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*airports for export  
from canada*



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***A Portfolio of Companies  
Participating in  
Airport Construction and Services***





Canada is today a leader in the world of commercial aviation and host country to the International Civil Aviation Organization of the United Nations. This proud position reflects the country's extensive aviation experience since the first flight in Canada in 1909.

Today, with 312 airports and 363 seaplane bases in use across this vast land (3,800,000 sq. miles—9,880,000 Km<sup>2</sup>—second only in size to Soviet Russia), Canada offers a wealth of experience and expertise in airport construction, equipment and services, no matter how large or small the need.

Already well known around the world, Canadian construction companies, consulting engineers and manufacturers of navigational and visual aids and other airport equipment are at your service.

Prepared by the Canadian Department of Trade and Commerce in co-operation with the companies listed, this booklet will provide buyers everywhere with a reliable guide to the comprehensive range of products and services available from Canada.

These companies will prove conscientious and energetic partners in airport development offering the highest standards in craftsmanship, equipment and services.

As the Canadian government minister responsible for encouraging the safe and orderly development of the aviation industry in Canada, I naturally take great interest in all its phases.

The Canadian Department of Transport owns and operates many airports throughout Canada, including all the major ones. All are included in a long-range plan of constant development to meet present and future needs.

Canada's highly developed aviation technology, which provides advice and services in all phases of the plan, has helped to build airports and provide expert counselling in many parts of the world.

The department provides a complex system of aids to navigation, staffed by its own air traffic controllers, meteorologists and electronic specialists at stations throughout Canada. In addition, much time, effort and staff are used to ensure that all aircraft and avionic equipment designed, built or used in Canada meet the highest standards of quality and design.

Our standards are second to none: so are Canada's airport equipment, avionic products, construction and consulting engineering services.

Robert H. Winters, Minister  
Department of Trade and Commerce  
Ottawa, Canada

J. W. Pickersgill, Minister  
Department of Transport  
Ottawa, Canada

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## ***Airports for export from Canada***

Canada is an air-minded nation devoting much of its technological resources to the ever increasing growth in air transportation both within the country and internationally.

With an area of 3,800,000 square miles (9,880,000 Km<sup>2</sup>) and widely scattered centres of population and industry, an efficient and comprehensive air network has been, and continues to be, essential to Canadian growth and development.

One result, over the years, has been an exceptional record in airport building, as shown in these figures:

By 1920, Canada had built 71 airports and had 7,000 miles (11,200 Km) of air routes. Today Canada has 312 licensed international, national or regional airports, 363 licensed seaplane bases, and almost 800 other recognized landing areas along 85,000 miles (136,000 Km) of air routes.

This wealth of experience in airport development has now been consolidated into a group of planners, builders and equipment manufacturers with the capability of creating complete airports anywhere in the world.

The group is capable of supplying everything from complete mechanical, electrical and electronic systems to runway lighting for the airfield and furnishings for the terminal building.

Included also are heavy construction companies

expert in building runway systems and terminal facilities, and consulting specialists providing complete services from the planning and designing of airport facilities to complete air transportation studies.

The substantial knowledge gained by these Canadian companies in the design and construction of airports in Canada—and recently in other countries—has made this service possible. Quality approved systems and equipment are ensured by the experience gained by these companies in building to the strict standards imposed by the Canadian Department of Transport, and by the International Civil Aviation Organization, in the Canadian programme.

This portfolio details the quality products and skilled services these companies can offer. For easy reference, the portfolio is in five sections: Consulting Engineers, Construction, Navigational and Visual Aids, Telecommunications, and Ancillary Equipment.

Further information on the group and individual companies may be obtained at any of the Canadian government trade offices listed at the back of this portfolio, *or contact:*

M. L. Nickerson  
Programme Manager  
Airport Exports Programme  
Electrical and Electronic Equipment Division  
Department of Trade and Commerce  
Government of Canada  
Ottawa, Canada  
Cable address: COMCOM OTTAWA

***CONSULTING ENGINEERS  
CONSTRUCTION  
NAVIGATIONAL AND VISUAL AIDS  
TELECOMMUNICATIONS  
ANCILLARY EQUIPMENT***

*Several companies appearing in individual sections are also highly competent in other fields. Please consult Product Cross-Index at the back of this Portfolio.*

## **CONSULTING ENGINEERS**

*Canadian consulting engineers participating in this portfolio are registered professional engineers engaged in private practice as sole proprietors, partnerships or firms providing a wide range of engineering services on a fee basis.*

*These engineers serve governmental, industrial and commercial clients in a variety of ways, from specialist consultation to complete planning, design and supervision of projects.*

*With the highest standards of ethics and efficiency, and experience in more than 30 countries, in climates varying from arctic to equatorial, Canadian consulting engineers offer a wealth of skills to serve airport development needs anywhere.*

***Acres International Limited***

***Cansult Limited***

***Foundation of Canada Engineering Corporation Limited***

***Hoyles, Niblock and Associates***

***Intertel Consultants Ltd.***

***A. D. Margison and Associates Limited***

***N. J. Pappas and Associates***

***C. C. Parker and Associates Limited***



**Acres International Limited**

1259 Dorchester Road

Niagara Falls, Ontario, Canada

Cable Address: ACRESCAN NIAGARA FALLS ONTARIO



*Acres' main office buildings reflect the company's modern engineering and architectural functional design philosophies. It is from this building that both the international operations and the major engineering and laboratory facilities are directed.*

Acres International Limited, a member of the Acres group originally established in 1924, has gained substantial experience in major construction undertakings in many countries outside Canada with projects designed and construction supervised in Africa, Asia, Central and South America, and Australasia.

The Acres group comprises eight regional and specialist companies and each member can thus draw on a diversity of talent to cope with the most complex engineering challenges.

Specialists in civil, hydraulic, geotechnical, mechanical, electrical and structural engineering and architecture, the company provides engineering and management for developments in all fields of generation, industry, communications, regional and urban planning and modern airports where professional services play a vital part.

The company employs modern techniques in its approach to engineering problems and is a recognized leader in its fields of activity. Within the organization, Acres has a research and planning company staffed by economists, traffic consultants, transportation specialists, planners, sociologists and other professions. This branch of the company undertakes airport planning and traffic study.

A modern twin-jet, company-owned aircraft flies Acres key executives between major regional offices and projects at day-saving speed, providing top efficiency in administration and management of multi-million dollar projects with tight contract schedules.

Acres' world-wide engineering activities include power systems, water and mineral resource development, municipal, urban and regional planning, airports and industrial plants.

The company is carrying out a planning study for the Canadian Department of Transport of future development of the Calgary international airport in Alberta, Canada. This study will involve all facets of airport operation.

Acres' Project 1223 is typical—an airport development plan for a new runway with associated taxiway, apron, lighting and drainage facilities.

Such plans review various aspects of existing facilities and present proposals for their integration with projected new runways and their associated works. The reports also include a study of the potential increase in the use of airport facilities and contain a development plan designed to cope with increased airport activity. Such a development plan is sectionalized for assimilation under these headings: layout; terminal building; hangarage; water supply; sewage disposal; fencing; and electric power. The report covers costs and construction schedules for the total development.



*Acres' Jet Commander executive aircraft.*



*Small airports need imaginative development. Acres' International undertakes full programmes from basic economic studies and traffic forecasts through geotechnical survey of engineering and construction management of complete facilities.*



**Cansult Limited**

75 Albert Street

Ottawa, Ontario, Canada

Cable Address: CANSULT OTTAWA

Cansult Limited, a consortium of Canadian consulting engineering firms, is fully organized to undertake work outside Canada in transportation, communications, industry, power, resources and urban development. The group makes available composite staffs and facilities of some 1,200 engineers and technical personnel on design and construction supervision of engineering works averaging about \$400,000,000 a year.

The consortium offers extensive experience in all phases of airport planning and engineering including feasibility studies, preliminary surveys, site selection, detailed design and supervision of construction.

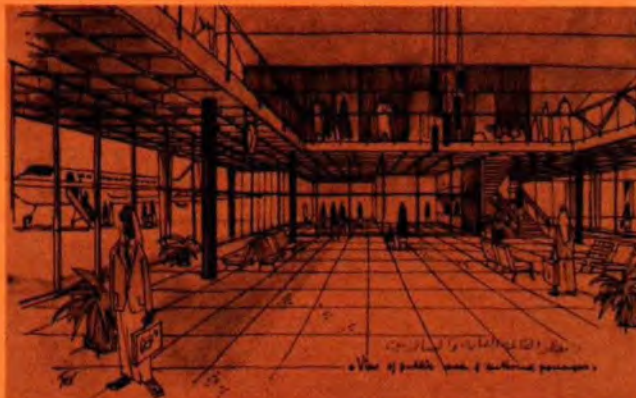
The company's services extend from initial surveys, soil testing and runway design, through terminal building architecture and engineering to all navigational aids including VOR, ILS, and VHF and HF communications.

Recent projects in Canada and other countries include both civilian and military installations for the largest jet aircraft in use: DC-8's, Boeing 707's and Super VC-10's.

Samples from Cansult's list of clients show geographic and climatological versatility. At one extreme of the geographic scale is the Abu Dhabi international airport in the Arabian (Persian) Gulf. Cansult contracted planning, design and supervision of construction for the complete jet airport including runways, taxiways, terminal building, navigational aids, communications and all other services.

In contrast, Cansult also conducted surveys and made master plans for large air bases at classified locations in the sub-Arctic for the Royal Canadian Air Force and the United States Air Force. These studies of building sites, runway layouts, approaches, hazards, lighting systems, navigational aids, waterworks, sewerage, power and communications, were based on the airports' capability to accommodate the largest of military jet aircraft.

A number of other airfield projects, such as airfield extensions and refuelling systems, have been completed by Cansult for the Canadian government and private sponsors.



*This terminal building, with its modern architecture, is part of the international airport which Cansult planned, designed and construction supervised for the Ruler of Abu Dhabi in the Trucial States in the Arabian (Persian) Gulf.*



Cansult Limited, while assuming complete responsibility for the consultant contract, has the work implemented by member firms. Depending on the nature and scope of the assignment, the work is carried out in one of three ways: by one specialist member firm with possible assistance from other member firms' engineers; by a joint venture on the part of two or more member firms; or by a task force made up of engineers or specialists selected from member firms and operating as a specialized project team.

Cansult's member firms have engineers and specialists experienced in carrying out projects in Latin America, Asia, Africa, the Caribbean and the Middle East, while representatives and associates are stationed in 33 cities in the world.

Cansult's services may be described in four phases: preliminary, pre-engineering, design, and construction.

The preliminary phase comprises feasibility reports, provision of layouts, estimates of cost and economic and market surveys.

The pre-engineering phase consists of surveying and investigation of site conditions, local materials, topography and climatology.

The design phase includes specifications for tenders, tender analysis, working drawings, contract documents, purchasing recommendations and associated work.

The final phase includes all construction supervision with provision of a resident engineer and field staff, progress reports and award certifications and finally preparation of "As Built" drawings and operators' manuals.



*Soil testing for the international airport in the Trucial States, Sheikhdom of Abu Dhabi, an oil-rich state in the Arabian (Persian) Gulf.*



*A new sign at the desert's edge ushers in the jet era to the Arabian (Persian) Gulf.*



*The public area and outbound passenger area at Abu Dhabi Airport terminal building are spacious and modern. The runways will accommodate the largest jet aircraft.*



**Foundation of Canada Engineering Corporation Limited**  
2200 Yonge Street  
Toronto 12, Ontario, Canada  
Cable Address: FOUNDANENG TORONTO



*This new interchange system on a modern multi-lane Canadian expressway was designed and supervised by FENCO engineers for Metropolitan Toronto. FENCO has also worked on United States expressway design.*

For more than 14 years the Foundation of Canada Engineering Corporation Limited (FENCO) staff of 500 specialists has provided services to a wide range of clients on private and public engineering projects in Canada and several areas of the world to the value of more than \$100,000,000 yearly.

This versatile company is a wholly-owned subsidiary of Canadian Foundation Company Limited and associated with The Foundation Company of Canada Limited, a large construction company for which FENCO provides engineering services.

FENCO versatility includes engineering services on such multimillion dollar projects as copper smelters, harbours, multi-lane highway bridges, pre-fabricated sub-aqueous tunnels, mining installations and large industrial complexes.

In activities outside Canada, FENCO is currently providing engineering services to the Inter-American Development Bank in connection with a \$100,000,000 iron ore mining expansion

programme in Brazil; to a Japanese consortium in connection with an underwater tunnel in Hong Kong; and has provided services to Norway and the Dominican Republic in mining studies; and to the Principality of Andorra for a tunnel in the Pyrenees.



*The air terminal building at the new international airport at Katunayake, Ceylon, is a FENCO project with the Canadian Department of Transport.*

FENCO is currently working closely with the Canadian Department of Transport on the design of a new Ceylon airport being built under the Colombo Plan.

Supervision of the construction of runways long enough to accommodate the most modern jet aircraft, and design and supervision services on the structural, mechanical and electrical features of the international terminal building at Katunayake, are all FENCO responsibilities.

In connection with airport design, FENCO will provide design services for runways and drainage, and administrative, service and terminal buildings.

Senior architectural staff at FENCO have the design capability to develop complete air terminal buildings as integrated functioning units, and would welcome opportunities to work with reputable technical firms in other countries.



***InterTel Consultants Ltd.***

*298 Elgin Street  
Ottawa 4, Ontario, Canada  
Cable Address: INTERTEL OTTAWA*

InterTel Consultants Ltd. was formed in 1961 to fill the need for telecommunications consulting services completely independent of any supplier or manufacturer affiliation. The company is currently engaged in planning and engineering for airway and control tower communications, radio, radar and visual aids to navigation for the central African republic of Malawi and the Persian Gulf Sheikdom of Abu Dhabi.

The policy of InterTel is to offer impartial and objective recommendations through its staff of highly experienced engineers, skilled technicians and support personnel for the most effective and economical solution to client needs.

InterTel has wide international and domestic experience as systems engineers to government and industry in the planning and design of wireline and point-to-point HF, VHF, microwave, tropospheric scatter and communication satellite systems, including the preparation of performance specifications, tender analyses and project installation supervision.

The many successfully completed projects of InterTel have called for representation and counselling in telecommunications at international conferences and before government departments, agencies and commissions. The firm also engages in consulting services concerning feasibility of, and negotiations for, international financing of communications and broadcasting; route surveys; studies in traffic flow, market potentialities and development; and frequency spectrum management to international civil and military standards, specifications and regulations.



*InterTel Consultants Ltd. is engaged in the planning and engineering of control tower communications, radar, and visual aids to navigation in Africa and Asia.*



***Hoyles, Niblock and Associates***

*3110 Boundary Road*

*Vancouver 12, British Columbia, Canada*

*Cable Address: TELECOM VANCOUVER*

Radio and radar, microwave and tropospheric scatter, electronic control and international HF communications systems are fields in which Hoyles, Niblock and Associates have demonstrated high competence in projects for airlines, industry and government agencies.

Services range from client representation through feasibility studies, economic analyses and other preparatory work to project planning and design, supervising construction and supervision of operation and maintenance. The services offered range from the execution of a single phase of a project to complete project responsibility.

Having no affiliations with manufacturers or suppliers the firm offers impartial advice and service. A comprehensive electronic laboratory is maintained, and the firm makes available a broad range of precision test equipment for international project acceptance testing.

The company has served many airline and airport clients in the design of ground-air-ground and point-to-point communications systems and in acceptance testing and calibration of aircraft and airport electronics equipment. These include the Canadian Department of Transport, Air Canada and Canadian Pacific Airlines.



*Typical airport control tower and communication antennas designed and erected in consultation with Hoyles, Niblock and Associates.*



**A. D. Margison and Associates Limited**  
1155 Leslie Street  
Don Mills (Toronto), Ontario, Canada



*Flexibility and ease of expansion keynote the design of Margison's headquarters office building at Don Mills (Toronto).*

A. D. Margison and Associates Limited was founded in 1950 by the partners of Margison and Babcock, an old-established firm of consulting engineers with a distinguished record in Canadian engineering projects since 1928.

Today, Margison is well equipped to handle projects of varied size and complexity from design to construction supervision and project management. It numbers among its clients all levels of government and diverse commercial enterprises in Canada and the United States.

The firm was design consultant for the complex operations buildings of the Royal Canadian Air Force's Pinetree Line—a radar network in the Canadian northlands. More recently, the firm designed and supervised construction of the underground northern NORAD headquarters (SAGE) for the RCAF at North Bay, Ontario. This unique project presented design problems never met before. To meet them, the firm developed an original and sophisticated design concept involving scientific and technical research in special aspects of the project.

Other projects completed by the firm range in variety from aircraft maintenance and storage hangars to highways, bridges, large industrial plants, research facilities and prefabricated church steeples.

On home ground, the firm points with pride to its own headquarters in Toronto, Ontario, as an example of its architectural and engineering skills. It was carefully planned to meet the executive and technical needs of extensive—and expanding—consulting and design services.

Margison's facility for anticipating future demands is well illustrated by airport buildings designed by the firm. Aircraft hangars designed by Margison and completed several years ago are still suited to any aircraft at present in operation and will accommodate any that are now on the drawing board.

Some examples of A. D. Margison's capabilities are illustrated on the following pages.

A. D. Margison and Associates has pioneered in the design of aircraft hangars for maximum flexibility. One example, in the defence field, is a thin shell concrete arch hangar for the Royal Canadian Air Force. This type of hangar has been built at several sites for the protected servicing of aircraft. As the need for more maintenance area arises, the basic design can be expanded by exterior additions along each side of the hangar. Sliding hangar doors of a new design permit high speed, independent mechanized operation of each leaf.

A modified version of the original design, including laboratories, shops and other facilities, was adopted by Canada's National Aeronautical Establishment.

One of the largest commercial hangars in Canada was designed by Margison for Canada's government-owned international airline, Air Canada. It was built for line maintenance and servicing of aircraft. Shops, stores, offices and power plant are in a separate section along the far side of the hangar.

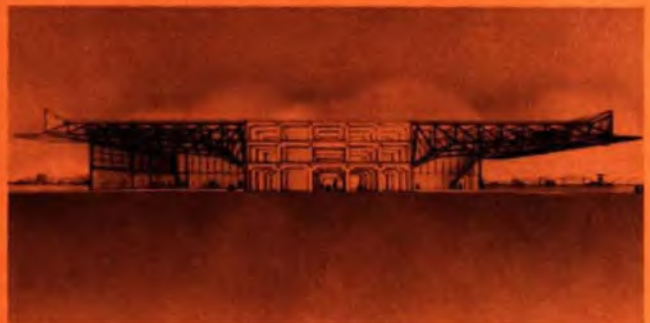
In another type of hangar that has been built at various sites across Canada the structural design allows for the addition of extra floors as required. Another feature is unrestricted opening along the whole length of each hangar area on either side of a central core.



*Canada's National Aeronautical Establishment.*



*Trans-Canada Air Lines (now Air Canada) building at Toronto's international airport was a Margison project.*



*This ingenious Margison hangar design allows for the addition of extra floors over the central core.*



***A. D. Margison and Associates Limited***

Another example of Margison capability is a single-storey warehouse more than a quarter of a mile (0.4 Km) long and covering 18½ acres (7.4 hectares) which the firm designed for the Royal Canadian Air Force. Design studies covered shipping and receiving; handling and storing; packaging and the preservation of costly materials and equipment.

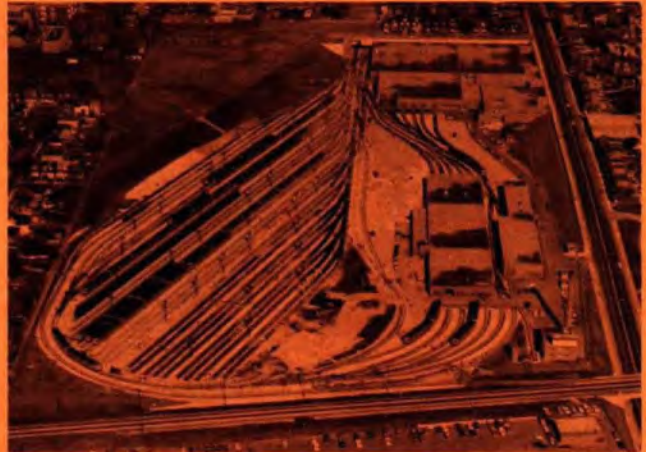
A central aisle, 30 feet (10 metres) wide, runs the full length of the building. Conveyor cars are moved by draglines recessed under the floor level. Economical structural design eliminates girders but gives a column spacing of 40 feet (12.1 metres) in both directions.

