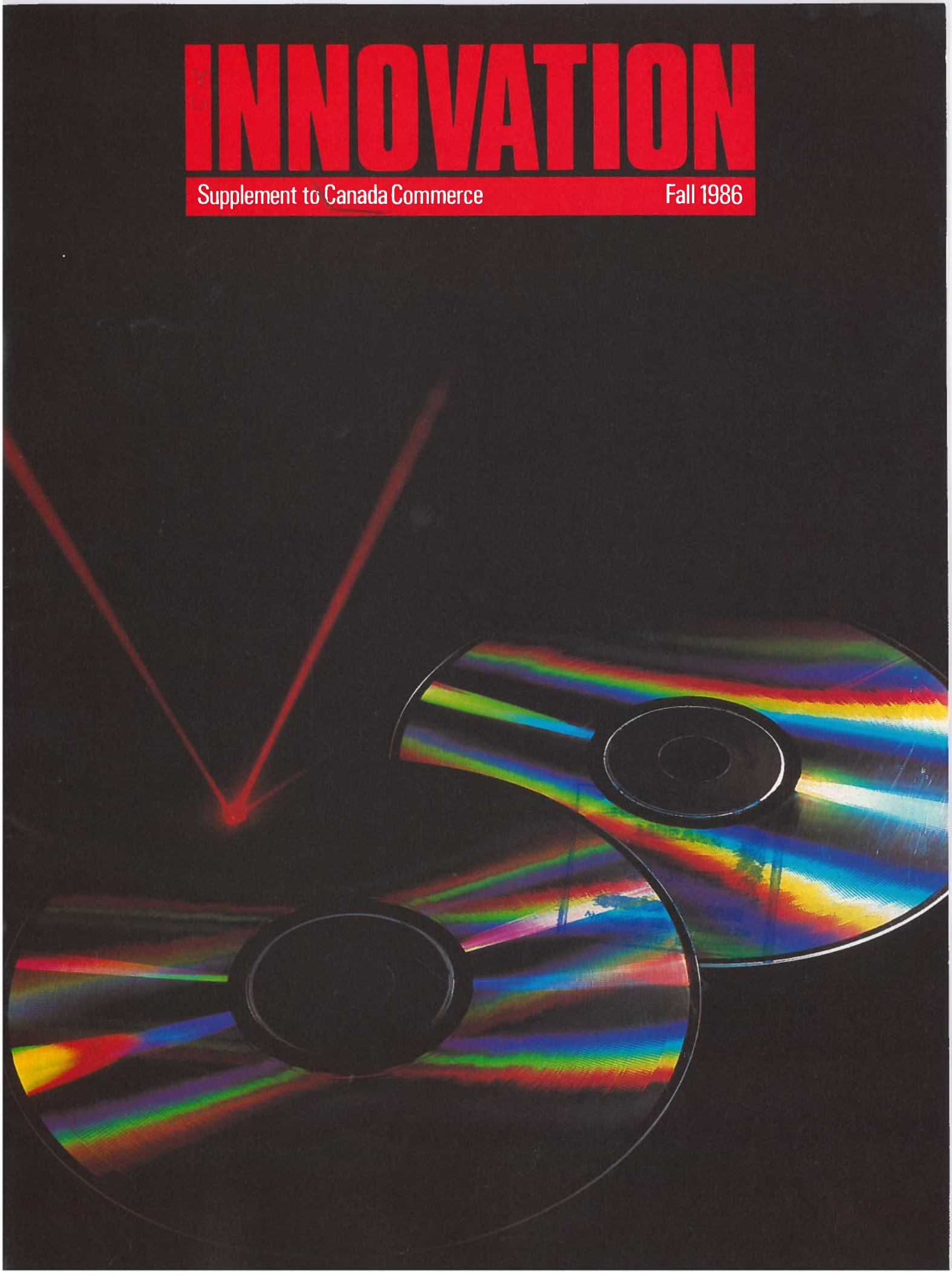
INNOVATION

Supplement to Canada Commerce — Fall 1986



INNOVATION

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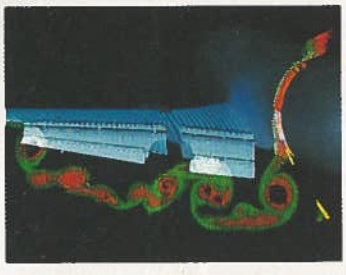

Innovation Supplement
This is a reader's magazine, open to ideas and information from its readers. Offers and requests of technology transfers must come from our readers in Canada to match those supplied from abroad. Ideas for articles and information, even finished articles, will be welcomed.

We invite you to become a part of the *Innovation Supplement* with your comments and ideas. You can contact us at:

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Hon. Michel Côté
Minister of Regional Industrial Expansion
Hon. Bernard Valcourt
Minister of State (Small Businesses and Tourism)

Editorial

EARLY this year, Boeing Commercial Airplane Company of Seattle, Washington, and the Government of Canada signed an agreement whereby the shares of government-owned de Havilland Aircraft of Canada Limited were sold to Boeing. Each in its own way had much to offer the other. de Havilland is one of Canada's largest aeronautical firms and a world leader in the development and manufacture of short take-off and landing (STOL) and commuter aircraft. Boeing is one of the world's largest and most successful suppliers of commercial and military aircraft and services.

As a result of the sale, on the one hand, Boeing has fleshed out its product line and, on the other, de Havilland has gained the financial clout and worldwide sales and technical network of Boeing. De Havilland will continue to develop and produce its STOL and small commuter planes on a world mandating basis, thus giving the best assurance of continuing employment to Canadian workers. In fact, a portent of the future is that, since the sale, de Havilland has announced the largest sales ever of its new Dash-8 commuter planes.

As outlined in this issue of Innovation, with its greater stake in Canada, Boeing will be more amenable to sharing its world-class technology and private testing and R&D facilities with Canadian suppliers and others.

The story on BIOS Ltd. outlines how this new firm keeps its customers supplied with the latest developments in biotechnology and how it arranges for technology transfer and joint venture partners to be brought together in this rapidly growing field.

Rounding out this issue devoted to successful high-tech firms is the story on Canadian Marconi Company, the pioneer in the development of radio and a world leader in the design and development of specialized radio, radar and navigational equipment.

R&D Notes

The National Research Council has announced the establishment of a Space Division to consolidate the management of Canada's continuing space research program. Under the policy guidance of the Ministry of State for Science and Technology, the new Space Division will be responsible for:

- Canada's contribution to the NASA Space Station;
- A user-development program for the development of Canadian industrial capabilities for space-based manufacturing;
- The Canadian Astronaut Program; and
- The space science research program previously co-ordinated by NRC's Canada Centre for Space Science.

The Space Division provides an increased measure of effectiveness in co-ordinating NRC's continuing space research efforts through such organizations as the Mobile Servicing Centre (MSC) and the User-Development Program Office.

The Mobile Servicing Centre will focus on a new generation of robotics technology and control systems. MSC will be a key element in construction of the space station and maintenence of the station, its instruments and other payloads. The space station is scheduled to be operational by 1994 barring any further space set-backs.

The User-Development Program Office will work with Canadian industries and government and university laboratories to identify and develop areas in which Canadians can exploit the commercial and research potential of space.

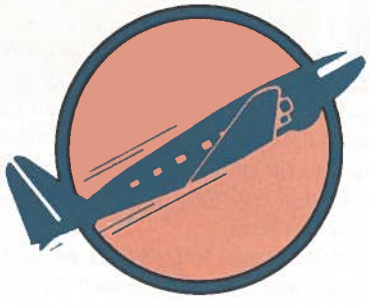
When NASA space shuttle flights are rescheduled, Canadian astronaut Steve MacLean will fly on the second Canadian mission in space, focused on a computerized Space Vision System developed by NRC. The space science program encompasses efforts in the fields of microgravity, space physics and upper-atmosphere research.

de Havilland & Boeing

Natural Partners

IN keeping with the federal government's intention to return to the private sector those Crown companies that no longer are required to ensure policy commitments, de Havilland Aircraft of Canada Limited was sold to Boeing Company of Seattle, Washington, early this year.

The sale has provided de Havilland and its workers with the most positive assurance of continuation, not only of employment but also the ability to remain in the forefront of its field through the promise of a world mandate in research and development of short take-off and landing (STOL) and commuter aircraft for Boeing Commercial Airplane Company.



Through the years since its establishment in Canada in 1928, Canada's oldest and most experienced aircraft manufacturer, de Havilland, has evolved into a fully integrated entity based at Downsview, northwest of Toronto. It now boasts over 200 000 square metres of production, design and office space and employs 4500 people.

4000 Aircraft

Since 1946, when the company designed its first wholly Canadian aircraft, de Havilland has built and delivered close to 4000 aircraft for use in more than 90 countries around the world.

De Havilland's Canadian-designed products include:

- the DHC-1 Chipmunk (216 built in Canada, 1600 built under licence in Europe);
- the DHC-2 Beaver (1631 produced);
- the DHC-3 Otter (466 produced);
- the DHC-4 Caribou (307 produced);
- the DHC-2 MKIII Turbo Beaver (60 produced);
- the DHC-5 Buffalo (120 produced);
- the DHC-6 Twin Otter (830 produced);
- the DHC-7 Dash-7 (107 produced);
- the DHC-8 Dash-8 (13 delivered to date and a full order book of over 40).

From the mid-1940s, through the next 25 years, de Havilland specialized in military and bush aircraft. Since the late 1960s, as the demand for military aircraft declined, the company responded to the demands of small commercial airline and charter operators with its current stable of commuter aircraft: the 19-passenger Twin Otter, 36-passenger Dash-8 and 50-passenger Dash-7.

As well as having its own work force, de Havilland currently does business with close to 1100 suppliers and sub-contractors from coast to coast in Canada.

To illustrate the employment potential of continuing sales to Canada, each Twin Otter represents 32.9 person-years of work, 165.6 for the Dash-7, and 112.7 for the Dash-8 at the company's facilities. And for every 100 jobs at Downsview, 70 others are created elsewhere in Canada.

Long History in Canada

While Boeing is an American-controlled company, it has had a long history in Canada. There are probably few Canadians who have flown to any great extent who, at one time or another, have not boarded one or the other of Boeing's fleet of commercial aircraft since the Boeing 727-200 entered into service in 1967.

This family of commercial jets includes the 737s, the 757s, the 767s and the 747s — the fleet's largest, carrying from 450 to 500 passengers up to 9800 kilometres (6100 miles).

In addition to de Havilland, Boeing has three other divisions in Canada, one each in Vancouver, Winnipeg and Arnprior, Ontario. Other Boeing personnel work in five cities providing field service support to Canadian airlines that operate Boeing jetliners. In all, these Boeing facilities employ over 1000 persons in highly skilled occupations tied to the leading edge of technology.

The Dash-8 is the latest in a long line of specialty aircraft designed and manufactured by de Havilland for Canadian and world markets.

