automatically. It is capable of storing up to 20 pre-selected channels and is the only automatic designer to handle output power to 10 kW. Seven of these systems have been in operation in Canada since 1978. They are currently upgrading their 1 and 10 kW couplers in order to provide frequency hopping capability.

- **Repair and Overhaul** - Valcom's technicians have through ongoing training programs, developed the ability to service LF, MF, HF, LF, MF, HF, couplers, coupler control units, transmitter/receivers and a variety of other military equipment.
Quality Control: Valcom's quality assurance plan meets the policies and procedures of DND 1015 specifications and US military standard MIL-Q-9858A. To ensure that the high quality standards set by customers and management are consistently achieved, the quality assurance staff and the engineering department determine product quality and design and implement inspection plans.

Manufacturing:
- Fiberglass Manufacturing Division: In 1964, Valcom's management recognized the demand from organizations throughout the world for durable, lightweight antennas for transmitting/receiving applications and developed a line of fiberglass whip antennas which ensure mechanical strength and electrical stability in even the most severe operating conditions. Available in sizes ranging from 29 to 85 ft, these antennas operate in the 10 KHz – 30 MHz range. Having produced over 5,000 whips, Valcom has become the world's leading manufacturer of high quality MF, HF, VHF fiberglass whip antennas. The company's expertise in antenna design and manufacture has resulted in its 35 ft AS2537A/SR whip receiving MIL-A-24319A (EC) approval from the US Navy. The US Coast Guard, the US, Spanish, Greek, Australian, South Korean, Italian, British, and Canadian Navies, and many commercial organizations specify Valcom's free-standing antennas for ground-to-air, ship-to-shore, and ship-to-ship applications. They also manufacture the AS2108ARN directional-finding antenna for the US Army.
- Electronics Assembly Division: Valcom's electronics assembly personnel built the company's 1 and 10 kW coupler systems and are skilled in building a wide range of electro-mechanical and avionics equipment to customer's print.
- Metal Fabricating and Production Machine Shop Division: Valcom's machine shop staff produce metal assemblies on a custom basis. With a fully equipped machine shop and knowledgeable personnel, Valcom services customers whose production requirements range from several units to thousands of pieces.

Average Work Force: 85 Total
Gross Sales: $7.5 to 8.0M
Plant Size: 45,000 sq ft
45,000 sq ft (HF, MF & VHF Antenna Facility Testing Site)

Experience: Valcom's customers include the Canadian Department of National Defense; US Navy, Army, and Coast Guard; the Navies of Spain, Greece, Australia, South Korea, New Zealand, Indonesia, Italy, and the UK; and the Canadian Atmospheric Environment Service.

Keywords: 3 = Avionics; 5 = Communications; 12 = Machining; 19 = Testing/Test Equipment; Communications Equipment = 5; Antennas = 5; Controls = 5; Electronic Equipment = 3, 5; Components = 5; Repair & Overhaul = 5, 19; Coupler Control Units = 5; Whip Antennas = 5; Lightweight Antennas = 5; Fiberglass Antennas = 5; Electronic Assembly = 3, 5; Build-to-Print = 3, 5; Machining = 5, 12.

Revised: Dec 83

VARIAN CANADA Inc

Code: VAR
Address: Varian Canada Microwave Division
45 River Drive

Contact: Mr. O J Caldwell, Marketing Manager – (416) 877-0161

History: Varian Canada Inc is a wholly owned subsidiary of Varian Associates of Palo Alto, CA. The Canadian operation, located near Toronto, Ontario, was originally incorporated in 1955 to supply microwave tubes to the Canadian military.

The engineering and manufacturing segment of the company, Varian Canada Microwave Division (VCMD), operates under the umbrella of the Electron Device Group of the parent company. This group forms the largest electron tube manufacturing operation in the free world. Since its inception, the Microwave Division has grown steadily and expanded its original charter to include many unique and customized products for world-wide markets (75% of sales are exported). Currently, the product line is split evenly between electron tubes and electronic equipment.