In transportation, a major Margison project comprised yard and shop facilities—which are among the largest and most modern in any country—for the Toronto Transit Commission (Canada's largest urban transportation complex). These facilities cover maintenance, overhaul and repair shops and off-peak-hour storage for subway trains.

Traffic studies and highway planning are included in the long list of Margison capabilities which range from the upgrading of rural roads to designing major urban expressways and interchanges.



*Central aisle of RCAF warehouse at Downsview, Ontario.*



*Toronto, Ontario, subway yard and shops.*



*The six-lane Frederick G. Gardiner Expressway, Toronto, Ontario.*



***N. J. Pappas & Associates***  
*5253 Decarie Boulevard*  
*Montreal 29, Quebec, Canada*  
*Cable Address: PAPPACO MONTREAL*

N. J. Pappas & Associates began in 1956 to provide propagation and systems engineering services for the domestic broadcasting industry and now works internationally in a number of architectural and consulting engineering fields.

In the past 10 years the organization has expanded its operation to provide specialist services in airport and operational building complexes, specialized telecommunications and radio frequency services, acoustics, structural dynamics, and vibration and noise control. Branch offices are maintained in Malaysia, Hong Kong and the United States. The firm also has associates in Greece.

Pappas & Associates provides airport design services in architecture; civil, structural, mechanical and electrical engineering; electronics systems engineering; quantity surveying and civil aviation department liaison.

The organization provides a comprehensive consulting service comprising feasibility studies; capital and operating cost projections; preliminary design; detail design to tender; and contract documents including working drawings and specifications. Services also include calls for tender; tender analysis; letting of contracts; construction supervision; and administrative structuring and training of personnel.

Pappas consults on site selection, runways and facilities (visual aids, lighting and instrument landing systems), terminal buildings and aircraft control services (including all passenger handling and building services, telecommunications and electronics systems), ancillary buildings (airfield lighting substations, meteorological stations, fire stations, air disaster units, freight and cargo handling, aircraft servicing and maintenance facilities, and related services), and airport management and operation.



**C. C. Parker and Associates Limited**  
688 Queensdale Avenue East  
Hamilton, Ontario, Canada



C. C. Parker and Associates Limited, established as consulting engineers in 1946, has a staff of 147 professional engineers and technical personnel which undertakes planning, design and supervision of construction in civil, electrical, mechanical, municipal and transportation engineering.

The multi-million dollar terminal building at Ottawa's International Airport is an example of CCP and Associates structural design accomplishments. The structural steel frame has large spans to accommodate flexible interior planning, and the entire structure is supported on pile foundations because of unsatisfactory soil conditions.

Besides airports, the firm conducts traffic and transportation studies, feasibility studies, and design for industrial buildings,

*C. C. Parker and Associates Limited was retained to provide structural design on the multi-million dollar terminal building of the international airport at Canada's capital city, Ottawa.*

bridges, highways, harbours, waterworks systems, and sewage treatment plants. It also undertakes complete construction contract administration.

Trinidad and Tobago, and the Union of Burma have sought C. C. Parker and Associates' services in the international field, and Canadian government departments, at the federal, provincial and municipal levels are regular clients.

Other clients include large Canadian industrial concerns such as Dominion Foundries and Steel Ltd., the International Harvester Company, and the Steel Company of Canada.

## **CONSTRUCTION**

*Construction in Canada has never been easy. Since the first log road was laid over treacherous bog, the construction industry in Canada has faced unusual challenges in forging transportation links across this great continent.*

*Canadian construction men have had to travel far to complete large projects in extremes of heat or cold in places where ancillary services and maintenance were scarce or non-existent. Great jumbles of rock and forest, miles of bog-like muskeg, river canyons and towering mountain ranges were all overcome by ingenuity and resourcefulness, with new construction techniques, innovations in machinery and transportation methods.*

*Within 100 years of the first canal systems, a trans-continental railroad had been built and airports were being constructed to speed contacts in this growing industrial nation. In 1920 there were 71; now there are 312, some of them high in the Arctic.*

*Illustrating the dramatic growth of this industry over a recent 10-year period, in 1955 all construction contracts in Canada totalled some \$5,000,000,000. By 1964 the construction industry had invested more than double this amount (\$10,827,000,000) in new machinery and equipment alone and companies are still enlarging their scope and experience.*

*With experience from the Arctic to Australia, the companies described in this portfolio offer the tough Canadian construction heritage as their credentials for undertaking airport projects wherever needed, whatever the size.*

### **British-American Construction & Materials Limited**

*Paving; complete construction.*

### **Dufferin Materials & Construction Ltd.**

*Paving.*

### **Mannix Co. Ltd.**

*Feasibility studies; complete construction.*

### **Standard-General Construction (International) Ltd.**

*Buildings; paving.*



**British-American Construction & Materials Limited**  
1500 Plessis Road  
Winnipeg 25, Manitoba, Canada



*Laying concrete by machine for the main runway of the Katunayake airport development programme in Ceylon. The rails on which the machine rides also make up the forms to contain the new concrete.*

British-American Construction & Materials Limited has a special airports division which has built more than 20 airports since 1950 and currently has three under construction, one of which is in the Arctic and another in Ceylon.

This versatile company has a thorough background in heavy construction and contracts total between \$50,000,000 and \$60,000,000 a year. It is prepared to work anywhere in the world in airport or other construction fields.

At Katunayake airport in Ceylon, part of Canada's Colombo Plan aid programme, Tallman Construction Ltd., one of the B-A Construction group, has completed a runway extension and overlay 11,050 feet (3,315 metres) long and 150 feet (45.6 metres) wide, plus overshoots 200 feet (60.8 metres) long. The runway system is complete with paved shoulders 25 feet (7.5

metres) wide and a taxiway providing runway turn-off access to the new terminal apron which measures 700 feet by 400 feet (212.8 by 121.6 metres).

Other installations will include high intensity runway lighting, taxiway and apron lighting and power distribution systems. A new terminal building is designed to handle 150 peak hour passengers and provide necessary airline, passenger and inspection services facilities together with related installations.

The Ceylon terminal building is scheduled for completion by July, 1968.



***Dufferin Materials & Construction Ltd.***

*2700 Dufferin Street  
Toronto 19, Ontario, Canada*

Dufferin Materials & Construction Ltd., with more than 60 years' airport and highway construction experience, is diversifying into the international field.

Modern machinery, with the latest innovations for concrete mixing, transportation and laying, experienced technical and administrative management, and proven ability to handle large projects to government airport and highway authorities specifications, make Dufferin a confident choice for airport work.

A Dufferin concrete laying machine is capable of pouring continuous strips 24-feet (7.3 metres) wide. A slip form paving technique is used by having the large machine move along the prepared sub-grade on crawler-type tracks. The slip forms—part of the machine—are 50 feet (15.2 metres) long, and as the concrete slab hardens sufficiently within them, they are eased slowly along the edges of the slab, providing room within the slip form to continue pouring.

Machines such as these are supplied with concrete by Dufferin's fleet of 98 Trans-Mix units—large concrete hauling trucks which mix the concrete on the way to the site. The trucks are loaded in turn at the company's dry mix, automatically controlled batching silos.

Where especially massive areas of paving are to be carried out, Dufferin's pre-mix concrete plant (capacity: four cubic yards—3.05 cubic metres) is used in conjunction with its fleet of 20 Dumpcretes—large trucks which haul and dump the pre-mixed concrete.

A similar plant, prefabricated for shipping abroad, is scheduled for use by Dufferin on airport construction jobs in countries where the machinery is not available. Such a plant, used in conjunction with Dufferin's associated equipment and engineering expertise, ensures rapid and competent fulfillment of paving contracts.

Dufferin also has complete capability for sub-surface grading, installation of sewers and drainage systems and static grounding systems for airports.



*Dufferin laid sub-systems and paved the apron area of Toronto International Airport: 248,000 tons of crushed rock preceded the laying of the 83,000 cubic yards (63,457.6 M<sup>3</sup>) of concrete for a 14-inch (355.6 mm) unreinforced surface with a flexural strength of 550-psi (35.15 Kg/cm<sup>2</sup>) at 28 days' curing.*



**Mannix Co. Ltd.**

815 2nd Street South West  
Calgary, Alberta, Canada  
Cable Address: MANXCO CALGARY

Construction contracts to a total value of more than \$250,000,000 in Australia, Canada and the United States, are currently being completed by Mannix Co. Ltd., one of Canada's largest construction companies.

Mannix, with over 70 years' experience, is sufficiently large and versatile to assume financial responsibility in multi-million dollar projects, and offers airport project services ranging from feasibility surveys to complete construction packages built to government specifications.

The runways at Canada's Namao, Alberta air base, 14,000 feet (4,267.2 metres) long, were laid by Mannix. This airport, from which the Royal Canadian Air Force services units with NATO and the United Nations, is said to have the longest runways in the Commonwealth. Mannix crews laid over one million tons of gravel as a base for the concrete and asphalt surfacing.

The company offers international clients a wide range of experience in construction and natural resources development. Airports, bridges, railways, oil and gas pipelines, as well as hydroelectric, highway and mining projects totalling billions of dollars, have been engineered and constructed by Mannix.

As a member of a group of 12 allied companies, Mannix Co. Ltd. can draw on a great variety of talent in differing specialties to supply a complete package construction proposal that incorporates the finest services, the most advanced administrative techniques and the most modern methods of construction.



*Mannix 30-ton super heavy duty trucks help contractors keep tight project schedules.*



**Standard-General Construction (International) Ltd.**  
5340 1st Street South West  
Calgary, Alberta, Canada

Standard-General Construction (International) Ltd. has been building airports since 1941, some under extremely difficult and hazardous conditions. In spite of the lack of many normal facilities for supplies and repairs, Standard-General succeeded in building two airports in the Arctic, one 100 miles north of the Arctic Circle.

This company built its first 10 airports for the Commonwealth Air Training Plan, and for the past 20 years has completed numerous airport expansion programmes to enable them to keep ahead of the startling increase in international air traffic.

Standard-General sponsored a joint venture which undertook the construction of an airstrip 6,000 feet (1,828.8 metres) long at Canada's new Arctic town of Aklavik, north of the Arctic Circle. The frozen muskeg, which comprised the only flat area available, was covered with a layer of quarried rock 8 feet thick (2.4 metres) to make a stable runway base, a new development in airport construction.

At the Arctic gold mining town of Yellowknife, Standard-General again overcame almost impossible transportation conditions by bringing its construction equipment and living quarters to the site over the ice of Great Slave Lake before the spring breakup of the ice. Runways were completely graded and paved by the September deadline and the equipment transported south again.

With this type of construction experience, Standard-General has developed portable hotmix plants, mobile concrete batch plants, excavation equipment, paving machinery, rollers, compaction equipment and a complete camp complex for staff housing, all of which are capable of being transported to airport construction jobs anywhere in the world.

This modern diversified equipment, highly trained and experienced staff and financial stability highlight Standard-General's ability to carry out any form of airport work from excavation, buildings and drainage to asphalt and concrete paving, and to do it within estimated costs and on schedule.



*The world's largest jet aircraft can use the 12,600 feet (3,840.4 metres) runway at Calgary International Airport. Standard-General completed runways, taxi strips, parking areas and drainage on time without disturbing air traffic flow.*

The 12,600 feet (3,840.4 metres) main runway paving, taxi strips and parking areas of the international airport at Calgary, Alberta, is a recent Standard-General accomplishment, and the company is currently engaged on a multi-million dollar contract at Vancouver International Airport which includes paving an area in excess of 290,000 square yards (242,810 square metres).



## **NAVIGATIONAL AND VISUAL AIDS**

*A report on Canadian airport facilities published in 1930 showed that a system of airline beacon lights and flood lights was placed in operation early that year; some were rotating beacons visible for 90 miles (144 Km) in clear weather.*

*Today each possible aircraft obstruction has its own beacon light, and Canada is covered from coast to coast by a chain of powerful long distance airways surveillance radar systems and every modern navigational aid. In airfield lighting Canada produces a complete range of field lighting facilities including high intensity, VASIS and centreline visual aids. Canada's Department of Transport Meteorological Branch has a satellite data centre at which cloud cover pictures received from orbiting photo-satellites are interpreted to assist in long range weather forecasting.*

*The companies listed in this section design and manufacture a wide range of the sophisticated audio, visual, and electronic aid equipment now needed in the area, terminal and airport divisions of air traffic control. The equipment meets—and often exceeds—the strictest performance specifications required by government bodies and the International Civil Aviation Organization.*

*The excellent performance and quality of Canadian-made equipment in this field is reflected by Canada's exceptional safety record in the air and in the latest annual total of 4,407,383,393 passenger miles (approximately 7,041,813,428 passenger/Km) flown by Canadian airlines in all weather.*

### **Beaconing Optical and Precision Materials Co. Ltd.**

*Threshold, VASIS, runway, taxiway, parking, high-speed and general lighting; meteorological, control tower and emergency supply equipment.*

### **CAE Industries Ltd.**

*Flight, weapons and radar simulators; supervisory control and telemetry systems; transistorized telegraph equipment; weather satellite information equipment.*

### **CLM Industries**

*Lighting regulator switchboards; VASIS lighting units.*

### **Crouse-Hinds Company of Canada Limited**

*Medium and high intensity marker lights; obstruction lights; terminal and parking area lighting; rotating beacons; beam ceilometer; illuminated wind cone fixture; electrical distribution equipment.*

### **Esna Limited**

*Cable lighting systems; time delay relays; connector kits; reflective legend material.*

### **Raytheon Canada Limited**

*Surveillance radars; solid state digital display systems; navigation systems; omnitest sets; ATC simulators and other specialized equipment.*



**Beacons Optical and Precision Materials Co. Ltd.**  
455 Craig Street West  
Montreal, Quebec, Canada  
Cable Address: BOPHAR MONTREAL

Special optical, mechanical and electronic devices, with emphasis on custom-built units, inventive design and skilled craftsmanship, make Beacons Optical and Precision Materials Co. Ltd. a first-line contributor to Canadian and United States defence projects, airports, and industry.

This rapidly expanding 18-year-old company also sub-contracts for major United States and Canadian electronic manufacturers, and has recently diversified into manufacturing airport equipment under license to one of the world's foremost suppliers of aviation aids: Barbier, Benard et Turenne of Paris.

Of high quality and sophisticated design, this equipment covers threshold, VASIS, runway, taxiway, parking and high-speed turnover lights, as well as meteorological, control tower and emergency supply equipment and general lighting. Under the Barbier, Benard et Turenne license, BOP has exclusive marketing rights in Canada, the United States and Commonwealth countries, as well as any countries receiving Canadian aid funds for purchase of such equipment.

BOP military electronic equipment is in service on a world-wide basis with the land, sea and air forces of both the United States and Canada.

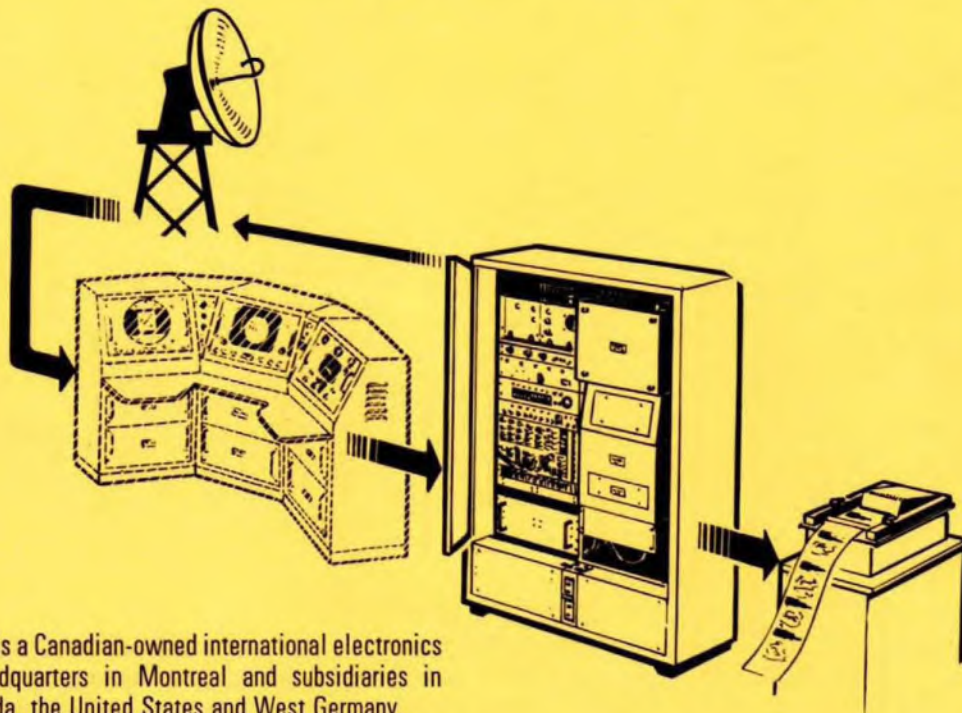
With one third of plant facilities devoted to engineering and electronic laboratories, the firm is in an excellent position to design and develop to special customer requirements.



*A precision made high intensity airfield approach light supplied to the Australian Department of Civil Aviation by Beacons Optical.*



**CAE Industries Ltd.**  
Place Ville Marie  
Montreal, Quebec, Canada  
Cable Address: CANAVELEC MONTREAL



CAE Industries Ltd. is a Canadian-owned international electronics company with headquarters in Montreal and subsidiaries in other parts of Canada, the United States and West Germany.

Since 1947, when the company began (as Canadian Aviation Electronics Ltd., an overhaul and repair establishment for electronic equipment), CAE has expanded and diversified. It now designs, develops and manufactures flight, weapons and radar simulators, supervisory control and telemetry systems, transistorized telegraph equipment and other electronic systems and apparatus for defence and industry.

CAE also performs research and development work on anti-submarine warfare equipment, magnetic detection devices, computers, solid state telegraph and control equipment and weather satellite information recovery equipment.

Three pieces of equipment produced and developed by CAE of particular importance to airports are Telepath digital communication equipment, a weather radar analyzer (WERAN) and a weather satellite picture receiving station.

*CAE's weather radar analyzer and data processor, with precipitation flux distribution computer, shows weather conditions within 100 miles (160 Km) on a radar screen and records them on paper via an associated electrolytic facsimile recorder.*

The WERAN system gives precise location and altitude information on weather conditions for a radius of 100 miles (160 Km) from the airport and provides warning and analysis of approaching storms, with an accurate presentation of precipitation content and intensity.

WERAN works by processing IF radar signals to produce constant altitude maps based on the McGill University CAPPI (constant altitude plan position indicator) concept. Horizontal sections of weather are shown at up to eight programmed altitudes, together with associated precipitation profiles in bar chart form. Maps are processed at a rate of eight every 15 minutes and can be transmitted over voice telephone lines to facsimile receivers.

The prototype is currently being evaluated at the Canadian Department of Transport meteorological headquarters.

CAE's ground receiving stations were developed to receive, record and reproduce TV-generated weather system photographs from weather satellites equipped with APT (automatic picture transmission).

The station consists of a steerable antenna designed for satellite tracking, an automatic antenna programmer and a special APT receiver. The receiver feeds into a tape recorder which records and stores the received signals and into three different types of read-out equipment: photographic facsimile, electrolytic facsimile or a kinescope with an attached Polaroid camera.

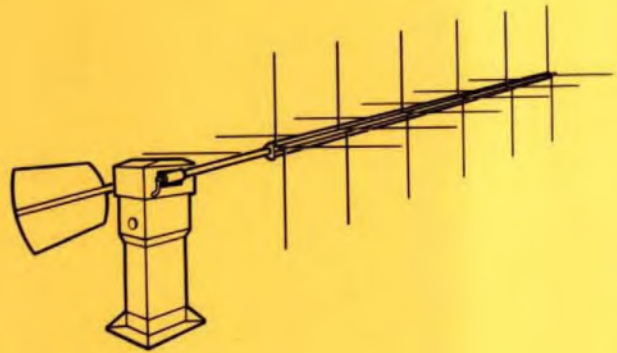
The CAE APT picture receiving stations are used on an operational basis by the meteorological division of the Canadian Department of Transport at two locations in Canada.

Used in airline reservations and communication centres, CAE's Telepath control equipment receives, edits and routes incoming traffic automatically to a designated office or location and is in world-wide service.