The CITIZEN, OTTAWA • WEDNESDAY, SEPTEMBE

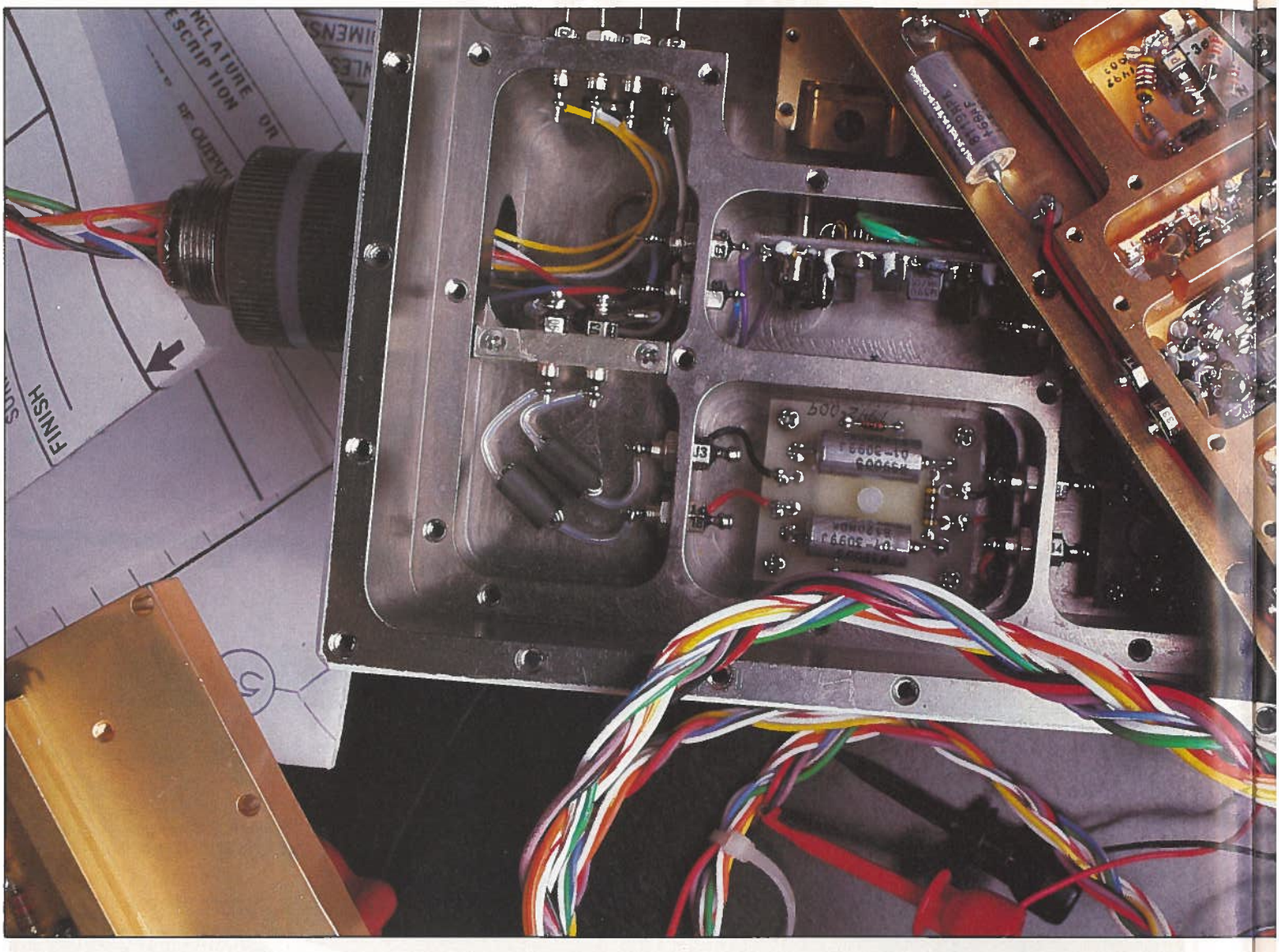
De Havilland lands record aircraft order

By Paul Koring
Southam News

FARNBOROUGH, England — Canada's de Havilland Aircraft Co. won its biggest-ever aircraft order Tuesday — the sale of six Dash 8 commuter aircraft to Henson Aviation, of Salisbury, Md.

Henson also took 18 options on the Dash 8, including six which may be applied to the larger, and yet to fly, Dash 8-300 which will seat 50 passengers compared to the 36 seats in the Dash 8-100.

If Henson takes up all its options, the deal worth $155 million and will give the company which feeds Piedmont Airlines [illegible] of de Havilland aircraft



Boeing plays a substantial role as a buyer of parts and services for incorporation into products that the company markets worldwide.

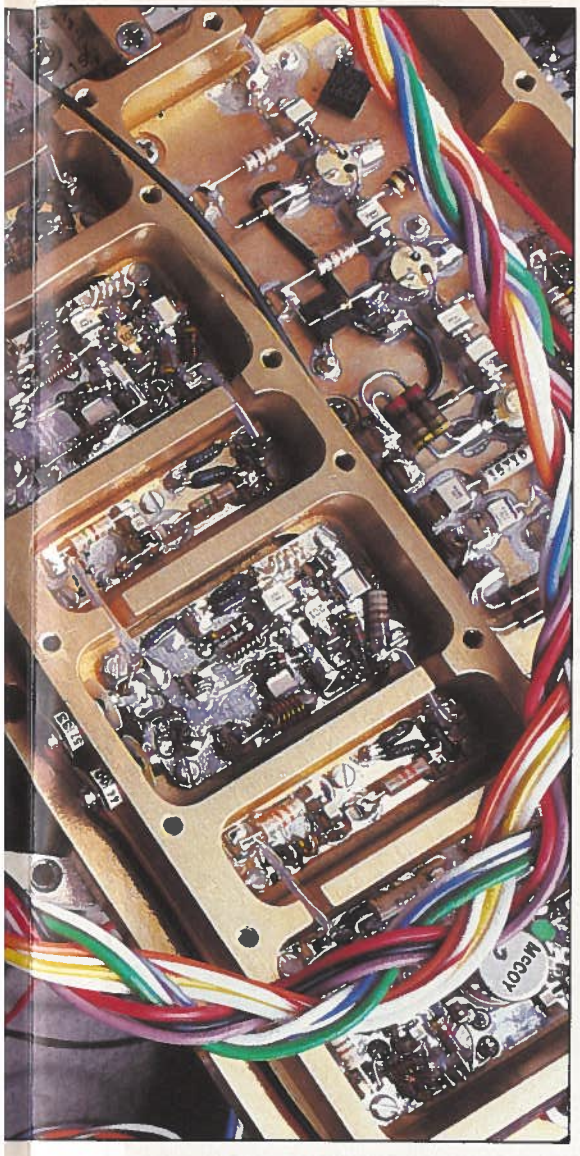
But Boeing's Canadian business involvement goes beyond its own facilities. Not only is it a supplier to Canadian firms and the Canadian government (160 jet transports delivered to air carriers and the Canadian Armed Forces, 21 helicopters for DND units), Boeing also plays a substantial role as a buyer of parts and services for incorporation into products that the company markets worldwide.

In the past six years, for instance, Boeing has placed $768 million in orders with companies in seven Canadian provinces. And recently, the company promised to inject a further $11 million annually into the Canadian economy with the announcement that its Winnipeg Division would become exclusive supplier of 24-metre-long, wing-to-body fairings for the 747 superjet.

This contract alone will create a further 250 jobs throughout Canada and is a direct result of the Boeing purchase of de Havilland.

All this is in addition to a $25 million package of new investments designed to upgrade de Havilland's capability to produce high technology composite material components for its own aircraft.

Prior to the de Havilland takeover, Canada was Boeing's fourth largest procurement source, but this is sure to change with this new inter-relationship and Canada is expected to catch up with some of the top three — the United Kingdom, Italy and Japan.



Connection Dates Back 66 Years

Boeing's connection with Canada is not a recent phenomenon. It dates back 66 years to the time when aviation was in its infancy, just 15 years after the Wright brothers' first powered flight. Because of the proximity of the two nations, it was natural that some of the first international aviation flights in the western hemisphere should be between Seattle, the home town of Boeing, and Vancouver and Victoria in British Columbia.

The first North American international airmail flight was carried out on March 3, 1919, from Vancouver to Seattle aboard a Boeing Model C biplane. The aircraft took off from Coal Harbour, B.C., carrying William E. Boeing, founder of the company, and his pilot, Eddie Hubbard, plus one mail bag. A 55-minute fuel stop at Edmonds, 19 km north of Seattle, made it an even three hours between the two cities, slow time by today's standards but faster than steamship or railroad of the time.

The following year, the pilot of the Vancouver-Seattle flight began the first U.S. international contract airmail service using a Boeing B-1 flying boat. But it wasn't until 1929 that Boeing arrived in Canada as a business entity.

In May of that year, Boeing Aircraft of Canada came into being when the company acquired the assets of Hoffar-Beeching Shipyards Ltd. of Vancouver, the largest builder of pleasure boats on the Pacific Coast.

In the early 1930s, such diverse aircraft were built there as Seattle-designed Boeing Model 204 flying boats — Canadian designation "Thunderbird"; the Canadian-designed Boeing "Totem" flying boat; Boeing "Steel-truss" gliders; and Boeing Model 40 mail planes also designed in Seattle.

However, the Great Depression's pall lowered over Boeing Aircraft of Canada's airplane building operations. It was not until 1937 that aircraft construction was again added to boat and shipbuilding and aircraft overhaul and repair. A modern plant was built at Sea Island Airport, present site of Vancouver's international airport.

The first product was the British-designed Blackburn "Shark" torpedo aircraft for the Royal Canadian Air Force, of which 17 were built as the war clouds gathered.

Wartime Production

With the coming of World War II, activity at Boeing Aircraft of Canada increased.

- Thousands of wing spars for Avro-Anson twin engine reconnaissance and training aircraft were fabricated.
- About 2000 tail surfaces were constructed for de Havilland "Mosquito" bombers and fighters.
- There were 307 Consolidated "Catalina" flying boats and amphibians built, as well as important subassemblies for Boeing B-29 bombers.
- Overhaul and repair work on RCAF aircraft was also carried out.

Peak wartime employment in the three Vancouver-area plants reached 10 275.

With the war over, the Sea Island plant was sold and, in 1953, Boeing Aircraft of Canada was dissolved as a Boeing subsidiary.

In 1960, Boeing reappeared in Canada as Boeing of Canada Ltd. Its forerunner was Piasecki Helicopter of Canada, established in May 1953 for repair and overhaul of helicopters sold to the Canadian government. It became Canadian Vertol Aircraft Ltd. and in 1960, following acquisition by Boeing of Vertol Aircraft Ltd., a helicopter manufacturing company, it became Boeing of Canada Ltd. (BCL).

Arnprior Division

Situated in Arnprior, Ontario, some 80 km west of Ottawa, the Arnprior Division of BCL continues to provide overhaul and repair service for Canadian Armed Forces helicopters and, in addition, manufactures precision parts for helicopters and fixed-wing aircraft, with almost 50 percent of the product marketed outside Canada.

Current business at the Arnprior Division is keeping 345 highly skilled employees occupied in making helicopter blade lag-dampers and other high-precision parts for the aircraft industry.

Division facilities are now being upgraded under a five-year, $10-million program designed to keep pace with advances in technology and to maintain and improve productivity. The division is now pursuing a U.S. Navy qualification program in order to secure additional navy business.

Winnipeg Division

A decade after Boeing's reappearance on the Canadian business scene, a joint announcement by the Government of Canada and Boeing revealed plans to build new facilities in Winnipeg. In 1971, the Winnipeg Division began operations in a new $3.5-million plant staffed by 57 employees. By 1973, employment had risen to 300, producing high strength-to-weight-ratio fibre composite plastic components for aircraft, spacecraft and other advanced technology applications.

The division has the engineering, manufacturing and development expertise to design and build solid laminate or sandwich panel components. Glass, high-modulus graphite and organic fibres, and thermo-setting resin systems are used.

The division produces both structural and non-structural glass fibre and advanced fibre composite components for a diversified range of products from aircraft to satellites. It is currently working with the Department of National Defence (DND) on the development of new-generation aerial targets to satisfy training requirements associated with state-of-the-art defence weapons now in use. These target systems offer world market potential.

Sales for the most recent fiscal year were $27.2 million, of which the greatest portion was contributed by aerospace products. The manufacturing facilities total 14 700 m^2 on a 51-ha site adjacent to Winnipeg International Airport, plus an additional 10 000 m^2 of nearby leased space. Current employment is 637.

An intensive research and development program, along with increased tool design and fabrication capability, is aimed at establishing the Winnipeg Division as a primary composites manufacturing organization within Boeing, and a Canadian leader in the field.

BCS Canada

In 1974, Boeing acquired Tennant, Song and Associates Ltd. which, as Boeing Computer Services of Canada Ltd. (BCS), markets a full range of computer services from its headquarters in Vancouver and offices in Calgary and Toronto. BCS Canada's customers include government departments and agencies, large companies in the private sector and, in Calgary, some major oil companies.

According to its Canadian president Norman Sung, BCS Canada, like other Boeing establishments in Canada, enjoys the benefits of "being a component of a large, successful, well-managed, leading-edge, multinational corporation, along with the prestige which this association implies."

Natural Partners

While Canada and de Havilland have benefited, and will continue to benefit, from the international sales and financial clout of its new parent, Boeing, in turn, will benefit from de Havilland's acknowledged leadership in STOL and commuter aircraft, a niche not previously filled by the parent company.

All in all, Boeing and de Havilland seem to be "natural partners" in the highly competitive international market for commercial and military aircraft and in retaining for Canada niches in the broader fields of high technology.

Editor's Note: See the following story about another Boeing service that could prove beneficial to a wide range of Canadian companies.

Boeing Technology Services

Technical Expertise on Tap

Boeing solved a problem of extreme temperature changes for the space telescope by developing a lightweight, durable, graphite-epoxy material able to support three tons of instruments during launch or re-entry.

