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Hydrogen — the Inexhaustible Fuel

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Managing Editor, Periodicals:
Anna Hibberd

Editor:
Don Wight

Contributing editors:
Bob McDonell
Shirley Plowman
John Hughson

Designer:
Stephen Shewchuk

Correspondence to:
Canada Commerce (98)
Department of Industry, Trade and Commerce
Ottawa, Ontario K1A 0H5

Telephone:
(613) 995-8900

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Hydrogen fuel cells supplied by Electrolyser — a joint company of Noranda Mines Limited and The Electrolyser Corporation Ltd. — at Hydro Quebec's Research Centre in Varennes.

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Publié aussi en français

The Honourable Herb Gray
Minister of Industry, Trade and Commerce
and
Regional Economic Expansion

The Honourable Charles Lapointe
Minister of State for Small Business and Tourism

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Editorially Speaking. . .

Some years ago a lively television commercial described natural gas as the "wonderful wonder-fuel". Today, with the world seeking viable alternatives to decreasing stocks of fossil fuels, the "wonder-fuel" of the future might possibly be hydrogen — clean and highly efficient. Sandy Stewart, President of Electrolyser Corporation Limited and Canadian delegate to the hydrogen program of the International Energy Agency in Paris, is highly optimistic about the potential of hydrogen, as his interview in this month's Commerce (Page 1) indicates.

Timing is all important to any publication and a current event that ties in with an article is an editor's delight. Minister Gray has handed us a dandy. He participated in the June 7 official opening of Electrolyser's newest hydrogen-oriented plant in Varennes, Québec, just in time for this June issue and our feature on hydrogen. The Varennes project has received technological development assistance through an Industry, Trade and Commerce $2.5 million PAIT (now under Enterprise Development Program) grant.

An example of "one that got away — but returned" in the realm of aeronautic technology is our story on the development of an air cushion landing gear for aircraft — started in Canada, slipped off to the U.S. and then brought back to Canada (Page 11). Commerce also studies the possibilities for Canadian businessmen of developing co-operative "buying groups" (Page 18) to help reduce costs for a host of common activities. The issue also looks at — the market potentials of the Pacific Rim and Southeast Asian countries in an article on the recent Pacific Rim Opportunities Conference in Toronto (Page 7); and Canadian fashions (Page 16). And there's more . . .

J.C.H.

For this, the fourth article in Canada Commerce's series on alternate energy, staff writer, Bob McDonell, interviewed Canada's (and possibly the world's) most enthusiastic supporter of.....

Hydrogen
the Inexhaustible Energy Source.

As the most plentiful element in the universe, and an excellent source of non-polluting energy, hydrogen promises to be the mobile power of the 21st century.

In researching this article, we interviewed Sandy Stuart, president of Electrolyser Corporation Limited, which has its offices and factory in west-end Toronto. His company has become a major manufacturer of industrial hydrogen and oxygen plants for world markets using the electrolysis of water processes that he and his father developed.

Electrolyser has built several hundred installations in more than 80 countries on five continents. Based on this experience in international trade, Mr. Stuart served two years as chairman of the Canadian Export Association and is vice-chairman of the Export Development Corporation.

An authority on hydrogen technology and its applications, he is Canadian delegate to the hydrogen program of the International Energy Agency in Paris, and will be chairman of the World Hydrogen Energy Conference when it meets in Toronto in July 1984. Mr. Stuart is also president of Electrolyser Inc., a joint venture company with Noranda Mines set up to apply new hydrogen technology, developed jointly, in large plants where electric power is in ample supply and hydrocarbons are not.

Mr. Stuart is also an enthusiastic conservationist and is this year's chairman of the Nature Conservancy of Canada.

Commerce:
Recent events seem to downplay the necessity of alternate fuels such as hydrogen. After all, even such an enthusiastic supporter as yourself admits that hydrogen cannot replace the world's present reliance on hydrocarbons without the expenditure of huge sums of money. In the present economic conditions this poses a serious problem.
Stuart:
While it is true that declining demand and falling prices for oil and gas, the delay or cancellation of major energy mega projects and new hydrocarbon discoveries seem to indicate that the search for alternate energy is a receding priority, I am of the opinion that present conditions are but a brief respite in the world search for renewable energy.

I argue that we and the world should start now to move more effectively and more resolutely towards a massive long-term objective — to reduce the dependence of every nation on fossil fuels . . . oil, gas and coal — while we still have them with us.

Commerce:
Would you care to elaborate on that position?
Stuart:
Yes. The message is still as clear as ever: first that the issue of energy supply will underlie and at times dominate the affairs of the nations of the world, and second, that it is in the interest of everyone — both oil rich and oil poor — to find an alternative, better distributed and sustainable energy supply and to apply that alternative to the service of man.

With more than 50 per cent of the free world's oil provided by OPEC, the strategic peril of relying on this source is obvious and hardly tolerable.

Yet, until some of these alternatives are in place and demonstrated, it will be difficult to set a limit on oil price demands when the West emerges from the present recession.

To put the problem of supply in proper perspective, we must look at present energy use.

If the United States' per capita energy consumption is taken as 100, Canada is close at 90 and overall world average is 18; India is only 1.6, China, with its colder climate, is 6.4 and Bangladesh is only .4 — that is about 1/250th of the North American per capita energy consumption. At the same time the population figures of the world are expected to increase from the present four billion to some 10 billion before levelling off. Just to maintain the present miserable per capita consumption of energy, global supply has to increase by more than 50 per cent over the next 20 years. No matter how much the industrial countries conserve, there will not be enough to meet the most moderate needs of the Third World, much less enable its members to improve their lot. There is yet another problem. India, for example, has become the world's tenth industrial power and is now moving into food surplus. But the import of oil requires 70 per cent of its import budget. This is typical of the situation in many of the non-oil developing countries, where the need to import oil reduces the import of other vital products. This has serious implications for our future exports and the whole world trading system.

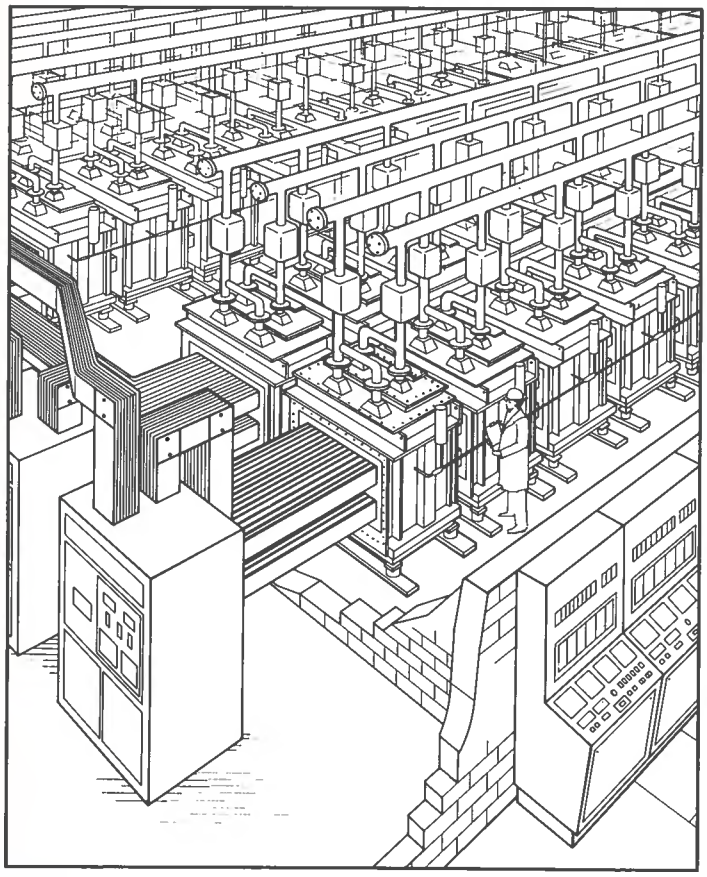
In the final analysis, each nation is going to have to increase its reliance on a sustainable alternate energy supply from its own resources even if the cost is higher than the world price. Coal, oil and gas are poorly distributed in the world and, in this transition from imported to indigenous energy, hydrogen can play an important role.

Commerce:
For many people, the world "hydrogen" conjures up images of the Hindenburg and the hydrogen bomb. Can these fears be overcome — or perhaps, more importantly, are these fears justified?
Stuart:
We are well aware of these fears, but, in fact, both incidents are unrelated to hydrogen's use as a fuel. About the only equally hazardous equivalents are the ones we now use every day — gasoline, propane and natural gas. The fact is we have learned to use these safely and we can do the same with hydrogen which even has some safety advantages. Unlike the heavier fuel gases, when hydrogen escapes it is so light it leaves the area immediately. While it does ignite very easily, it burns invisibly, and does not cook its surroundings by radiant heat. Like any useful fuel, hydrogen has to be handled properly and with respect, but its industry safety record testifies this can be done.

Commerce:
If I recall my basic chemistry, it requires more energy to produce hydrogen than the hydrogen contains. Does this not make it much more expensive than using the energy directly?
Stuart:
To answer this, it is necessary to examine the various forms of energy:

The kinds of primary energy — that is energy found in nature — which are suitable for making hydrogen are — or can be — fairly equitably dis-

tributed in one form or another throughout the globe. They are of course **solar energy** and its indirect forms of hydro-electric power; wind power and vegetation energy or "biomass"; **geothermal energy** from the molten magma beneath the earth's crust; **gravitational energy** in the form of tidal power; and last, but decidedly not least, **nuclear energy** as electric power. With the exception of biomass, all of these sustainable primary sources exist as energy of motion or as heat energy, and about the only way we know to make them recoverable and more broadly useful is to convert them into electricity. Such electricity can of course perform many, if not most, energy functions directly but it cannot perform them all. The only practical way electricity can be economically stored in bulk, transported very long distances or fully used in all the ways that fuel is used, is to electrolyse water into its "primitive elements" — hydrogen and oxygen. Electrolysis of water is in fact the only known practical way to convert electricity into fuel. Fortunately this can be done at high energy efficiencies — 80 to 85 per cent by today's technology, and probably rising higher.



Electricity sources are relatively abundant and the energy problem of the world is essentially a fuels problem. For many countries, electrolytic hydrogen will, therefore, be part of the answer.