Capability: The following is a brief description of the major products manufactured at Varian Canada Microwave Division. Since many of the products were developed at the Division, full facilities and capabilities exist in-house for customizing to the needs of individual customers. Both MIL and commercial specifications can be met.

Travelling Waves Tubes: These tubes are produced for microwave Line-of-Sight (LOS) Communication applications and cover frequencies ranging from 3.5 GHz to 15 GHz at power levels up to 50 watts. The product line includes a complete selection of conventional technology TWTs as well as metal-ceramic high efficiency and high linearity tubes. The company has the capability to customize existing designs to meet customer's unique requirements, and to develop retrofit packages to upgrade older field installations.

Power Klystrons: This product line consists of a series of power klystrons used primarily as high power amplifiers in satellite earth stations and troposcatter communication applications. These are available at frequencies of 5, 6, and 14 GHz with power levels up to 3 kilowatts. Various channel tuner configurations are available, including a microprocessor-controlled, automatic-channel tuner.

Reflex Klystrons: VCMD has an extensive line of reflex klystrons typically used in communications and radar systems for airborne and ground based applications, plasma diagnostics, spectroscopy, meteorological instrumentation and other experimental and scientific applications. The line ranges from the lower frequency tubes (8 to 25 GHz) with power outputs from 10 to 450 mW up to millimeter reflex klystrons ranging from 30 to 220 GHz with out powers from 5 to 800 mW.

Extended Interaction Klystrons: This product line originated at the VCMD facility and extensive development efforts are continuing. The products address the very high frequency ranges for microwave applications, ranging from 30 GHz to 280 GHz. EIKs are rugged, lightweight, compact and are capable of generating medium rf power levels in either continuous or pulsed modes. The cw power levels of these klystrons range from 1 kW at 15 GHz to 1 watt at 280 GHz. Peak power outputs range from several kilowatts at 30 GHz to 60 watts at 220 GHz. These EIKs are well suited as rf power sources for a wide range of applications such as – Fire control radar; air traffic control radar; illuminators; weather radar; plasma heating; radio astronomy; surveillance radar; satellite communications; tracking radar; radar modeller; and fusion diagnostics.

Millimeter Wave Subsystems: VCMD offers a range of millimeter wave transmitter subsystems which consist of a modulator, a power supply and control circuitry driven the Varian line of Extended Interaction Klystrons.
These transmitter systems operate in discrete frequency bands ranging from 30 to 220 GHz for pulsed and cw applications and can be designed to meet customer requirements to commercial of MIL specifications.

**Power Supplies:** The basis of this product line is a complete series of power supplies which complement VCMD’s electron tubes. However, in addition, specialized, complex power supplies have been developed and manufactured by the Division to both MIL and commercial specifications, requiring capabilities such as high and low voltage outputs; DC or AC inputs; multiple outputs; stringent noise and regulation requirements; and unique shapes and sizes. Power levels up to 30 kW and voltages up to 50 kV have been achieved.

Satellite Communications Power Amplifiers: A series of high power commercial amplifiers of VCMD design is available for satellite communications in frequencies ranging from 2 to 14 GHz with power levels up to 3 kW. These amplifiers consist of the power klystron, power supplies, cabinetry, waveguide/RF circuits, and control circuitry. A specialized military high power (10 kW) amplifier for satellite communications has also been designed and manufactured in Canada. The amplifier forms a complete subsystem incorporating an X-band klystron, power supplies, control circuitry, waveguide runs, and liquid cooling equipment consisting of a water-to-air heat exchanger and a purification loop.

VCMD is able to qualify and test to MIL and commercial specifications. Customized products are a specialty of the Division. Organizational and administrative systems are in place to ensure the smooth execution of commercial and military contracts requiring exceptional attention to detail. These include fully computerized and on-line Manufacturing Resources Planning and a complete Quality Assurance system appropriate for MIL requirements.