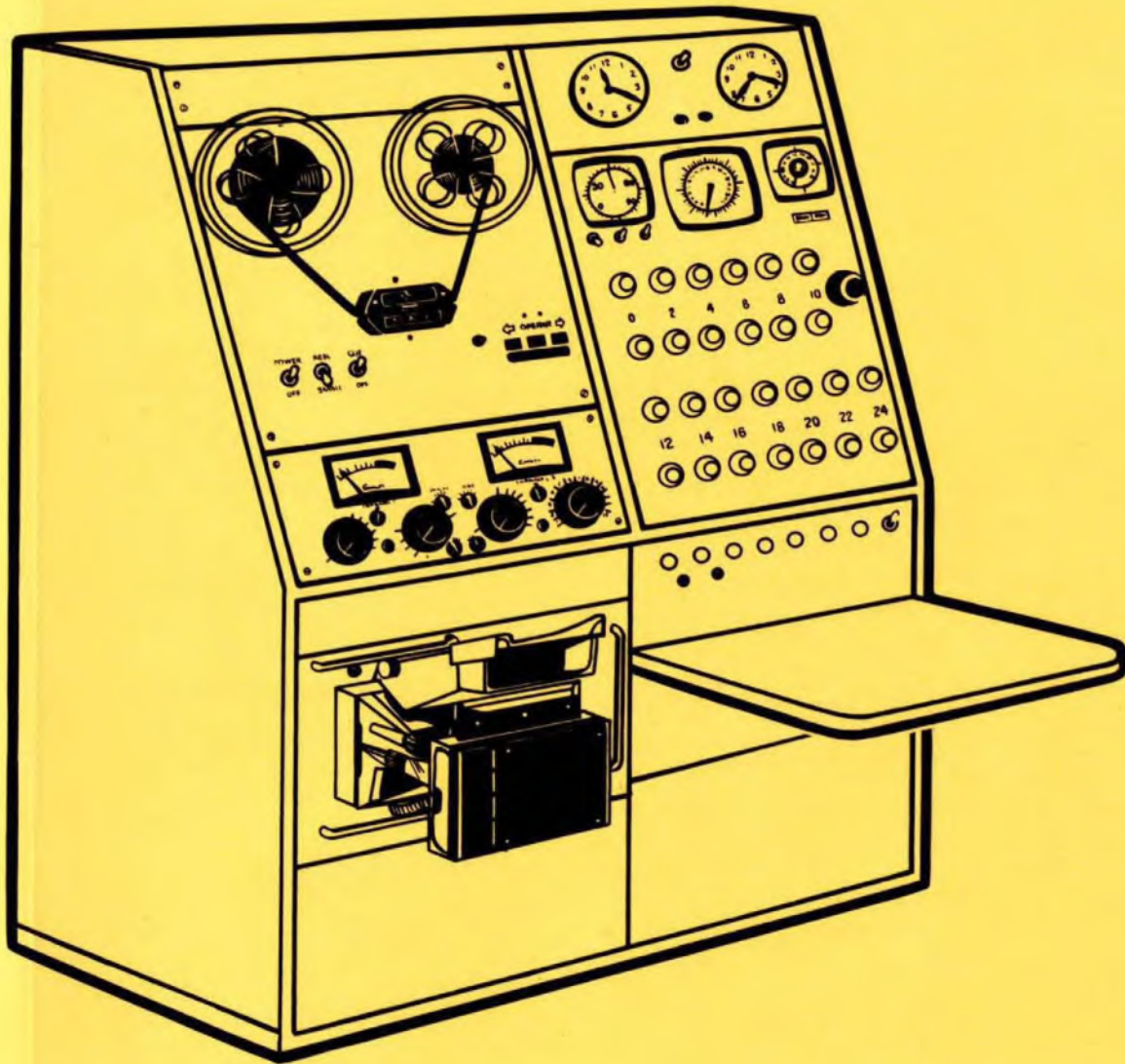
Telepath also speeds up traffic handling and translates code languages of various data handling equipments to a common communication code language. The system uses selectors, translators and line switching equipment for selecting and controlling outstations, and performing other functions.

The system will control, over a common communications network, reservation requests, flight, equipment and maintenance schedules, ground and other operational services.

Telepath on-line data control equipment is used by Air Canada, Canadian Pacific Airlines, British Overseas Airways Corporation, Pan American Airlines and International Aeradio in teletype communications and reservation networks.



*Steerable antenna of CAE's APT high altitude weather station is designed for satellite tracking to receive high altitude weather system photographs.*



*CAE weather satellite picture receiving stations are fully operational and pictures received help meteorologists make long-range weather forecasts.*



**CLM Industries**

3595 St. Clair Avenue East  
Scarborough, Ontario, Canada  
Cable Address: CALIMA TORONTO

Recent Canadian Department of Transport contracts for airport lighting have been awarded to CLM Industries, a company with 45 years experience in outdoor lighting and power control systems.

CLM Industries, with branches from coast to coast, has major contracts with Canadian hydro-electric authorities in advanced hardware for extra high voltage applications. It also supplies metal-clad switchboards for municipal utilities and industry and lighting equipment for many large projects. The Canadian Forces and many industrial and telecommunications companies are other customers.

Outside Canada the company has major contracts in Colombo Plan projects.

Complete airport lighting installations can be controlled from the control tower with CLM's type MAL 1DL-01 metal-clad regulator switchboard. This factory-assembled unit of modular control cells conforms to strict government specifications and provides a regulated constant current power supply to airport series lighting facilities such as runways, taxiways and VASIS. The system also provides selection of circuits, brightness control and power to single phase multiple circuits.

The modular construction allows flexibility in number and arrangement of the cubicle units and makes provision for future expansion. Each cubicle is a free-standing unit—they may be arranged in a single line or back to back, as space dictates.

The 20-kw drawout metal-clad constant-current regulator provides a power supply to airport lighting circuits. It features solid state control circuitry and vacuum circuit breaker protection. The drawout secondary power truck provides power to single phase multiple circuits as required, and the drawout high voltage relay assembly allows selection and switching of regulators to various field circuits.



*CLM's type MAL 1DL-01 regulator switchboard can be used to control complete airport lighting installations from one central point. Modular construction affords adaptability to various requirements.*

VASIS (Visual Approach Slope Indicator System) is a special light system designed to act as a visual guide to aircraft pilots on landing approach. It helps to maintain an established glide slope and touch-down in the established zone. CLM Industries manufactures the units to rigid government specifications.

Each unit contains four precisely focused 250-watt sealbeam lamps which project a beam through a narrow horizontal rectangular aperture. Immediately in front of the lamps is a pair of heat-resistant glass filters, one red and one white, separated from each other by a horizontal transition bar. The unit projects a beam of which the bottom half is red and the top half white.

Twelve units make up the system. They are grouped in three's to form a bar, with two bars on each side of the runway several hundred feet apart and aimed at exactly the correct glide path angle. On landing approach, if the aircraft is too low, the pilot will see all red; if too high, all white. On the proper glide path angle, the pilot will see the upwind bars red and the downwind bars white.

The units are rigidly mounted on concrete pads. The aluminum housings have four legs with coarse and fine adjustments and two spirit levels, factory set to ensure absolute accuracy of beam alignment. Each lamp is individually adjusted for focus and has its own insulating transformer so that if one lamp burns out, it will not affect the other. Louvers in the bottom of the housing ensure that melted snow or rain will drain out.



*Seen from the front, a VASIS unit showing the rectangular light beam aperture, adjustable legs, and hinged lids for easy maintenance. The four individual lamp cables run to underground insulating transformers.*



*Looking down into a VASIS unit showing the four sealbeam lamp units on their adjustable spring mountings. The long vertical filters are in front of the lamp-mounting partition and held by four spring clips.*



**Crouse-Hinds Company of Canada Limited**  
1160 Birchmount Road  
Scarborough, Ontario, Canada  
Cable Address: CROHINDS TORONTO

A major breakthrough in air terminal and parking area lighting, the Profile Light, comes from Crouse-Hinds Company of Canada Limited. This new light, with a unique rectangular beam profile, is the latest development in the company's 56-year history.

Geared for fast service on export orders through agents in 29 countries, Crouse-Hinds can draw on a substantial inventory of some 16,000 catalogue items of electrical distribution equipment and lighting for airport, industry, traffic and other applications. In addition, the company has an extensive special products division which offers custom design service, quality casting in its own foundries in gray iron, bronze or aluminum, and complete machine shop facilities.

Crouse-Hinds' Profile Light was designed with a rectangular beam because most terminal areas are rectangular. Thus, more than 85 per cent of generated light is concentrated in the designated area assisted by an asymmetrical reflector. Four types are available: 1,000W, 400W and 175/250W. All are stressed for winds up to 100 mph (161 Kph). Lenses are of heat-tempered, shatter-resistant, weatherproof glass. The 1,000W on a standard 41-foot (14-metre) pole will light an area in excess of 10,000 square feet (929 square metres) with a minimum of one candlepower. The lights may also be used to illuminate vertical surfaces with a minimum of vertical beam spill.

On complex sizeable projects, the company offers swift computer-calculated lighting layouts with a plan view of foot-candle readings for the whole surface to be lighted.



*Crouse-Hinds' revolutionary rectangular beam Profile Light gives even intensity over the entire pattern with a minimum of waste and glare.*



Unusually high efficiency, rugged construction and versatility mark Crouse-Hinds' rotating airport beacons. The type DCB-36 is a 36-inch (914.4 mm), 1,000-watt heavy duty model, approved by the United States Civil Aeronautics Administration as a standard airport beacon. The 500-watt type DCB-10, is ideal for airports with no regularly scheduled air traffic. It is easy to maintain and operating costs are minimal.

Both beacons have rugged aluminum weathertight housings designed for easy maintenance. In the DCB-10 only three bolts need be unscrewed to remove the complete optical and mechanical systems. Both provide alternate clear and green light flashes on a 6-rpm rotation cycle. In the DCB-36 the complete housing rotates, while only the optical system turns in the DCB-10. A magnetic lamp changer switches bulbs in case of operational bulb failure which is indicated to airport personnel by a pilot light.

The DCB-10 for small airports has a powerful clear beam of 130,000 candlepower with a beam spread of only 5 degrees.

Export shipping weights are 855 pounds (387.8 Kg) for the DCB-36, and 260 pounds (117.9 Kg) for the DCB-10.

Particularly designed for use as a red hazard marker beacon on major air navigation obstructions, Crouse-Hinds' FCB-12 meets all Canadian Department of Transport and United States Federal Aviation Agency and Federal Communications Commission specifications.

Flashed by Crouse-Hinds' TSS-23 flasher, this powerful beacon, 31-inches (787.4 mm) high, and 13-inches (330.2 mm) in diameter, is of aluminum watertight construction and needs no ventilation. Four Fresnel lenses give a definite beam through 360 degrees.

A transfer relay switches bulbs in case of operational failure.



*Crouse-Hinds' DCB-36 standard airport rotating beacon has 36-inch (914.4 mm) diameter lenses at each end of the heat-radiating aluminum alloy housing throwing two powerful beams from one standard beacon 1,000-watt lamp.*



*Ideal for smaller airports, Crouse-Hinds' DCB-10 beacon is rugged and easy to maintain. The 130,000-candlepower light is visible at any angle because of the Pyrex glass dome cover.*



*The FCB-12 hazard marking and airport identification beacon is a large powerful beacon for marking radio, microwave and other hazards to air navigation. Export shipping weight is 69 pounds (31.3 Kg).*

For fast installation of runway and taxiway lighting systems, Crouse-Hinds' ERL and HRL medium and high intensity marker lights are a boon to new airfields or for conversion of existing fixtures.

A single series conductor with brightness control, insulating transformers, and the Crouse-Hinds ML452 light base is recommended for new installations. Waterproof connector kits are supplied.

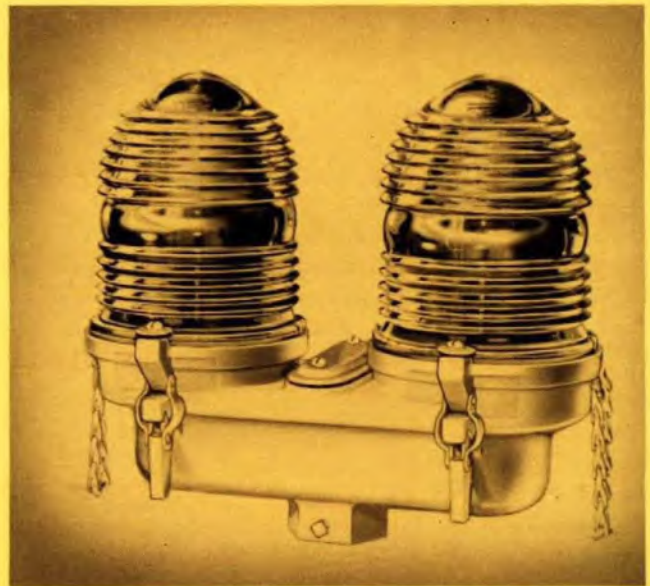
Many airports now specify the HRL high intensity lights for all runways since costs are only slightly above the medium intensity units.

A special aluminum coupling on the light column is designed to shear under horizontal loads, thus protecting aircraft from off-runway damage. The Pyrex glass globes are in standard colours with symmetric or asymmetric lenses optional.

An obstruction light with side hub fittings is now made under the EOL designation by Crouse-Hinds, especially for mounting on the sides of radio and other towers. This light, in single or double units, may be fitted with a transfer relay for bulb burn-out switching, or with an underground insulating transformer for series connection.

Crouse-Hind's type VAW marker lights, also to government specifications, are also available in single or double units, but without the side hub fitting. The VAW is usually wired with a multiple circuit, and has clear or yellow prismatic globes available for boundary lights, blue for taxi lights and red for obstructions.

The housings of both lamps are rugged cast alloy, galvanized and painted. Maximum shipping weight is 30 pounds (13.6 Kg) for the EOL, and 17½ pounds (7.9 Kg) for the type VAW.



*EOL lights mark airport and airway obstructions such as high buildings and radio and television towers.*



*Crouse-Hinds' type VAW marker lights may be fitted with yellow, blue, red or clear globes for different applications.*

Crouse-Hinds heavy duty illuminated wind cone fixture consists essentially of a standard fabric wind sock, 12 feet (4 metres) long and 36 inches (914.4 mm) diameter, a cylindrical steel framework, a main vertical pipe support, and four 200-watt lighting reflectors. A standard VAW obstruction light with red prismatic globe is included with the type "II" fixture. The type "I" is for mounting on a standard wind cone bracket on the side of a steel beacon tower.

The mast is pivoted and counterweighted to fold for easy servicing at ground level. Shipping weight (without counterweight) is 775 pounds (351.5 Kg).

Another advanced product from Crouse-Hinds, a rotating beam ceilometer provides accurate ceiling readings every six seconds 24 hours a day.

A three-piece system—projector, detector and indicator—the ceilometer works by transmitting a powerful beam of modulated light at the cloud base and detecting and measuring the light rays reflected back downwards. Because the light is modulated by a shutter mechanism it can be detected even in daylight, offering full 24-hour operation.

Remote control, with the scanning units mounted at the most desirable approach end of the runway, allows the operator to give pilots of approaching aircraft the cloud height measurements at the most critical point of approach. The large substantial cases are of cast aluminum.



*Crouse-Hinds rotating beam ceilometer projector transmits a 1,300-watt modulated light beam at the cloud base every six seconds (left).*

*This 41-inches (1,041.4 mm) square detector cabinet is 68 inches (1,727.2 mm) high with a de-icer cover that contains heater, blower and adjustable thermostat (right).*



*Wind cone fixture in position for servicing. Concrete balance weight is about 510 pounds (231.3 Kg) and measures 12 by 24 by 20 inches (304.8 by 609.6 by 508.0 mm)*



*Crouse-Hinds illuminated wind cone fixture shown in working position. Total height is about 30 feet (10 metres).*



**Esna Limited**

271 Progress Avenue

Scarborough, Ontario, Canada

Cable Address: ESNATOR TORONTO

Esna Limited is a 53-year-old electrical company specializing in airport lighting systems which are now specified equipment for military and civil installations in several countries.

This well-established company has modern facilities comprising design, engineering, manufacturing, sales and administration units. The company markets its commercial electrical products and components as well as its airport lighting equipment from coast to coast in Canada and exports to many Commonwealth countries.

Of special interest to airport authorities is Esna's patented Elastimold Airport Lighting System which consists of rubber encapsulated transformers and moulded waterproof cable sets and connector kits.

First developed as components of new underground power distribution systems for runways and taxiways of military airfields, they are now specified by the Canadian Department of Transport (Canada's civil airport authority), the Royal Canadian Air Force, and the United States Federal Aviation Agency.

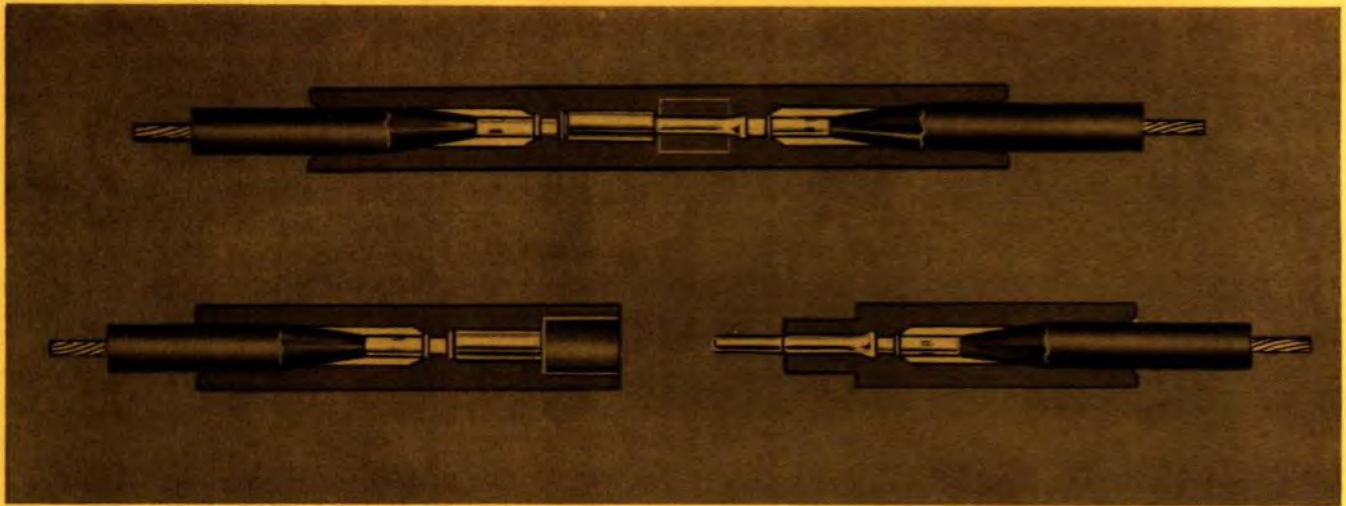
Recent installations include several major New Zealand airports, including the new international terminal at Auckland, and a major new airport in Ceylon.

Esna also produces Agastat time delay relays to control electrical power in terminal, parking lot and runway lighting; marine lighting equipment; and Stimsonite legend material, a reflective material used to mark roads and ground signs on runways and taxiways. Buchanan wire connectors for general building wiring and Buchanan terminal blocks for electrical equipment, capable of connecting from No. 22 AWG wire through 250 MCM cable are other products marketed by Esna.

Esna is interested in establishing agents in Commonwealth countries other than Australia and New Zealand (where the company is already represented) and Britain, where there is an associate company, Esna Products Limited.



*Each individual light in the Esna Elastimold system carries its own transformer to eliminate total blackout when one light fails.*



*Elastimold kits reduce installation costs and simplify maintenance.*

Esna's Elastimold Airport Lighting System provides an important safety bonus by eliminating total blackout of a runway lighting system when one light fails—as happens in the normal series system.

Installation costs are reduced by Esna's quick plug-in connections and maintenance is simplified by easy isolation of sections for trouble-shooting simply by unplugging them. Rigid testing ensures reliability in high voltage underground environments.

The Elastimold rubber encapsulation makes transformer and leads into a one-piece waterproof unit, factory tested after prolonged submergence in water at 5-15 kv.

The transformers are connected, one at each airport light, by simply attaching the plug and receptacle of the Elastimold connector kit to the two ends of the supply cable, removing the protective caps from the transformer primary leads and plugging them into the supply cable.