Commerce:
What about cost?
Stuart:
With a hydrogen advocate like me, it is an established tradition to be long on concept and short on costs. Today I won't betray that fine tradition. One of the very difficult questions when looking at hydrogen costs is the wide variance in costs of electric power, and whether or not it is produced from surplus electrical power in off-peak hours or from new facilities dedicated solely to the production of hydrogen. Even in this case, the recently published Ontario Hydrogen Energy Task Force report claims that hydrogen produced from electricity will be competitive on a centralized basis by the mid 1990s. What I have suggested about the eventual competitiveness of electricity and hydrogen in Ontario will apply sooner in other regions of Canada and the world, where electricity is now abundant and hydrocarbons are less available. What opens, therefore, is the possibility of a society which could gradually turn to electricity and hydrogen as fossil fuel supplies diminish.

Commerce:
So far, we have been talking about the properties of hydrogen as a fuel but have not mentioned an obvious advantage, that is, its environmental effects.
Stuart:
When hydrogen is burned the product is water vapour, which is a natural constituent of the environment, and which is conveniently returned through nature's water cycle for re-use. When hydrogen is produced from water by electrolysis, the oxygen needed to combust it is automatically co-produced and there is no net consumption of atmospheric oxygen, as occurs with the burning of fossil fuels. Other than a controllably small quantity of nitrogen oxide which is produced when hydrogen is burned with air, hydrogen fuel itself makes no contribution to pollution. This environmental advantage of hydrogen may in the end prove to be its most valuable and important characteristic.

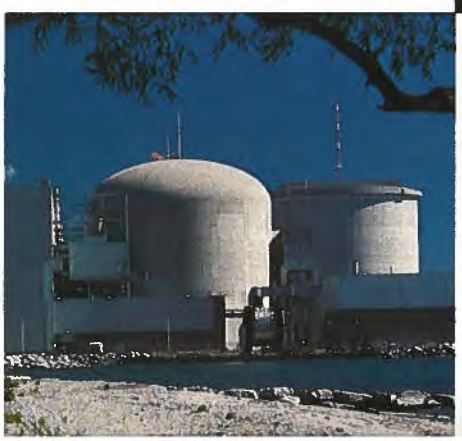
Environmental concern on the part of the general public is, I think, here to stay — one of the

better, if not the best, results of the political and sociological climate of the 1960s.

An awareness of this deep-rooted environmental concern was shown in the remarkable report produced in Ottawa last spring by the Special Committee of the House of Commons on Alternative Energy and Oil Substitution. After reviewing all of the alternatives to oil which are available in Canada, this all-party Committee concluded unanimously that, in parallel with oil sands and natural gas developments, we should move aggressively towards a long-term energy system based on electricity and hydrogen. This far-reaching conclusion has naturally attracted both praise and controversy, but has commanded international attention and respect, particularly for its urging that today's decisions in energy should reflect the very long-range concerns which will become decisive — sustainable supply and preservation of the biosphere in which we live.

The report in particular emphasized that the world's present fossil fuel economy gives rise to major atmospheric pollutants. Dr. Kenneth Hare, Provost of Trinity College, is an internationally recognized authority on the atmosphere, and has stated that the sulphur dioxide/acid rain problem is now regarded as a regional international problem (for example between Canada and the United States); but that carbon dioxide — not yet officially accorded the status of a pollutant — could become a global problem, to be dealt with only on a global basis. The issue is complex and serious investigation just beginning but some authorities feel that the "greenhouse" effect of carbon dioxide on the world's climate may cause a warming trend to become evident as early as the year 2000; the adverse effects on the distribution of the earth's rainfall, and the threat of an increase in sea level, could be an important influence on the acceptance of hydrogen.

Commerce:
I note that you include CANDU produced electricity in your scenario of the future, yet this is considered by many to be an environmental danger.
Stuart:
Yes. I have no hesitation in including nuclear energy in the category of a sustainable and environmentally benign energy source. Sustainable because, compared to any other reactor design CANDU makes more efficient use of the world's uranium supplies, and when these become depleted, the CANDU can be converted to use the relatively abundant element thorium as fuel, thus ensuring supplies of electricity for centuries, and long before then, unlimited nuclear fusion energy will be available.



I regard the CANDU (see CANDU, a Marvel of Canadian Ingenuity, May '82 Canada Commerce) as environmentally benign because, if we allow the matter to be judged in a fair perspective, no other energy source capable of supplying the concentrated energy demands of an urban and industrial society can perform with as little ecological impact and with as strong a record of safety and reliability. The CANDU system is a Canadian scientific and engineering achievement on a world scale, of which we should be proud.

In respect to electric power, we are increasing our advantage over the United States. The energy policies of successive U.S. administrations have become, in my opinion, badly distorted by an unrealistic assessment of the available energy options — too pessimistic about nuclear and too optimistic about solar and hydrocarbons. One result has been the U.S. emphasis on coal. In spite of cleaner coal technology, it seems likely that we will be experiencing the adverse environmental results of those decisions here in Canada for some time to come.

Commerce:
How do you see the switch from a hydrocarbon to hydrogen-based fuel economy developing over the next few years.
Stuart:
Unfortunately the family car is not an early prospect, because the extreme flexibility required calls for better on-board fuel storage systems than we currently have, and also a hydrogen distribution infrastructure which could take years to achieve. Fleet vehicles are a better bet, where fuelling points can be predicted, and, as one example, the Urban Transit Development Corporation has embarked on a major program to develop a hydrogen-powered transit bus.

Hydrogen will first be used where its characteristics offer some compelling economic or operational advantage. In certain locations, for example, electricity may be more available than imported fuel and hydrogen can be generated economically from it in quite small quantities for both engine fuel and heating: and there are off-road vehicle possibilities in agriculture, construction, forest operations and open pit mining.

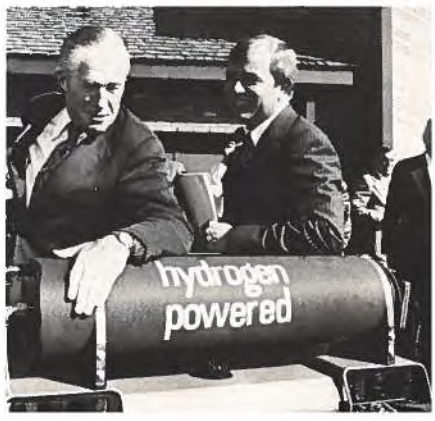
Gasoline engines can be adapted fairly simply to use hydrogen, and energy efficiency gains have been claimed up to 15 to 20 per cent, because of the better throttling techniques which are possible. Agricultural tractors can be converted and this could be useful in those Third World countries where electricity is available.

As a matter of fact, we are now converting our own farm tractor to use hydrogen this year.

Researchers are seeking a simple compact lightweight means to carry hydrogen on board — some sort of "hydrogen sponge." For this INCO Ltd. has developed metal hydrides, which are improving steadily although still too heavy and bulky. Hydrides have an important safety advantage, being about as combustible in a collision as a pile of coal.

Methanol and ammonia may be good chemical hydrogen carriers and liquid hydrogen is the answer for certain commercial applications such as buses and aircraft. As the lightest element, hydrogen has only 40 per cent of the weight of conventional jet fuel for the same energy content. A liquid hydrogen-powered aircraft could cover much greater distances at better fuel economy and, in advanced aircraft, there may be a further gain of up to 30 per cent by cooling some of the aerodynamic surfaces to reduce drag. Hydrogen-powered aircraft have actually flown, and Canadian interest is justified because the required fuel could be readily manufactured here and because our large defense task of aerial surveillance would benefit from the longer operating range. Of course, the Columbia space vehicle is the most famous application of hydrogen fuel technology.

Commerce:
Many experts claim that the early use of hydrogen will be in fuel upgrading.
Stuart:
The direct use of hydrogen as a fuel for engines has attracted the most attention, but in fact the much more immediate bulk energy application is to a less visible use — the manufacture of synthetic hydrocarbons fuels.



The remaining enormous resources of low grade hydrocarbons such as tar sands bitumen, heavy oil, oil and coal all require additional hydrogen for conversion to desirable light fluid products. The coupling of CANDU-based hydrogen, or hydro-electric-based hydrogen, to the upgrading needs of our heavy oil and coal resources opens an enormous requirement in both eastern and western Canada. The by-product electrolytic oxygen can also be used to gasify the heavy petroleum ends, from which more hydrogen can be made; and also the oxygen can be applied in-situ recovery and to environmental clean-up.

Another important potential application for both hydrogen and oxygen is to the production of methanol from wood waste or from coal, peat or lignite. The methanol thus produced can then, if desired, be converted to gasoline. However methanol itself will probably be a very important new fuel, especially in the Third World.

In the vital area of food production, the celebrated Green Revolution, which has changed the outlook of the entire Third World, depends upon nitrogen fertilizer, which is made by combining hydrogen and nitrogen from the air. At present 99 per cent of that hydrogen is made from fossil fuels. One of the early priorities for non-fossil hydrogen will be for fertilizer production, especially in the oil-poor countries, using indigenous electricity.

Commerce:
How does hydrogen fit into Canada's energy picture?
Stuart:
Canada has a wide spectrum of energy options. We will need them all and it is, I think, a desirable national objective that there should be some balance by way of regional energy sourcing. Electricity and hydrogen represent an excellent opportunity for central Canada. Electricity is a job maker — a high technology job maker. Figures from EEMAC, the Electrical and Electronics Manufacturers Association, indicate that almost nine times as many jobs in Ontario result from expenditure on electricity compared to equivalent expenditure on natural gas; and even greater multiples apply in Quebec and Manitoba. I quote these figures, not for narrow provincial reasons, but to show how diverse energy sourcing can create diverse economic opportunity.

With an electricity base, Ontario, Quebec and Manitoba are all planning to develop the hydrogen opportunities that lie ahead. Quebec is forming a Council for hydrogen industries and Dr. David Scott of the University of Toronto has been appointed to organize the Ontario Institute for Hydrogen and Electrochemical Systems. The federal government has been sponsoring a major integrated hydrogen program for several years, with which my company, in partnership with Noranda Mines Limited, has been associated. Practical results are now emerging with respect to hydrogen production, which we hope will maintain Canadian leadership in this area of growing importance.

Other countries — notably France, Japan, Germany and the United States — are also carrying out large hydrogen programs, some parts of which are co-ordinated through the International Energy Agency in Paris.