### Average Work Force

**Gross Sales:** $30.0M

**Plant Size:** 100,000 sq ft (2 Facilities)

**Equipment/Facilities:** VCMD has, in-house, all of the extensive facilities and capabilities needed for the manufacture of high quality electron tubes and electronic equipment. A few of the facilities which support such precise and delicate design and manufacturing activities are “Watchmaker accuracy” machine shop, in-house manufacturing of high voltage transformers; test facilities for microwave tubes; subsystems and power supplies; clean rooms; vacuum sealing facilities; electric discharge machining; environmental test facilities; hydrogen and vacuum furnaces; and laser welding.

**Experience:** VCMD has in excess of twenty-five years of experience working with original equipment manufacturers of microwave and satellite telecommunications equipment. The Division has also been involved in various development programs for power supplies and other electronic subsystems to customers’ specifications for many years.

Military programs have been a successful part of VCMD’s operation. The largest single program lasted three and one-half years and was valued at approximately $6.0M in 1979. The company produced a space qualified instrument which was successfully flown on a NASA satellite designed to measure the earth’s magnetic field. As well as private industry throughout North America, Europe and the Far East, the clientele also includes the Canadian, US and several European Governments, plus various agencies, laboratories and research institutions associated with these governments.

**Keywords:** 7 = Electronics, 18 = Space Systems, Solid State Devices = 7, Travelling Wave Tubes = 7, Klystrons = 7, Reflex Klystrons = 7, Power Klystrons = 7, Extended Interaction Klystrons = 7, Power Supplies = 7, Power Amplifiers = 7, Satellite Communications Power Amplifiers = 7, 16; Pulsers = 7, Millimeter Wave Subsystems = 7, 18, Waveguides = 7, Amplifiers = 7, Amplifier Subsystems = 7, 18, Control Circuitry = 7, Cabinets = 7.

**Revised:** Dec 83

**VICTRIX Ltd**

**Code:** VIC

**Address:** Box 1807

Guelph, Ontario, Canada N1H 7A1

OTTAWA OFFICE

29 Pellan Crescent

Kanata, Ontario, Canada K2K 1J7

C B Dowden, Engineering Manager

(613) 592-3888

**Contact:** Mr. H Lawry, Dir of Marketing

(519) 836-1480

**History:** Incorporated in 1975 (100% Canadian owned).

**Capability:** Approximately 80% of their R&D and manufacturing is for the Canadian Department of National Defense. Typical engineering projects include:

- Technical investigations and engineering services to DND on marine weapon systems drives and controls.
- Engineering services to industry on control systems for machinery and large winches.
- Engineering services to industry on sound and vibration problems in gear systems.
- Design and prototype fabrication of 20 kW vertical axis windmill.
- Designed and developed 1.2 m plastic parabolic antenna for 11.6 GHz satellite receiving.
- Developed production techniques for fabrication of outdoor unit to house LNA of satellite receiving antenna.
- Investigated dielectric feed horn problems and developed modifications.
- Engineering services on avionics flight surfaces control systems.

**Small manufacturing capability include the following items**:

- Amplifiers, reactors, special transformers, & RF coils
- Fiberglass microwave dish antennas
- Small gears and gear reducer assemblies
- Extrusion and molding of miscellaneous plastic and rubber parts
- Aircraft smoke signal markers pyrotechnics
- Cable assemblies
- Marine projectile line throwing devices
- Inflatable mast antennas
- Marine weapon system drive and controls

**VCirta also has an R&D capability for radar duplexer, precision electronic components and power supplies.**

**Average Work Force:**

1 Senior Scientist (Electronics)
1 Mechanical Engineer
1 Telecommunications Engineer
2 Technologists
2 Technicians
3 Machinists
30 10-30 Production People
1 Quality Control Manager

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Europe.