CANADIAN suppliers and industries have gained an important plus in the higher profile of Boeing Technology Services (BTS) in Canada, one result of the recent purchase of de Havilland Aircraft of Canada Limited by Boeing Company of Seattle, Washington.

While primarily established to provide Boeing companies with research and development and testing facilities for leading-edge technology in the aircraft business, Boeing Technology Services has developed into one of the largest and most progressive private research facilities in the world.

BTS is one of two subsidiaries of the Boeing Corporation involved in marketing corporate technology. Patents or products created as offshoots of the corporation's aeronautical business are sold via Boeing Associated Products Ltd.

BTS operates as a consulting operation with responsibility for technical services in problem resolution. While BTS provides revenue from services rendered, it is also considered a generator of goodwill in supporting aircraft sales and certifying suppliers, both directly and indirectly. According to C. Scott Church, president of Boeing Technology Services International, an offshoot of BTS, it is this that has interested senior management in selling corporate services, particularly if advanced technology is involved.

Thus, with Boeing's increasing presence in Canada, it is more than likely that increased efforts will be made to promote and sell BTS services to both its suppliers and other Canadian industries.

The company has had several contracts in Canada, most notably in working with Canadair on the Challenger's nose gear, with Pratt & Whitney on a flying test bed which allowed engines to be tested on aircraft, and in the provision of laser measuring technology to MacMillan Bloedel Ltd. for one of its sawmills.

Church emphasized that BTS is prepared to certify new Canadian suppliers to Boeing. They will be placed on Boeing's approved suppliers list and invited to bid on tenders. Boeing certification is recognized by aeronautical firms throughout the world.

But, BTS goes far beyond both certification and the aeronautical field.

BTS can authenticate a Rembrandt, find a few metal particles in a truck load of ground beef or determine whether a siren and top light will blow off a police car. More than 1000 different customers have asked for solutions to these and many more mundane problems since BTS was organized in 1972.

BTS contracts with companies or individuals (and they need have no relation to the aerospace industry) to solve their problems by finding the right experts in the right discipline at Boeing.

"You don't have to be an aerospace conglomerate to come to us," Scott Church emphasizes. "We have provided cost-effective solutions for jobs as small as a $500 materials testing request. Of course, we have also helped with multi-million-dollar manufacturing programs."

Many of its aerospace customers, such as NASA, Pratt & Whitney, Canadair and Martin Marietta, come to BTS routinely, but the customer list also includes Ford Motor Company, General Motors, Weyerhauser and the U.S. Coast Guard. However, most of the customers are smaller, specialized firms.

"Most people aren't aware of all the varied resources Boeing must maintain to produce its high-technology jetliners, space vehicles and electronic systems," Church says.

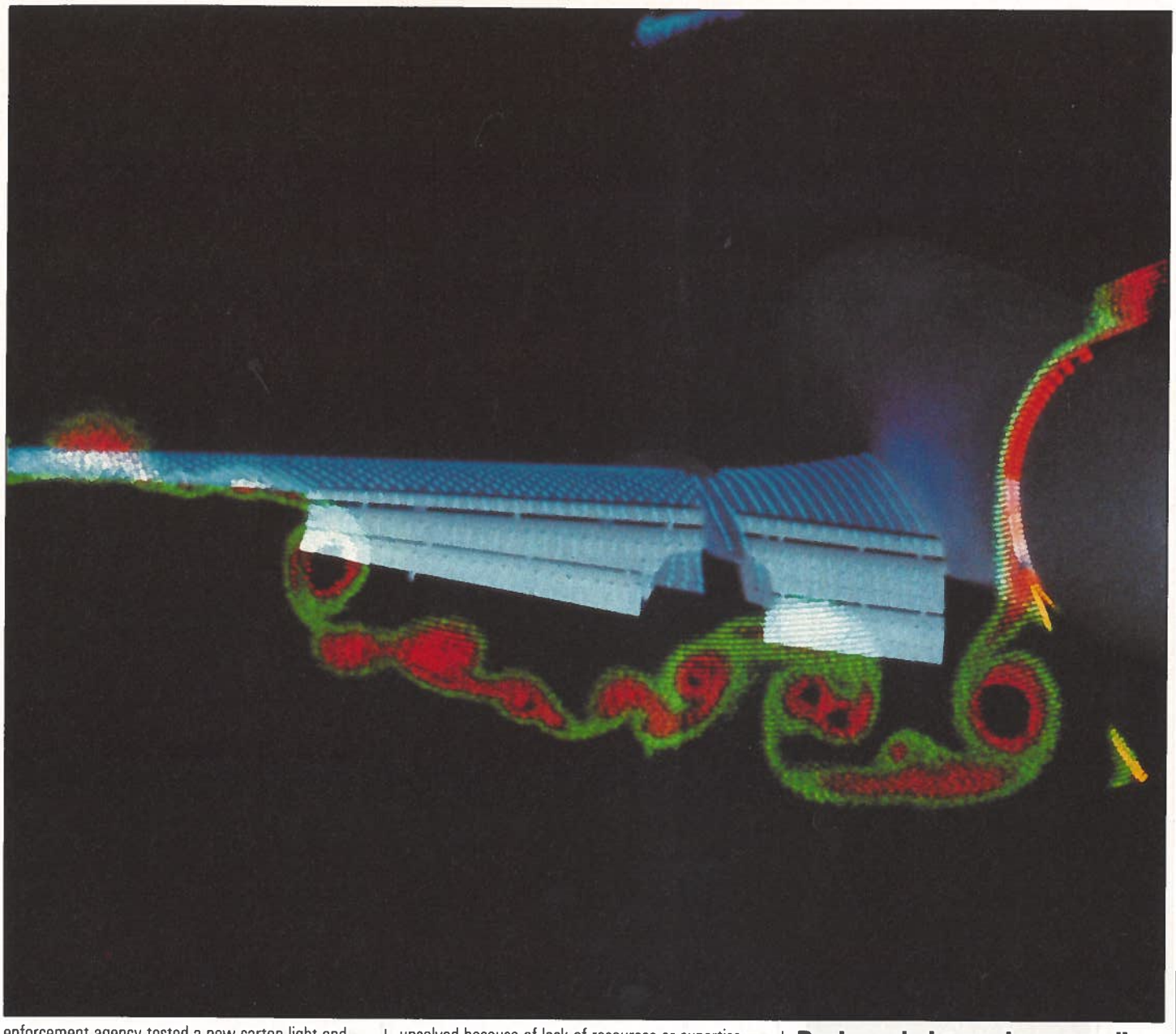
Some of these are:

- the largest privately owned wind tunnel complex;
- state-of-the-art material testing facilities;
- centres for research into environmental, noise, propulsion, structures and manufacturing problems;
- special software for inspection systems, CAD/CAM programs and software development consultation.

Most of the contracts require the use of Boeing's Materials Laboratory which contains more than $50 million worth of inspection and testing equipment for materials qualification and analysis. It was in this laboratory that the Rembrandt was authenticated. Currently, the lab is heavily involved in composite development.

The Boeing Aerodynamic Laboratory is not only physically the largest privately owned wind tunnel complex, but it also provides the support facilities, personnel and expertise necessary to design and run specialized tests. Normally these tunnels are filled with aircraft models, but they have been used to test other pressure-sensitive items.

Tunnels available include test sections from 10 cm by 10 cm to 2.4 m by 3.6 m, speeds from 80 to almost 40 000 km per hour and run times from 20 seconds to continuous. From these alternatives, tests can be tailored to meet almost any conceivable requirement or budget. It was here that a local law



enforcement agency tested a new cartop light and siren design.

The Boeing Acoustical Laboratory is also among the most advanced in the world. Primarily used to reduce engine and aerodynamic noise for jetliners, it can be used to perform tests and aid in design analysis and vibration control on virtually any noise-sensitive product. Community and industrial noise surveys are other areas of Boeing expertise.

Almost anything and everything can be tested by Boeing's environmental test resources. These have checked out a Boeing 747's communication system, an icebreaker propeller and the effects of fire and smoke. Atmospheric chambers and hydraulic and mechanical labs are just some of the facilities.

A relatively new business for BTS is the sale of application software developed within Boeing Commercial Airplane Co. According to BTS marketing manager, David Richardson, "Our programs, developed in the Flight Simulation Lab, can be a tremendous benefit to the aviation industry, covering fields from crew training, avionics design and integration to weather and environmental modelling."

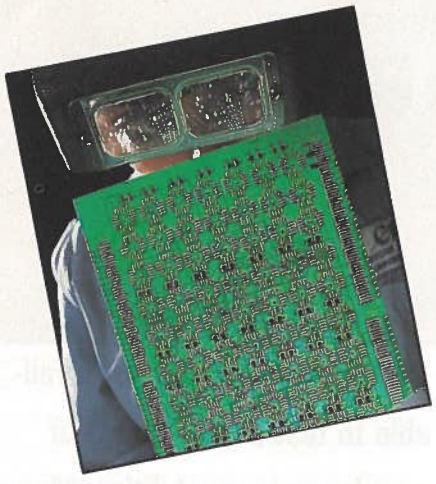
Church says, "We find it rewarding to help others solve technical problems that might otherwise go unsolved because of lack of resources or expertise.

"But sale of our technology also benefits us. Not only does it provide revenue, but we gain experience and knowledge from solving problems in non-related industries. Also, it lets us exercise our skills during times of low design and development activity in-house."

For more information, contact: David R. Richardson, Marketing Manager, Boeing Technology Services, Box 3707 (M.S. 9R-28), Seattle, WA 98124, U.S.A., Telephone: (206) 237-4490.

Boeing wind tunnels are available to test a wide range of aerodynamic capabilities. Many problems can be solved through computer-based simulation without the added expense of modelling.

Canadian Marconi Company



A leadless chip carrier board (LCC) printed circuit board at one of many inspection stages.

EVEN after more than 80 years in the communications business, Canadian Marconi Company (CMC) still maintains its pioneering spirit in the highly competitive and innovative fields of high-technology electronics and communications.

The company was founded in 1903 by Guglielmo Marconi, the genius who engineered and received the first trans-Atlantic wireless signal at Signal Hill, outside St. John's, Newfoundland, in December 1901.

From its roots in maritime wireless communication, broadcasting (CFCF-Montréal was one of the world's first commercial radio stations) and consumer market radio and television, the company has developed into one of the world's foremost manufacturers of high-tech electronics and communications equipment.

General product categories encompass avionics, tactical communications radar, specialized electronic components and telex systems.

CMC's operations are divided into two major management groups. The Communications Group includes the Defence Communications and Special Services Divisions; the Electronics Group comprises the Avionics, Components, DataComm Products and Radar Divisions.

Marconi's wholly owned U.S. subsidiary, CMC Electronics Inc., complements CMC's activities in product development, sales and systems support.

CMC is a publicly held Canadian corporation, with The General Electric Company p.l.c. of Great Britain holding 51.6 percent of outstanding shares.

Since 1903, the company's executive offices and main manufacturing facilities have been located in Montréal. In 1982, a second facility was established in Kanata, Ontario, and now houses the Radar and DataComm Products Divisions, and selected avionics engineering and development programs. Also based at Kanata is the production of ground-based navigation equipment, such as microwave and instrument landing systems.

The defence agencies of some 20 countries rely on CMC's military avionics products.

The CMA-730 line of opto-electronic engine instruments has set a standard for the aerospace industry and their performance has led the U.S. military to select them for the Mohawk, Apache, Seahawk, Ahip and Blackhawk helicopter programs. A new version, using LED crystal display (LCD) technology, is also available.

Some 5000 CMC Doppler radar navigation systems are in use around the world. CMC's global positioning system receivers, which will receive transmissions from the U.S. Air Force's Navstar satellite constellation, have recently been introduced. A newly developed airborne MLS receiver, exceeding U.S. military requirements for the equipment, is now in production. CMC has received a contract to develop and manufacture the operator's display console for the Trinity gun system manufactured by Bofors Ordnance of Sweden.

CMC has designed command, control and communications systems for various countries around the world. CMC's AN/GRC-103 line-of-sight radio is the most widely used in the western world, with 14 000 sold to date. The new CMR-104 is a compact digital UHF multi-channel radio for tactical environments.

The company's AN/TRC-180 radio terminal set, a communications shelter containing three radio/cable/multiplex stacks, has been delivered to the U.S. Army for evaluation. Recently, CMC signed a contract with GTE for the provision of tactical radios for the multimillion-dollar MSE contract.