The installer can make the connections in minutes by following illustrated kit instructions. Each kit forms a plug and receptacle. Only one kit is required per transformer. Metal plug and receptacle fittings are crimped onto the conductors and then inserted into the moulded rubber housings. When the assemblies are pushed together the circuit is ready for immediate use. Shielded connectors are available in the 15-kv class.

The connectors and transformers are designed to work with the usual airport constant current/variable voltage system of 6.6 amps and higher and 800-5,000 volts. Using the variable

voltage technique, light intensity may be varied to suit weather conditions—very bright in bad weather and low intensity with clear skies. Normal intensity is 250 watts for approach lighting and 30-45 watts for taxiways, although other ratings are available in both 50 and 60 cycles.



**Raytheon Canada Limited**

400 Phillip Street  
Waterloo, Ontario, Canada

Raytheon Canada Limited, the foremost supplier of air traffic control systems to the Canadian government, has developed a secondary surveillance radar system to supplement its highly successful Airport and Airways Surveillance Radar (AASR).

The new system, type SSR-801, incorporates the latest solid state techniques to achieve the highest possible accuracies, reliability, and ease of maintenance. It is normally operated in association with a primary radar, such as the AASR, with its antenna mounted on top of the larger unit. It can also be operated independently with the addition of antenna pedestal, servo system and display units.

Designed to equal or exceed standards set by the Canadian Department of Transport, the United States Federal Aviation Agency and the International Civil Aviation Organization, the SSR-801 features dual channel interrogators, common decoders, monitors and remote channel change equipment. Single channel equipment, with provision for future expansion, is also available.

The ground station consists of a beacon interrogator, antenna, stray video noise rejection (defruiter), remoting equipment, decoders, and built-in test equipment. Provision is made for side lobe suppression units.

Raytheon's AASR—the first such system in the world—consists of 16 high-powered radar links which extend over 4,000 miles (6,400 Km) coast to coast across Canada.

These flight trackers are designed for continuous operation. Two transmitters and receivers per installation permit routine maintenance without interrupting operations. The trackers help safeguard aircraft in any weather and at every stage of flight, pinpointing aircraft positions at up to 200 miles (320 Km) and up to altitudes of 70,000 feet (21,233 metres).

Like the radar equipment, the associated antenna—40 feet (12.1 metres) long, 11 feet (3.3 metres) high—is designed for high reliability and continuous operation. Thermostatically controlled heaters ensure lubrication at 10 degrees below Fahrenheit ( $-24^{\circ}$  C).



*Here is the indicator panel used in Raytheon's AASR. Bright display systems which permit radar signals to be shown on a TV screen are incorporated in latest models.*

The system incorporates the latest concepts for minimizing storm and ground clutter. RF components are designed to handle up to 10 times present power levels. A new type of microwave power-amplifier tube, the Amplitron, coupled to a new 80-foot (24.3-metre) antenna with high discrimination will provide even greater power and range.

Besides the AASR chain, Raytheon Canada has designed and supplied bright display equipment for both the Canadian and United States governments.

This equipment permits radar displays to be shown on a TV screen so that it is visible in normal light without the use of a special viewing hood.

Another advantage is that once a TV video signal has been obtained—through a transistorized scan converter—it can be fed to any number of studio type TV monitors, providing a bright display in any location. This bright display shows all targets at a glance in addition to a trail representing their previous movements during a time selected by the operator. This time may be varied within the range of five seconds to two minutes. An erase button provides for instant erasure.

Identification symbols can also be superimposed and the converted radar data can be sent over TV microwave systems.

Another major Raytheon product, TACAN (Tactical Air Navigation) gives improved performance and 77 per cent lower operating costs with new solid state systems. The unit includes DME (distance measuring equipment) which can also be used with Raytheon's VOR (VHF omnidirectional radio range) equipment. All meet Canadian Department of Transport specifications.

Raytheon has also produced digital displays for SAGE, VOR systems, Omnitest sets, ATC simulators for training purposes and a variety of specialized civil and military equipment for the governments of Switzerland, Lebanon, West Germany and Italy, as well as Canada and the United States.



*The Raytheon high gain (34 db) antenna has a dual rotary RF joint to allow both primary and secondary radar operation and a choice of circular polarization of RF energy by remote switching.*



*Secondary surveillance radar is an addition to a primary system and is operated in conjunction with it. These units are operating at every major Canadian airport.*

## **TELECOMMUNICATIONS**

Canadian companies are well in the forefront in the design and manufacture of advanced telecommunications equipment. They have developed a superior expertise in a number of ways. Some advancements have come through meeting the exacting and particular needs of Canada's 85,000 miles (136,000 Km.) of airways. Others have been developed in establishing the world's longest microwave telecommunications system—part of a 600-channel, 10,000-mile (16,000 Km.) network linking Canada's widely separated areas of population.

And Canada has been, and continues to be, a major contributor to United States space programmes—thus involving the Canadian electronics industry in a continuing programme of technological research and development in microminiaturization, solid state physics and ferrites. Literally hundreds of Canadian-built components are now providing vital communications links in these programmes and in Canada's own satellite probes of the ionosphere.

A vigorous Canadian electronics industry is therefore well equipped to undertake telecommunications assignments of the most sophisticated kind anywhere in the world. International compatibility of Canadian equipment is assured through Canada's membership in the International Telecommunications Union and its active participation in the communications and electronics activities of the International Civil Aviation Organization.

A cross-section of Canadian telecommunications capabilities is shown in the companies participating in this section.

### **Canadian General Electric Company, Limited Electronic and Defence Products Department**

*Voice communications systems; video integrators; audio-visual multiplexers; transceivers.*

### **Collins Radio Company of Canada Limited**

*UHF, VHF and HF single sideband ground and airborne communications equipment.*

### **Northern Electric Company, Limited**

*Comprehensive range of telecommunications equipment; wires and cables.*

### **Philips Electronic Industries Ltd.**

*Communications control and radio beacon systems; radio beacon monitoring systems; transportable control towers.*

### **Sinclair Radio Laboratories Limited**

*UHF, VHF and glide path antennas; multicouplers; land, sea, air, missile and satellite communications equipment.*

### **Spilsbury & Tindall Ltd.**

*Single sideband radio equipment; antenna systems; radio beacon transmitters.*

### **TMC (Canada) Limited**

*Airport radio transmitters and receivers; remote control equipment; single sideband radio equipment; LF, MF and HF equipment; antenna systems; multicouplers; wide band transformers.*

### **Topping Electronics Limited**

*Solid state audio amplifiers; airport radio beacons, ILS alarm units and other solid state components on a custom basis.*





**Canadian General Electric Company, Limited**  
*Electronic and Defence Products Department*  
830 Lansdowne Avenue  
Toronto 4, Ontario, Canada  
Cable Address: GELECTRON TORONTO

Canadian General Electric Company, Limited is one of the giants of Canadian industry and a substantial contributor to Canadian and United States space and defence programmes in electronics, avionics, nucleonics and communications systems.

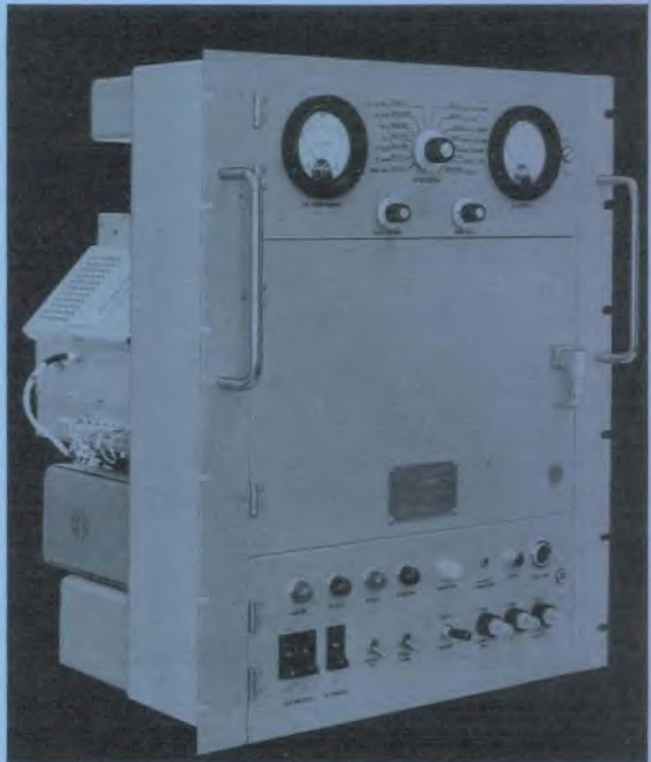
The Electronic and Defence Products Department, one of CGE's 10 operating departments, occupies five of the company's 19 plants and is widely recognized for outstanding research and development achievements.

Designed for the Canadian Department of Transport's ground-based aeronautical voice communications system, CGE's 50-watt VHF transmitter type CRC/CTC-04 is ideal in airport applications. This single channel, crystal-controlled unit operates between 118 and 152 mcs from a 102-127-volt, 60-cycle input. It draws 570 watts and may be operated remotely via 600-ohm telephone lines.

Airport surveillance radar already installed may be improved in performance by CGE's video integrator type CRC-RVE-01. This unit operates at the video stage and may be fitted to almost any existing radar set. It will stretch operational performance with an 8 db signal-noise and a 15 db interference-rejection gain. The unit operates by superimposing weak signals from the same target upon each other, via a delay line, to make a strong composite signal with significant gain over random noise or other signal levels.

For closed circuit television applications, CGE manufactures a multi-channel, modular, solid-state, audio-visual multiplexer for plug-in installation in a standard 19-inch (482.6 mm) rack. The unit is compatible with colour television systems, and sends broadcast quality audio through video processing, switching and distribution systems.

An excellent transceiver for desk top use at isolated locations is CGE's AM radiotelephone, type CRC/FRT-1006. This fixed-frequency crystal-controlled unit operates in the marine band—1600-3500 kcs. It uses four transistorized modules and has an output of 20 watts RF carrier power. Three modes of operation apply: receiver; receiver and press-to-talk; and transmitter only. Power requirements are 10-14 vdc, nine amps.



*Designed by Canadian General Electric Company, Limited for the Canadian Department of Transport, this 50-watt VHF transmitter is ideal for ground-based aeronautical voice communications systems.*



**Collins Radio Company of Canada Ltd.**  
150 Bartley Drive  
Toronto 6, Ontario, Canada  
Cable Address: COLINRAD TORONTO



Collins Radio Company of Canada Ltd., has developed specialized facilities for research, development, production and support—particularly in the design and manufacture of UHF, VHF and HF single sideband (SSB) ground and airborne communications equipment.

Collins Canada was incorporated in 1953, expanded rapidly into new manufacturing premises in 1955 and quickly became a major supplier of airborne communications equipment to the Canadian armed forces and NATO allies. In the commercial field, Collins Canada produces HF single sideband equipment for use in airborne, marine, mobile and fixed base installations throughout the world.

To keep pace with growing demand the company moved again in 1963 into a fully integrated manufacturing plant at Toronto, Ontario, covering 104,000 square feet (about 36,000 square metres).

Progressive management and extensive investment in long-range research are two reasons for the company's success. Through specialized development of facilities, Collins Canada can give the same kind of individual attention to high-volume production that it devotes to short-run production.

*This Collins VHF receiver (51M-8G) features a double conversion super-heterodyne circuit, an advanced design automatic noise limiter and improved carrier-operated squelch circuit.*

Strict adherence to quality control is a tradition at Collins Canada and the Canadian Department of Defence Production has approved its quality control performance on a plant-wide basis.

Typical of Collins Canada products is a 400-watt, 28,000-channel single sideband HF transceiver (the 618T). It has found world-wide acceptance as a highly reliable communications system and is now used by 25 international air carriers. In addition, units have been produced in volume for the United States and Canadian governments.

In VHF ground equipment, Collins Canada has produced the 51M-8G receiver for the Canadian Department of Transport for its extensive cross-Canada airport network.

Looking to the future, Collins Canada has developed a complete microelectronics capability. Current programmes include the development of manpack and handheld UHF transceivers which permit immediate selection of any one of 3,500 channels in the 225-400 MHz band.

Collins 618T HF single sideband transceiver—for long-range voice, CW, data or compatible AM communication in the 2.0-29.999 mc frequency range is in world-wide use in airborne, mobile and semifixed station applications.

The operating frequency is indicated directly in a digital-type presentation. Nominal transmitting power is 400 watts PEP in SSB, or 100 watts in compatible AM.

The 618T gives RF spectrum conservation with immunity to multipath distortion and a much greater signal-to-noise ratio than conventional AM. With SSB, all power amplifier and power supply capacities are used to amplify the intelligence of the transmitted signal, resulting in more usable power for transmission.

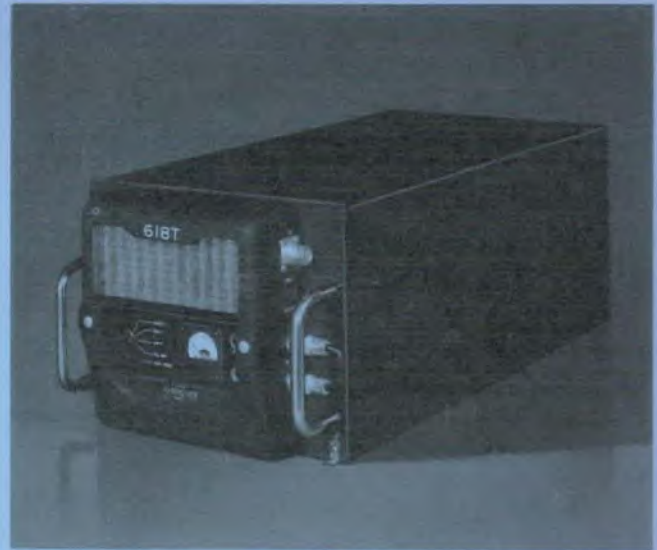
Phase-locking circuits ensure accurate frequency control in both transmission and reception for the proper operation of the suppressed carrier SSB system. The carrier wave suppressed at transmission point is accurately re-injected by a local oscillator at the receiver.

A wide range of accessories makes this Collins transceiver highly efficient in many roles.

Collins 51M-8G VHF single channel AM communication receiver for continuous duty at aeronautical ground stations will operate on any fixed frequency in the 108-152 mc range. A dual voltage transformer permits the equipment to be operated from either 115 v or 230 v, 50-60 cycle power sources.

An almost rectangular selectivity curve allows reception of stations with normal frequency tolerances while giving more than 70 db rejection to signals on adjacent 50 kc channels. The series diode-type limiter, with noise detector and balancing circuits, gives excellent suppression of impulse noises.

When no signals are being received, a carrier-operated reply-type squelch circuit silences the receiver. The ratio of signal levels needed to open and close the squelch system is less than 1.5:1. This permits the squelch to be set to open on very weak signals and still close at the end of transmission.



*The Collins 618T is a compact HF SSB transceiver which can be automatically tuned in 28,000 1-kc channel increments by a remote control unit.*



**Northern Electric Company, Limited**  
1600 Dorchester Boulevard West  
Montreal, Quebec, Canada  
Cable Address: NORELCAN MONTREAL

The Northern Electric Company, Limited is the largest and most diversified manufacturer of telecommunication products in Canada. In addition to being the major supplier to the Bell Telephone Company of Canada, the Northern Electric Company is also the prime source of supply for most other Canadian telephone companies and public utilities. First-class engineering design, development and product reliability has made Northern Electric internationally recognized as one of the world leaders in its field.

Northern Electric owns and operates one of the most advanced telecommunications research and development laboratories in Canada and is one of Canada's largest employers of scientific staff. The recent addition of an Advanced Devices Centre further enhances the company's ability to employ the most highly developed techniques in internationally accepted products. Northern Electric's contribution to the communication facilities of major airports in Canada, from Montreal to Vancouver, is well known because of the high degree of performance consistently provided over many years. The company is a member of the CCITT and CCIR and, through the Canadian Standards Association, participates actively in the work of the International Electrotechnical Commission (I.E.C.) and the International Standardization Organization (I.S.O.).

Total facilities for manufacturing, as well as for distribution and administration, are continually expanding. At present, Northern Electric occupies floor space of several millions of square feet. The company employs many thousands, including a large number of engineers and skilled technicians who are continually engaged in the refinement of design and application of complete systems: their ingenuity and inventive skills are now being successfully applied to the communications problems of many countries in all parts of the world.

Today, after more than 50 years' leadership, Northern Electric is identified with the highest quality in telecommunications equipment.



*Lachine Works — Wire and Cable Lachine, Quebec*

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For further information please write to:  
The International Sales Manager,  
Northern Electric Company, Limited  
1600 Dorchester Boulevard West  
Montreal, Quebec, Canada

## TELECOMMUNICATIONS EQUIPMENT

### AMPLIFIERS

Baseband  
Bridging  
Carrier Frequency  
Clamper  
Microwave  
Parametric  
Voice

### BLOCKS

Connecting  
Fuse  
Protector  
Terminal

### CARRIER EQUIPMENT

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Open Wire  
Radio Frequency  
Trunk  
Voice Frequency Telegraph

### COIN COLLECTORS (PAYSTATIONS)

Prepay  
Postpay  
Semi-Postpay

### COMMUNICATION SYSTEMS

Carrier for Long and Short Haul  
Crossbar Telephone Exchanges  
Data Transmission  
Dial Telephone Exchanges  
Emergency Reporting  
Microwave Radio Relay for Long and Short Haul  
Radio Telephone  
Tropospheric Scatter

### CONNECTORS

Coaxial Cable  
Waveguide

### CONNECTOR CABLES

### DIALS

Push Button  
Rotary

### DISTRIBUTING FRAMES

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Intermediate (I.D.F.)  
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Home  
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### KEY TELEPHONE SYSTEMS

### POWER PLANTS

Various Ranges for Telephone, Carrier, Microwave, Scatter and Key Telephone Systems

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### PRIVATE AUTOMATIC EXCHANGES (P.A.X.)

### PRIVATE BRANCH EXCHANGES (P.B.X.)

### PROTECTORS

Line  
Station

### RECEIVERS

### RELAYS

General Purposes (All Types)  
Mercury Contact  
Miniature  
Polarized  
Signal  
Thermal  
Wire Spring

### REPEATERS

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Single Line  
Telegraph  
Telephone  
Voice Frequency

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Rotary  
Step-by-Step

### TELEPHONE BOOTHS

### TELEPHONE EXCHANGES (AUTOMATIC)

Branch Automatic (Attended)  
Private Automatic (Non-Attended)  
Small and Large Crossbar Central Offices  
Small and Large Dial Central Offices

### TELEPHONE EXCHANGES (SWITCHBOARDS)

Common Battery  
Cord, Multiple  
Cord, Non-Multiple (Magneto, Common Battery)  
Cord, Universal

### TELEPHONE SETS

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Dial and Pushbutton  
For Noisy Locations  
Hard of Hearing  
Local Battery Talking  
Magneto  
Manual Common Battery  
Mine  
Police  
Portable  
Bedroom Extensions  
Taxi

### TERMINALS

Building Cable  
Cable  
Combined Telephone and Power  
Pedestal  
Telephone Pedestal  
Wire

LEADER IN RESEARCH AND DEVELOPMENT



*Research and Development Laboratories  
Ottawa, Ontario*



*Advanced Devices Centre  
Ottawa, Ontario*



*Montreal Works — Transmission  
Montreal, Quebec*



*Toronto Works — Switching  
Toronto, Ontario*



*London Works — Apparatus  
London, Ontario*



*Belleville Works — Apparatus  
Belleville, Ontario*



**Philips Electronics Industries Ltd.**  
*Telecommunications Department*  
116 Vanderhoof Avenue  
Toronto 17, Ontario, Canada

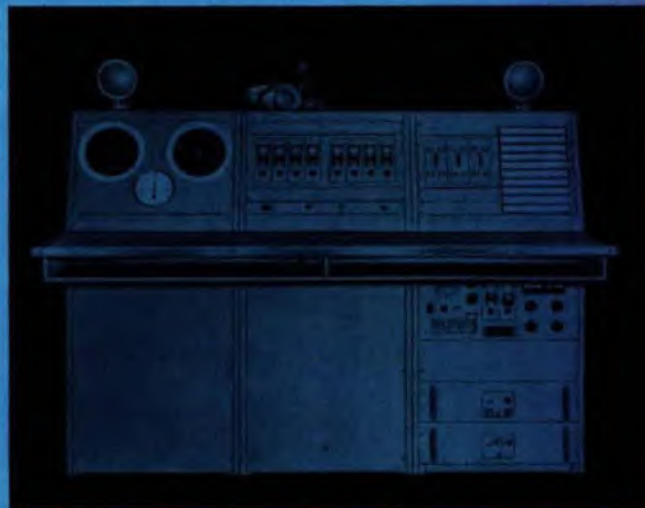
Philips Electronics Industries Ltd. offers a complete line of communications control and radio beacon systems for use in air traffic control, aeradio, and marine communication facilities. The company has supplied a wide range of these systems to a number of industrial and government clients, including the Canadian Department of Transport, Canada's air authority. The company has free access to one of the world's largest electronics patent pools and research establishments.