The emphasis in the provincial and federal programs I have mentioned will not only be on hydrogen production but on the enormous technical challenges in hydrogen storage and transportation, fuel cells, synthetic fuels production and other hydrogen-using end processes. While most other countries, including especially the United States, are following chiefly carbonaceous energy paths, we have the opportunity to develop here **electrically based technologies** which will solve our own problems and, at the same time, create exportable systems which the world is going to need. This can be the way we turn energy challenge into economic opportunity.

Second Pacific Rim Conference:

The Two-Way Street That Leads to Success

by Cecile Latour

A single theme threaded its way through the Second Pacific Rim Opportunities Conference in Toronto earlier this year. The countries of the Pacific, although differing culturally, socially and politically, represent an area of economic potential superior to most other regions. And Canadians — business and government alike — must spend much more time and effort learning about the region and building long-term relationships if they are to take advantage of this most lucrative market.

More than 400 persons attended the conference organized by the Canadian Committee of the Pacific Basin Economic Council, including two Canadian federal ministers, prominent guests from the Asia and Pacific region, Ambassadors and High Commissioners to Canada, and some 60 other panelists, plus successful Canadian businessmen, prominent academics and Canadian Trade Commissioners.

Canadian Minister of State for Trade, the Honourable Ed Lumley, who had chaired the First Pacific Rim Opportunities Conference in Vancouver 18 months before, opened the conference by reminding the participants that Canada, more than any other industrialized country in the world, is dependent upon trade for the wellbeing of its economy. Over the past two years, trade has represented nearly one-third of Canada's GNP compared to 18 per cent for other industrialized countries.

Despite high unemployment and the slow growth rates being experienced by nearly all nations of the world, Lumley said, it was clear that the governments of the industrialized world attach the highest priority to the maintenance of a liberalized trading system. He referred to the Key Biscayne meeting, which emphasized that protectionist policies work in the long run to the detriment of domestic interests and added that the Canadian government will do its very best during the next few months to resist domestic and international pressures to go back to the days of protectionism.

Canadian Success

Canada has been extremely successful in the Pacific Rim, the Minister said, and one reason for this success is the phenomenal increase in economic activity in the region. "By the year 2000, the combined GNP of Pacific Rim countries will rise from the present figure of 16 per cent to more than 25 per cent of the world total, equalling the GNP of the European Economic Community. And our trade with the Pacific community is rapidly closing in on our trade with the Atlantic for one of the few times in our history."

According to Tun Tan Siew Sin, financial advisor to the government of Malaysia, "It's interesting to note that the economies in a region that has practically no natural resources have done superbly well in the economic field. I am, of course, referring to Japan, South Korea, Taiwan, Hong Kong and Singapore." Tun Tan Siew Sin is also Chairman of Sime Darby Berhad, the large Asian multinational.

He pointed out that Hong Kong has an area of slightly more than 1,040 square kilometres (400 square miles) and that even this tiny area consists for the most part of hilly land that is both uninhabitable and uncultivatable. Singapore, he added, has an area of only 582 square kilometres (224 square miles) and has no natural resources of any kind, "and yet these two densely populated and tiny islands have achieved a rate of economic growth and progress that is incredible by any standard."

Other countries in the region produce substantial quantities of strategic raw materials that are vital to the needs of the industrial world. ASEAN, a grouping of five countries that consists of Indonesia, Malaysia, the Philippines, Singapore and Thailand, accounts for the world's largest production of natural rubber, tin, palm oil, coconut products and copra. ASEAN is also rich in copper, bauxite, nickle and iron ore, has large and fertile agricultural estates, vast tracts of timberland and tropical hardwood and a combined population of 250 million.

The five countries, said Tun Tan Siew Sin, have one characteristic in common. "They have the most important resource, and that is people who are prepared to work hard, who are frugal, enterprising and dynamic and in the last analysis, this is what really counts.

"The Sime Darby Group, of which I am chairman, operates in 22 countries around the world through a collection of 251 companies, but our results show that our most profitable areas of operations are the countries of East and South-East Asia, while Western Europe is the least attractive, to put it mildly," he said, "Judging from present indications, it is a fair guess that the destiny of the human race in the closing years of this century will be decided in the Pacific Basin."

One reason for this satisfactory state of affairs, he believes, is that South-East Asia has not been "infected by a disease which I call milk and water socialism, whose basic philosophy is more and more pay for less and less work for every year that passes. We are still old-fashioned enough to believe in hard work, thrift, innovation and profits, and this has paid off."

Tun Tan Siew Sin was asked to identify specific opportunities for trade and investment for Canadian companies in the Pacific region. "The developing countries of the Pacific Basin need technology most of all, and this is where Canadian technology can play an important role."

The first step, he advised, was for more and more Canadians to come to his part of the world to acquaint themselves with its needs and their opportunities. "Until your people see for themselves what is available on the ground floor, you cannot realistically size up the situation."

Specific Opportunity Areas

Identifying specific opportunity areas, Trade Minister Lumley stated: "Japan and Korea will continue to need raw materials from Canada to supply their manufacturing sectors. And despite efforts towards self-reliance, some Pacific countries will continue to require certain types of food imports — fisheries, wheat and other products. In the area of resource development, Canada is in a second-to-none position to assist with the expertise and technology."

He cited the vast potential for resource development in Australia, and the "very positive missions" made there by the Honourable Horst Schmid, the Minister of International Trade for Alberta.

"Another major factor that is contributing to the growth in our trade opportunities is the international energy situation," Lumley said. "All countries of the Pacific have embarked on economic development plans aimed at reducing their dependence on oil imports and traditional sources of energy. Who in the world has better expertise and greater knowledge of the energy development field than Canada — to participate in virtually all sectors of energy development such as oil, gas, coal, coal-related projects, nuclear energy and hydro-electric power?"

Derek Davies, editor of the Far Eastern Economic Review, reinforced the message that Canadian businessmen should see the Pacific countries first hand. He suggested that "some of the images that dominate Canadian thinking are wrong," and took some responsibility as a member of the press for creating those images. Asia, he said, is not the unstable, extremist, leftist and totalitarian centre many Westerners think it is. He argued that Asia, and particularly East Asia, is a region that tends to work always towards moderation. "This is an area of the world that has gone through enormous traumas, including the trauma of modernization, and has done it with less social unrest than many societies of the West."

Forms of extremism noted in East Asia are nearly always the result of external pressures, he added. As cases in point, he cited China as having gone through the most bitter struggles and argued that present policies towards Vietnam have produced the sort of dependence on Moscow and extremism which we should have learned not to repeat through our experience learned with China.

At the Pacific Rim Opportunities Conference II are from the left Robert G. Rogers, chairman of the conference and vice-chairman, Canadian Committee of Pacific Basin Economic Council, and Eric A. Trigg, senior vice-president, Alcan Aluminium Ltd.

Dr. W.W. Peters, chairman, Canadian Committee of the Pacific Basin Economic Council (PBEC) with two of the Conference's keynote speakers, Tun Tan Siew Sin, financial consultant to the Government of Malaysia and chairman, Sime Darby Berhad; and Derek Davies, Far Eastern Economic Review.

One of the misconceptions Westerners have about Asia, said Davies, is the brand of socialism that swept across the continent with independence. "The longer and more bitter the struggle for independence, the more extreme the form of left wingery, of socialism or communism that resulted, and the more sensible the handover of power, the more benign the form of socialism that resulted."

Davies pointed out that several ASEAN countries switched from moderate forms of socialism to benign forms of capitalism after the region gradually de-ideologized itself out of the leftism that failed to eradicate poverty. Canadians have failed to appreciate the influence of Confucianism, he said, which has created the social and political systems labelled by Westerners as totalitarian and authoritarian — while seen by others as responding to the aspirations of the people.

"Canada has much to offer Asia — all types of economies in Asia — because you are so lucky in your resources," added Davies. "You can supply them with everything from energy and timber and natural primary materials right through the shopping list to modern technology, computerization, expertise in communications, all of which Asia is so desperately in need."

Secretary of State for External Affairs, the Honourable Mark MacGuigan, echoed Davies' call for greater attention to the priorities and aspirations of the people of Asia and the Pacific. "Partnership is a two-way street and if we are to expect the countries of Asia and the Pacific to take account of our concerns we must demonstrate that we are alive to their interests. Our policies and activities must be increasingly responsive, not only to our own interests but to the specific priorities and aspirations — political, economic and cultural — of the countries concerned. To achieve this demands improved understanding at all levels and the growth of mutual awareness between Canadians and the peoples of Asia and the Pacific."

Canadian Businessmen React

Canadian businessmen, themselves, said the region must be recognized as more than just a prospective market. Said Eric Trigg, senior vice-president of Alcan Aluminum Ltd.: "When we talk about trade in the Pacific, we must not lose sight of the fact that our trading partners are, in many instances, also our competitors. And as the world's interdependence grows, this fact will reassert itself with ever-increasing importance."

Good sales representatives, good pricing, good financing, perseverance are key ingredients to Canadian business success in Asia and the Pacific Rim.

Stephen Mostardi, President of Pacific Truck and Trailers Limited, warned that "Japanese presence, which usually involves extensive local contacts and ultimate knowledge of the languages and customs, is hard to beat." To meet this competition, George Janigan, President of Combustion Engineering — Superheater Limited, prescribed three essential ingredients: good sales representatives, good pricing and good financing — at low and fixed rates, and long-term repayment. Bob Mason of the Canadian Embassy in Jakarta added a fourth: perseverance. For Hong Kong, Canadian Commercial Counsellor John Treleaven advised: "Canada has no profile problem in Hong Kong; 60,000 graduates of Canadian universities are Hong Kong residents. Put a Canadian flag on your product. If you have 'Buy Canadian' labels, leave them on; they will sell for you."

A few businessmen experienced in the region credited their success to having a local office. Marcel Desjardins, President of CEGIR, said that his first contract from the Philippine Development Bank would not have happened except for a continual presence. Similarly, K.A. Littzen of Montreal Engineering said that co-operation with a local firm resulted in transfer of technology and ultimately the establishment of his firm's credibility.

Said Keith Greenaway of SEACan Development Limited: "These countries are very different from Canada, and from one another. Efforts to understand them, however, can result in rewarding and enjoyable new associations, and new perspectives of one's own business."

Second Canadian Wins Wallenberg Award

For the second time since its inception, the internationally-awarded Marcus Wallenberg Prize has gone to a Canadian!

The 1982 recipient (shown at right of photo) is Dr. Ricardo O. Foschi of Vancouver.