Major international corporations, including the top 10 North American aerospace manufacturers, specify

Wireless Pioneer Still Leads in High-Technology Communications

CMC components for their avionics, defence communications, airborne early warning and guidance systems, and other strategic equipment.

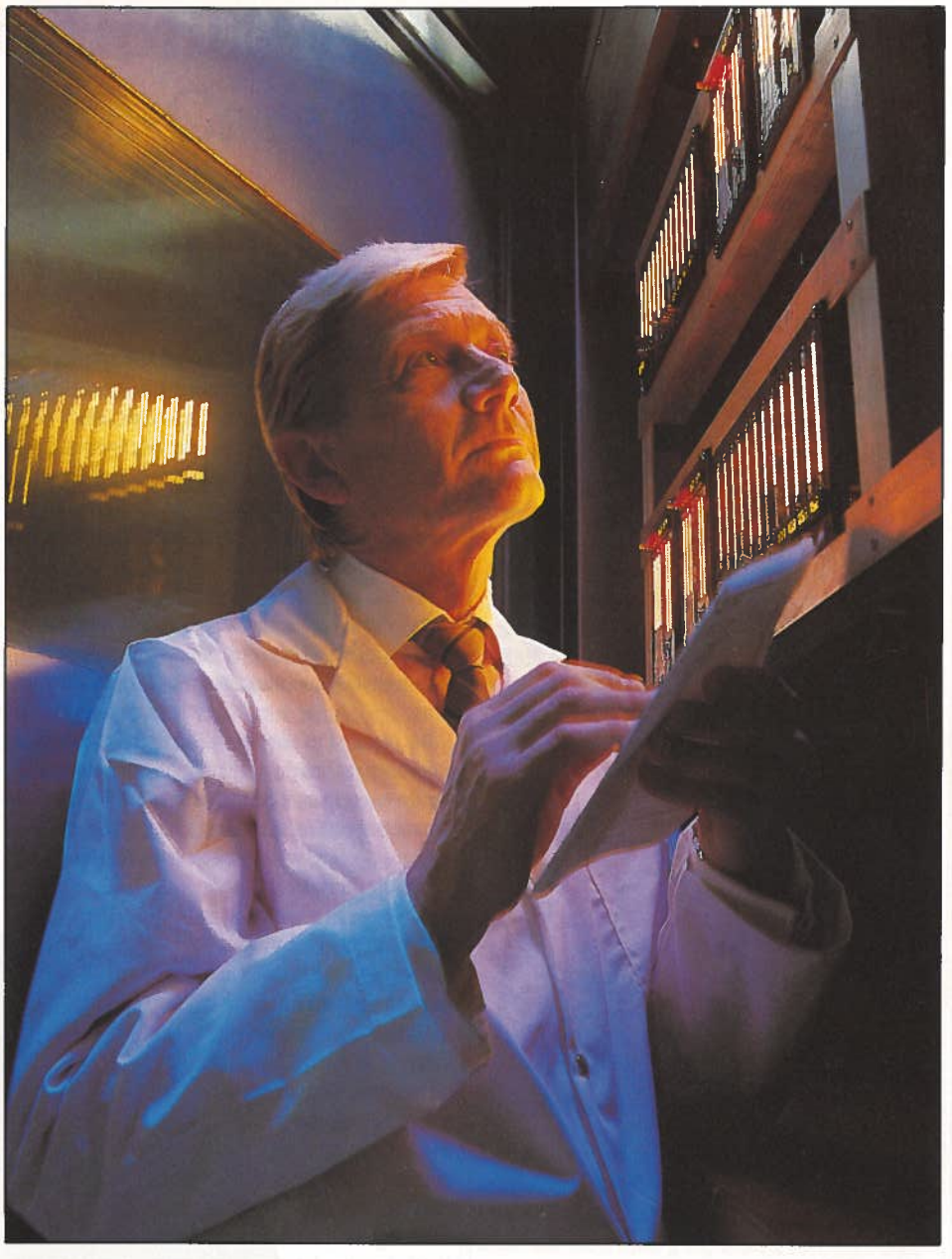
CMC's customized printed circuit boards, hybrid microcircuits, illuminated panels, night vision goggle (NVG) compatible displays, power supplies and machined parts form the core of many high reliability systems. Hazeltine Corp. has ordered CMC power supplies for its MLS ground stations destined for U.S. airports.

CMC's AN/SPS-503 medium-range surveillance radar was developed for the Canadian Destroyer Life Extension (DELEX) program, and is available for adaptation to various craft. The company's LN-66 surface search radar is in use on most U.S. military ships, from river patrol craft to aircraft carriers. Current R&D activities encompass a C-band radar and a range of products associated with the AN/SPS-503.

CMC's DataComm Products Division developed the CMA-755 telex and low-speed data exchanges for the upgrading of Britain's inland telex network. The $50-million contract, calling for the installation of some 60 000 telex line terminations in 10 British cities, was the largest ever awarded in the field. All the exchanges are now in service, and a series of expansions at the Keybridge exchange in London is under way.

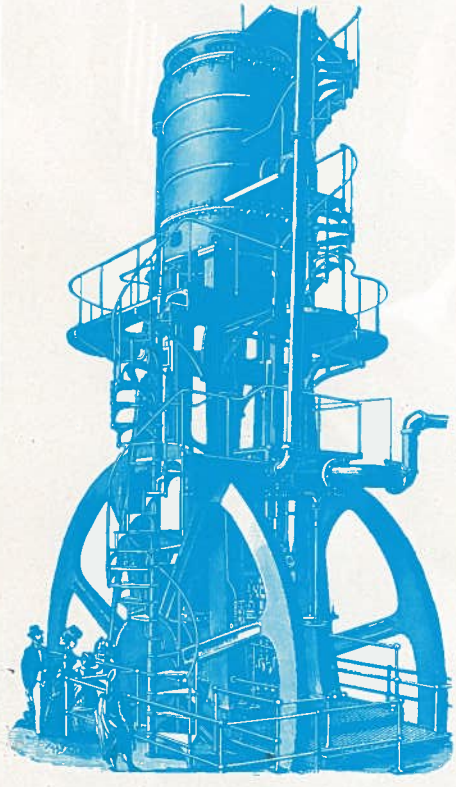
The Special Services Division is involved in specialized work for customers such as the Canadian Department of National Defence, including repair, calibration, equipment installation and testing for the CF-18 fighter aircraft, as well as repair and overhaul of airborne radar and navigation aids.

For further information, contact: Canadian Marconi Company, 2442 Trenton Ave., Montréal, Quebec, H3P 1Y9, Telephone: (514) 341-7630.



A complete helicopter engine instrument system is about to undergo repetitive temperature cycling to detect weaknesses in components or fabrication before delivery to the customer.

Why Automate?



FAR too many companies are still viewing automation as a means for labour content reduction. This is a rather myopic view, satisfying no one and upsetting many.

In the recently published report *Factories of the Future: Defining the Target* of the U.S. National Science Foundation, four major trends were identified in the advanced manufacturing industries.

The first major trend is a push for speed. The total manufacturing cycle from design through delivery must be reduced by an order of magnitude — not an incremental improvement, but rather a qualitative jump.

The pressure to eliminate all unnecessary delays is motivated not only by the desire to provide better service to customers, but also by a need for better control and cost reduction. For example, capital equipment items, which on an average take six to 12 months to make in Canada or the U.S., take six to 12 weeks to make in Japan.

The second major trend is the need for flexibility. The range of the manufacturing systems and all hardware and software must be greatly extended in order to accommodate the variations that will become accepted as normal.

Equipment must be versatile so that its cost can be amortized over many different products. The time and effort in set-ups must be reduced to the point where they are not a factor in costs; very small batch sizes can then be economic.

Average set-up time in metal stamping industries in North America, for instance, is somewhere between two and 12 hours, depending on the size of the dies. Many Japanese firms do this in two to 12 minutes. Again, the difference is not incremental — it is one of an order of magnitude.

The third large trend is the transition to more machine intelligence. The entire manufacturing system must escape from its current reliance upon human interpretation or individual judgement, starting with management of the enormous quantities of data that organizations deal with and gradually moving past data into information, and from information into knowledge.

It will not be sufficient to capture human expertise in expert systems, because the intuitive methods of people (while often surprisingly effective) are too prone to error, too slow and arbitrary to provide a basis for good control of tightly coupled, complex and fast-moving systems.

Finally, the integration of technologies is crucial.

Advances in narrow, highly specialized fields of research will only be wasted if bottlenecks at the interfaces impede productivity. No organization will be able to gain the full benefit of known technologies unless they fit together in an elegant, graceful way.

Furthermore, the kind of integration that will produce the greatest benefit in the future is not a "paste-together" band-aid kind, but rather a well planned "rebuild-from-common-foundation" kind.

The difficulty of getting individuals and companies to pay serious attention to issues of integration should not be underestimated, for it is a reversal of a historical trend towards segmentation and specialization.

Manufacturing is a complex system. For many years it has been run as a large system with many human beings fine-tuning it with mountains of paper.

Some case studies showed that 30 to 50 pieces of paper were needed to move one part through the manufacturing process. The development of each piece of paper, with the corresponding data or information contained on it, represented cost, time and possibility of error. It represented communication problems.

So long as competition and new technologies did not disturb this complex system, it was just a matter of fine-tuning the existing system in order to be competitive.

Management paid attention mainly to bottlenecks or fire-fighting. There was no need for a long-term view as to where the company was and where it was going. To make matters worse, manufacturing for many years was considered a "second class citizen". To work in manufacturing was not considered very prestigious.

This changed almost overnight. On the one hand, competition is pushing us into faster, more accurate and less costly ways of doing things, while improving quality at the same time.

On the other hand, new technologies, such as computer and microprocessor technologies, are allowing us to do all of these and other things we only dreamt about a few years ago.

Automation is not a way of reducing labour content. It is a totally new way of doing business from planning, marketing, product development through manufacturing and distribution to servicing the product. All of these and more have to be re-thought with a totally new concept and perspective in mind.

Automation is the only alternative, considering the new demands for new, better and cheaper products moving into the marketplace faster, and the consequent need for increased speed, flexibility, machine intelligence and integration.

The survival imperative has become the automation imperative. As someone put it succintly: liquidate or automate! There is no way back.

For further information, contact: Peter A. Urban, Managing Director, Computer Integrated Manufacturing (528597 Ontario Limited), P.O. Box 7317, 1276 Sandhill Drive, Ancaster, Ontario L9G 3N6; Telephone: (416) 648-5011.

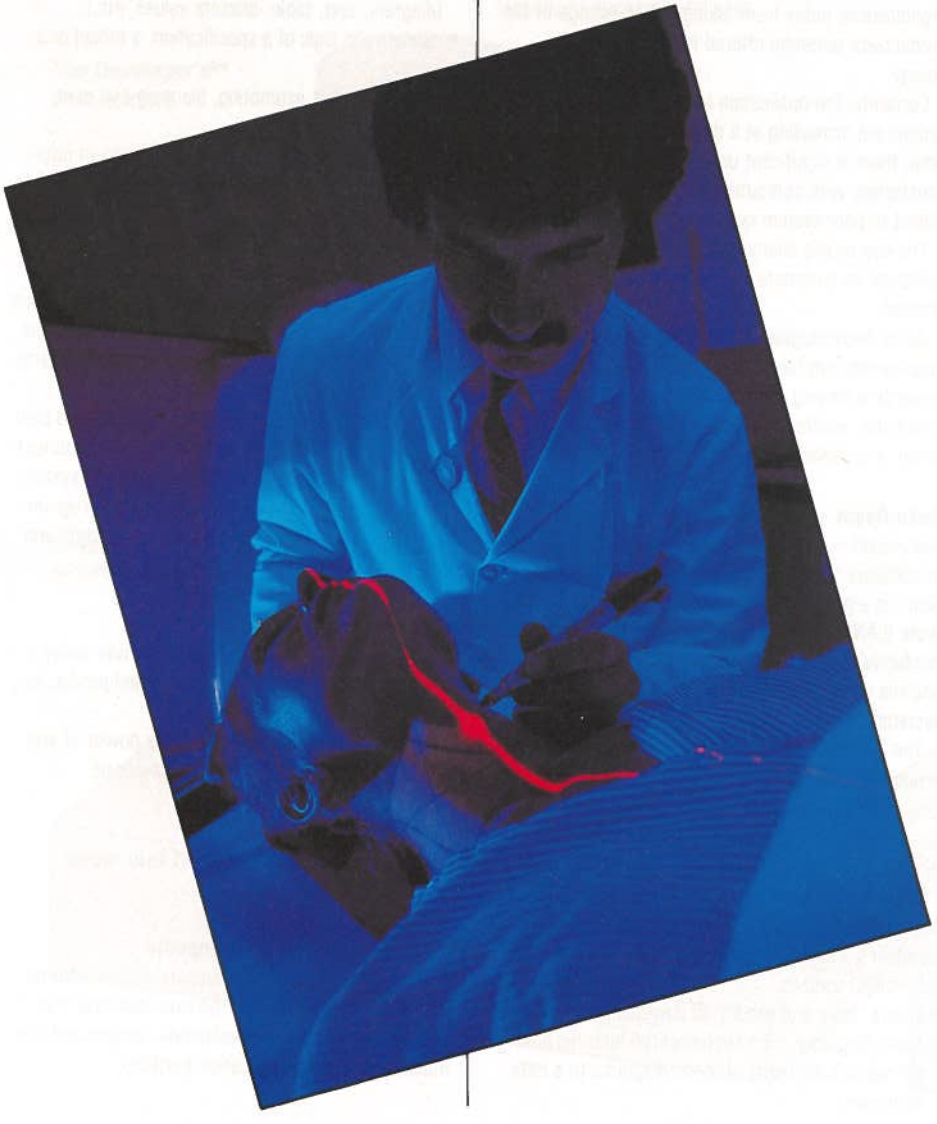
The Search for New Life-Care Products

BIOS

IN the past 60 years Canadians have provided the world with insulin, contributed to the polio vaccine, developed the first practical cancer diagnostic test (carcino embryonic antigen — CEA), introduced improved bone fracture healing techniques through continuous passive motion devices and created Pablum, that mainstay of early life for young Canadians.