At Philips' modern plant, research and development facilities permit investigation of the most advanced concepts in the state of the art. Plant wiring and assembly lines are designed for flexibility in size and urgency of contracts.

Philips communication control systems control transmit/receive equipment in airports or marine stations. A typical system may control 20 channels from eight operator positions. Communication channels can be shared by operators according to airport traffic conditions; the first operator to engage a channel retains control of it until it is de-activated. A hot line facility for communication between operating personnel is provided.

Control consoles containing a minimum of active switching apparatus, amplifiers and other devices are centralized in a remote equipment location. Basic systems can be combined to increase traffic handling capacity as required.

Because of their vital function, communications control systems demand a minimum of down time. Philips achieves this by the use of high quality materials and workmanship and a flexible patching facility through which all signals are routed and can be re-routed or disabled as necessary. In this way, operating console frequency assignment can be changed, spare channels assigned and circuits disabled for repair within seconds. A comprehensive master test set simplifies maintenance procedures.



*This Philips control tower console is fitted with a meteorological equipment panel that shows wind velocity and barometric pressure.*



The Philips radio beacon is a non-directional, dual low-frequency transmitter designed as a land-based navigational aid for use at remote unattended stations.

The beacon is available in 50 and 1,000-watt versions, type numbers 8RB550 and 8RB551 respectively. Because of its conservative design and extensive use of military-approved components it provides high reliability and long operational life over a wide range of environmental conditions with little maintenance.

The beacon satisfies International Civil Aviation Organization recommendations. It operates in the 200 to 415 KHz range as a non-directional beacon, with tone frequency modulation or with voice modulation, and can be remotely controlled in any mode.

In accordance with ICAO recommendations the radio beacon incorporates a dual transmitter. A transmitter transfer unit is used to change over from the main to the standby transmitter if low carrier voltage, drop in modulation level, keyer failure or continuous modulation occurs.

An external alarm can be provided to indicate change-over and single transmitter beacons can be provided.



*Philips dual radio beacon comprises a main and standby transmitter. Automatic change-over to the standby unit occurs if the main transmitter's performance fails. A remote control unit permits voice modulation with a press-to-talk switched microphone, and other functions.*



*The Philips radio beacon monitoring receiver monitors beacon transmitter output and signals faulty performance.*

The Philips radio beacon monitoring receiver is a transistorized, pre-tuned, crystal-controlled receiver, with alarm facilities, operating in the 200 to 415 KHZ range.

Its purpose is to monitor the carrier output and keyed, tone-modulated signals from non-directional radio beacons in accordance with requirements established by the International Civil Aviation Organization Annex 10. Keyed tone-modulation of the beacon signal can be monitored aurally.

Malfunctions of the radio beacon or the monitor receiver itself are indicated visually, and alarm relay contacts are provided for remote indication purposes.

The monitor receiver will detect the following conditions: reduction of radiated beacon carrier power by more than 3 db; transmission failure of beacon identification signal; and failure of the beacon monitor receiver itself.

Transportable control towers and compact, economical, self-contained units are also produced by Philips Electronics Industries Ltd. The towers are designed to function as permanent traffic control centres at secondary airfields or in under-developed areas; temporary traffic control centre at airfields which will later be equipped with permanent installations; temporary traffic control centres at small airfields whenever emergencies result in heavy traffic; or support for the rapid deployment of military forces in small airfields or airstrips.

The towers are equipped with their own power supplies, standard meteorological equipment and advanced electronic devices. Air conditioning and heating are provided to ensure the comfort of tower operators in any climate from the tropics to the Arctic.

Through the use of light alloys and lightweight equipment the total weight of the tower is limited to approximately 5,500 pounds (2,494 kg) which allows the tower to be airlifted by a medium-sized helicopter.

It can be dismantled, loaded into a light aircraft, and re-assembled in a few hours. It is designed to require little or no maintenance.

Electrical power supply is provided by an alternator/generator rated at 15 kw, 115/230 volts ac, 50/60 cps, driven by a four-cycle engine. This powers a variety of basic equipment including traffic surveillance radar with a range of 20 miles (32 Km); VHF direction finder with three-channel selection in the 118-136 mc range; HF transceiver with four-channel selection producing 100 watts SSB in the 3-16 mc range; a 50-watt VHF 2-channel transmitter/receiver for the 118-152 mc range, and a radio remote control system with ATC logging recorder.

Complete meteorological equipment plus standard miscellaneous equipment used to sustain operational traffic control and facilitate field maintenance of units is also included.

Miscellaneous equipment includes dynamic microphone, headphone, CW key, daylight signal lamp, magnetic compass, 24-hour dial clock, flare pistol, flashing warning beacon light, fire extinguisher and two operators' chairs.

Optional equipment includes radar position plotter, UHF transceiver, LF radio beacon with A2 and A3 mission modes (automatic mcw), VHF simultaneous multichannel operation, portable chemical toilet and elevated tower and platform structure.



*This control tower can be transported easily for permanent, temporary or emergency use where required. It is equipped with sophisticated electronic equipment for full air traffic control.*



**Sinclair Radio Laboratories Limited**

21 Toro Road

Downsview, Ontario, Canada

Cable Address: SINCLABS TORONTO

New standards of accuracy and refinement in airport glidepath antennas have been set with the Model 50111 antenna from Sinclair Radio Laboratories Limited. This is the latest in a range of highly sophisticated UHF and VHF antennas from this key supplier of land, sea, air, missile and satellite communications equipment to the United States and Canadian governments.

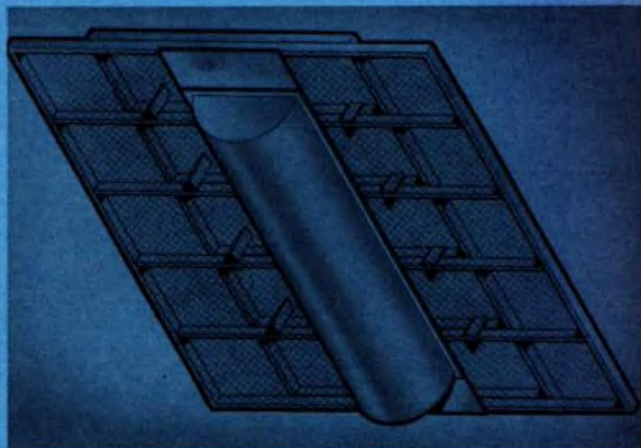
Starting as specialist consultants, the company went into manufacturing in 1951. Sinclair's team of mathematicians, scientists and engineers has worked on many top level research and development projects such as advanced antenna designs for jet fighters and Canada's Alouette satellites. The company is also a highly experienced manufacturer of multiplexers, and its success in the antenna and multicoupler fields has led to a subsidiary company being incorporated to manufacture these items in the United States. Airtech Limited of Haddenham, England, manufactures Sinclair products under license for the British and continental European markets.

Sinclair's new glidepath antenna Model 50111 features a very narrow main beam width of 32-36 degrees which reduces reflections from obstacles close to the runway. It has very high side lobe and back lobe suppression (30 db down).

The antenna is an array of three dipole elements stacked approximately one quarter wavelength in front of a metallic screen. A radome covers the dipole elements for protection from rain and snow. The screen reflector is purposely made large to produce very low back radiation, and a tapered power distribution across the feeds serves to limit the side lobes and produce the narrow main beam.

The frequency range of the antenna is 329-335 mcs and maximum input power 50 watts. The input connector is a standard type N receptacle. The 8 by 8 foot (2.4 by 2.4 metres) reflector is aluminum with a polypropylene radome. The assembly is finished in international orange paint and weighs 150 pounds (68.02 Kg).

A typical glidepath system utilizes two model 50111 antennas mounted on a single tower one above the other. To produce a 2.5 degree glide angle the lower unit is mounted 17 feet (5.1 metres) above ground and the upper unit 34 feet (10.4 metres) above ground.



*The Sinclair Model 50111 glidepath antenna has a projected area of 64 square feet (6.945 M<sup>2</sup>). Horizontal thrust, with 110 mph (176 Km/h) winds, is 3,300 pounds (1,496.8 Kg).*

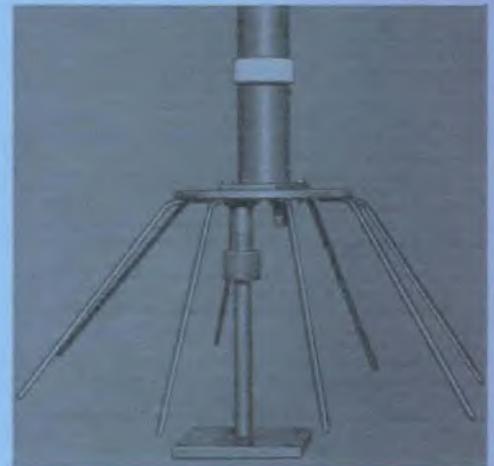
Sinclair was first to offer UHF and VHF antennas designed specifically for the severe Canadian climate, and of especially rugged construction. The company remains the major supplier of such antennas in Canada.

The Model 216-A is a groundplane-type antenna suited for broadband use. It is an extremely rugged unit employing a radome covered vertical radiator coupled to four angled ground rods. The entire antenna assembly is of aluminum in both cast and extruded forms. The frequency range is 108-174 mcs with an omnidirectional pattern in the H plane and in the E plane a half-power beam width of 95 degrees. The input impedance is 50 ohms with a rated input power of 350-watts cw. The antenna has a clear anodized finish and its horizontal thrust, with 150 mph (240 Km/h) winds is 125 pounds (57 Kg.)

Another Sinclair groundplane-type antenna, designed for 225-400 mcs band and with an input of 300 watts, is the model 218, a rugged broadband UHF antenna. At 5 pounds (2.2 Kg) and 20 inches (508 mm) high it is one quarter the weight and half the height of the 216-A. The horizontal thrust of the 218 in 85-mph (136 Km/h) winds is only 19 pounds (8.6 Kg).

The model 219 is a broadband UHF dipole of sturdy aluminum construction designed to operate in the 225-400 mcs range with a power input of 300 watts. Polarization can be either horizontal or vertical. E and H plane patterns are the same as in the 216-A and 218. The 219 weighs only 5 pounds (2.2 Kg) and has a horizontal thrust of only 12 pounds (5.4 Kg) in an 85-mph (136 Km/h) wind. Finish on the 218 and 219 models is anodize and paint.

Sinclair also makes a variety of antennas in yagi, corner reflector, parabolic, cardioid and unity gain coaxial types for ground use, as well as aircraft models in the 135-10,000 mcs range. All ground models comply with Canadian Standards Association class B conditions—85-mph (136 Km/h) wind, half-inch (12.7 mm) radial ice.



*Shown from top to bottom are Sinclair Radio Laboratories Limited types 216-A, 218 and 219 antennas. All Sinclair antennas have a nominal 50-ohm impedance with a VSWR of less than 2-to-1 throughout the operating band. Most antennas may be vertically or horizontally polarized and the type N receptacle is standard on all models. Mounting brackets and kits are readily available.*

Sinclair multicouplers offer an important advantage in allowing a reduction in the number of antennas. There is therefore a significant saving in initial cost, lower maintenance, and a significant improvement in performance due to the excellent filter action removing unnecessary transmitter noise.

They allow simultaneous operation of as many as 24 transmitters or receivers, or any combination of these, on one antenna. The only requirement is that each piece of equipment be separated from the other by discrete frequency differences.

The Sinclair C series multicouplers are in commercial use at airports, telephone exchanges, taxi and law enforcement base stations all over the world in every conceivable environment.

The C-157 multicoupler channel is a two-cavity unit. This type is recommended where one band-pass and one band-reject section is adequate. Basic characteristics are: insertion loss, factory adjusted, 0.7 db to 3.2 db at 1 mc to 42 db at 5 mc from  $f_0$ . Operation frequency is 148-174 mc.

Additional filtering is provided by the C-257 three-cavity channel. The two band-pass, one-band reject configuration may be used as a companion unit with any number of C-157 or C-357 sections. Basic characteristics are: insertion loss, factory adjusted 1.2 db to 3.2 db for attenuation of 32 db at 1 mc to 79 db at 5 mc from  $f_0$ . Operating frequency is 148-174 mc.

Using four cavities, the Sinclair model C-357 provides a degree of isolation at close frequency separation. Three band-pass sections and one-band reject section offer outstanding performance.



*Models differ in degree of frequency isolation. In all three, the resonant frequency of the filter is passed with little attenuation between the equipment and antenna terminals but cannot pass from the antenna terminals to the feed-through terminal. Mounting is horizontal or vertical. Units are 32 inches high (812.8 mm), 7 inches (177.8 mm) diameter, and weigh 10 pounds (4.5 Kg).*



**Spilsbury & Tindall Ltd.**

120 East Cordova Street  
Vancouver 4, British Columbia, Canada  
Cable Address: SPILTIN VANCOUVER

Spilsbury & Tindall Ltd. specializes in the design and development of radio communications equipment especially suited for areas where permanent equipment has not yet been installed and trained personnel are lacking. The rugged field-proven S & T sets are lightweight, easy to install and operate, and require negligible maintenance. They are being used extensively throughout Canada and also in South America, Africa and Asia. (S & T equipment provided the communications for the Himalaya and Arctic expeditions.)

Some of the prime users of Spilsbury & Tindall equipment are: mining and oil companies, exploration parties, forestry, airlines, and air charter services.

Outstanding examples of the company's achievements in its 25 years' experience are the SB-60 transceiver and the LW-500 radio beacon transmitter, both of which will provide instant radio capability at new airports for air-to-air, base section and mobile use.

A compact 60-watt unit, the SB-60 is available in two models: a four-simplex channel, and an eight-channel crossband type SB-60H. Choice of AM or SSB operation is by panel switch. A meter and selector switch give performance information.

Separate power supplies permit operation on 12, 24, 32 or 117 volts dc, or 117 volts ac. As a base station it may be operated on 117 or 235 volts, at 50 or 60 cycles.

Both the SB-60 and SB-60H may be used to advantage with S & T's newly developed RAY-D-8 tuned antenna system which increases effective signal strength up to 10 times over conventional installations.

The company's LW-500 radio beacon transmitter, designed for reliability with low cost, operates from standard supply voltage. Output is 50 watts on a crystal-controlled frequency in the 200-400 kcs band. The type A2 (MCW) emission has 100 per cent modulation at 1,000 cps, and automatic keying of two-letter identification eight times a minute. When supplied with antenna



*For base, field and airborne operation, the SB-60 weighs only 8 pounds 5 ounces (3.7 Kg), and is simple to operate. It measures only 5 by 9 by 11 inches (127 by 228.6 by 279.4 mm).*

coil A2500, the unit will operate on an antenna of 250-uuf capacity on any frequency in the beacon band.

Spilsbury & Tindall's highly skilled research and development department has a new development slated for early production: an extremely light, single channel, low power transceiver, with ground rod and whip antenna made as a "talking walking-stick", for short range walk-around use. It has been made virtually indestructible by encapsulating the circuits in an epoxy sandwich.



**TMC (Canada) Limited**

R.R. No. 5

Ottawa, Ontario, Canada

Cable Address: TEPEI OTTAWA

Communications equipment designed and manufactured by TMC (Canada) Limited, is now used in more than 50 countries and has been a vital factor in the Mercury and Gemini space flights. The company's airport (ground-air) radio transmitters, receivers and remote control equipment will also be used in re-entry communications for the forthcoming Apollo moon shot.

TMC designs, develops, manufactures and installs precision LF, MF and HF communications equipment and antenna systems and specializes in single sideband (SSB) communications, synthesized transmitting and receiving equipment, multicouplers and wide band transformers.

The company's TechniMatiC remote tuning system can control transmitters and receivers from an operator's console miles away. The unit will select automatically any one of 280,000 channels on TMC transmitters.

This equipment is widely used in government, military, and commercial communications systems in North and South America, Africa, Asia, the Caribbean and Europe.

The TMC model TSTE-10K TechniMatiC tuned transmitter used in the Apollo project is an adaptation of the TMC general purpose 10-kw transmitters. The unit can be tuned remotely, from input to antenna, in seconds, from 2 to 30 mcs in 100-cycle steps. It operates on SSB, ISB, CW, AME, FSK and FAX with appropriate converter. Tuning is by in-station dc control from a remote central console by means of teletypewriter or by front panel push buttons. Frequency is read directly by illuminated numerical display.

The primary power input to the solid state power unit can be tapped over a range of 195/380-v to 225/480-v. Long-term warranty silicon diode rectifiers are used and the equipment is designed to operate in temperatures between 32-122° F (0°-50°C) and up to 95 per cent humidity. Cooling is by filtered forced air. Overload and bias protection with alarm is built in, and safety interlocks are provided in all high voltage circuits.



*Model TSTE-10K, 2-30 mcs, 10-kw PEP, TechniMatiC tuned transmitter used in the Apollo project is one of the TMC line of 10 kw general purpose transmitters with complete remote control. Shipping weight is 4,911 pounds (2,227.4 Kg).*



The TMC control assembly for remotely tuned DDR-5 synthesized MF/HF receiving systems is normally installed in an operator's console along with transmitter control units and ancillary equipment. Complete tuning of DDR-5 group receivers can be carried out by this unit in 100-cycle steps from 2 to 32 mcs.

The console permits an operator to tune both transmitters and receivers remotely to frequencies and various modes of operation on an automatic and pre-programmed basis by means of pre-cut tapes, cards or memory systems of manual selection. It also provides a readback of information to the operator, showing him that the selected tuning functions have been performed.

The system is unique in that manual override is provided at the remote site. However, any change in the positioning of the controls at the remote site would automatically be indicated on the remote controller's console. Tuning functions of transmitters and receivers, including the selection of frequency, audio, RF level and sideband, are controlled at this console. Readback indication of tuning is presented on an illuminated 1-inch (25.4 mm) digital display at the console, as are other tuning indications.

An example of the TMC line of TechniMatic tuned receivers is the DDR-5BR. It can work in AM, SSB, ISB, FSK, FAX, CW and MCW modes. Incorporated within the receiver is a memory system that accepts 7.42 or 7.0 baudot teletypewriter code from the remote console, stores the information and provides it to the receiver's tuning mechanism on command. Receiver mode and frequency changes can be made in this way in as little as one second, depending on receiver setting.

Power requirements for the receivers are 115/220 volts at 48 to 62 cps, single phase. Maximum power draw at 115 volts is approximately 1,000 watts.



*Eight remote control assemblies are shown mounted in one cabinet. Normally they would be installed in an operator's console. This particular assembly is set up for the remotely tuned DDR-506 synthesized MF/HF receiving system used in the Apollo re-entry communications network.*



**Topping Electronics Limited**  
94 Laird Drive  
Toronto 17, Ontario, Canada

Airport control tower audio networks can benefit from the new lightweight solid state audio amplifier from Topping Electronics Limited. This rugged transistorized unit is one of a large selection of equipment manufactured for airports, communications companies, Commonwealth airport authorities and the defence departments of Canada and the United States.

Topping offers a comprehensive range of electronics manufacturing and engineering services, and will produce sophisticated state-of-the-art components, or complete units, on a custom basis to client designs. The company will also undertake complete design, development and the manufacture of equipment to meet specialized communications problems and demands.

A typical Topping product is its E29 audio amplifier. This is a rack-mounting group chassis with a power supply and from one to six amplifiers designed for the 250-3,500 HZ range. It delivers a power output of 1.5 watts per amplifier into a 600-ohm load. Tailored frequency response gives high attenuation outside the designated band. Plug-in modules offer easy servicing.

Each transistorized amplifier has two input channels: 600-ohms low impedance, and 10,000-ohms high impedance. Bridging input may be used if necessary. The amplifier, as general purpose equipment, is ideal for airport control tower audio networks or for any microphone, booster, or programme amplifier requirement.

A transistorized low-frequency airport radio beacon by Topping, the E31, is ideal for unattended locations and operates from 120-volt systems or batteries. Output is 20 watts, crystal controlled and it operates in the 200-415 KHz frequency range.