The Marcus Wallenberg Prize — the Swedish award for contributions to the forest industry — is awarded by Stora Kapparberg, the oldest publicly-owned company in the world still in operation. Dating to 1288, the firm is one of Sweden's largest enterprises for forestry and forest products.

The Prize was conceived to recognize, encourage and stimulate pioneering scientific achievements that significantly contribute to broader knowledge and technical development within the forest industry.

Dr. Foschi received the award for establishing, mathematically, how wooden structures can be evaluated for withstanding stress. Specifically, he was named the winner of the 1982 Prize for his work on "The Assessment and Prediction of the Structural Reliability of Structures Fabricated from Wood and Wood Products".

His contribution to the design of wooden structures — to meet the maximum (or limit) stresses the structures will probably encounter during their service life — is both unique and vital to the continuing use of wood as a major construction material.

The difficult combination of mathematical endeavours and pragmatic engineering evaluations that constitute Dr. Foschi's contributions in this area were deemed evidence of his expertise.

Dr. Foschi's work now is providing a rational basis for the engineering design of wooden structures, taking into account the various factors unique to this type of construction — the variability of wood; its behaviour under long-term loads; and the type of fastenings used.

An adjunct associate professor at the University of British Columbia's departments of forestry and civil engineering, Dr. Foschi works at Forintek Canada Corp.

Forintek is a private company involved in research and development of solid wood products. Its laboratories in Ottawa and Vancouver provide research and development for the forest industry, including new uses of wood, certification services for manufactured wood products, testing of fabricated wood products, and codes and standards work.

The first Canadian to win the Prize (in 1981) was Dr. H. Holton of Canadian Industries Limited.

A new amphibious aircraft.

The Development of an Aircraft Air Cushion Landing Gear

by S.B. Shaw, Senior Project Officer Aerospace Industries Directorate

Canada does not lack inventive genius but has lost opportunities in the past to foreign nations apparently better able to get their act together. The LACTA project is an example of one initiative that did get away but has returned to Canada. This project demonstrates the complexity of getting a new technology product underway and the necessity of combining the skills and resources of industry, university and government at an international level in order to proceed towards a commercially viable manufacturing operation. The current proof-of-concept phase will probably require a joint venture to manufacture and market a new Canadian aircraft.

LACTA is not, as one may be forgiven for thinking, a milk product but an acronym for Light Air Cushion Triphibious Aircraft. The "Tri" indicates ability to operate on water, land or snow but should, perhaps, be "Multi" as the aircraft can also land on ice, marsh, sand and any combination, with the proviso that the surface is reasonably flat.

The versatility of the LACTA is attractive to operators of aircraft in frontier regions, to military organizations and to airlines operating very large transports whose use can be severely limited by the inability of many runways to withstand the repeated impact of several hundred tonnes.

Development of the LACTA has commenced at Bell Aerospace Canada Textron (BACT), located at Grand Bend, Ontario, on the shore of Lake Huron. Its origins, however, go back to work initiated at Avro Canada in the 1950s, followed by the conversion of a small amphibious aircraft and a medium transport to incorporate an air cushion landing gear.

During the 1950s, Avro Canada, Malton, Ontario, initiated the development of the Avrocar as a simplified version of the sophisticated U.S. Air Force-funded Project Y. This was a vertical take-off and landing supersonic fighter which proved to be too exotic and was cancelled.

The circular Avrocar was supported on an air cushion created by an air jet curtain around its periphery. The huge frisbee probably gave rise to accounts of flying saucer visits to Malton. A study funded by the Defence Research Board found the Avrocar to be ingenious but underpowered and difficult to control. It was concluded that there must be a better way of applying air cushion technology to aircraft and this was under consideration when the axe fell on Avro in 1959.

One of the principal engineers on the Avrocar and the subsequent study was Desmond Earl who later joined Bell Aerospace Textron in Niagara Falls, New York. Earl was convinced that the air cushion principle could somehow be applied to aircraft landing systems, thereby dispensing with the various inefficient and expensive appendages needed for amphibious operations. In 1964, Earl and his colleague, Wilfred J. Eggington, identified a practical approach to an aircraft landing system based on an elastic bag air cushion and this idea was patented by Bell in 1965 with the two engineers named as co-inventors.

Proof of the Air Cushion Landing Gear (ACLG) was demonstrated in 1967 when a converted, small, amphibious aircraft, a Lake LA-4, was flown from the Bell facility at Buffalo. The unique aircraft continued with a series of tests where the ACLG performed well on ice, snow, grass and water in addition to conventional runways. Taxi tests over mud and ploughed ground did

While conception may be easy, radically new aircraft invariably have a difficult birth. Maturation is a lengthy and expensive process, to the extent that development, certification and production start-up costs may never be recovered through the production life of the aircraft.

Lake LA-4 and de Havilland Buffalo with air cushion landing gear.

not stop the versatile little aircraft and the U.S. Air Force became interested in the application of the ACLG to a tactical transport which would be able to fly into front line airfields.

The U.S. Air Force and the Department of Industry, Trade and Commerce co-operated on an ambitious conversion program in 1970. The Department of National Defence loaned the project a de Havilland Buffalo CC 115 aircraft which, for reasons best known to the USAF, was re-designated the XC-8A. The XC-8A, at 18,600 kg (41,000 lb.) compared with the LA-4's 1,140 kg (2,500 lb.), was a much more sophisticated aircraft and a large portion of the project's resources was devoted to maintenance and operation of the aircraft under USAF regulations.

While the XC-8A took off and landed on its air cushion many times, the project was only a limited success for the ACLG with some major problems being identified. It was concluded that too large a development step had been attempted, compounded by the inherent problems of trying to modify an existing aircraft to incorporate an ACLG.

In 1971, the emphasis shifted to high-performance, jet-powered aircraft and an ACLG was installed, under USAF sponsorship, on an Australian Jindivik drone. The Jindivik was modified at Wright Patterson Air Force Base in the U.S., test flown in Australia and demonstrated the feasibility of high-speed flight and landing. A reservoir of knowledge was developed which has yet to be tapped.

The modification of existing aircraft had met with mixed success and it was considered necessary to design a new aircraft in order to optimise the advantages of the ACLG. The design concept developed by Earl has the fashionable wide-body, but on a much smaller scale than the Boeing 747 as it accommodates only two pilots and six passengers. The wide body is a natural result of the LACTA requiring a large area, wide track, ovoid air cushion which is obtained from a low wing layout. Twin tail booms contain a 400 h.p. Lycoming piston engine mounted over the fuselage and driving a Hartzell 208.2 cm (82 in.) diameter, three-bladed, propeller. A 10 degree dihedral on the inner portion of the 9.7 m (32-ft.) span wings provides water-borne stability and the wing-tip tanks provide safe storage for fuel while adding buoyancy. A hydraulic pump driven by the main engine inflates the landing gear which is elastic and conforms with the fuselage profile in flight.

While conception may be easy, radically new aircraft invariably have a difficult birth. Maturation is a lengthy and expensive process, to the extent that development, certification and production start-up costs may never be recovered through the production life of the aircraft.

Bell Aerospace, Buffalo, was not interested in pursuing a complete aircraft development program and was reluctant to invest funds without a pretty clear indication that there would be an aircraft requiring an air cushion landing gear. The other side of that coin was that airframe manufacturers would not get involved unless they had evidence that the air cushion gear would work. Interest waned at this point and Earl had to content himself with building and flying a radio-controlled model of the LACTA.

While all this work was taking place in the U.S. during the 1960s and 1970s, Bell Aerospace established the facility, Bell Aerospace Canada Textron (BACT) at Grand Bend, Ontario, to develop the Voyageur air cushion vehicle, The Voyageur and its smaller sister, the Viking, did not sell as well as expected but this work did grow into the manufacture of a large vehicle, the LACV-30, for the U.S. Army. BACT was busy with the LACV-30 but sought ACV-related

work to diversify its product line and requested assistance from the Department of Industry, Trade and Commerce (IT&C) to continue development of the LACTA in Canada.

Neither BACT nor IT&C was prepared to embark on a full scale, LACTA development project which could cost more than $20 million, but both organizations were willing to share the cost of a limited ACLG proof-of-concept project. Specifications were established which aimed at proving that the LACTA air cushion landing gear would work efficiently and cost no more to operate than a conventional wheeled gear. If this objective could be attained, the multi-phibious capability would be available at no extra cost. Additional advantages were seen in the inherent characteristics of the LACTA to make a soft vibration-free landing, and to land in cross-wind conditions that would defeat a conventional aircraft.

The converted Lake LA-4 was pulled out of storage at Buffalo and shipped to Grand Bend to be the LACTA landing gear test bed. Joe Nash, President of J&J Nash Co., Strathroy, Ontario, is an experienced pilot and his company builds internationally-recognized fibreglass yachts. Nash successfully manufactures fibreglass parts for the LACV-30 program and was charged with constructing a plywood and fibreglass LACTA ventral fuselage section into which the LA-4 is confidently expected to nestle comfortably. The new fuselage section incorporates the air cushion gear which it is planned to test in different conditions by taxiing the LA-4 over a variety of surfaces.

The modified LA-4 is not expected to be airborne beyond the 7.6 to 10 cm (three to four inches) of cushion height but, in case the test pilot gets enthusiastic, it has been restored to operating condition by Blue Water Aero Services, at Grand Bend airport.

The major task, currently in progress, is to develop the elastic material and construct the doughnut-shaped air cushion trunk. This is where Earl's inventive genius is given full rein as he nurses rubber tire cord through a complicated machine of his own invention to make elastic tape which is laid-up on a 425 cm × 290 cm (168 in. × 114 in.) steel template. The whole assembly will be trucked to the 3 m (10-ft.) diameter autoclave at Fleet Industries, Fort Erie, Ontario, to be cured in a vacuum bag at 4.5 kg/cm^2 (65 psi) pressure and 142°C (287°F) temperature for 30 minutes, after which it will be returned to Grand Bend, snapped on to the LA-4 and inflated. The doughnut is perforated with more than 2,000 holes through most of which air escapes, providing a film of air on which the aircraft is supported. The remaining holes are plugged with hardwearing chlorobutyl rubber which provides a replaceable braking surface.

In parallel with the air cushion tests, design of the complete aircraft continues: this process takes into account the requirements of the market, manufacturing techniques and materials, airworthiness certification procedures and hydrodynamic and aerodynamic performance. The major tools used in the procedure are the Computer Aided Design facility at Bell, Buffalo, the radio-controlled model built by Earl, and wind tunnel tests by the National Aeronautical Establishment at Ottawa, using a truly beautiful mahogany and aluminum 1/8 scale model created by Ontario Pattern Works Ltd. at Malton, Ontario.