Today, more than $400 million worth of biomedical research and development is undertaken in Canada each year. Universities and corporations are constantly seeking to understand and treat disease, provide better vaccines and disease controls and improved hospital and home care.

Biomedical Investment Opportunities Services (BIOS) Inc.'s business is based on the reputation of Canada's major biomedical contributions, and the opportunities for future contributions that will evolve from the annual outlay on health care research and development. This level of activity is built on both the internationally recognized research ongoing in Canadian hospitals and universities and on the number of specialized corporations providing biomedical services and products to world markets.



BIOS recognizes that health care companies worldwide are looking outside for new product opportunities and human resources to complement internal resources.

BIOS introduces the high-calibre medical researchers in universities and small biomedical companies in Canada and their promising projects to international health care companies involved in developing new products and services.

The company visits researchers, institutions and companies from coast to coast to discuss current projects and the information on each project is condensed into a two page "listing". This non-proprietary listing is reviewed and approved by the individual researchers and their employers prior to its controlled release to BIOS subscribers.

Companies and individuals providing information to BIOS do so free of charge while BIOS receives its compensation from its subscribers in the form of annual subscription fees.

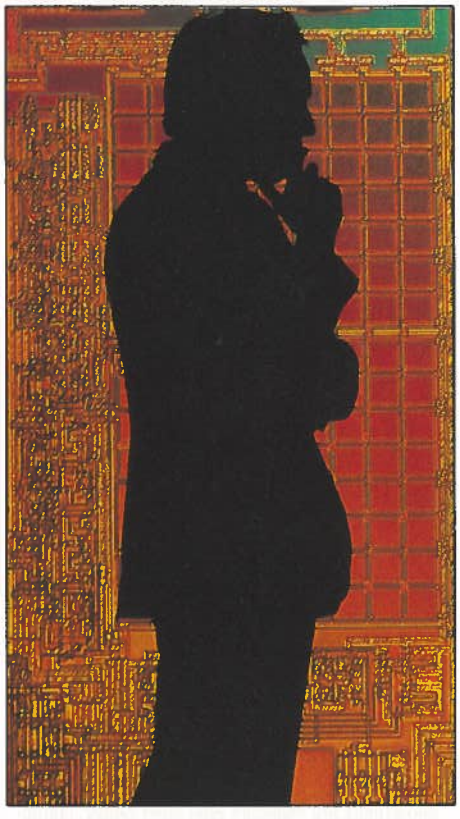
BIOS directs its subscribers to licensing, acquisition, joint ventures and other immediate investment opportunities. Subscribers deal directly with the new-product innovator. In one call, discussions begin. If a subscriber and a listed group make a deal, BIOS does not participate.

Subscribers are investors who need timely, continuing coverage of new products in health, personal and animal care, and food production. They are business development managers, licensing officers, new product champions, venture capitalists, investment dealers, regional brokers and major life-care companies like Connaught, Kodak, DuPont, Ciba-Geigy, Cyanamid and Miles Labs.

BIOS is currently expanding its services and now lists opportunities found in Canada and the U.S. European opportunities will be added. Current subscribers are based in North America, but will include European and Japanese groups this year.

For further information on subscriptions or to announce your opportunities through BIOS contact: John Fraser, BIOS Inc., 7 Sultan Street, Toronto, Ontario M5S 1L6;
Telephone: (416) 967-5852.

New Key to Meet the Productivity Challenge in Systems Development



CURRENT computer technology offers unprecedented potential for increased productivity in both private industry and government organizations.

Our ability to capitalize on this potential, however, depends on our ability to develop the required software to take full advantage of this technology.

On the other hand, software development has, up to now, been very labor intensive. In fact, the productivity of the software professional has only increased marginally over the past twenty years. This represents the major road block preventing most organizations today from taking full advantage of the productivity potential offered by computer technology.

Currently, the application backlogs in most organizations are increasing at a dramatic rate. At the same time, there is significant user and management dissatisfaction with computer systems which can be traced to poor system quality and maintainability.

The key to this dilemma is to tap the power of the computer to automate the systems development process.

Asyst Technologies inc., a Montréal-based software engineering firm has recently set a new milestone towards achieving this objective by announcing The Developer, another product within its Auto-Asyst family of software tools.

Auto-Asyst — The Developer

Auto-Asyst — The Developer — is an integrated set of software tools running on an IBM PC or equivalent, in a portable, stand-alone and/or local area network (LAN) environment. It significantly increases the productivity of systems development professionals and the quality and maintainability of the resulting systems.

The Developer supports the systems development process, from the initial stages of information systems master planning through ongoing maintenance of an organization's software applications and documentation.

More specifically, The Developer provides automated support for most aspects of the analyst's, designer's and project manager's work. It is a powerful product used to:

- create, store and modify all flowcharts and structured diagrams, with sophisticated features linking the various elements of these diagrams to a data dictionary;
- manage all cross-references between elements, identifying which processes use which data, which programs use which files, etc.;
- store and access all elements related to the same application (or project) whatever their format (diagram, text, table, discrete values, etc.);
- validate the logic of a specification, a model or a system;
- assist in project estimating, planning and management;
- store and control the thousands of items of information needed to develop and maintain an application portfolio.

A Solid Architecture

The value and potential of a commercial development (e.g., a new office complex) is closely related to the quality of its architecture and engineering. The same can be said of a software product.

The Developer was architected, designed and built using the most up-to-date software engineering techniques and methodologies, such as data and system modelling, structured analysis, design and programming, as well as the latest ergonomic concepts and user interface design.

This results in:

- features, power and flexibility to answer today's requirements for increased quality and productivity in systems development; and
- an architecture to capitalize on the power of artificial intelligence for tomorrow's systems development.

The Developer is made up of four major elements:

The Development Encyclopedia

A powerful data base that supports all the information elements required for the execution and management of a systems development project and the maintenance of an application portfolio;

The Workbench Tools
Constitutes the foundation that supports and links all the other modules together. It consists of the following interfaces:

- the User Inferface;
- the Encyclopedia Interface;
- the Import/Export Functions.

The Customizer
It enables each Auto-Asyst installation to adapt the product to its own environment, standards and practices.

The Experts and Asystants
The Experts execute professional and project management tasks to replace work while the Asystants assist the professional and project manager to perform other tasks that cannot be automated in the most productive manner.

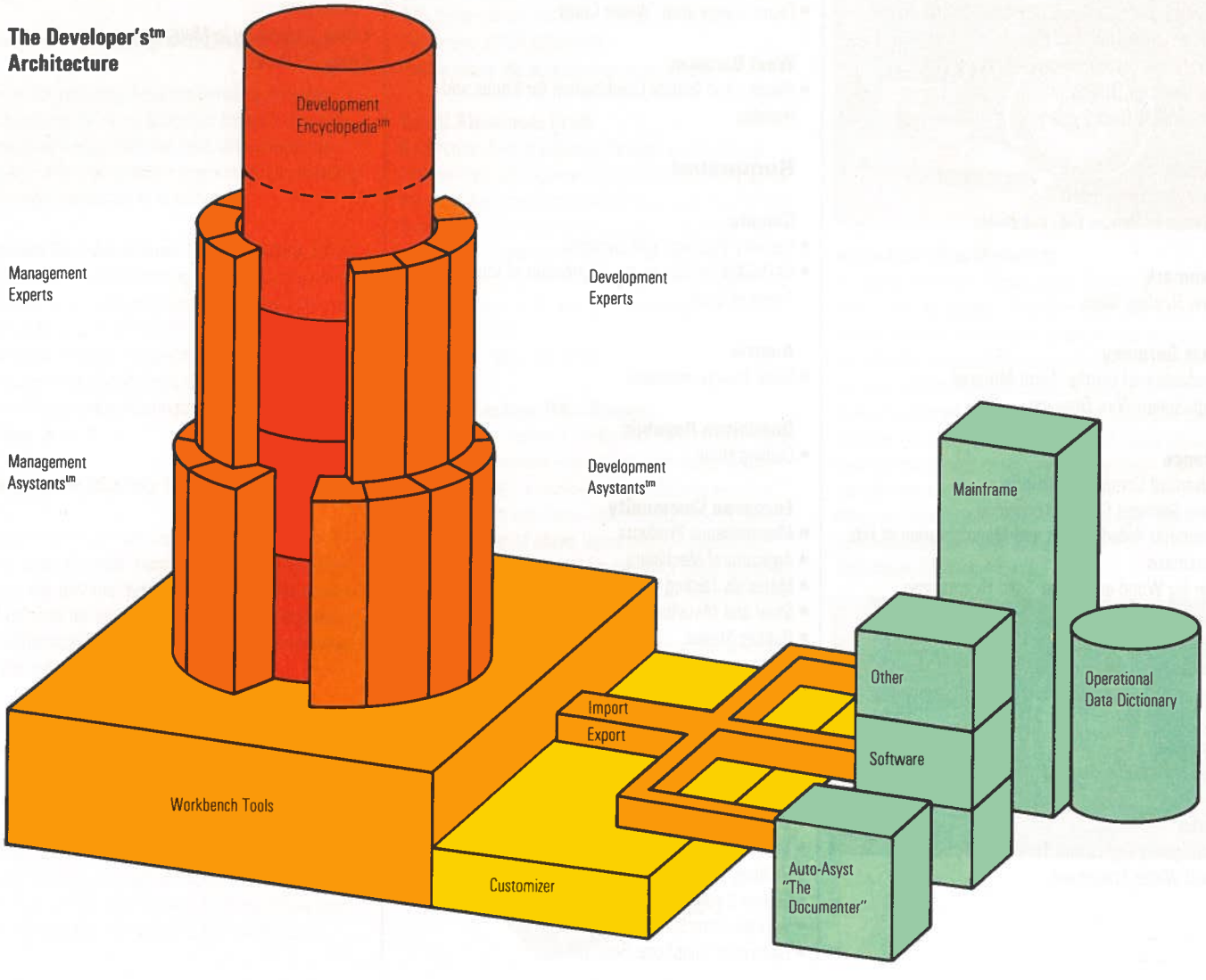
Each set of components has its own specific structure and functions, and communicates with other components through standardized interfaces.

This modular approach enables Asyst Technologies inc. to easily evolve the product at minimal cost to its customers. It also enables rapid incorporation of the latest technologies and software development techniques and methodologies.

Asyst Technologies inc.
Asyst Technologies inc. is a member of the Atkinson Tremblay Group, a leader in information systems architecture and engineering. Another member is Atkinson, Tremblay & Assoc. Inc., a consulting and systems development firm offering a variety of services in major North American cities.