A dual channel amplifier by Topping, the E16, is designed for use with single frequency radio receivers as a two-channel amplifier-speaker unit for voice reception. Each channel has its own controls and earphone jack.

Topping's model E15 alarm units bring increased airport safety by indicating malfunction in instrument landing systems. Two units, master and auxiliary, are mounted in the radio range office and the air traffic control tower.



*An outstanding feature of Topping's E29 amplifier is the total weight of only 60 pounds (27.2 Kg.). The chassis weighs 12 pounds (5.4 Kg) and the six amplifier modules 6 pounds (2.7 Kg) each. The assembly mounts in standard 19-inch (482.6 mm) rack and works from 117 volts ac.*

## **ANCILLARY EQUIPMENT**

*Whatever the ancillary equipment required for efficient airport operations, Canada can supply it—from cable to controls to the most sophisticated electronic devices.*

*Products from Canadian companies in this field are in use in all of Canada's 312 airports, in airports in the United States and elsewhere.*

*A wide variety of this highly reliable ancillary equipment is used by Canada's Department of Transport and meets its exacting requirements as well as those of the International Civil Aviation Organization.*

*The companies participating in this section are representative of the many Canadian companies able to meet needs for ancillary equipment anywhere in the world.*

### **Aviation Electric Limited**

*Vehicle navigation set.*

### **Canada Wire and Cable Company Limited**

*Full range of wires and cables.*

### **Canadair Limited**

*Transportable control towers; air traffic control cabs.*

### **Canadian Controllers Limited**

*Motor control centres; general building and electrical services.*

### **Ferranti-Packard Electric Limited**

*Flight information boards.*

### **Marsland Engineering Limited**

*Runway visual range computers; transmitters; servo amplifiers and mechanisms; sonar and airborne recorders; nuclear instrumentation; solid state devices.*

### **Millard Electric Limited**

*Runway approach lighting towers.*

### **Pyrotenax of Canada Limited**

*Power and heating cables.*

### **RCA Victor Company, Ltd.**

*Information display systems.*

### **Sicard Inc.**

*Runway snow blowers and sweepers; high speed snow ploughs; crash rescue firefighting tenders; aircraft towing tractors.*



**Aviation Electric Limited**

P.O. Box 2140, St. Laurent  
200 Laurentien Boulevard  
Montreal, Quebec, Canada  
Cable Address: AVIATION MONTREAL

Established 35 years ago, Aviation Electric Limited has taken part in all major Canadian aircraft programmes and several important development projects financed by the Canadian government. The company has a well-established reputation in product design, manufacturing, sales, repair and overhaul.

Aviation Electric has prospered steadily and since 1955 has been an affiliate of the Bendix Corporation. The AEL main plant in Montreal covers 220,000 square feet (21,200 square metres) and has more than 1,000 employees.

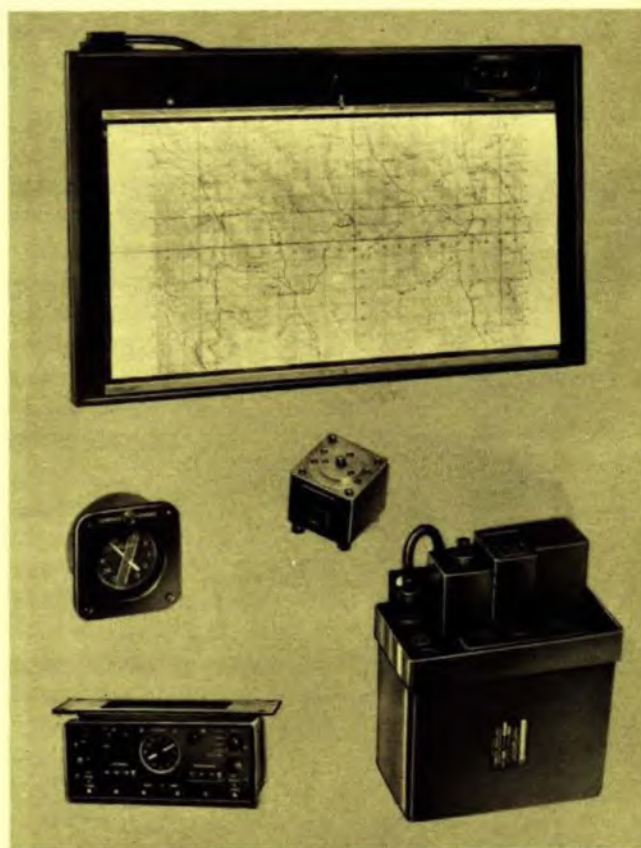
The company designs and produces to military specifications. One of its most important products, the AEL Vehicle Navigation Set—which has important airport applications—was designed for the Canadian Army. These sets are now finding buyers in other NATO countries—a substantial quantity has been sold to the British Army.

In airport use, the AEL Vehicle Navigation Set greatly simplifies emergency movement of airport vehicles under conditions of zero-zero visibility. Britain's London Airport, often subject to extreme fog conditions, has an AEL set installed on a fire truck to overcome such difficulties.

This completely self-contained system consists basically of a vehicle position plotter, position and heading indicator and computer. Heading is obtained either from a true north-seeking gyro compass or from a low-drift directional gyro, with power supplied by a static inverter. Distance is obtained from the odometer drive of the vehicle.

The position plotter gives a continuous pictorial presentation of heading and position on an area map, making it possible—with a radio link between airport radar surveillance operator and vehicle driver—to drive blind along runways, taxiways and cleared areas. Aircraft can be towed to and from runways or maintenance areas.

The AEL Navigation Set is only one of the many valuable contributions this company has made—and continues to make—to the aviation industry, especially in control and communications systems.



*Units of the AEL Vehicle Navigation Set shown here are: (top) the vehicle position plotter; (middle left) the driver's heading reference; (middle right) the electrical distance transmitter; (bottom left) the heading and position indicator; (bottom right) the computer fitted with electrical distance receiver.*



**Canada Wire and Cable Company Limited**  
 Postal Station "R"  
 Toronto 17, Ontario, Canada  
 Cable Address: CANWIRCO TORONTO

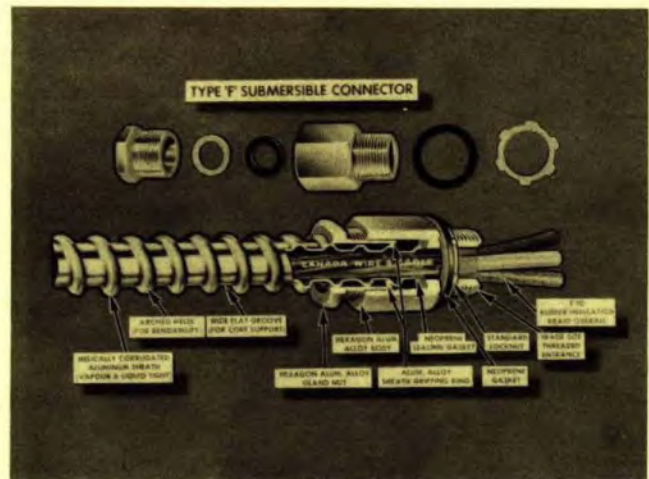
Canada Wire and Cable Company Limited manufactures a full range of wires and cables for airport applications, from major electric power supply cables through runway and building lighting, to fine electronics wires.

Since 1911, when the company delivered its first order of weatherproofed electrical wire, Canada Wire has become Canada's largest exclusive manufacturer of electrical wires and cables. The company has nine plants across Canada and is a partner in manufacturing companies in Mexico, Venezuela, Colombia, Santo Domingo and New Zealand. Sales outlets are also maintained in the Caribbean, Central America, South America, Africa, Asia, New Zealand and Australia.

The company shares research facilities with one of Canada's largest copper producers, Noranda Mines Limited of Quebec. Its Magnet Wire Division is one of the most completely automated magnet wire operations in the industry. It also employs a vertical continuous vulcanizer to produce large rubber insulated cables with cores up to 2½ inches (63.5 mm) in diameter, and has a new and extensively automated rubber mill which compounds and processes rubber from the crude state to a finished product.

New plastic extruders are used with heads up to eight inches (203.2 mm) for extruding cable jackets in excess of four inches (101.6 mm) diameter. The company manufactures buoyant cable for minesweeping; an extremely light submarine cable and cables for space research rocket instrumentation and defence projects.

Canada Wire provides research and engineering facilities for individually engineered projects in the extra high voltage power field and nuclear power development.



*Typical Canada Wire and Cable aluminum sheathed cable (CORFLEX) showing a moisture-proof or submersible connector on a three-core cable.*



**Canadair Limited**

*P.O. Box 6087*

*Montreal, Quebec, Canada*

*Cable Address: CANADAIR MONTREAL*

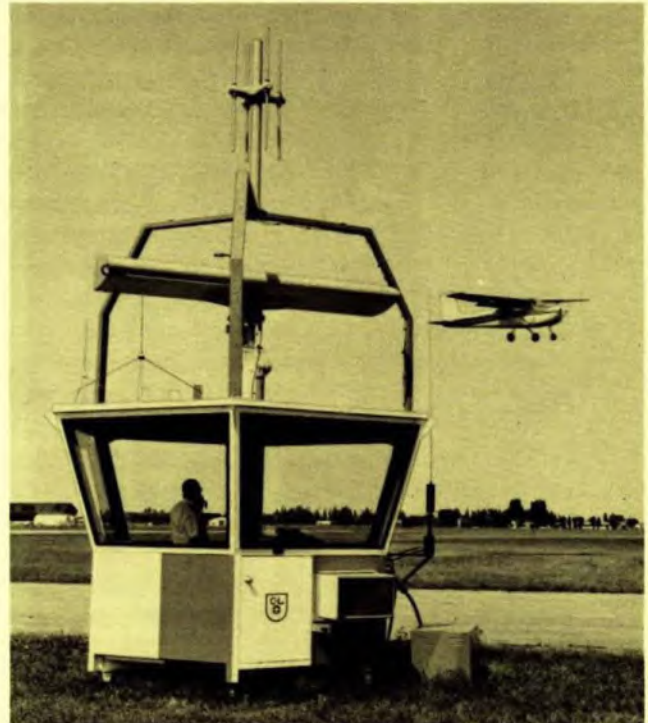
New from Canadair Limited, a versatile aircraft and aerospace manufacturer, is a self-contained transportable air traffic control tower. It is especially suitable for developing areas and is used in military support operations, at secondary airfields, and to supplement existing installations.

Since the 1920's this company has produced a variety of aircraft from early flying boats through jet and propjet fighters and transports to ground effects vehicles, aerospace hardware and digital computer devices. Canadair has drawn upon this extensive experience to design and produce sophisticated air traffic control towers.

Canadair's transportable control tower can be moved by an aircraft or medium helicopter with a door opening size of 45 by 46 inches (1143.0 by 1168.4 mm) and a payload capability of at least 2,500 pounds (1,134 Kg). It is designed to be erected by two men in less than one day.

The structure consists of assemblies which interlock to form a hexagon-shaped control cab. These sub-assemblies are completely finished in baked acrylic enamel for all-weather protection. Floor, roof and side panels are fully insulated for all weather and temperature conditions. Levelling is by screw jacks attached to the floor panel structure.

Optional equipment may also be supplied to customers' specifications. This includes consoles, heating and air conditioning, communications and meteorological equipment. A steel support tower, 25 feet (7.6 metres) high, designed for wind forces up to 100 mph (161 Kmph) unguyed, is also available.



*Canadair's transportable air traffic control tower measures 9 feet (2.73 metres) in diameter, 7 feet (2.13 metres) in height, with a floor area of 66 sq. feet (6.13 sq. metres). Weight is approximately 2,500 pounds (1,134 Kg) including the 12,000 BTU (3,000 Kg/cal) heater and air conditioning units.*

The Canadair main air traffic control cab meets pressing needs for the expansion and standardization of facilities for air traffic control throughout the world. Considerable savings can be realized through a pre-engineered cab eliminating duplication and expense of individual design and fabrication costs.

These cabs were developed through research and analysis of present and anticipated requirements for air traffic control. The cab provides an essentially free and unobstructed panoramic view of the airfield and surrounding airspace. Pentagon-shaped to minimize hazardous internal reflections, the control cab is designed to take modular standardized fittings. It is prefabricated in completely finished sub-assemblies for rapid field assembly, and designed to withstand extremes of weather.

The unit is a factory finished, prefabricated metal and glass building. The penthouse, roof panels, ceiling panels and consoles are fabricated of steel; the remaining sub-assemblies of aluminium. All exterior metal surfaces are factory finished in baked acrylic enamel; interior surfaces in baked enamel. The weight of the completed cab, less roofing, ceiling finish, electrical conduit and wiring is approximately 40,000 pounds (18,143 Kg). Cab components are supplied with all necessary hardware and are packaged and shipped by Canadair to the designated site for erection by the tower contractor. All shipments are FOB Montreal.

The cab is designed and fabricated for assembly on concrete tower shafts up to 150 feet (45.6 metres) high, or a special sling can be provided for hoisting complete cabs which have been pre-assembled by the contractor on the ground.



*Canadair Limited's air traffic control tower cab is an ultra-modern unit which will accommodate every facility for air traffic control. It is prefabricated and finished for on-site assembly and includes a full range of modular modules. The 275 square feet (25.5 square metres) of floor area provides adequate space for four men.*



**Canadian Controllers Limited**

1550 Birchmount Road  
Scarborough, Ontario, Canada  
Cable Address: CANTROL TORONTO

Canadian Controllers Limited, a company with over 35 years' experience, offers a new design in motor control centres, CEMA CW-20.

The company manufactures a large variety of motor starters and controllers ranging from a simple wall-switch type to giants over 400 feet (121.6 metres) long which accept instructions from computers and control automation processes in steel mills, petrochemical plants and paper mills.

In airport applications, Canadian Controllers' products operate every type of building service from boilers and pumps to fans and complete air-conditioning systems and many other electrical services. The company is a main supplier to the Canadian Department of Transport, Canada's airport authority.

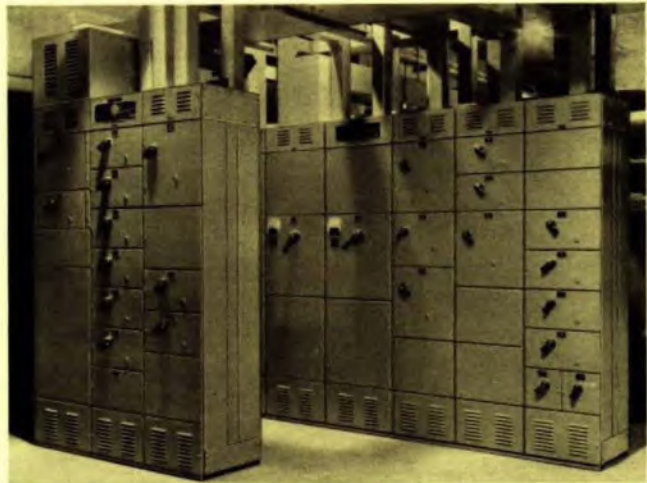
Active in the export field, the company has clients in Latin America, the Caribbean, Africa, Australasia, and Europe.

The new CW-20 combination starter units feature maximum flexibility in layout and assembly with minimum floor space requirements. This modern design is ideally suited to grouping the electrical control and protective equipment for a few motors or for an entire plant in a centralized location.

Each control centre is a functional grouping and uses standard components in a new cost-saving and attractive floor mounted unit, 90 inches (2,286 mm) high, complete with bus work, wiring troughs and terminal boards. One vertical section of the control centre will hold up to seven plug-in modular starter units.

The assembly is free standing and needs no special foundation or supporting structures. It may be arranged in U, L, or E-shaped fashion, with control units inserted on one side only, or back to back.

These control centres can effect savings up to 50 per cent in valuable plant space over individual combination starters, while the centralized, enclosed controls prevent tampering with motor controls.



*Centralized control of all airport electric motor driven systems is possible with the versatile and compact AC motor control centres from Canadian Controllers Limited.*

Tilt-out arrangement of the modules makes for easy servicing and the modular construction makes selecting and pricing simple, since units to suit floor space requirements and conduit placement are easily planned in advance. Factory assembly reduces on-the-job work and expense to a minimum.





### **Ferranti-Packard Electric Limited**

*Industry Street*

*Toronto 15, Ontario, Canada*

*Cable Address: FERRANTI TORONTO*

*TWX: 610-491-1434*

Producer of the first digital and general purpose computers in Canada, Ferranti-Packard Electric Limited is making major contributions to airline and airport operations with electronic information display boards and electronic reservation systems.

At airports, where arrival/departure and other information must be legibly displayed, but is subject to rapid change, Ferranti-Packard information display boards are outstanding in a number of ways: cost, clarity, simplicity and versatility.

The boards, proved in airport use since 1962, and in stock exchanges, cost less to install because of their light weight and the fact that in most cases only two wires are required which greatly reduces conduit requirements. The information display surface is a matrix of thin metal discs with permanent magnets fixed to them. The discs are black on one side and white or coloured on the other. A short current pulse, either positive or negative, flips the discs to show one colour or another. In this way discs are made to show letters or numerals from two inches (50.8 mm) to two feet (609.6 mm) high.

The unit has complete message flexibility—every character position can show any alphabetical or numerical character. The information, in two languages if necessary, can be changed in an instant by simply typing it on a teletype machine or feeding it in from punched paper tape or cards.

Operating costs are low since power is required only to change the characters. The display remains even if power fails—a useful emergency feature.

Visibility is excellent because viewing is by reflected light. This is ideal for modern bright buildings as there is no fading of the display. The simple design results in high reliability and long life (more than 20,000,000 operations) since there are no light bulbs to burn out or mechanical linkages to wear.

Options make the boards even more versatile. Automatic removal of information after arrival or departure of an aircraft and the insertion of new data is one feature. Direct video output can be arranged from the keyboard input to normal television sets.



*This 300-character Ferranti-Packard flight information board has been in operation at the Western Airlines terminal at Los Angeles, California, since March, 1962.*

One of the newest and largest displays—two boards, each 10 feet by 60 feet (3.05 by 18.2 metres) with characters 4 inches (101.6 mm) high has been installed at the Chicago Board of Trade. Other displays of this type have been operating on a full daily basis at two Canadian stock exchanges since 1965.



**Marsland Engineering Limited**

350 Weber North

Waterloo, Ontario, Canada

Cable Address: MARSENG WATERLOO ONTARIO

Runway visual range computers and transmissometers, manufactured by Marsland Engineering Limited, perform the vital task of providing the Canadian Department of Transport with accurate visibility readings at airports in bad weather.

The computer is part of a compact one-cabinet unit. The Marsland transmissometer set uses a light beam generator and photo-electric cell detector and associated equipment. The signal elements are set on towers 10 feet (3.0 metres) or higher, 600 feet (182.8 metres) apart, and measure the light intensity between them. The resulting measure of visibility can be shown on a meter, a chart recorder, or via the computer as a digital readout.

The components for use on the towers are rugged and weather-proof. They have heater elements and air blowers to keep them working efficiently at temperatures from 40°F below to 122°F above (-40°C to +50°C). The mounting towers themselves must be strong enough to keep movement to a 0.1-inch (2.54 mm) alignment tolerance of the optical system.

The equipment is adjustable for day and night use and a separate control permits instant computer adjustment for background light conditions which may vary transmissometer readings. Three special tools are provided for adjustment of the optical system.

The runway visual range computer is part of a system which takes light readings in the vicinity of a runway and converts them to a digital display of RVR (runway visual range) readings. The readout is in the airport control tower and may also be presented in five remote locations up to 25 miles (40 Km).

Test apparatus permits push-button testing of equipment operation at generating, receiving and display equipments. When under test sequence, the letter T forms part of the digital read-out.

Marsland, a company with modern plant facilities and over 40 years' experience, also produces servo mechanisms, sonar and airborne recorders, nuclear instrumentation, servo amplifiers and solid state devices for a variety of government, industrial and manufacturing clients.



*In the front panel of the runway visual range computer, the digits 20-T indicate visibility is 2,000 feet (600 metres) and the unit is under test.*



**Millard Electric Limited**  
Dufferin Street  
Perth, Ontario, Canada



A lightweight, but rugged, aluminum tower for airport runway approach lighting applications is offered by Millard Electric Limited.

Designed and built to meet exacting Canadian government specifications, Millard towers are now specified equipment in all civil and military airports in Canada.