An idea initiated by Avro Canada has taken about 25 years to bring to the proof-of-concept stages on an aircraft specifically designed to have an air cushion landing gear. The ACLG development has gained valuable impetus from the U.S. Air Force and Bell Aerospace in the U.S. but it has taken the combined efforts of Canadian companies and government agencies to bring the project close to commercial reality. With Bell Aerospace Canada in the lead and assistance from J&J Nash, Fleet Industries, Ontario Pattern Works and Blue Water Aero Services, the late summer should see tangible results.

Government agencies are playing their part: the National Research Council is to conduct wind tunnel tests of the LACTA; the Department of Transport provides essential advice on air cushion vehicle operations and the stringent requirements for an airworthiness certificate; the Department of Defence is encouraging the use of advanced composite materials; and the Department of Industry, Trade and Commerce is providing funding assistance and also chairs the Project Review Group which protects the public investment and co-ordinates government involvement.

An important element of the co-operative effort is vested in the University of Toronto's Institute of Aerospace Studies which operates a unique air cushion vehicle test track with sophisticated instrumentation and has developed a valuable understanding of the dynamic behaviour of air cushion systems. The University also trains the engineers who exploit the new ideas and one must recognize the foresight of the Transportation Development Centre in Montreal which has, for many years, provided the necessary sustaining funds.

Progress beyond the ACLG demonstrations with the LA-4 this summer will require the co-operation of a partner with airframe and aircraft systems expertise. Several Canadian companies have the capability to undertake this role but cost, marketing and service are vital factors which could dictate a joint venture with a foreign major airframe manufacturer. Bell Aerospace Canada would certainly be pleased to talk with any potentially interested company. Any offers?

For further information contact:
S.B. Shaw
Senior Project Officer
Aerospace Industries Directorate
Industry, Trade and Commerce
235 Queen Street
Ottawa, Ontario
K1A 0H5
Tel: (613) 995-3201

Mater Artium Necessitas

If "necessity is the mother of invention" as the ancient Latin dictum claims, then the Canadian Government, its academic community and Canadian business had to invent.....

The Industrial Innovation Centres

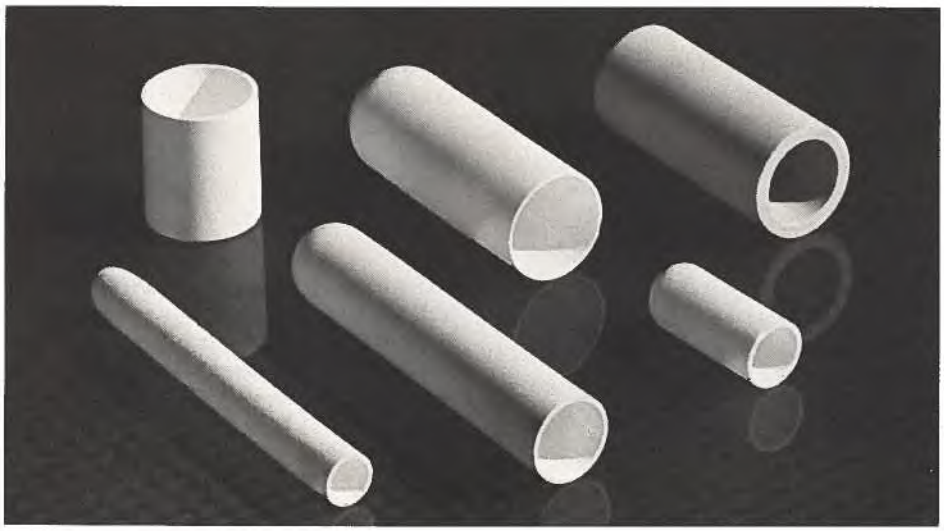
To maintain its place in a rapidly changing world, Canada in the 1970s had to develop a climate for small innovative businesses and individual inventors. As early as 1976, the École Polytechnique in Montreal and the University of Waterloo in Ontario, with the help of grants from the federal government, set up study groups to assist inventors develop their ideas and to lay the groundwork for the establishment of centres which would study and encourage innovation in Canadian business.

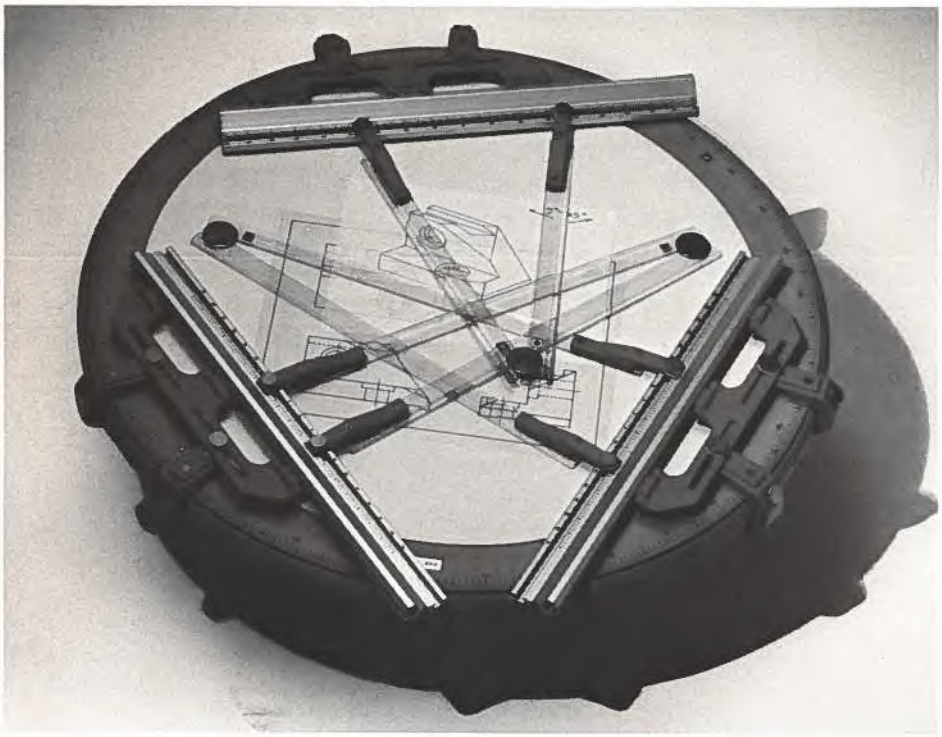
As a result of the work of the study groups, Industrial Innovation Centres were established late last fall in Montreal and Waterloo, again with major funding from the federal government. They were set up as non-profit entities to foster inventions, technological innovation and entrepreneurship.

While separate, the two centres, first of five proposed by government, maintain a close working relationship with the universities and the Canadian business community.

The Centres' Strategic Objectives..

- Invention Development and Utilization: To stimulate and facilitate disclosure, evaluation, development and utilization of invention.
- Enterprise and Entrepreneur Development: To guide and assist entrepreneurs and potential entrepreneurs in appraisal, development and start-up of technology based business opportunities.
- Student Inventors and Entrepreneurs: To encourage and assist students to acquire inventive and entrepreneurial knowledge and skills and to develop and put to profitable use in Canada their own inventions and business proposals.
- Education for Innovation: To serve the educational needs of inventors, innovators and managers of such activities by creation, preparation and delivery of instructional programs including aids, materials, hands-on experience and assistance.
- Research in Innovation Processes: To stimulate and co-ordinate research activities to increase and disseminate knowledge of the processes of invention, innovation and entrepreneurship.





The centres have important blends of skills and capabilities which are offered to technology based clients in the form of specific services:

- Consulting — business planning and consulting
- Technology assessment
- Financial advice, accounting, bookkeeping
- Patenting advice

Canada's highly specialized and often centralized society, which has been moulded by invention, is itself a threat to further invention.

We tend to expect development of new ideas only from those sources already participating in the field we associate with those ideas and are inclined to deny credibility to outside sources.

This syndrome is particularly evident in Canada which is, in large measure, a branch plant economy. Innovation usually involves business risk and the prudent manager, left to his own choice, will usually elect to minimize risk and innovation with it. There is also the influence of today's problems being far more urgent than tomorrow's. Thus, unless top management of an enterprise is deliberately committed to innovation, it seldom occurs.

New enterprise starts based on technological innovation face different problems. The young entrepreneurs are afforded little opportunity to learn the essentials of business management including the necessity of financial planning and control. The conventional advice they obtain tends to dissuade them from launching innovative ventures.

The Innovation Centres were established to serve the above needs through direct assistance and participation in the innovation tasks and through the preparation of people for their roles in those tasks. While initial funding has been supplied by the federal government, the Centres are designed to become self-sufficient through participation in the success of their clients.

- Co-ordination with their respective university facilities and expertise
- Worldwide technology sourcing
- Access to available inventions in their Innovation Banks.
- In-house education on innovation.

In separate upcoming articles, Canada Commerce will cover each centre and its methods of operation.

For further information in the meantime contact:

Montreal:
Centre of Industrial Innovation Montreal
University of Montreal Campus
P.O. Box 6079, Station A
Montreal, Quebec.
H3C 3A7

Waterloo:
Canadian Industrial Innovation Centre/Waterloo
156 Columbia Street West
Waterloo, Ontario
N2L 3L3

When it comes to fashion, international buyers are coming to the realization that Canada is a centre that can no longer be overlooked.

Fashion in the Spotlight

Canadian fashion designers and manufacturers have been quite aware for some time that they can compete favourably with the best in the world.

That confident message was abundantly clear when Canadian clothing manufacturers stepped into the fashion spotlight at the Canadian Fashion Fair held March 3 to 5 in Winnipeg, Manitoba.

The three-day event, held at the Winnipeg Convention Centre, resulted in on-site sales of $1,000,000. An additional $2,800,000 is expected to be generated in follow-up orders.

Some 300 buyers, primarily from the United States as well as Europe, were more than pleased with the diversity, style and quality of goods.

The display range included: leathers, sheepskin and down-filled apparel, ski and other sportswear such as co-ordinate outfits for men and women, and men's clothing including slacks, suits, shirts and related accessories.

The buyers were pleased — and so, too, were the majority of the 67 Canadian apparel exhibitors. In addition to making on-site sales, several manufacturers developed important and valuable new contacts as well as renewing old ones. Indeed, once the fair was over, a number of manufacturers were looking down the road, confident of clinching a deal with a variety of potential customers.