For more information on Auto-Asyst, write:
Asyst Technologies inc.
1080 Beaver Hall, Suite 1400
Montréal, Quebec H2Z 1S8
Telephone: (514) 871-0108

The Developer's[tm] Architecture



Technology Transfers

Offered

Canada
- Charged Particle Detector
- Atmospheric Air Sample Collection Device
- Improved Zinc-Aluminum Casting Alloy
- Apparatus for Heating Granular Materials
- Ceramic Materials with Enhanced and Predictable Resistance to Fracture
- Purification of Hemoglobin and Modified Hemoglobin by Affinity Chromatography
- Small Aluminum Craft
- A Multi-Tasking DNC Coupler
- Gas Nitriding Process
- Autoskate Aids Motorists
- Device Detects Internal or External Corrosion in Carbon Steel Tube and Pipe
- Ultra-Sonic Instruments and Probes
- Ball Joint for Drilling
- Kitchen/Bar Rack System

Britain
- New Soft Drink/Tonic
- Process to Renew Old, Used Files

Denmark
- New Roofing Slate

East Germany
- Production of Leather Fibre Material
- High-Speed Wire Drawing

France
- Advanced Composite Material
- New Garment Cutting Technique
- Computer-Aided Design and Manufacturing of Hip Prosthesis
- Kiln for Wood and Other Solid Hygroscopic Materials
- New Tangential Filtration Process
- Automatic Sampling of Bulk Materials
- Instantaneous Assessment of Metal Structures

Iceland
- Geodesic Dome Construction System

India
- Emergency Lights and Torches
- Feed Water Treatment

Israel
- Immunohistology and Veterinary Diagnostic Kit
- Technology Enhancement for Solar Cells
- Veterinary Diagnostic Kits
- Mobile Real-Time X-Ray Screening System
- Real-Time X-Ray Vehicular Screening System
- Optical Elements for Infrared Systems
- Food Irradiation
- 4-Fold Stretcher

Switzerland
- Universal Pipe Joint Concept
- High-Energy Concentrate for Dairy and Beef Cattle

U.S.A.
- Clean Energy from Waste Coals

West Germany
- Plastics and Metals Combination for Knobs and Handles

Requested

Canada
- Security Products and Systems
- CAD/CAM for Use in the Fabrication of Various Types of Craft

Austria
- Wind Energy Recovery

Dominican Republic
- Cooling Units

European Community
- Miscellaneous Products
- Agricultural Machinery
- Materials Testing Equipment
- Steel and Metallurgical Products
- Rubber Sheets
- Photometric Material

India
- Light Assembly Die-Castings
- Solar Heating Devices
- Pre-fabricated Buildings
- Cranes, Material Handling and Industrial Equipment
- Microwave Ovens
- Building Chemicals
- Energy Systems and Devices
- Wireless Intercom
- Electronic Telephone Receivers

Ireland
- Industrial Maintenance Products

Kenya
- Renewable Energy Devices

Nigeria
- Bricks

Switzerland
- Miscellaneous Machinery and Equipment

West Germany
- Chemical Specialties and Additives
- Manipulation Systems, Hydraulic Controls and Actuators
- New Technology in Magnetics
- New Products

Offered

Canada

Charged Particle Detector 7838
This detector of secondary charged particles is capable of analysing relatively large specimens in electron, ion or particle probe instruments, such as scanning electron microscopes, mass spectrometers, X-ray detectors, light detectors, back scattered electron detectors, secondary electron detectors, energy spectroscopes, electron energy analysers, Auger analysers, etc. The particular advantage of this device is its long lateral 'reach' into confined or cluttered spaces such as that between the final lens of a scanning electron microscope and a large planar specimen.

Atmospheric Air Sample Collection Device 7887
A device for collecting environmental air samples used for industrial occupational or hygienic environmental monitoring. This low-cost, disposable, self-filling and self-sealing device requires simple handling and is easily adaptable to automation.

Improved Zinc-Aluminum Casting Alloy 7944
Zinc-aluminum foundry casting alloys with 8 percent, 11 percent or 27 percent aluminum can be improved by the addition of less than 0.06 percent strontium. This additive used in combination with proper riser volume, pouring temperature and sand system consistently produces castings without underside shrinkage defects.

Apparatus for Heating Granular Materials 7968
An apparatus for efficient and uniform heating of various kinds of seeds, nuts or beans using simultaneously, hot gas and microwave energy. The system could be used for drying, roasting, enzyme inactivation, pasteurization or sterilization. A prototype was built and tested.

Ceramic Materials with Enhanced and Predictable Resistance to Fracture 8381
These ceramic materials and, specifically, partially stabilized zirconia employing Beta-alumina, can be made with a high Weibull Modulus, greater than 40 (steel has a Weibull Modulus of 50) with a probability of fracture of one sample per 1000. These ceramics, which have a high resistance to fracture at low and high temperatures, can be used for turbine components, for cryogenic environments and for applications where conductive heat transfer is not desired.

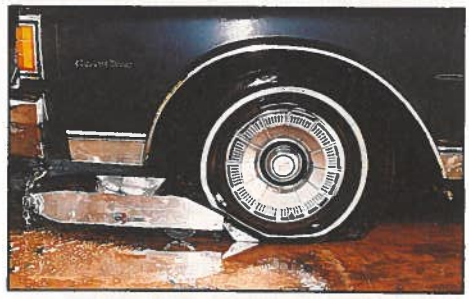
Purification of Hemoglobin and Modified Hemoglobin by Affinity Chromatography 8421
This invention involves the isolation of high purity (oxy) hemoglobin in a one-step chromatographic procedure, using gentle conditions which do not disrupt the native structure of the protein or its binding characteristics. The procedure is readily adapted to the large-batch preparations necessary for scaled-up production of hemoglobin-based blood substitutes.

For any of the offers listed above, write to:
Canadian Patents and Development Limited,
275 Slater Street, Ottawa, Ontario K1A 0R3.
Telephone: (613) 990-6100.
Please quote the appropriate case number.

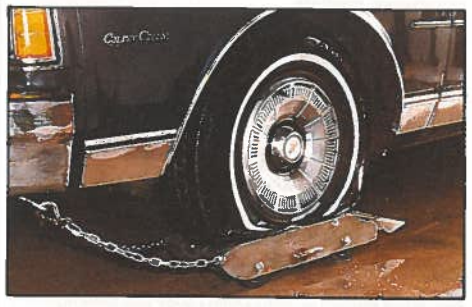
Small Aluminum Craft
A Canadian firm is offering through a licensing or joint-venture arrangement, its technology related to the manufacture of small aluminum craft (up to 65'). These include fishing vessels, survey launches, fast rescue craft, pleasure craft, and work boats.
Write to: Gary Luton, Marketing Sales, Crockett McConnell Inc., P.O. Box 500, Bridgewater, Nova Scotia B4V 2X6.
Telephone: (902) 543-9100.

A Multi-Tasking DNC Coupler
The Canadian Institute of Metalworking is offering to Canadian companies a license for the manufacture of its "CIMlink", a multi-tasking DNC coupler. It is claimed that it has many advantages, among them the elimination of paper tapes and the capability of being used as a terminal, at the shop floor, to collect the work-in-process data and retrieve manufacturing information.
Write to: P. Urban, Canadian Institute of Metalworking, 1276 Sandhill Drive, P.O. Box 7317, Ancaster, Ontario L9G 3N6.

Gas Nitriding Process
A Canadian firm is offering, through a licensing agreement, its technology related to a new gas nitriding process. It is claimed to improve performance and durability of components when used by parts manufacturers while at the same time substantially reducing costs. The firm claims this new process of enriching the surface layer of steel with nitrogen results in the formation of a hardened surface of machine components with improved fatigue, wear and/or seizing resistance.
Write to: M.J. Korwin, President, Nitrex Metal Inc., 3480 Poirier Blvd., St-Laurent, Quebec H4R 2J5.



Autoskate Aids Motorists
A Canadian firm is offering under licensing agreement, the "autoskate". The firm claims that the device is quickly attached to a wheel disabled by a flat thereby allowing the driver to reach a garage without further damage to the tire and the rim. The device is secured by attaching safety chains to pre-installed hooks and can be used on all types of cars, front or rear wheel drive, and trailers (boat, house, camper, etc.).
Write to: FTN International, P.O. Box 855, NDG, Montréal, Quebec H4A 3S3.
Telephone: (514) 484-5415.



Device Detects Internal or External Corrosion in Carbon Steel Tube and Pipe

A Canadian company is offering to Canadian firms, through licensing or joint venture its technology related to a device which detects internal or external corrosion in carbon steel tube and pipe. It is computer controlled and comes with a probe launcher. The inventor claims that this instrument can analyse the level of corrosion in a 12.2-m (40-foot) exchanger tube in less than 90 seconds. Suggested applications: exchanger tubes, pipelines, well tubing and casing, drillpipe, process pipe, furnace and boiler tubes.
Write to: D. Russell, Russell Ultra-Sound Services (NDT) Ltd., 4909–75th Avenue, Edmonton, Alberta T6B 2S3.

Ultra-Sonic Instruments and Probes

A Canadian company is offering to Canadian firms, through licensing or joint venture an ultra-sonic system, consisting of instruments and probes to inspect plastic pipe in the factory for wall thickness variations. The instrument can control the haul-off speed from the extruder.
Write to: D. Russell, Russell Ultra-Sound Services (NDT) Ltd., 4909–75th Avenue, Edmonton, Alberta T6B 2S3.

Ball Joint for Drilling

A Canadian firm is offering through a licensing or joint-venture agreement, a ball joint for use in drilling from moving "floating" platforms. The firm claims the ball joint can transmit high torque of 135 558 Nm (100 000 ft. lbs.) or more, while accommodating angular misalignment up to three degrees, and can also transmit high thrusts or tensions 1 800 kg (200-ton force) while revolving. It is claimed that in addition to the transmission of high forces, the ball joint can internally transmit up to three separate fluids or drilling mediums.
Write to: Patrick Bermingham, Berminghammer Corporation Limited, Wellington Street Marine Terminal, Hamilton, Ontario L8L 4Z9.

Kitchen/Bar Rack System

An Ottawa designer with two Canadian design registrations and U.S. patents pending wishes to sell outright or licence, manufacturing and marketing rights to a kitchen rack design and a bar rack system which holds glass stemware and/or wine bottles in both horizontal and vertical formats. Applicants should have capacity to work in small-diameter rod or tube and offer plated or plastic coated finishes. Wide-ranging sales potential including both residential and commercial markets.
Write to: J.M. Fagan, 260 Daniel Avenue, Ottawa, Ontario K1Y 0C8.
Telephone: (613) 728-2338.

Britain

New Soft Drink/Tonic

A British firm is offering to Canadian companies, through licensing, its technology related to a new soft drink/tonic. The firm claims that this unique, refreshing drink caters to those engaged in sports activities, strenuous work or exercise, sauna and high ambient temperatures. It is formulated to replace both salts lost through perspiration and lost energy, provide a store of energy on a "time-release" basis, protect from premature tiredness and quench thirst.

Process to Renew Old, Used Files

A firm from Britain is offering to Canadian companies, through licensing, technology related to a process for renewing and resharpening old, used files. It is claimed that this process enables companies to save between 25 and 40 percent of their file purchase costs.
For the offers listed above, write to: Derek Rowlands Technology Transfer, Ray House, Westgate, Kent CT8 8QA, Great Britain.

Denmark

New Roofing Slate

A Danish firm is offering to Canadian companies, through licensing, technology related to its asbestos-free roofing slate with a natural finish. The company claims that this new slate has outstanding strength, durability and is frost resistant. It has been successfully tested in Scandinavia for resistance to most severe climates.
Write to: Commercial Office, Royal Danish Consulate General/Toronto, 151 Bloor Street West, Suite 310, Toronto, Ontario M5S 1S4.

East Germany

For more information on the following, please write to: L. Zanker, Manager Marketing Department, Zentrales Buro fur Internationalen Lizenzhandel, Fernschreiber, Berlin 0 112 191, East Germany.

Production of Leather Fibre Material

A German firm is offering to a Canadian company a licensing arrangement for technology for the manufacturing and processing of a leather fibre material made from leather waste. The fibre is produced in the form of sheets or rolls and may serve as the starting material for the manufacture of insoles, counters and heel seats in the footwear industry, pursemaking, and bookbinding. It is claimed that the production of this fibre material is non-polluting.

High-Speed Wire Drawing

A group of German inventors is offering to Canadian firms, through licensing, technology for the rational cold forming of wires by drawing, with the use of the novel type of high-performance lubricant developed by the inventors. The technology is suitable for the drawing of wire from steel and nonferrous metals, including high-melting metals and metallic compound materials. The inventors claim that this technique has several advantages, e.g., the forming can be done on the basis of great reductions in cross sections down to 50 percent per pass and with drawing speeds of more than 500 m/min even in case of highly alloyed steel wire.