Large area solar simulators are installed in Canada and Mississauga, Ontario. Vortek lamps for laser development and radiation testing. Semiconductor annealing equipment. NASA and DOD use arc lamps and optics

Experience:

- Marine Weapon System Drive Controls
- Aircraft Smoke Signal Markers
- Marine Line Throwing Device
- Portable Antenna Masts
- Modular Practice Bombs

DOC - Satellite M/W Parabolic Dishes

Keywords: 1 = Aircraft, 2 = Armament, 4 = Chemistry, 8 = Energy, 12 = Machining, 16 = Security & Safety, 18 = Space Systems, 19 = Testing/Test Equipment, Ground Station Antennas = 18, Pyrotechnics = 1, 4, 16, Smoke Markers = 1, 4, 16, Portable Antenna Masts (Surface) = 18, Weapon System Controls = 19, Windmills = 8, Electronics = 19, Plastic Fabrication = 12, Modular Practice Bomb = 2, Practice Bomb = 2

Revised: Dec 83

VORTEK INDUSTRIES Ltd

Code: VOR

Address: 1820 Pandora Street
Vancouver, British Columbia, Canada V5L 1M5

Contact: Dr. G G Albach, President - (604) 251-2451

History: Vortek is a private Canadian company, incorporated in 1975 in the Province of British Columbia, with no other branches or US subsidiaries.

Capability: Vortek specializes in the manufacture and development of ultra-powerful arc lamps and related optical systems. The lamps operate at input powers of up to 160,000 watts, using a patented internal cooling method. Originally developed for outdoor floodlighting, the lamps have proven to be an excellent light source for solar simulation and industrial processes. Vortek also operates a high-power plasma arc laboratory. New product designs are tested prior to production and radiation experiments are conducted for clients on a contract basis.

Average Work Force: PhDs = 3
Engineer = 1
Others = 5

Gross Sales: No Data

Plant Size: 6,000 sq ft

Equipment: The company has developed sophisticated fabrication techniques for liquid-cooled tungsten electrodes, and operates the only commercial tungsten electrode fabrication facility in Canada. Engineering of large, high-power optical systems is done using an in-house Data General Computer System. The company fabricates liquid-cooled optical assemblies, and maintains a large area rhodium metal plating facility for reflector production.

Experience: The company is an OEM supplier of ultra-powered arc lamps and optics to Eaton Corp in Boston, for use in semiconductor annealing equipment. NASA and DOD use Vortek lamps for laser development and radiation testing. Large area solar simulators are installed in Canada and Europe.

Keywords: 8 = Energy, 9 = Environment, 10 = Image Processing & Optics, 20 = Miscellaneous: Arc Lamps = 8, 9, Tungsten Electrodes = 8, 9, 20, Solar Simulation = 9, Metal Plating = 8, 9, 10, Optical Processing = 10, Plasma Arc = 8, Optics = 8, 9, 10, High Intensity Light Source = 8

Revised: Dec 83

WHITESHELL NUCLEAR RESEARCH ESTABLISHMENT

Code: WNR

Address: Pinawa, Manitoba, Canada R0E 1L0

Contact: Mr. Raymond O Sochaski, Mgr. Commercial Ops Office - (204) 753-2311

History: The Whiteshell Nuclear Research Establishment (WNRE) came into being in 1963 for the purpose of developing the organic cooled nuclear power reactor concept. WNRE is part of the Atomic Energy of Canada Research Company (AEC-RC), which in turn is a part of Atomic Energy of Canada Ltd (AECL). The latter is a crown corporation of the Government of Canada.

Canada's nuclear program had its beginning during the Second World War when a team of Allied scientists were assembled in Montreal for work related to the development of atomic weapons. With the end of the war, the Canadian effort was redirected, and since then all work on atomic energy has been concerned with peaceful uses.

The program was initially administered by the National Research Council of Canada, but by 1952 it had expanded so much it was placed under a new, specialized organization (AECL). In the fall of 1979, a commercial Operations Office was established at WNRE for the purpose of marketing site services, products and transferring technology.

AECL pursues a wide range of activities, from basic science to wholly commercial operations, with the main effort being devoted to the development, testing, commercialization and marketing of CANDU reactors, heavy water isotopes, irradiation equipment and a nuclear fuel.