In this its third year, the Canadian Fashion Fair (the new name for what was formerly the Canadian Outerwear Fashion Fair) differed in a number of ways from the two previous annual events.

To begin, there were a number of leading Canadian designers represented, including Leo Chevalier, Pat McDonagh, Pat Kuzik, Gabriel Levy, Marilyn Brooks, Linda Lundstrom, Debbie Schuchat, Paula Lishman, Loni Groper and Anna Simon.

While the emphasis in past fairs was predominantly on outerwear, this 1982 event was expanded to include sportswear, activewear, jeans, men's fine clothing and a variety of accessories.

As the "fashion show" commentator noted: "This year is different; we have a little bit of everything — to show how talented Canadian manufacturers really are."

Another departure — and one that, judging by the audience/buyer response, proved most effective — was the holding of a fashion show/luncheon right at the exhibition site and in an area adjacent to the displays.

Formerly this portion of the fair was a separate event, usually held in the evening, away from the exhibition hall and, invariably, in the glamorous surroundings of a ballroom.

This year, in holding the fashion show/luncheon on-site, the intention, as show co-ordinator Marjorie Salki explained, was "to reach the buyers during the day, so they can leave the show with what is available fresh in their minds." There were three such luncheon shows — one for each day of the fair.

These events seemed certainly to have achieved their aim. Once they were over, buyers were able to leave, knowing they could go directly (only a few steps away!) to the buying floor in search of the garments they had just seen — and had mentally selected as their season winners!

"Canada Day," another departure from previous shows, saw the last day of the fair being set aside especially for Canadian buyers.

Lou Kliman, chairman of this year's organizing committee for the fair and president of Standard Knitting Mills, Winnipeg, commented:

"In past years, the fair — known as the Canadian Outerwear Fashion Fair — emphasized exports of Canadian-made outerwear. Now, along with the change of name, we have expanded the fair to include leathers and fur, sweaters, jeans, sportswear, some men's clothing and a variety of related products.

"Because of this," he said, "Canadian buyers will now be exposed to a range of products unparalleled in any other similar activity in Canada."

Viewed, too, as an opportunity to expand business in Canada, "Canada Day" worked very well.

According to fair co-ordinator Ivan Berkowitz, who is also president of H.I. Marketing Services, Winnipeg:

"It gave Canadian buyers the opportunity to view lines they normally don't see outside the show rooms and it kept the momentum of the fair going."

Belonging to a Buying Group — Is It For You?

by Jim Kelly

Even Harrod's, the huge ultra-prestigeous department store in London, England, where the Queen and the sheiks of Araby shop, is a member of a buying group. Canada's Hudson Bay department store chain is a member of a buying group, ditto the 1,000-store home hardware retail organization. A number of furniture manufacturers in Manitoba formed a buying group to obtain better prices on furniture components and several wood-stove manufacturers are in the process of doing the same. In Quebec a 283-member buying group purchases foodstuffs and supplies equipment and services for hotels, restaurants, senior citizens' homes and cafeterias. On a smaller scale, health food store owners in one medium-sized Canadian city have formed a buying group to purchase inventory and to share the cost of newspaper advertising.

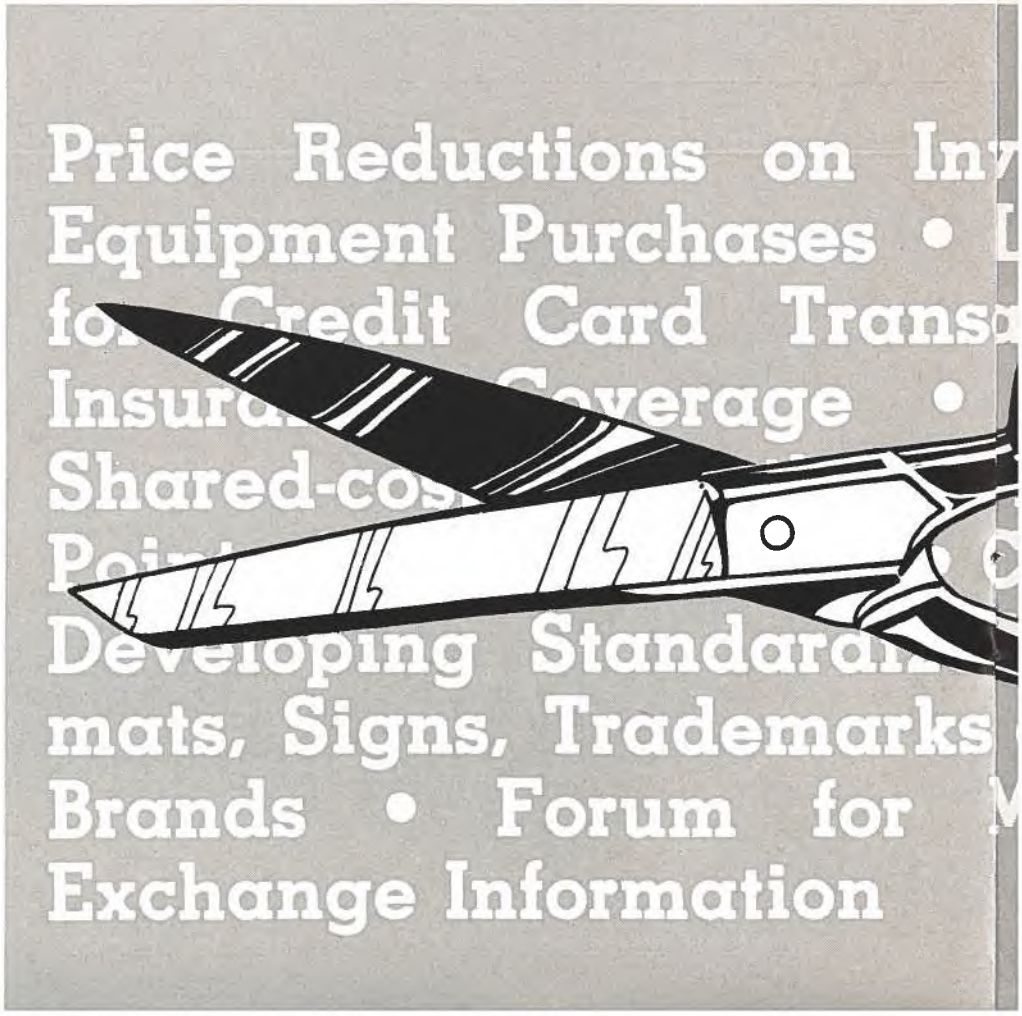
Interested? Where do you start to investigate whether a buying group is right for your firm? The first step is to determine if there is a good buying group in existence that your firm can join. No complete listing of buying groups is available, so begin your search by calling your industry contacts. They will determine if a buying group already exists within your line of business that would be suitable for your firm to join taking into consideration the services provided and the financial and other benefits of membership. Why form a new buying group if a suitable one already exists?

If no suitable buying group exists that your firm might join, you may wish to form a buying group. How do you begin? Why, of course by following the step-by-step bar chart planning system and accompanying manual available from the Department of Industry, Trade and Commerce/Regional Economic Expansion. (See box for where to obtain the chart and manual.)

The bar chart planning system divides the planning process into the following areas:

- Objectives and scope of the buying group
- Financial justification
- Organizational structure
- Legal
- Financial
- Membership recruitment and relations
- Purchasing
- Distribution
- Accounting services
- Tradenames/Trademarks/Graphics
- Advertising/Publicity/Promotional/Merchandising

Complicated? Not at all. This planning system is very simple and straightforward. Of course, setting up a buying group that will meet the needs of four or five retail stores in one city will obviously be much less complex than setting up a buying group that will have a coast-to-coast membership of a number of firms. However, proper planning techniques should always be employed irrespective of the nature of the buying group to be formed, to



ensure a proper foundation for successful operation.

When planning the formation of a buying group, key considerations include the number and types of individuals brought together as the "founding members." It has been said that having more than eight to 12 individuals involved in the formation of a new buying group is quite unwieldy, leading to coordination problems. And it is important that all the "founding members" are able to work effectively in group situations, or at least not be "difficult" to the point of impeding the formation of the group.

It is also very important at the outset to clearly define what the buying group will do and what it will not do, and to obtain the understanding and concurrence of all members. For example, will the buying group negotiate for insurance coverage for members? Will it become involved in advertising and in the production of catalogues? It is also very important to ensure that all members are aware of the time required by the new buying group to develop the various services that will eventually be offered.

Typically buying groups start off by providing self-financing services, which produce financial surpluses that can subsequently be utilized to finance additional services. As would be expected, the first service normally provided is bulk purchasing of merchandise, followed later by the negotiation of preferential rates for members on store equipment and furnishings, and services such as insurance. Shared cost advertising and promotional programs are also provided rather early in the development of a buying group. Other services that include production of merchandise catalogues, market surveys, and development of training programs for staff of buying group members, are usually developed at a later stage in the development of the buying group.

The working capital required to establish and operate the buying group may be raised in a number of ways:

- An initial membership fee, plus a continuing (monthly, annual) membership fee, may be levied
- Issuing shares (discuss the legalities of such with your lawyer)
- The accumulation of volume purchase rebates from suppliers
- Adding a surcharge to members' invoices

It should be noted that the amount of capital required by the new buying group will obviously be greatly affected by whether the buying group intends to establish and operate its own warehouse and distribution centre. If the decision is made to do so, the buying group should contact appropriate federal, provincial and municipal officials to determine if financial assistance such as loan guarantees, low interest loans and assistance in training are available.

Still interested? If so, you can obtain a copy of the manual on "How to Form a Buying Group," by contacting:

Jim Kelly
Distribution Services Branch (88)
Department of Industry, Trade and Commerce/Regional Economic Expansion
235 Queen Street
Ottawa, Ontario
K1A 0H5
Tel: (613) 593-7981

Buying groups receive very little publicity in business circles. However, many Canadian companies, large and small, are enjoying the cost-cutting and profit-improving benefits of membership. Buying groups can be a low-cost, low risk way to reduce costs and increase profits for retailers, wholesalers, manufacturers, professionals and others. In addition to obtaining price reductions on inventory and equipment purchases, buying groups can provide such other services and benefits to members as negotiating lower rates for credit card transactions and for insurance coverage, developing shared-cost advertising programs, point-of-sale materials and catalogues, and developing standardized store formats, signs, trademarks and private brands. Buying groups can also provide a forum for members to exchange information on such subjects as market trends.