France

Advanced Composite Material

A French company is offering to a Canadian firm under licensing or joint-venture arrangements, technology pertaining to a new composite material used in the manufacture of hooped/armoured pipes, hooped vessels, braided/woven/thermoshaped mechanical components, engineered finish products as well as a variety of other products.
Write to: Jacques Bernard, Spiflex, 33, quai De Dion-Bouton, 92814 Puteaux, France.

New Garment Cutting Technique

A French inventor is offering Canadian companies, under licence, technology for a new garment cutting technique. The inventor claims that this new technique makes it possible to reduce the quantity of raw materials needed and that it will lead to savings, in time, of from 25 to 45 percent, depending on the style and type of garment involved.
Write to: H. Brzustowski, 6, rue du XXème Corps Américain, 57000 Metz, France.

Computer-Aided Design and Manufacturing of Hip Prosthesis

A French firm is offering to Canadian companies, through a licensing agreement, technology related to the computer-aided design and manufacturing of hip prosthesis. It is claimed that the computerization of the prosthesis involves over 900 points which are elaborated by software specially developed for this application. The prosthesis is made of titanium alloy, material which exhibits very interesting mechanical features such as high strength and a Young's modulus closer to that of bone than other materials.
Write to: Monsieur Cravoisy, GERDIC, 52, rue d'Alima, 88000 Epinal, France.

Kiln for Wood and Other Solid Hygroscopic Materials

A French inventor is offering Canadian companies, under a licensing agreement, technology involving a process for the installation of a kiln for drying hygroscopic materials, especially wood, at temperatures below 100°C and at subatmospheric pressure. The inventor claims that this speeds up drying and offers optimum product quality.
Write to: Cabinet Etudes Techniques J.P. GAUTREAU, Impasse de l'Ecole, 21200 Beaune, France.

New Tangential Filtration Process

A French company is offering Canadian companies, under licence, technology for a new tangential filtration process using mineral membranes, which reduces operating costs and results in considerable saving of time. The company states that this technique can be used (1) in all branches of the agri-food industry for the sterile filtration of fruit juices, concentration and separation of proteins, concentration and selection of yeast and crystallized substances (sugar refineries and distilling industry) and (2) in water treatment processes such as clarification, purification of water for drinking purposes and sterilization, in rural and urban areas, hospitals and the pharmaceutical industry, etc.
Write to: Mr. Castellas, IMECA, Z.I. B.P. 94, 34800 Clermont L'Herault, France.

Automatic Sampling of Bulk Materials

A French company is offering Canadian companies, under licence, technology involving a new process for the automatic sampling of bulk materials. This sampler is operated entirely by a programmable robot and is intended for professionals using and analysing

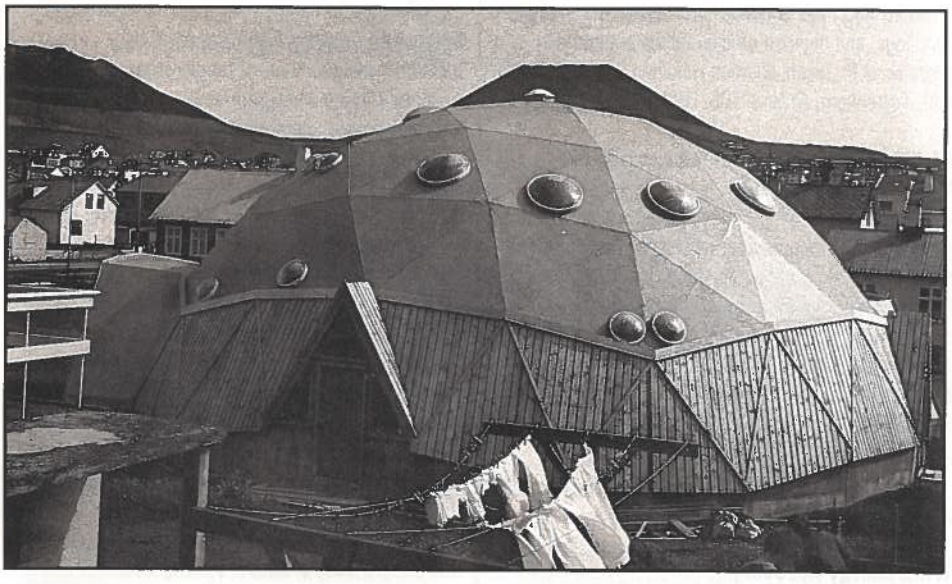
powdered, granulated or liquid products stored in bulk as well as for the agri-food, chemical products, glass and ceramics, oil, mining, building and public works industries.
Write to: Mr. Dufief, Serval International, B.P. 4, 79800 La Mothe Saint Heray, France.

Instantaneous Assessment of Metal Structures
A French company is offering Canadian firms, under licence, technology involving a mechanical device that can memorize the cyclical stress applied to a structure by totalling the damage caused by each load cycle while taking into account the value of the corresponding amplitudes. This system is intended specifically for structures that are subject to stress, such as cranes of all kinds, lifting equipment, travelling cranes, engineering structures, sea structures, iron and steel industry equipment, equipment made of aluminum, etc.
Write to: Mr. Chevalier, STAS, 77, rue Henri Brisson, 78500 Sartrouville, France.

Feed Water Treatment
Manufacturers of a corrosion inhibitor compound offer technical assistance, know-how and co-operation for the treatment of feed water in steam boilers, cooling systems and heating systems.
Write to: H. Natarajan, Vigneshwar Enterprises, "Medhuban" Industrial Estate P.O., Trivandrum 695 019, India.

Israel

Immunohistology and Veterinary Diagnostic Kit
An Israeli firm is offering to Canadian companies through a joint-venture agreement, technology related to production of its immunohistology and veterinary diagnostic kits. This new technology permits the specific demonstration of cell and tissue antigens in a variety of fixed tissues.
Write to: Bio-Yeda Ltd., Kiryat Weizmann, Rehovot 76326, Israel.



Iceland

Geodesic Dome Construction System
An Icelandic firm is offering licensing or joint-venture arrangements to a Canadian firm to produce and market its "Geodesic Dome Construction System" for Canadian and U.S. markets. It is claimed that the total erection of the dome will take a minimum amount of time (i.e. 12.2 m dome needs 150 person-hours). No special metal connectors are necessary. There are a variety of outside finishes and it is claimed that energy savings of a 15.2 cm insulation in a 18.2 m dome is up to 66 percent.
Write to: Einar Thorsteinn, Construction Lab, P.O. Box 62, Reykjavik, Iceland.

India

Emergency Lights and Torches
Sophisticated silicon-controlled rectifier design for charging as well as totally solid-state switching circuitry, is offered by manufacturer of emergency lights and torches.
Write to: Bhatts Electronics (P) Ltd., 8/1, Palmgrove Road, Bangalore 560 047, India.

Technology Enhancement for Solar Cells
An Israeli inventor is offering to Canadian companies through a licensing agreement, technology related to a fluorescent panel enhancing sunlight for solar cells. The inventor claims that this new development should considerably reduce the price of power from solar cells and that even on a cloudy day the panel can collect enough energy to power the cells.
Write to: Moshi Vigdor, Yissum Research Development Company of the Hebrew University of Jerusalem, P.O. Box 4279, Jerusalem 91042, Israel.

Veterinary Diagnostic Kits
An Israeli firm is offering to Canadian companies through a joint-venture agreement, technology related to the production of veterinary diagnostic kits called "ImmunoComb" for detection of the Newcastle disease in poultry.
Write to: Orgenics Ltd., P.O. Box 360, Yavne 70650, Israel.

For all the following offers please write to:
Mr. I. Laufer, Soreq Nuclear Research Center, Yavne 70600, Israel.

Mobile Real-Time X-Ray Screening System
An Israeli organization is offering to Canadian companies through a licensing arrangement, technology related to a mobile inspection system for medium-size cargoes. The system is claimed to be a rapid, comprehensive radiographic cargo inspection at air and sea ports, freight depots, customs warehouses, border crossing points and other fixed transit locations across which unauthorized cargo could be transported.

Real-Time X-Ray Vehicular Screening System
An Israeli organization is offering to Canadian companies through a licensing arrangement, technology related to an X-ray imaging system designed as a fixed installation for the automatic scanning, in less than one minute, of passenger cars, pick-up trucks and small vans.

Optical Elements for Infrared Systems
An Israeli organization is offering to Canadian companies through licensing, technology related to optical elements for infrared systems. These are claimed to offer advantages in terms of costs and high optical quality.

Food Irradiation
An Israeli company is offering to Canadian firms through licensing, technology used to improve and preserve foods. The company claims that this new process extends shelf-life of fruits and vegetables, fresh meat, fish and poultry. It also decontaminates stored grains, pulses, nuts and citrus fruits and reduces or eliminates pathogenic organisms in a variety of foods and animal feeds.

4-Fold Stretcher
An Israeli firm is offering to Canadian companies through a licensing agreement, technology for a 4-fold stretcher which can be used in many areas such as military and police rescue, civil defense, camps, parks, ski resorts, etc. The inventor claims many advantages, such as: super compactness (55 × 16.5 × 11.5 cm when folded); lightness (about 7 kg); high strength and durability — proven during extensive field trials; resistance to extreme conditions such as weather, mud, sand and water; the cover can be replaced in a matter of minutes without tools; deployment is easy and does not require special training and can be done in total darkness. Several optional accessories can be added.
Write to: Z.M. Zimal Development Co. Ltd., P.O. Box 645, Holon 58105 Israel.

Switzerland

Universal Pipe Joint Concept
A Swiss firm is offering to a Canadian company through licensing arrangement, the right to manufacture its universal pipe joining concept which although simple and rapid in use, apparently provides a maximum of safety. The company claims that this concept replaces flanges, fittings, welds and many other pipe joining methods. It can be applied to virtually all kinds of pipelines from the small water pipe.
Write to: Kurt Frey, Commercial Officer, Canadian Embassy, Kirchenfeldstrasse 88, CH-3005 Berne, Switzerland.

Requested

High-Energy Concentrate for Dairy and Beef Cattle

A Swiss firm is offering to Canadian companies through a licensing or joint-venture agreement, its technology related to the manufacturing of high-energy concentrate for dairy cows and beef cattle. The firm claims that this unique product is a rumen-bypass product, and is entirely natural containing 92 percent crude fat (no protein or fibre). It is also claimed that feeding costs per litre of milk and per kilogram of meat are lower than with conventional compounds; milk production potential of mixed feed is about 25 percent higher than in conventional dairy mixed feed.
Write to: Ernest Boehlen Corporation, P.O. Box 242, CH-4900 Langenthal, Switzerland.

U.S.A.

Clean Energy From Waste Coals

An American firm is interested in forming a joint-venture partnership for pilot plant testing and commercialization of its process to produce clean energy from waste coals. The company claims that this new process facilitates the direct combustion of coal refuse materials, oil shales, and low-grade coals, to generate low-cost electric power and to produce oil economically.
Write to: James Mayer, President, A.J. Mayer International, Inc., Suite 409, 993 Old Eagle School Road, Wayne, Pennsylvania 19087.

West Germany

Plastics and Metals Combination for Knobs and Handles

A West German firm is offering to Canadian companies, through a licensing agreement, a system for the manufacture of handles, knobs, holders, etc. from a combination of steel and plastics, in all colours and heat resistant up to 300° Celsius. These can be used as accessories for cookware made of aluminum, enamel and stainless steel. The technique of combining plastic and metal as well as the tools necessary for production are an essential part of the offer.
Write to: Dr. Gregory, Th. Schemm Metall-und Kunststoffwarenfabrik, 5952 Attendorn, Papiermuhle, West Germany.

Canada

Security Products and Systems

A Canadian company is seeking under licensing agreement, unique technology related to security products and/or systems for application in the prevention of break-ins and theft in residences, highrises and single dwellings, and highrise offices, hotels and motels.
Write to: J.P. Jacob, Biomed Holdings Ltd., P.O. Box 580, Tottenham, Ontario L0G 1W0.

CAD/CAM For Use in the Fabrication of Various Types of Craft

A Canadian company is seeking through licensing or joint-venture arrangements, new technology related to products that could complement its CAD/CAM facility used in the fabrication of fast rescue craft, hydrographic vessels, commercial craft, etc.
Write to: Gary Luton, Marketing Sales, Crockett McConnell Inc., P.O. Box 500, Bridgewater, Nova Scotia B4V 2X6.
Telephone: (902) 543-9100.