AECL is a Crown Corporation with a total staff of approximately 7000 people. The Corporate Office is located in Ottawa, Ontario. It manages the five companies listed below:

AECL Corporate

- AEC-RC
- AEC-RC
- CANDU OPERATIONS

- WNR
- CRNL
- Operations
- Sales & Proposals
- Finance, Commercial & Resources

AEC-RESEARCH CO (AEC-RC) - Head office is in Ottawa with sites at Chalk River, Ontario and Pinawa, Manitoba

AEC RADIOCHEMICAL CO (AEC-RC) - Head office and manufacturing facilities at Kanata, Ontario, with offices scattered in foreign countries

AEC-CANDU OPERATIONS (Operations) - Head Office in Mississauga, Ontario.
AEC CANDU OPERATIONS (Sales & Proposals) – Head Office in Mississauga, Ontario.

AEC-CANDU OPERATIONS (Finance, Commercial & Resources) – Head Office in Mississauga, Ontario

Capability: WNRE is an Research & Development site. It performs fundamental and applied research, develops processes, products and components, and has a large staff of experienced people in most disciplines and trades. Our greatest asset is the ability to innovate, develop, test, commercialize and market a concept.

Keywords that describe their capability are as follows

- ASME Codes
- Biological Environment
- Chemical Analysis
- Chemical Processes
- Chemistry
- Colloidal Chemistry
- Combustion
- Computer Code Development
- Contract Research
- Corrosion
- Derived Release Limits
- Detonation
- Disposal
- Electrochemistry
- Electronics, Nuclear
- Environment
- Explosions
- Fluid Dynamics
- Fracture Mechanics
- Health Physics
- Hydraulics
- Instruments, Nuclear
- Irradiations
- Isotopes
- Materials Characterization
- Materials Testing & Development
- Mechanical Testing
- Medical Biophysics
- Metallurgy
- Metallurgical
- Mathematics
- Neutron Activation
- Non-destructive Testing
- Nuclear
- Nuclear Design
- Pathways Analysis
- Professional Services
- Physics
- Quality Assurance
- Rail Transport
- Reactors
- Radiation
- Radiation Shielding
- Radioactive Wastes
- Research & Development (R&D)
- Risk Analysis
- Safeguards
- Separation Processes
- Surface Chemistry
- Tailings
- Thermal Analysis
- Toxic Chemicals
- Trace Analysis
- Vitrification
- Waste Management

Average Work Force: Professional – 300
Technical – 330
Clerical – 175
Prevailing Rate – 245

Gov’t Appropriation – $55M
Commercial Revenues – $7M

1982/1983 – Annual Budget – $77M
Gov’t Appropriation – $68M
Commercial Revenues – $9M

Plant Size: Approximately 10 major buildings which house R&D facilities – a research reactor (WR-1), engineering offices, machine, construction and maintenance work shops, administrative offices, protective services fire department, and stores and warehousing. Very rough area of all facilities is 150,000m².

Equipment and Facilities: WNRE’s major research facility is the western world’s only reactor using an organic fluid to remove heat from the core. The reactor (WR-1) moderated by heavy water, as are all Canadian reactors, went into operation in 1965 and has proven to be a versatile and effective tool for the testing and development of nuclear fuels and materials. It has shown the potential of the organic-cooled reactor as a source of large quantities of steam for industry. One application that is receiving increasing attention is the use of steam generated by the reactor to recover bitumen from deposits of oil sands. The WR-1 reactor has been used to heat buildings at WNRE for several years and additional surplus heat could be used for other purposes such as heating greenhouses and drying agricultural crops.

In addition to the WR-1 reactor with its facilities for irradiating and testing materials, WNRE has a variety of facilities and expertise available for undertaking commercial work. e.g.