As an aid to Canadian business, the Department of Industry, Trade and Commerce/Regional Economic Expansion has developed a manual titled: "How to Form a Buying Group." The contents of this manual include a 69-step bar-chart planning system to guide the formation of a new buying group, a paper covering the legal aspects of buying groups, a case study, examples of materials used by buying groups to recruit members, and a report "expansion of your business by forming a buying group" developed by the government of Quebec. Copies of this manual are available at no charge. See address at close of article.

Well-known among the business community for its long-term lending and venture capital activities, the Federal Business Development Bank continues, in this issue, the second in a three-part series on "Going into Business for Yourself." Here the FBDB looks at. . . .

Financing Available to Small Business

There are two types of financing, that done with borrowed dollars (debt financing) and that done with ownership dollars (equity financing). Borrowed dollars are the most common form of financing but ownership dollars are also needed if the business is to have a balanced capital structure.

Borrowed dollars are most often available through either an operating loan (demand loan) or a term loan. Most small businesses will have both types of loans outstanding at any given period. Another source of short-term financing with borrowed dollars is by way of trade credits.

An operating loan is money generally advanced on a revolving credit basis and used to cover recurring but temporary financial requirements. Such requirements might arise as a result of receivables being at their peak during the busiest period of the year.

The operating loan, in this instance, would be liquidated as the receivables are collected. That is, in fact, one of the principal characteristics of an operating loan. The lender knows that the loan is for a limited period and that, if the business performs to expectations, it will be self-liquidating.

An operating loan is usually in the form of a demand loan, that is the lender can demand repayment of the loan at any time if it is felt the business is not performing satisfactorily. Other characteristics of an operating loan are that interest charged on it may be lower on signing than interest charged on a term loan and that it will fluctuate over the period of the loan.

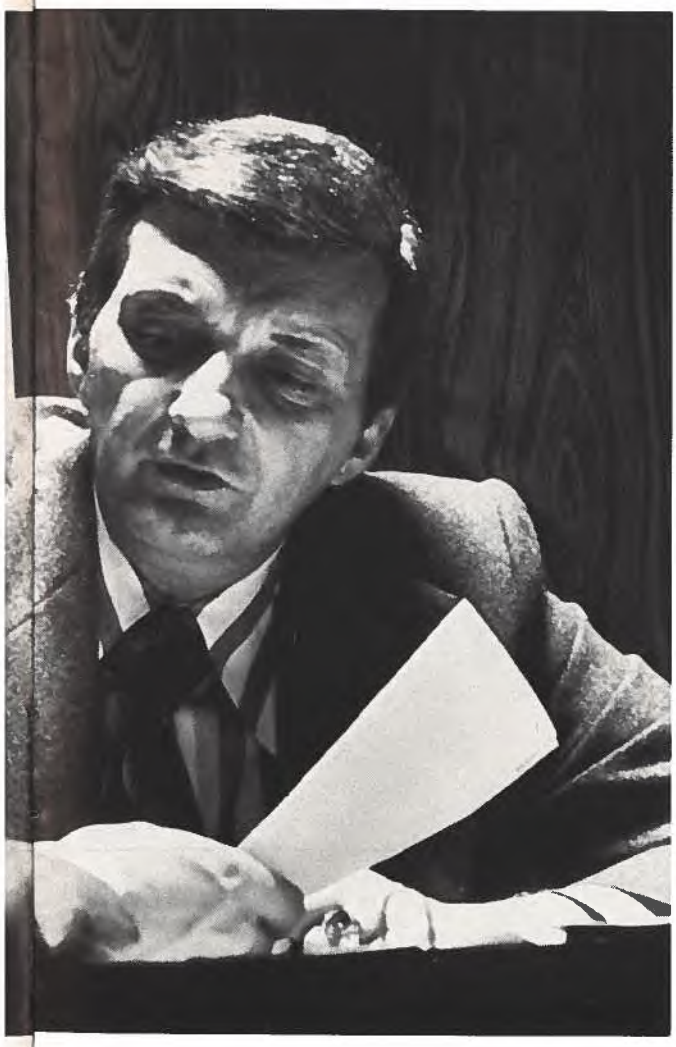
And often an operating loan can be quicker to obtain than a term loan, primarily because it is for a limited period and is self-liquidating.

A term loan is for a period of from one to several years, even as much as 15 years. A term loan is sometimes amortized, that is, regular payments include a reduction in the amount of the loan as well as interest on it.

Term loans make capital available to finance the cost of a specific long-term requirement of the business. It might be a new heating system. It might be to expand the premises. Whatever the purpose, a term loan enables the business owner to use outside funds rather than having to draw on his own resources.

Supposing, as one example, a small auto parts manufacturer needs new equipment so that he can increase his production but lacks the funds to buy it. With a term loan, the equipment can be purchased and the loan retired with the help of the additional income the new equipment will generate.

Most term loans are secured by the fixed assets of a business but lenders place great importance in the ability of the business to repay the loan out of earnings over the life of the loan. Other characteristics of a term loan are that the interest rate at time of signing is usually higher than for an operating (demand) loan, the payments of interest and principal are fixed as is the period for final repayment, and it usually takes longer to obtain.



Trade credit is the most often used form of short-term financing. It is offered by the supplier who agrees to accept payment 30 days, 60 days or even longer after delivery. The supplier is, in effect, lending the business the cost of what has been purchased for an agreed period of time.

Suppose a retailer buys $4,000 worth of stock from a supplier, stock that is expected to be sold within 60 days. If the retailer can obtain a 60-day trade credit, he can pay for that stock out of the proceeds of the sale rather than having to draw on working capital to pay for it at the time of delivery.

There is a fixed cost for the use of borrowed dollars — the monthly payments of interest on an operating (demand) loan, the monthly payments of interest and repayments of principal on a term loan and, in the instance of trade credit, forfeiture of any discounts that might be offered for payment on delivery.

These costs are a drain on the cash flow of the business. That drain can be avoided by using ownership dollars. These are the dollars that the owner, his partners or his shareholders put into the business usually when the business is being started or later when the business is being actively expanded. A business would draw on ownership dollars, too, when it needs new financing but has exhausted its borrowing capacity.

Ownership dollars constitute the equity capital of a business. Those who provide equity financing are repaid out of the profits a business earns. Sole owners of businesses are frequently reluctant to seek additional outside equity financing because it means they must share the profits with others. But if additional equity financing will help a business grow, they have also to ask which is better: having a small pie to oneself or having a slice of a larger pie?

One way to avoid having to seek additional equity investment is to regularly reinvest the profits of the business. In this way, the owner is able to supplement or replace the use of borrowed dollars and limit the need for outside equity when new financing is required.

Next: The sources of business financing.

Should you be interested in finding out more about going into business for yourself, the Federal Business Development Bank offers a self-instructional program, "Financing a small business." Known as a Management Clinic, it consists of a 20-minute audio-visual presentation and accompanying workbook. This Management Clinic is available, at a nominal charge, at any FBDB branch office across Canada.

Economists' Corner

Canada's Recent Experience with Inflation

Canada's experience with inflation during the 1970s was a frustrating one, particularly during the past five years. Double-digit rates of price increase first emerged here in 1974 and 1975. The application of monetary and fiscal restraint, coupled with wage and price controls, did bring temporary relief between 1976 and 1979 as consumer price increases fell to an average rate of 8.3 per cent. But during the last two years inflation has once again deteriorated to double-digit rates.

A number of factors have contributed to this deterioration since 1978 including the depreciation of the Canadian dollar, another OPEC increase in world oil prices and the renewal of double-digit wage demands in Canada. In 1980 the CPI in Canada increased by 10.2 per cent and in 1981 it increased by 12.5 per cent, the latter increase the largest registered since 1948.

This note reviews the key factors contributing to the resurgence of double-digit inflation in Canada in an attempt to provide some guide to the likely future course of inflation in this country.

Inflation analysis can follow a number of methodological paths. One particularly informative method is to break the price level down into a few key components and thus allow for the vastly different ways that some kinds of prices are determined. For example, it is useful to consider food prices separately because they are highly volatile, dependent as they are upon international market conditions, major weather changes, currency realignments, etc. It is also useful to consider energy prices separately because they are dependent upon OPEC agreements, world demand and supply conditions, domestic pricing policies, etc. The remaining set of prices — i.e. the non-food, non-energy ones, accounting for more than 72 per cent of the items consumers buy including cars, clothes, houses, haircuts and health care — can thus be considered as a separate group. This group, more than either of the other two, reflects the set of demand and supply factors peculiar to, and thus subject to influence by, domestic economic conditions.

Before proceeding it is important to note that this particular decomposition of consumer prices is not undertaken to convey in any way that the prices paid by consumers for certain products are more important than the prices they pay for other products. What is important is the total cost of all the items consumers buy relative to their incomes. But this particular breakdown is useful because it stresses the unique way that each of these components contributes to inflation.

Food Prices

Since 1977 food prices in Canada have been increasing at an average annual rate of 12.7 per cent and in each year the rate of increase exceeded 10 per cent. That is quite a bit faster than the 9.3 per cent average rate of increase in non-food prices over the same period.

During the 1960s both food and non-food prices grew at about the same rate, 3 per cent per year, although food prices were more volatile. However, during the 1970s food prices grew faster at more than 10 per cent per year compared to 7 per cent for non-food prices. Factors contributing to this divergence include worldwide influences such as accelerating demand for food and frequent supply interruptions, and domestic influences such as increasing market management and exchange rate depreciation.

Last fall it was expected that over the next few years food prices would continue to rise at a rate exceeding that of non-food prices. However, since last summer food price increases have declined significantly due to a number of factors including bumper wheat crops, fal-

tering consumer demand and intensive regionalized retail competition. Thus, for 1982 at least, food prices may increase by less than non-food prices.

Energy Prices

During the 1960s "real" energy prices were falling in Canada and thus were not a significant factor in the overall inflation rate at that time. OPEC and 1973 changed all of that, of course, although federal government policy which kept domestic oil prices below world levels insulated the impact of this change on Canadian consumers through most of the decade. Since October 1980, however, Canada's National Energy Plan has permitted large domestic energy price increases to take place.

Thus in 1981 energy prices paid by consumers increased by 30.1 per cent, up from a 16.0 per cent increase in 1980. As 1982 began the year-ago rate of increase was still high at 24.1 per cent since the NEP will permit increases averaging 18.7 per cent for all of 1982 and 15.3 per cent in 1983. However, such large increases may not occur because the worldwide recession has reduced demand for oil and has resulted in a decline in world oil prices since last summer. Nevertheless, in the near term energy prices in Canada are likely to contribute to sustaining high inflation overall, not to reducing that rate.