Millard towers, which carry the approach lighting, are fabricated from aluminum alloy. They will remain undeflected with a load of half an inch (12.7 mm) of radial ice in a 20 mph (32 Kph) wind, yet have only 0.1 the "knockdown resistance" of a timber pole to minimize aircraft damage in event of crash landings.

Light, easy to assemble and climb, the towers are designed to withstand the severe icing conditions of Canadian winters and require minimal maintenance.

Towers and guyed masts utilizing similar construction are in service in the Arctic, Europe, and in the Carribean. Weight of

*Paired Millard towers carry approach lighting to the international airport serving Ottawa, the Canadian capital. The towers vary in height from 5 to 45 feet (1.5 to 13.7 metres).*

tower sections is minimal; a 10-foot (3.4-metre) tower section, 13 inches (330.2 mm) square, weighs only 36 pounds (16.3 Kg). A 100-foot (30-metre) tower in sections can thus be easily transported on a cartop carrier. Such a tower can support a compressive load of 32,000 pounds (14,515 Kg).

The towers are supplied in complete units. Guy wires are pre-cut, colour-coded and pre-fitted with thimble and shackle. Anchor plates with shackles, equalizer plates and turnbuckles are ready to fasten in position. A simplified instruction booklet is supplied. A survey tower, 20 feet (6.0 metres) high with centre core to hold a theodolite, was assembled by three Canadian army men in 19 minutes.

Millard type 18-T-55 sections may be used to assemble towers up to 300 feet (91.4 metres) in height for other applications.



**Pyrotenax of Canada Limited**  
250 West Street  
Trenton, Ontario, Canada

Pyrotenax of Canada Limited, manufacturer of a wide range of electrical products, has supplied many major airports in Canada with its 600-volt MI power cable. It has also supplied all of them with special harnesses for runway lighting.

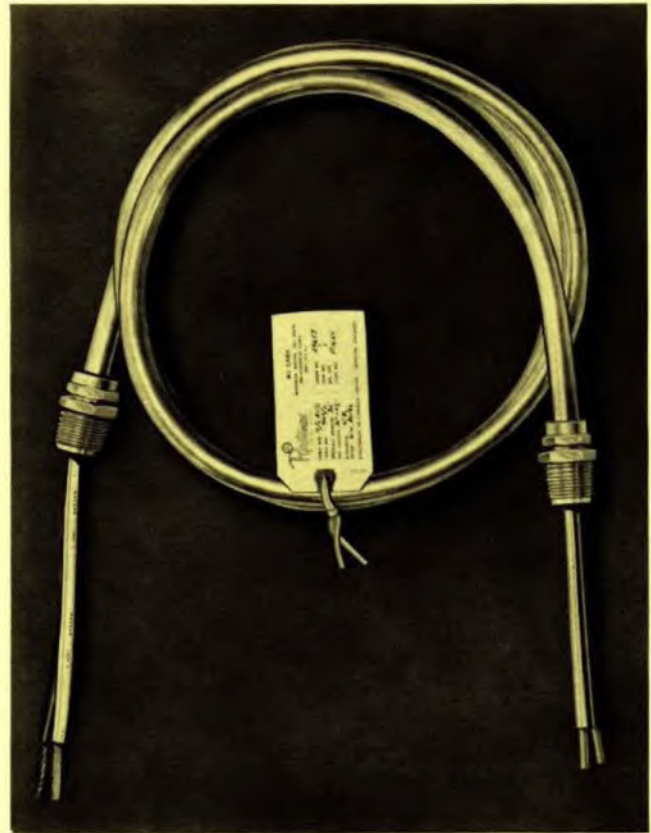
MI cable was originally developed to meet the need for a fire-resistant wiring product that was free from inflammable materials and that could not cause, or contribute to, a fire.

The insulation is compressed magnesium oxide, a mineral which remains unchanged and stable at temperatures up to 5,000°F (2,800°C). Thus the cable will continue to operate at temperatures up to the melting point of the seamless copper sheath and solid copper conductors.

Supplied in 1, 2, 3, 4 or 7 conductor units, the Pyrotenax 600-volt cables range from 18 AWG to 250 MCM in size, and are available for both general and hazardous applications. The cables resist oil, corrosion, moisture and ageing. They are non-sagging and easy to install. Thermo-plastic jackets can be supplied where the cable may be subjected to conditions corrosive to the copper sheath.

In a fire test Pyrotenax cable remained intact two hours at 1,760°F (960°C). In crush tests the installation is maintained even when the cable is flattened to less than one third of its original diameter.

These cables are available in bulk or in factory-assembled harnesses, with end fittings, ready for installation. For custom installations special Pyrotenax tools are available.



*Pyrotenax 600-volt power cables are supplied in special factory-assembled harnesses for airport lighting.*



*Pyrotenax MI heating cable is used to ensure snow-free roadways at all times at Toronto International Airport.*

Pyrotenax supplies heating cables for many applications. These cables are 250 or 600 volt, mineral insulated and stainless steel sheathed, with pure copper or resistance alloy conductors. Copper or Everdur sheaths are rated for temperature to 482°F (250°C), and stainless steel sheaths are rated to 932°F (500°C).

The conductors are of Everdur in the Everdur sheath cables, and nickel chrome in the stainless steel sheath cables. The resistance of Everdur and nickel chrome remains almost unchanged throughout their temperature range.

The heaters are supplied as heating units complete with MI power cable factory-spliced to the heating section to provide a non-heating cold lead-in cable which permits power connections outside the heated zone. The lead-in is completely terminated, ready to connect into a junction box.

Where heating cables are used to melt snow and ice from ramps, roofs, driveways and sidewalks the main factor is the loading, a minimum of 35 watts per square foot (per .09 sq.

metre) at air temperature of 10°F (-12°C) for concrete applications.

For heating large areas the 600-volt cable would be most suitable. Cable spacing in concrete slabs is normally 4 to 8 inches (101.6—203.2 mm). For asphalt applications the cable should be covered with metal mesh and the loading should never exceed 27 watts per foot (304.8 mm) of cable.

Heating cables can be used to prevent pipes from freezing, or to compensate for heat loss in pipes carrying previously heated materials. The heat requirement will vary depending on the pipe length, pipe diameter, temperature difference and insulation thickness. Standard units are held in stock and custom units can be engineered to meet specific design requirements.

Pyrotenax offers engineering assistance for projected designs.



**RCA Victor Company, Ltd.**

1001 Lenoir Street

Montreal 30, Quebec, Canada

Cable Address: VICTORADIO TORONTO

Telex: 01-2522

Airline schedule information originating from teletype or punched tape can now be easily displayed on standard TV sets as printed messages with a new system developed by RCA Victor Company, Ltd.

A leading Canadian manufacturer, with a highly developed electronics capability, RCA Victor is a major contractor in microwave, satellite and satellite-tracking developments in the United States and Canada.

DIVCON, the company's newest contribution to visual communications—as used in airports and on stock exchange boards—converts digital information to 525 or 625-line video signals for display as printed messages. It is used with inputs from teletype, punched tape, computer or local keyboards.

Normally supplied with two output channels of single or double size characters, the DIVCON display system can present information on aircraft movements in airport passenger assembly areas. Any word or character can be flashed on and off to emphasize change or importance. Up to 32 lines of 64 characters each are available and rewriting of a complete message is not needed to change one or more characters. Updating of character symbols is instantaneous and can be made automatic.

In airport administrative functions, the DIVCON system can present constantly updated information on reservations, maintenance, stock control, or crew scheduling. A light-probe attachment facilitates fast-access information retrieval from main or sub-directory units. Application of the light-probe to key squares on the main directory activates sub-directory displays. These may be further expanded by keying sub-units of each category, such as particular flight routes under the reservations heading.

The equipment power requirement is approximately 1500 VA at 115 volts, 60 cycles. Baudot or ASCII input codes enable acceptance of parallel signals from standard teletype equipment. Circuitry is solid state. The unit is 78 inches (1,981 mm) high, 28 inches (711 mm) wide and 24 inches (609 mm) deep. It weighs 950 pounds (430.9 Kg).



*Installed in a teletype unit, a DIVCON monitor shows the main operational directory. The operator is using the light probe to key the passenger service sub-directory.*



**Sicard Inc.**  
2055 Bennet Avenue  
Montreal 4, Quebec, Canada

Designed and built in Quebec where an 8-foot (2.4 metre) annual snowfall is normal, Sicard's first model snow-blowers went to work in 1927 and served efficiently for 25 winters before being replaced by a new model in 1952.

Today's Snow Master by Sicard is an improved and much more powerful snow removal machine. Its special multi-wheel drive chassis, developed especially for the snow-blower, is used as a superior base for a line of heavy duty trucks and a versatile crash-rescue and firefighting tender for airport use.

A new runway sweeper is the latest in a series of tough airport and construction equipment which has driven Sicard's sales from \$4,000,000 in 1955 to \$20,000,000 in 1965—a period of only 10 years. Sicard has since opened plants in Canada and the United States to cope with increased orders. Over 50 per cent of Sicard's total production is from the company's Ste. Therese, Quebec, manufacturing facility.

Modern airports must operate around the clock, and Snow Master equipment ensures their continual operation. More than 200 of these units are used at Canadian airports, 400 at United States Air Force bases, in addition to the many others in use at airports around the world.

At important airports, runways must be cleared to the pavement in about 30 minutes because today's modern jets, with low-slung engines and poor starting thrust, cannot operate from a snow or slush covered runway. Snow Masters, working alone or in conjunction with Sicard high-speed snow plows, clear runways, taxi strips and parking bays in record time, and with Sicard's new runway sweeper designed to remove any residual snow or slush, planes can be assured of landing on clear pavement on a year-round basis.

The Snow Master's powerful turbine, fed by two 20-inch (508 mm) diameter steel-edged cutting augers, can handle wet or dry snow up to 100 inches (2,544 mm) deep, and throw it up to 200 feet (61 metres)—well clear of runway shoulders. This snow dispersal reduces the risk of driftback and build-up of snow banks which can endanger low-slung jet engines and wingtips.



*Sicard's heavy duty Snow Master snowblowers are built to cope with the worst of Canada's winters, keeping airport runways clear round the clock. They clear snow-choked city streets overnight and keep traffic flowing in the Swiss and Italian Alpine passes.*

The patented impeller chute also allows the truck operator to deposit snow extremely accurately if desired, or load a truck running alongside, in close-quarter snow clearing operations.

A 150 bhp gasoline engine drives the truck at speeds from 1.8 mph (2.9 Kph) to 42 mph (67.3 Kph), while a 340 bhp supercharged diesel drives the blower mechanism.

The Pyrene/Sicard airport fire and crash rescue vehicle is a highly mobile unit fitted with a versatile mechanical foam system. This combination has successfully completed comprehensive test-to-destruction evaluation trials by the Canadian Department of National Defence and the Canadian Department of Transport.

Fully equipped, the 36,195-pound (16,417-Kg) vehicle has all-wheel drive and a suspension system which allows it to negotiate deep ditches, mud, water and other hazards to reach off-the-airport crash locations quickly. The 884-cubic-inch (14,597-cc) engine provides ample power to move the heavy duty vehicle at speed. An auxiliary engine drives the foam-making apparatus.

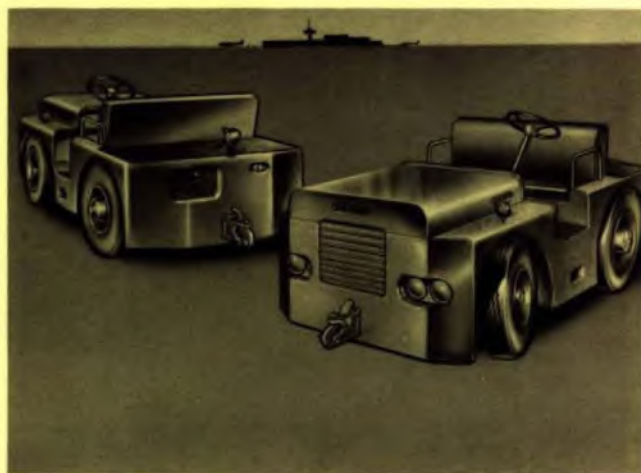
The Pyrene foam-making system is one of the most simplified and reliable systems used internationally, and is capable of delivering over 800 Imperial gallons (3,600 litres) of controlled homogenous foam with a minimum of delay.

The all-weather control cab has a 60,000 BTU/hr (15,000 Kg/c/hr) heating system, and the vehicle is equipped with automatic transmission, power brakes and steering, ensuring comfort and maximum ease of operation. All major components in the Sicard chassis are used extensively by United States automotive and military services—an important service consideration.

Sicard's aircraft towing tractor is low and compact. The unit body of ¼-inch (6.35 mm) steel plate and iron counterweights ensure a minimum loading of 5,000 pounds (2,267.9-Kg) over the driving wheels at a 4,000-pound (1,814.3-Kg) drawbar pull. A three-speed automatic transmission and large powerful brakes make for safe handling of large aircraft.



*The powerful six wheel drive Pyrene/Sicard fire-fighting and crash rescue vehicle can get to a crash scene quickly over off-the-airport terrain. It can discharge over 800 Imperial gallons (3,600 litres) of fire killing foam.*



*Sicard's aircraft towing tractor model 4000 is a compact 120 inches (3,048 mm) long, 73¼ inches (1,860.5 mm) wide and 62¼ inches (1,581 mm) high. Maximum speed is 23 mph (32.4 Kph). A Chrysler six-cylinder engine is used.*



# Canadian Trade Offices

Information on products and services from Canada is readily available at any of the following trade offices. They cordially invite your inquiries.

## CONTACT IN CANADA:

**M. L. Nickerson**  
Programme Manager  
Airport Exports Programme  
Electrical & Electronic Equipment Division  
Department of Trade and Commerce  
Government of Canada  
Ottawa, Canada  
CABLE ADDRESS: COMCOM OTTAWA



## ARGENTINA

**Commercial Counsellor**  
Canadian Embassy  
Casilla de Correo 3898  
Suipacha 1111  
Buenos Aires, Argentina

*Cable:* CANADIAN      *Tel:* 32-9081  
*Telex:* 121383 (DOMCAN BA)  
*Territory:* Paraguay.

## AUSTRALIA

**Commercial Counsellor for Canada**  
P.O. Box 3952, G.P.O.  
A.M.P. Building, 21st Floor  
Circular Quay  
Sydney, Australia

*Cable:* CANADIAN      *Tel:* 27-7565  
*Telex:* 089 20600 (CDN GOVT AA 20600)  
*Territory:* States of New South Wales and Queensland, Capital Territory, Northern Territory, and Dependencies.

**Commercial Counsellor for Canada**  
Mobil Centre  
2 City Road  
South Melbourne S.C. 4, Australia

*Cable:* CANADIAN      *Tel:* 61-3473  
*Telex:* 089 30501 (CDN GOVT AA 30501)  
*Territory:* States of Victoria, South Australia, Western Australia, Tasmania.

**Commercial Counsellor**  
Office of the High Commissioner for Canada  
Commonwealth Avenue  
Canberra, Australia

*Cable:* DOMCAN      *Tel:* 7-2541  
*Telex:* 089 62017 (DOMCAN AA 62017)

## AUSTRIA

**Minister-Counsellor (Commercial)**  
Canadian Embassy  
P.O. Box 190, Vienna 1/8  
Obere Donaustrasse 49/51  
Vienna II, Austria

*Cable:* CANADIAN      *Tel:* 23-32-94  
*Telex:* 75320 (DOMCAN A)  
*Territory:* Albania, Bulgaria, Czechoslovakia, Hungary, Rumania, Yugoslavia.

## BELGIUM

**Commercial Counsellor**  
Canadian Embassy  
35 rue de la Science  
Brussels 4, Belgium

*Cable:* CANADIAN      *Tel:* 13.38.50  
*Telex:* 221613 (DOMCAN BRU)  
*Territory:* European Economic Community, European Atomic Energy Community, European Coal and Steel Community.  
Other countries: Luxembourg.

## BRAZIL

**Commercial Counsellor**  
Canadian Embassy  
Caixa Postal 2164-ZC-00  
Edificio Metropol  
Av. Presidente Wilson 165  
Rio de Janeiro, Brazil

*Cable:* CANADIAN      *Tel:* 42-4140  
*Telex:* RIO 175 (DOMINION RIO)

**Consul and Trade Commissioner**  
Canadian Consulate  
Caixa Postal 6034  
Edificio Scarpa  
Av. Paulista, 1765, 9 andar  
São Paulo, Brazil

*Cable:* CANADIAN      *Tel:* 36-6301, 36-6302

## BRITAIN

**Minister (Commercial)**  
**Office of the High Commissioner for Canada**  
**One Grosvenor Square**  
**London, W.1, England**

*Cable:* SLEIGHING, London, W.1. *Tel:* 629-9492 (Area Code 01)  
*Telex:* 22526/254428 (DOMINION LDN)

**Canadian Government Trade Commissioner**  
**Martins Bank Building**  
**Water Street**  
**Liverpool, England**

*Cable:* CANADIAN *Tel:* MARitime 2177  
*Territory:* Midlands, North England.

**Canadian Government Trade Commissioner**  
**Cornhill House**  
**144 West George Street**  
**Glasgow C.2, Scotland**

*Cable:* CANTRACOM *Tel:* DOUglas 6751  
*Territory:* Scotland.

**Canadian Government Trade Commissioner**  
**15-17 Chichester Street**  
**Belfast 1, Northern Ireland**

*Cable:* CANTRACOM *Tel:* 21867  
*Territory:* Northern Ireland.

## CHILE

**Commercial Counsellor**  
**Canadian Embassy**  
**Casilla 771**  
**Agustinas 1225, 5th Floor**  
**Santiago, Chile**

*Cable:* CANADIAN *Tel:* 64189  
*Telex:* 3520068 (3520068 DOMCAN)

## COLOMBIA

**Commercial Secretary**  
**Canadian Embassy**  
**Apartado Aereo 8582**  
**Edificio Banco de Los Andes**  
**Carrera 10, No. 16-92**  
**Bogota, Colombia**

*Cable:* CANADIAN *Tel:* 43-00-65  
*Telex:* M100 (DOMCAN BOG)  
*Territory:* Ecuador.

## CUBA

**Commercial Division**  
**Canadian Embassy**  
**Gaveta 6125**  
**Calle 30 No. 518 esquina 7ª Avenida**  
**Miramar**  
**Havana, Cuba**

*Cable:* CANADIAN *Tel:* 2-6421

## DENMARK

**Commercial Counsellor**  
**Canadian Embassy**  
**Prinsesse Maries Allé 2**  
**Copenhagen V, Denmark**

*Cable:* CANADIAN *Tel:* Hilda 3306  
*Telex:* 5036 (DOMCAN KH)  
*Territory:* Greenland, Poland.

## DOMINICAN REPUBLIC

**Commercial Secretary**  
**Canadian Embassy**  
**Apartado 1393**  
**Edificio Copello 408**  
**Calle El Conde**  
**Santo Domingo, Dominican Republic**

*Cable:* CANADIAN *Tel:* 2-8138  
*Telex:* 3460140 (DOMCAN 3460140)  
*Territory:* Haiti, Puerto Rico.

## FRANCE

**Minister-Counsellor (Economic/Commercial)**  
**Canadian Embassy**  
**35 Avenue Montaigne**  
**Paris 8<sup>e</sup>, France**

*Cable:* CANADIAN Paris 086 *Tel:* BALzac 99-55  
*Telex:* 022/20600 or 20601 (DOMCAN A PARIS)  
*Territory:* Algeria Monaco Morocco.

## GERMANY

**Commercial Counsellor**  
**Canadian Embassy**  
**Kennedy-Allee 35**  
**5320 Bad Godesberg, West Germany**

*Cable:* CANADIAN *Tel:* 76995  
*Telex:* 886421 (DOMCAN BONN)  
*Territory:* States of Baden-Wuerttemberg, Bavaria, Hesse, Rhineland-Palatinate, Saar; West Berlin.

**Consul General**  
**Canadian Consulate General**  
**Koenigsallee 82**  
**4000 Duesseldorf 1, West Germany**

*Cable:* CANADIAN *Tel:* 320525  
*Telex:* 8587144 (DMCN D)  
*Territory:* State of North Rhine-Westphalia.

**Consul General**  
**Canadian Consulate General**  
**Esplanade 41-47**  
**2000 Hamburg 36, West Germany**

*Cable:* CANADIAN *Tel:* 351805  
*Territory:* City States of Bremen and Hamburg; States of Lower Saxony and Schleswig-Holstein.