- Other irradiation devices – a gamma-irradiator, Van de Graaf and fast neutron generator
- “Hot Cell” facilities capable of handling up to 10⁶ Curies of radioactive material
- Various test “loops” for materials, component and corrosion testing
- Comprehensive metallurgical and mechanical testing facilities with expertise in testing ferrous and non-ferrous metals, ceramics, glasses, rocks and composites
- Expertise in electron microscopy, acoustic emission, fracture mechanics, etc., that can be applied to solving problems involving deformation, hydrogen embrittlement, stress corrosion cracking, creep cracking and fracture
- Extensive analytical chemistry facilities including micro-analytical, radiochemical, neutron activation mass spectrometry, atomic absorption spectroscopy, plus a unique capability for the characterization of surfaces by such means as scanning electron microscopy, scanning Auger microscopy, secondary ion mass spectrometry and photoelectron spectroscopy.
- A research chemistry group adept in the measurement of the thermodynamic properties of solutions at high temperature and pressure, in the application of electrochemical techniques to the study of corrosion and film formation, in the study of gas phase reactions, and in several areas of colloid and surface chemistry.
- Combustion test facilities to study the detailed deflagration and detonation behavior of mixtures of combustible gases from the fundamental chemistry of combustion to engineering scale verification or demonstration experiments
- Environmental research laboratories and field test facilities with experienced staff to study the impact of chemical and radioactive effluents of the environment.
Biophysical research laboratories with expertise in virology, cell biology, radiobiology, biochemistry and biophysics.

A geotechnical research capability which, by 1986, will include an underground research laboratory for excavation damage experiments for different excavation techniques, development of in-situ stress measurement techniques, evaluation of rock thermal/mechanical properties, hydraulic conductivity and rock porosity measurements and various geochemistry experiments.

Expertise in modelling fluid heat transport systems and high pressure steam/water behavior.

Consulting service groups encompassing nuclear engineering, risk analysis, development of computer models, mathematical analyses and meteorological assessments.

**Experience:** AECL has been in existence for approximately 36 years. During this time, it has developed the CANDU pressurized heavy water reactor system. It has helped to commercialize the radioisotope industry in the medical, pharmaceutical and industrial fields; developed and commercialized the Canadian heavy water industry. Canada is currently the world’s largest producer of this commodity. In addition, AECL has been instrumental in developing the Canadian nuclear fuel industry and has played a large part in developing the US nuclear fuel designs, for both military and civilian reactors. It has also played a major role in developing and commercializing zirconium alloys.

More recently, AECL has been charged with the responsibility of managing the Canadian Waste Management program. It includes conceptual planning, fundamental research, development, testing, piloting, verification, acceptance, optimization, and providing specifications for the commercial system. Spent fuel storage (wet and dry), transportation, fission products removal and waste disposal are sub-sets of the total program. All of this work is being coordinated from WNRE.

AECL’s major assets are experienced staff and state-of-the-art facilities and equipment. Its reputation as a respected leader in the nuclear and non-nuclear industries is acknowledged both domestically and internationally.

**Keywords:** 4 = Chemistry; 6 = Computers; 7 = Electronics; 8 = Energy; 9 = Environment; 16 = Security & Safety; 19 = Testing/Test Equipment; 20 = Miscellaneous; ASME Codes = 20; Biological Environment = 9; Chemical Analysis = 4; Chemical Processes = 4; Chemistry = 4; Colloid Chemistry = 4; Combustion = 20; Computer Code Development = 6; Contract Research = 20; Corrosion = 19; Derived Release Limits = 9; Detonation = 20; Disposal = 9; Electrochemistry = 4; Electronics-Nuclear = 7; Environment = 9; Explosions = 20; Fluid Dynamics = 20; Fracture Mechanics = 19; Health Physics = 20; Hydraulics = 20; Instruments-Nuclear = 7; Irradiations = 20; Isotopes = 20; Materials Characterization = 19; Materials Testing & Development = 19; Mechanical Testing = 19; Medical Biophysics = 20; Metallography = 19; Metallurgical = 19; Mathematics = 20; Neutron Activation = 20; Non-Destructive Testing = 19; Nuclear = 8; Nuclear Design = 20; Pathways Analysis = 9; Professional Services = 20; Physics = 20; Quality Assurance = 19; Rail Transport = 20; Reactors = 20; Radiation = 20; Radiation Shielding = 20; Radioactive Wastes = 9; Research & Development = 20; Risk Analysis = 20; Safeguards = 16; Separation Processes = 4; Surface Chemistry = 4; Tailings = 9; Thermal Analysis = 20; Toxic Chemicals = 9; Trace Analysis = 4; Vitrification = 4; Waste Management = 9.

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