Austria

Wind Energy Recovery

An Austrian firm is seeking know-how and technology for energy recovery from wind to produce wind turbines up to 1 000 W.
Write to: Otronic GmbH, Spinozagasse 20, A-1170 Vienna.

Dominican Republic

Cooling Units

Technology sought to repair hermetically sealed condensing units for refrigeration equipment.
Write to: Helmut Schorgmayer, Director, Centro de Estudios Energeticos y Recursos Naturales, Universidad Catolica Madre y Maestra, Santiago de los Caballeros.

European Community

Miscellaneous Products

A British firm specializing in various industrial sectors (production of fibreglass wool insulation for boats; trade in defence equipment and electrical cables; services for cathodic production and electrolytic water treatment) is seeking partners for joint marketing.
Reference No: BRE/8718/49

Agricultural Machinery

A French manufacturer of agricultural machinery, fertilizer spreader trailers, tipping trailers and slurry tanks is seeking a partner for joint research and development of new products.
Reference No: BRE/8704/32

Materials Testing Equipment

A German manufacturer of temperature probes, electronic measuring equipment and computer hardware for the chemical, glass, synthetic products and ceramics industries, for manufacturers of materials testing equipment and manufacturers of furnaces and research laboratories, is seeking a partner for joint marketing.
Reference No: BRE/8507/34

Steel and Metallurgical Products

Spanish manufacturer of various products for the steel and metallurgical industries seeks partner for exchange of technology and know-how.
Reference No: BRE/8710/22

Rubber Sheets

A Spanish producer of rubber sheets, rubber profiles and moulded articles is seeking a partner for exchanges of technology and know-how.
Reference No: BRE/8744/48

Photometric Material

Spanish topographical surveying firm, using photometric material from aerial surveying operations, seeks engineering partners engaged in remote sensing for acquisition of technological know-how.
Reference No: BRE/8733/50

For more information on these and other requests please write to:
Business Co-operation Centre, 6 Rond-Point Schuman, Boîte 3, B-1040 Brussels, Belgium.

India

Light Assembly Die-Castings

Manufacturer of non-ferrous die-castings seeks technical and commercial co-operation to manufacture light assemblies based on die-castings with buy-back arrangements.
Write to: Director, Surya Die-castings Pvt. Ltd., 511 Kakad Market, 306, Kalbadevi Road, Bombay 400 002, India.

For the following requests, direct enquiries to:
Mr. Han-Chol Kang, Adviser, Technology Utilisation, Asian and Pacific Centre for Transfer of Technology, 49 Palace Road, P.O. Box 115, Bangalore – 560052, India.
Please quote the project number.

Solar Heating Devices (Project RE-55a)
An Indian firm is seeking to enter into a joint-venture or licensing agreement with a Canadian company to acquire new technology related to the fabrication of solar heating devices.

Pre-fabricated Buildings (Project LCC-59)
An Indian firm is seeking to enter into a joint-venture or licensing agreement with a Canadian company to acquire new technology related to the manufacture of pre-fabricated buildings suitable for the farming community.

Cranes, Material Handling and Industrial Equipment (Project MISC-22)
An Indian firm is seeking to enter into a licensing agreement with a Canadian company to acquire new technology related to cranes and material handling and industrial equipment.

Microwave Ovens (Project EE-38)
An Indian firm is seeking to enter into a licensing agreement with a Canadian company to acquire new technology related to domestic microwave ovens.

Building Chemicals (Project LCC-1)
An Indian firm is seeking a licensing agreement with a Canadian company for the acquisition of technology related to admixtures for building chemicals such as waterproofing compounds, adhesives, floor hardeners, etc.

Energy Systems and Devices (Project RE-56)
An Indian firm is seeking to enter into a licensing or joint-venture agreement with a Canadian company to acquire new technology related to alternate and renewable energy systems and devices to be used in windmills, wind generators, solar pumps, solar refrigerators and solar systems.

Wireless Intercom (Project EE-2)
An Indian firm is seeking a licensing agreement with a Canadian company for the acquisition of new technology related to wireless intercom.

Electronic Telephone Receivers (Project EE-30)
An Indian firm is seeking a joint-venture arrangement with a Canadian firm to acquire new technology related to all types of electronic telephone receivers which have better acoustic characteristics than the electro-magneto version and are ideally suitable for semi-automated, mass production techniques.

Ireland

Industrial Maintenance Products
An Irish company is seeking, under licensing or joint-venture arrangements, new technologies related to industrial maintenance products, such as metal sprays, lubricants in aerosol spray canisters, sealants in tube and can form, high precision rubber component manufacturing, and other new products and processes.
Write to: G. McIvor, Chemoflon GmbH. Seals and Packings, 48 Cookstown Industrial Estate, Tallaght, Co. Dublin, Ireland.

Kenya

Renewable Energy Devices
Financial assistance, equipment and, possibly, joint venture sought to manufacture renewable energy devices such as solar water heaters and photovoltaic, biogas and wind energy systems for small-scale power generation and water pumping. Infrastructure available.
Write to: C.O. Rioba, Solar World (E.A.) Ltd., P.O. Box 2472, Kisii, Kenya.

Nigeria

Bricks
Technical assistance, machinery, equipment and co-operation sought to set up a refractory plant for the production of 10 000 to 20 000 tonnes of refractory mortar, high alumina and fireclay bricks per year.
Write to: E.P. Obidigbo, Managing Director, Acton Techniques Ltd., P.O. Box 3344, Surulere, Lagos, Nigeria.

Switzerland

Miscellaneous Machinery and Equipment
A Swiss trading house is interested in buying from Canadian firms, the following equipment:
- Steel sandwich panels with rockwool insulation (warehouse panels)
- Equipment to manufacture skis (snow)
- Machines for the manufacture of ceramic products (insulators, bricks, tiles, tableware)
- Viscose pulp mill with capacity of 100 000 tonnes per year. Plant is to refine hardwood.
- Machinery to produce flexible packaging (i.e. milk, juice containers, food and frozen food, etc.) with a capacity of 60 000 tonnes per year.
- Painting equipment including spray powder, coating and pumps.

Write to: Mr. Atle Lygren, Becx Corporation, 12, rue de la Combe, 1260 Nyon, Switzerland.

West Germany

For more information on the following requests, please write to:
G. Schaude, Innovationsberatung, Finkenstrasse 14, D-7534 Birkenfeld, West Germany *and indicate the SP number.*

Chemical Specialties and Additives (SP 8306)
A West German firm is seeking a licensing arrangement for the acquisition of new technology for the manufacture of new products in the field of chemical specialties/additives for rubber, sugar, yeast, paper and sealant industries, and water and waste water treatment. The new products should rate as specialty products, be of high quality, provide high yields and be patented or patentable.

Manipulation Systems, Hydraulic Controls and Actuators (SP 8422)
A West German firm is seeking a licensing arrangement with a Canadian company for the acquisition of new technology in the field of manipulation systems, hydraulic control elements and hydraulic actuators applicable to the following areas: robots, valves, actuators, sensors and hi-tech hydraulic components.

New Technology in Magnetics
A West German firm specializing in the manufacture of measuring instruments is seeking through licensing or joint-venture arrangements, a new technology; namely, a new physical principle to replace conventional magnets in magneto-electric measuring instruments. This new technology must meet the following requirements: have great coercive force, be easy to magnetize and demagnetize, easy to form (mould, cast, sinter, etc.) and must be cheaper than competitive products.
For information on the following, write to:
Dr. H. Wenzl, Batelle-Institut E.V. Am Romerhof 35, Postfach 900160, 6000 Frankfurt am Main 90, West Germany.

New Products
A West German firm is seeking, through licensing, new technologies related to machines where drive unit and functional unit are integrated into one, equipment to protect, in the immediate environment of large machines, against noise, vibrations, etc., and machines or other devices to generate or utilize strong magnetic fields.

Another West German firm is seeking, through licensing arrangements, new technologies related to products made from engineering plastics (fibre-reinforced, conducting, etc.), sensor applications, products used for assembly and joining of components, tubes, etc., in particular those suitable for automatic assembly (including tools, necessary machines, etc.) and special tubing (up to 20 mm outer diameter).

Special Events

Summary

West Germany
- IENA '86
  Nuernberg — November 1986

Hong Kong
- Consumer Products Exhibition
  Hong Kong — November 1986

West Germany
- International Plastics and Rubber Trade Fair
  Dusseldorf — November 1986

Britain
- Techmart 86
  Birmingham — November 1986

Canada
- IHC '86
  Toronto, Ontario — November 1986

West Germany
- Technology Forum Berlin
  Berlin — November 1986

Belgium
- Eureka 35th World Inventions Exhibition
  Brussels — November/December 1986

Canada
- Toronto Home Builders Assn., Annual Conference and Trade Show
  Toronto, Ontario — December 1986

India
- Aluminum Congress
  New Delhi — January 1987

Malaysia
- ELENEX '87
  Kuala Lampur — March 1987

France
- 1987 International Symposium on Wood and Pulping Chemistry
  Paris — April 1987

IENA '86
International Exhibition for Ideas, Inventions and New Ideas
Nuernberg Fairground
Messezentrum Nuernberg
Federal Republic of Germany
November 5-9, 1986
Contact: AFAG Ausstellungsges. GmbH, Messenzentrum Nuernberg, D-8500 Nuernberg, West Germany
Telephone: 0911/86691, Telex: 622080

Hong Kong Trade Fair
Consumer Products Exhibition
Hong Kong Exhibition Centre
Hong Kong
November 6-9, 1986
Contact: Hong Kong Trade Fair Ltd., 4306 China Resources Bldg., 26 Harbour Road, Hong Kong
Telephone: 5-736211, Telex: 68444 HKTF HX

International Plastics and Rubber Trade Fair
Fairgrounds
Dusseldorf, Federal Republic of Germany
November 6-13, 1986
Contact: Dusseldorfer Messegesell schaft mbH, NOWEA, Postfach 32 02 03, 4000 Duesseldorf 30, West Germany
Telephone: (02 11) 4 56 01, FS: 8 584 853

Techmart 86
National Exhibition Centre
Birmingham, England
November 11-14, 1986
Contact: Helen Lord, National Exhibition Centre Ltd., Birmingham B40 1NT, England
Telephone: 021-780 4141

IHC'86: The International Innovative Housing and Components Exhibition
Metro Toronto Convention Centre
Toronto, Ontario
November 12-16, 1986
The exhibition represents a multilateral trade opportunity for manufacturers, suppliers and users from around the world who will display new and innovative housing technology and components.
For additional information contact: IHC'86, Manumod Exhibitions Inc., 209-77 Mowat Avenue, Toronto, Ontario M6K 3E3
Telephone: (416) 533-4888

Technology Forum Berlin
International Innovation Market
Exhibition and Congress
Berlin, Federal Republic of Germany
November 25-28, 1986
Contact: AMK Berlin Ausstellungs-Messe-Kongress GmbH, Messedamm 22, 1000 Berlin 19, West Germany
Telephone: 030/3038/1, Telex: 182908

Eureka 35th World Inventions Exhibition
Parc des Expositions
Brussels, Belgium
November 30-December 8, 1986
Contact: Foire Internationale de Bruxelles, Parc des Expositions, 1020 Brussels, Belgium
Telephone: 02/478.48.60, Telex: 23643

Toronto Home Builders Association Annual Conference and Trade Show
Metro Toronto Convention Centre
Toronto, Ontario
December 9-10, 1986
Contact: Southex Exhibitions, 1 Scotsdale Rd., Don Mills, Ontario, M3B 2R2
Telephone: (416) 445-6641

Aluminum Congress
Vigyan Bhavan, New Delhi, India
January 27-29, 1987
Contact: High Commission of India, 10 Springfield Rd., Ottawa, Ontario, K1M 1C9
Telephone: (613) 744-3751

ELENEX '87
Putra World Trade Centre
Kuala Lampur, Malaysia
March 25-28, 1987
Contact: Malaysian Exhibition Services, 2nd Floor, Wisma Socfin, Jalan Samantan, 50490 Kuala Lampur
Telephone: 03-2551717/2550261

1987 International Symposium on Wood and Pulping Chemistry
Palais de Congres-Porte Maillot
Paris, France
April 27-30, 1987
Contact: Canadian Pulp and Paper Association, Sun Life Building, 23 Floor, 1155 Metcalfe St., Montréal, Quebec, H3B 2X9
Telephone: (514) 866-6621

Regional Offices

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