## **GHANA**

**Commercial Secretary  
Office of the High Commissioner for Canada  
P.O. Box 1639  
E 115/3 Independence Avenue  
Accra, Ghana**

*Cable:* CANADIAN *Tel:* 4824  
*Telex:* 224 (DOMCAN ACC)  
*Territory:* Guinea, Ivory Coast, Liberia, Mali, Mauretania, Togo,  
Upper Volta.

## **GREECE**

**Commercial Counsellor  
Canadian Embassy  
31 Vassilissis Sophias Avenue  
Athens 138, Greece**

*Cable:* DOMCAN ATHENS 5584 *Tel:* 714-041  
*Telex:* 5584 (DOMCAN ATHENS)  
*Territory:* Turkey.

## **GUATEMALA**

**Commercial Secretary  
Canadian Embassy  
P.O. Box 400  
5a Avenida 11-70, Zone 1  
Guatemala City, C.A., Guatemala**

*Cable:* CANADIAN *Tel:* 28448  
*Territory:* Costa Rica, El Salvador, Honduras, Nicaragua, Panama,  
and Canal Zone.

## **HONG KONG**

**Senior Canadian Government Trade Commissioner  
P.O. Box 126  
P & O Building, 11th Floor  
21-23, Des Voeux Road, Central  
Hong Kong, Hong Kong**

*Cable:* CANADIAN *Tel:* 224087  
*Telex:* HKG 391 (DOMCAN HKG)  
*Territory:* Cambodia, Communist China, Laos, Vietnam, Macao.

## **INDIA**

**Commercial Counsellor for Canada  
P.O. Box 11  
13 Golf Links Road  
New Delhi 1, India**

*Cable:* CANADIAN *Tel:* 61-8254  
*Telex:* 346 (DOMCAN DLI)  
*Territory:* Bhutan, Ceylon, Nepal, Sikkim.

## **IRAN**

**Commercial Division  
Canadian Embassy  
P.O. Box 1610  
Bezrouke Building  
Corner of Takht Jamshid Avenue and Forsat St  
Tehran, Iran**

*Cable:* CANTRACOM *Tel:* 613560,4-9291  
*Telex:* 2037 (DOMCAN TEHERAN)

## **IRELAND**

**Commercial Secretary for Canada  
66 Upper O'Connell Street  
Dublin, Ireland**

*Cable:* CANADIAN *Tel:* 44251  
*Telex:* 5488 (DOMCAN DUBLIN)

## **ISRAEL**

**Commercial Secretary  
Canadian Embassy  
P.O. Box 20140  
84 Hahashmonaim Street  
Tel Aviv, Israel**

*Cable:* CANADIAN *Tel:* 37161/2  
*Telex:* 740 (DOMCAN TV)  
*Territory:* Cyprus.

## **ITALY**

**Commercial Counsellor  
Canadian Embassy  
Via G. B. De Rossi 27  
Rome, Italy**

*Cable:* CANADIAN *Tel:* 864-327  
*Telex:* 61056 (DOMCAN ROME)  
*Territory:* Provinces of Toscana, Marche, Umbria, Lazio,  
Molise, Puglia, Campania, Basilicata, Calabria, Sicilia, S.  
Other countries: Libya, Malta.

**Consul General and Trade Commissioner  
Canadian Consulate General  
C.P. 3977  
Via Vittor Pesani 19  
Milan, Italy**

*Cable:* CANTRACOM *Tel:* 652-485/652-600  
*Telex:* 31368 (CANTRCOM MILAN)  
*Territory:* Provinces of Emilia-Romagna, Lombardia, Piedim.  
Trentino-Alto Adige, Veneto, Liguria, Trieste, Valle D'Ao:  
Friuli-Venezia.

## JAMAICA

**Commercial Counsellor**  
**Office of the High Commissioner for Canada**  
**P.O. Box 1500**  
**Tobago Road**  
**Corner Trafalgar Road and Knutsford Boulevard**  
**Kingston 10, Jamaica**

*Cable:* CANADIAN *Tel:* 68711  
*Telex:* KGN 30 (BEAVER KINGSTON)  
*Territory:* Bahamas, British Honduras.

## JAPAN

**Minister (Commercial)**  
**Embassy of Canada**  
**Akasaka Post Office**  
**Tokyo, Japan**

*Cable:* CANADIAN *Tel:* 408-2101/8  
*Telex:* TK 2218 (DOMCAN TK 2218)  
*Territory:* Korea, Okinawa.

## KENYA

**Commercial Secretary**  
**Office of the High Commissioner for Canada**  
**P.O. Box 30481**  
**Silopark House, Room 303**  
**Queensway**  
**Nairobi, Kenya**

*Cable:* DOMCAN NAIROBI *Tel:* 28257  
*Territory:* Malawi, Tanzania, Uganda, Zambia.

## LEBANON

**Commercial Counsellor**  
**Canadian Embassy**  
**Boîte Postale 2300**  
**Alpha Building**  
**Rue Clemenceau**  
**Beirut, Lebanon**

*Cable:* CANADIAN *Tel:* 250955  
*Telex:* 652 (DOMCAN BERYT)  
*Territory:* Aden, Iraq, Jordan, Persian Gulf area, Saudi Arabia, Syria, Yemen.

## MALAYSIA

**Commercial Counsellor**  
**Office of the High Commissioner for Canada**  
**P.O. Box 990**  
**A.I.A. Building, Ampang Road**  
**Kuala Lumpur, Malaysia**

*Cable:* DOMCAN *Tel:* 89722/4  
*Telex:* KL/TX279 (DOMCAN KL)  
*Territory:* Brunei, Burma.

## MEXICO

**Commercial Counsellor**  
**Canadian Embassy**  
**Apartado Postal 5-364**  
**Melchor Ocampo 463, 7th Floor**  
**Mexico 5, D.F., Mexico**

*Cable:* CANADIAN *Tel:* 33-14-00  
*Telex:* 000177716 (DOMCAN MEX)

## NETHERLANDS

**Commercial Counsellor**  
**Canadian Embassy**  
**Sophialaan 5-7**  
**The Hague, Netherlands**

*Cable:* CANADIAN *Tel:* 61-41-11  
*Telex:* 31270 (DOMCAN HAGUE)

## NEW ZEALAND

**Commercial Counsellor**  
**Office of the High Commissioner for Canada**  
**P.O. Box 12-049 Wellington North**  
**ICI Building, 3rd Floor**  
**Molesworth Street**  
**Wellington, New Zealand**

*Cable:* CANADIAN *Tel:* 70-644  
*Telex:* 065-3505 (DOMCAN NZ 3505)  
*Territory:* Fiji, Tahiti, Tonga, Western Samoa.

## NIGERIA

**Commercial Secretary**  
**Office of the High Commissioner for Canada**  
**P.O. Box 851**  
**Barclays Bank Building, 4th Floor**  
**40 Marina Road**  
**Lagos, Nigeria**

*Cable:* CANADIAN *Tel:* 25262  
*Telex:* 275 (DOMCAN LAGOS)  
*Territory:* Dahomey, Gambia, Niger, Senegal, Sierra Leone.

## NORWAY

**Commercial Counsellor**  
**Canadian Embassy**  
**Fridtjof Nansens plass 5**  
**Oslo 1, Norway**

*Cable:* CANADIAN *Tel:* 33-30-80  
*Telex:* Oslo 1880 (DOMCAN OSLO)  
*Territory:* Iceland.

## PAKISTAN

**Commercial Counsellor**  
**Office of the High Commissioner for Canada**  
**54 Lawrence Road**  
**Rawalpindi, Pakistan**

*Cable:* DOMCAN RAWALPINDI  
*Telex:* LH 15 (LAHORE 15)  
*Territory:* Afghanistan.

**Commercial Secretary**  
**Office of the High Commissioner for Canada**  
**P.O. Box 3703**  
**12 B Clifton**  
**H. K. Kriplani Road**  
**Karachi 6, Pakistan**

*Cable:* CANADIAN *Tel:* 52021  
*Telex:* Karachi 10 (DOMCAN KHI)

#### PERU

**Commercial Secretary**  
**Canadian Embassy**  
**Casilla 1212**  
**Edificio El Pacifico**  
**Corner Avenida Arequipa and Plaza Washington**  
**Lima, Peru**

*Cable:* CANADIAN *Tel:* 72760  
*Telex:* WLA 5323 (DOMCAN LIMA)  
*Territory:* Bolivia.

#### PHILIPPINES

**Consul General and Trade Commissioner**  
**Canadian Consulate General**  
**P.O. Box 1825**  
**L & S Building, 3rd Floor**  
**1414 Roxas Boulevard**  
**Manila, Philippines**

*Cable:* CANADIAN *Tel:* 5-85-97, 5-86-15  
*Telex:* 3252 (DOMCAN MN 3252)  
*Territory:* Republic of China (Taiwan).

#### PORTUGAL

**Commercial Counsellor**  
**Canadian Embassy**  
**Rua Marques de Fronteira, No. 8—4° D°**  
**Lisbon, Portugal**

*Cable:* CANADIAN *Tel:* 55-31-18  
*Telex:* 377 (DOMCAN P)  
*Territory:* Azores, Cape Verde Islands, Madeira, Portuguese Guinea.

#### SINGAPORE

**Commercial Counsellor**  
**Office of the High Commissioner for Canada**  
**P.O. Box 845**  
**International Building, 11th Floor**  
**360 Orchard Road**  
**Singapore 9**

*Cable:* CANADIAN *Tel:* 36-1322  
*Telex:* 277 (DOMCAN SPORE)  
*Territory:* Indonesia, Thailand.

#### SOUTH AFRICA

**Canadian Government Trade Commissioner**  
**P.O. Box 715**  
**Mobil House, 17th Floor**  
**Corner Rissik and De Villiers Streets**  
**Johannesburg, South Africa**

*Cable:* CANADIAN *Tel:* 834-6521  
*Telex:* 7189 (DOMCAN J 7189)  
*Territory:* States of Natal, Orange Free State, Transvaal.  
Other countries: Angola, Botswana, Lesotho, Malagasy, Mauritius,  
Mozambique, Reunion.

**Canadian Government Trade Commissioner**  
**P.O. Box 683**  
**African Life Centre, 13th Floor**  
**St. George's Street**  
**Cape Town, South Africa**

*Cable:* CANADIAN *Tel:* 2-5134/5  
*Telex:* 7060 (5-7060 CT)  
*Territory:* Cape Province. Other countries: St. Helena,  
South West Africa.

#### SPAIN

**Commercial Counsellor**  
**Canadian Embassy**  
**Apartado 117**  
**Edificio Espana**  
**Avenida de Jose Antonio 88**  
**Madrid, Spain**

*Cable:* CANADIAN *Tel:* 247-54-00  
*Telex:* 7347 (DOMCAN MADRID)  
*Territory:* Balearic Islands, Canary Islands, Gibraltar, Rio Muni,  
Spanish Sahara.

#### SWEDEN

**Commercial Counsellor for Canada**  
**P.O. Box 14042**  
**Skeppsbron 24**  
**Stockholm, Sweden**

*Cable:* CANADIAN *Tel:* 24-87-42  
*Telex:* 10687 (DOMCAN STHLM)  
*Territory:* Finland.

#### SWITZERLAND

**Commercial Counsellor**  
**Canadian Embassy**  
**Kirchenfeldstrasse 88**  
**Berne, Switzerland**

*Cable:* CANADIAN *Tel:* 44-63-81  
*Telex:* 32489 (DOMCAN BERNE)  
*Territory:* Tunisia.

## TRINIDAD AND TOBAGO

**Commercial Counsellor**  
**Office of the High Commissioner for Canada**  
**P.O. Box 1246**  
**Colonial Building**  
**72 South Quay**  
**Port-of-Spain, Trinidad**

*Cable:* CANADIAN *Tel:* 34787  
*Telex:* 31314 (POS 31314)  
*Territory:* Barbados, Leeward and Windward Islands, Guyana,  
French Guiana, Surinam, Guadeloupe, Martinique.

## UNION OF SOVIET SOCIALIST REPUBLICS

**Commercial Secretary**  
**Canadian Embassy**  
**23 Starokonyushenny Pereulok**  
**Moscow, U.S.S.R.**

*Cable:* CANAD *Tel:* 415142  
*Telex:* 945 (DOMCAN MSK)

## UNITED ARAB REPUBLIC

**Commercial Division**  
**Canadian Embassy**  
**Kasr el Doubara Post Office**  
**6 Sharia Rouston Pasha**  
**Garden City**  
**Cairo, Egypt**

*Cable:* CANADIAN *Tel:* 23110  
*Territory:* Sudan, Ethiopia.

## UNITED STATES

**Commercial Counsellor**  
**Canadian Embassy**  
**1746 Massachusetts Avenue, N.W.**  
**Washington, D.C. 20036**

*Cable:* CANADIAN *Tel:* DEcatur 2-1011 (Area Code 202)  
*Telex:* 0089664 (DOMCAN WSH)  
*Territory:* District of Columbia.

**Deputy Consul General (Commercial)**  
**Canadian Consulate General**  
**680 Fifth Avenue**  
**New York City, N.Y. 10019**

*Cable:* CANTRACOM *Tel:* JUdson 6-2400 (Area Code 212)  
*Night Line:* JUdson 6-2321  
*Telex:* 00126242 (DOMCAN NYK)  
*Territory:* States of Connecticut, New Jersey (eleven northern  
counties), New York. Other countries: Bermuda.

**Consul and Senior Trade Commissioner**  
**Canadian Consulate General**  
**500 Boylston Street**  
**Boston, Massachusetts 02116**

*Tel:* 262-3760 (Area Code 617)  
*Telex:* 0094567 (DOMCAN BSN)  
*Territory:* States of Maine, Massachusetts, New Hampshire, Rhode  
Island, Vermont.

**Consul and Senior Trade Commissioner**  
**Canadian Consulate General**  
**310 South Michigan Avenue, Suite 2000**  
**Chicago, Illinois 60604**

*Tel:* 427-1031 (Area Code 312)  
*Telex:* 254171 (DOMCAN CGO)  
*Territory:* States of Illinois, North Dakota, South Dakota, Minnesota,  
Wisconsin, Indiana, Iowa, Kansas, Kentucky, Missouri, Nebraska.

**Consul and Senior Trade Commissioner**  
**Canadian Consulate**  
**Illuminating Building**  
**55 Public Square**  
**Cleveland, Ohio 44113**

*Tel:* 861-1660 (Area Code 216)  
*Telex:* 00985364 (DOMCAN CLV)  
*Territory:* State of Ohio.

**Consul and Trade Commissioner**  
**Canadian Consulate**  
**1920 First Federal Building**  
**1001 Woodward Avenue**  
**Detroit, Michigan 48226**

*Tel:* 965-2811 (Area Code 313)  
*Telex:* 0023445 (DOMCAN DET)  
*Territory:* State of Michigan.

**Consul and Trade Commissioner**  
**Canadian Consulate General**  
**510 West Sixth Street**  
**Los Angeles, California 90014**

*Tel:* MADison 2-2233 (Area Code 213)  
*Telex:* 00674119 (DOMCAN LSA)  
*Territory:* States of California (ten southern counties), Arizona,  
New Mexico, Clark County in Nevada.

**Consul and Trade Commissioner**  
**Commercial Division**  
**Canadian Consulate General**  
**2110 International Trade Mart**  
**2 Canal Street**  
**New Orleans, Louisiana 70130**

*Tel:* JAcKson 5-2136, 5-2137 (Area Code 504)  
*Telex:* 0058237 (DOMCAN NLN)  
*Territory:* States of Louisiana, Texas, Oklahoma, Arkansas, Mississippi,  
Tennessee, Alabama, North Carolina, South Carolina, Georgia,  
Florida.

**Consul and Trade Commissioner**  
**Canadian Consulate**  
**3 Penn Center Plaza**  
**Philadelphia, Pennsylvania 19102**

*Cable:* CANADIAN *Tel:* LOcust 3-5838 (Area Code 215)  
*Telex:* 0083396 (DOMCAN PHA)  
*Territory:* States of Delaware, Maryland, New Jersey (nine southern  
counties), Pennsylvania, Virginia, West Virginia.

**Consul and Trade Commissioner  
Commercial Division  
Canadian Consulate General  
111 Pine Street  
San Francisco, California 94111**

*Cable:* CANADIAN      *Tel:* 433-2517 (Area Code 415)

*Telex:* 0034321 (DOMCAN SFO)

*Territory:* States of California (except the ten southern counties),  
Wyoming, Nevada (except Clark County), Utah, Colorado,  
Hawaii.

**Consul General  
Canadian Consulate General  
1308 Tower Building  
Seventh Avenue at Olive Way  
Seattle, Washington 98101**

*Tel:* MUtual 2-3515 (Area Code 206)

*Telex:* 0032462 (DOMCAN SEA)

*Territory:* States of Oregon, Idaho, Washington, Montana, Alaska.

#### **URUGUAY**

**Commercial Counsellor  
Canadian Embassy  
Casilla Postal 852  
No. 1409 Avenida Agraciada Piso 7°  
Montevideo, Uruguay**

*Cable:* CANADIAN      *Tel:* 96096

*Telex:* 398078 (DOMCAN MVD)

*Territory:* Falkland Islands.

#### **VENEZUELA**

**Commercial Secretary  
Canadian Embassy  
Apartado del Este 11452  
Avenida La Estancia No. 10  
Ciudad Comercial Tamanaco  
Caracas, Venezuela**

*Cable:* CANADIAN      *Tel:* 32.40.41/44

*Telex:* 877 (877 DOMCAN)

*Territory:* Netherlands Antilles.

# PRODUCT CROSS-INDEX

Chart alongside indicates section in which information on the company appears

	NAVIGATIONAL & VISUAL AIDS	TELECOMMUNICATIONS	ANCILLARY EQUIPMENT
<b>Airport and Airfield Lighting Systems &amp; Ancillaries</b>			
Beaconing Optical and Precision Materials Co. Ltd.	●		
Canada Wire and Cable Company Limited			●
CLM Industries	●		
Crouse-Hinds Company of Canada Limited	●		
Esna Limited	●		
Millard Electric Limited (towers)			●
Northern Electric Company, Limited (wire and cable)		●	
Pyrotenax of Canada, Limited (cable and cable harnesses)			●
<b>Cable</b>			
Canada Wire and Cable Company Limited			●
Northern Electric Company, Limited		●	
Pyrotenax of Canada, Limited			●
<b>Communications Ancillaries</b>			
Millard Electric Limited (towers and masts)			●
Sinclair Radio Laboratories Limited		●	
TMC (Canada) Limited		●	
Topping Electronics Limited		●	
<b>Communications Control Systems</b>			
Philips Electronics Industries Ltd.		●	
<b>Communications Transmitters and Receivers</b>			
Canadian General Electric Company, Limited		●	
Collins Radio Company of Canada Limited		●	
Spilsbury & Tindall Ltd.		●	
TMC (Canada) Ltd.		●	
<b>Control Towers and Ancillaries</b>			
Canadair Limited			●
Philips Electronic Industries Ltd.		●	



# PRODUCT CROSS-INDEX

Chart alongside indicates section in which information on the company appears

	NAVIGATIONAL & VISUAL AIDS	TELECOMMUNICATIONS	ANCILLARY EQUIPMENT
<b>Electrical Services</b>			
Canadian Controllers Limited			•
CLM Industries	•		
Crouse-Hinds Company of Canada Limited	•		
<b>Information Display Systems</b>			
Canadian General Electric Company, Limited		•	
Ferranti-Packard Electric Limited			•
Raytheon Canada Limited	•		
RCA Victor Company, Ltd.			•
<b>Meteorology</b>			
Beaconing Optical and Precision Materials Co. Ltd.	•		
CAE Industries Ltd.	•		
Crouse-Hinds Company of Canada Limited	•		
Marsland Engineering Limited			•
<b>Navigational Systems, Simulators and Ancillaries</b>			
Aviation Electric Limited (vehicle navigation sets)			•
CAE Industries Ltd. (simulators)	•		
Canadian General Electric Company, Limited (video integrators)		•	
Philips Electronic Industries Ltd. (radio beacon systems)		•	
Raytheon Canada Limited	•		
Spilsbury & Tindall Ltd. (radio beacons)		•	
Topping Electronics Limited (radio beacons, ILS alarm units)		•	
<b>Telephone and Telegraph Systems</b>			
CAE Industries Ltd. (telegraph equipment)	•		
Northern Electric Company, Limited		•	
<b>Vehicles</b>			
Sicard Inc.			•

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