Prices and Costs in Canada 1978-81

(Percentage Changes)

	1978	1979	1980	1981
Consumer Prices				
Total CPI	9.0	9.1	10.1	12.5
Food	15.5	13.2	10.7	11.4
Energy	9.5	9.8	16.0	30.1
All Other	6.1	7.6	9.4	10.9
Labour Costs				
Labour Income Per Employee	5.6	7.5	8.9	10.9
Productivity	0.3	−0.9	−2.7	0.4
Unit Labour Costs	5.2	8.5	11.8	10.5
Average Weekly Earnings	6.2	8.6	10.1	12.0
Non-COLA Negotiated Settlements	7.1	8.7	11.1	13.4

Non-Food, Non-Energy Prices

There is a tendency for non-food, non-energy prices in Canada to follow in step with underlying labour cost developments. Overall demand conditions do affect such prices of course, as do other costs of production including capital, raw materials and profits. Nevertheless, the key underlying factor in non-food, non-energy price determination is labour costs. Thus as unit labour costs in Canada accelerated from a 5.2 per cent increase in 1978 to a 10.5 per cent in 1981, non-food, non-energy prices accelerated from a 6.1 per cent increase to 10.5 per cent over the same period.

It is widely expected that unit labour costs in Canada will continue to grow at double-digit rates in the near future; wage settlements which have consistently remained above 10 per cent since the spring of 1980 ensure that this will be the case. And, at least to date in 1982, no significant sign of moderation has yet emerged on the labour cost front despite the recession and high unemployment. Yet for Canada to see a significant break in inflation in the next little while, a moderating shift in wage setting must occur.

The Outlook for 1982

Private sector forecasters now predict an increase in Canada's CPI in 1982 of between 10 and 11 per cent. The continuation of double-digit inflation in Canada for the rest of this year is particularly worrisome at this point in time because of the very significant improvement in the U.S. rate of inflation that is currently underway: forecasters now expect that the U.S. rate for all of 1982 will be between 6 and 7 per cent. For an industrial nation like Canada, which is so heavily involved in international trade and thus so dependent on remaining internationally competitive, this emerging cost gap is a cause for concern.

T.W. McCormack
Economic Intelligence Directorate
Office of Policy Analysis
Tel: (613) 995-2785

African Development Bank

Canadian business was not taking full advantage of its opportunities in Africa, more than 600 business executives were told at a series of three African Development Bank (ADB) seminars held earlier this year in Vancouver, Toronto and Montreal.

Lost Opportunities for Canadian Business

While Canadian exports to Africa have increased from $639 million in 1978 to $1.5 billion in 1981, mostly in manufactured goods, Canadian firms have not been doing as well on multi-lateral financed projects. As an example, from its inception in 1967 to 1980, the African Development Fund has financed the procurement of Canadian goods and services amounting to $2.3 million. This represents a one per cent share of the cumulative procurement of all members of the Fund, compared to 14 per cent for Germany, 19.5 per cent for France and 5.4 per cent for Britain.

At the same time Canada has subscribed $135 million dollars to the Fund's $1.1 billion account to December 31, 1980, third among the Fund's 22 non-African participants after Japan and the United States.

This state of affairs is made more disappointing by the fact that Canadian firms have the know-how and technology in most of the sectors where multi-lateral financing is providing the money for development — such areas as energy, mining, forestry, agriculture, transportation and communications.

It was to encourage greater participation in this huge market that the African Development Bank seminars were held, sponsored by the Trade Relations sector of the Department of External Affairs in co-operation with the African Development Bank, provincial governments, the Association of Consulting Engineers of Canada and the Canadian Chambers of Commerce.

Throughout the sessions, which encouraged audience participation to the full, the delegates were given a rundown on the type of projects sponsored by the ADB; methods of tendering; financial and administrative procedures followed; and the type of assistance available under various government programs designed to aid exporters.

More and more, the developing nations are encouraging consultants and manufacturers from the developed nations to enter into joint venture agreements with their nationals. The ADB is actively pursuing this type of arrangement provided such ventures are on an up-and-up basis and are not merely window dressing with little or no contribution from the native partners. For the Canadian consultant or business, these arrangements provide not only on-the-spot representation but also a knowledge of the customs and resources.

With the increasing emphasis placed, by the Canadian government, on Africa as an excellent export market, and with greater African interest in Canada, Canadian business executives would be well advised to explore this market.

The African Development Bank (ADB) is an international development finance institution with the participation of 50 African states. The organization, open to all independent African nations, was formed in 1963 and has its headquarters in Abidjan, Ivory Coast.

The ADB was a co-operative response by the African states, mostly newly independent, to stimulate economic and social development in order to raise the living standards of their peoples. The attainment of these objectives has been made difficult by a number of adverse factors in the African region, chief of which have been shortages of capital, poor technology, limited markets and the vagaries of nature.

The purpose of the ADB is to help fill some of these critical gaps by using the technical and financial resources at its disposal. The bank is also required to pay special attention to investments which are multi-lateral in scope to foster intra-African trade and development, and to co-ordinate its efforts with other regional, international and bilateral institutions with similar concerns for development in the region.

A major thrust of the bank and one of its sources of funds is the African Development Fund. ADF was established in 1972 by the bank with participation of non-regional countries. The fund's administration is carried out by the ADB under the direction of the Board of Governors, of which Canada is a member.

The main objective of the fund is to mobilize funds for the long term development requirements of ADB member countries. In particular, these funds are meant to give special assistance to the poorer members of the ADB by granting interest free long term loans to developmentally important but low financial return projects in the rural and social sectors.

For further information, contact:
In Ottawa:
Jacques Desjardins
Africa Division
Bureau of Pacific, Asian, African and Middle East Affairs
Trade Development
External Affairs Canada
235 Queen Street
Ottawa, Canada
K1A 0H5
Tel: (613) 995-8188

In Abidjan:
Jean H. Guilmette
Canadian Executive Director
African Development Fund
B.P. 1387
Abidjan 01, Ivory Coast
Tel: 32-99-08
Telex: AFDEV Abidjan 3263

Jacques Filion
Counsellor (Commercial)
Commercial Division
Canadian Embassy
P.O. Box 4104
Trade Centre Building
23 Nogues Avenue
Abidjan 01, Ivory Coast
Tel: 32-20-09
Telex: (Destination code 983) 3593

Oceanographic Assembly, MAREX 82 to be Hosted in Halifax in August

An event that takes place only once every six years and which has been held in Tokyo, Moscow, New York and Edinburgh, is scheduled for Halifax August 2-13, 1982.

Attracting some 1,500 delegates from all countries involved in the marine sciences, the Joint Oceanographic Assembly is being held at Dalhousie University.

The Halifax occasion is also distinguished by a first-time event — MAREX 82, a showcase of the latest marine science hardware available from manufacturers around the world, is being held in conjunction with the Joint Oceanographic Assembly.

The prime goal of MAREX 82 is to create a marketplace for manufacturers, designers; marine scientists and engineers. Together with governments and other interested parties they will be able to meet and exchange technical knowledge and sell their products.

A highlight of the final three days (August 11, 12, 13) of the Assembly, MAREX 82 will be held in downtown Halifax at the new Metro Centre, conveniently located near a number of ocean research centres and several leading Canadian universities. Fully modern, the Centre has 3,716 square metres (40,000 square feet) of exhibition space.

Canadians interested in more information or in booking space for MAREX 82 should contact: Denman Exhibitions Limited, 1588 Hollis Street, P.O. Box 878, Halifax, Nova Scotia B3J 2W2. Telephone (24 hours): (902) 422-8471. Telex: 019-21573.

Hydrogen, a fuel with a future (see article on page 1), was brought a step closer to economic viability with the opening, this month, of the new test facility for hydrogen generation at Varennes, Québec. It was officially opened by the Hon. Herb Gray, seen here with Yves Duhaime, Québec Energy Minister; Sandy Stewart, President of Electrolyser Inc.; and Lionel Boulet, Hydro-Québec research institute director.

The facility, supported by a $2,497,000 grant under the old federal program for Advancement of Industrial Technology (now replaced by the Enterprise Development Program administered by the Department of Industry, Trade and Commerce/Regional Economic Expansion), will carry out research and development of unipolar cells for use in large commercial hydrogen plants. It will be operated jointly by Electrolyser Inc., a joint combined company owned by Electrolyser Corporation of Toronto and Noranda Mines of Montreal, and by IREQ, the research arm of Quebec Hydro.

Research to be carried out at the facility will enhance hydrogen generation technology for application to future industrial and commercial uses such as energy storage and transmission, synthetic fuel production, commercial fertilizers, and upgrading and recovery of heavy oils and oil sands.

A byproduct of the electrolytic process is heavy water, which is produced in small quantities and can be used to supplement the requirements for CANDU reactors.

For further information, contact:
J.W. Earle
Electrical and Electronics Branch (45)
Department of Industry, Trade and Commerce and Regional Economic Expansion
235 Queen Street
Ottawa, Ontario
K1A 0H5
Tel: (613) 593-4481

Titles of new and updated publications

CANADIAN OCEAN INDUSTRIES DIRECTORY

Published by the Department of Industry, Trade and Commerce on a co-publishing basis with Oilweek Magazine, this latest directory outlines the capabilities of Canadian companies which provide equipment and services to ocean industries interests around the world.

Includes an alphabetical list of companies, a list of products and services, and contact information for Canada's trade offices around the world. Profiles of the listed companies provide company contacts and the necessary specifications of their products and services.

English — 166 pages

For copies contact: Harry Shaver, Ocean Industries Division, Aerospace and Marine Branch, Department of Industry, Trade and Commerce (51), 235 Queen Street, 6th Floor East, OTTAWA, Ontario, K1A 0H5, Telephone: (613) 995-3201 ext: 309

REFERENCE MANUAL '82 CANADIAN DATASYSTEMS

Produced by "Canadian Datasystems", a monthly publication, this guide to buyers contains a product index, an advertisers' index, a calendar of Electrical Data Processing (EDP) conferences, exhibitions and seminars, company profiles, and articles on the following: **the computer industry in general, in government and in industry; communications; legal benefits and liabilities; software; management; technology.**

A special section is devoted to Canada's data processing service companies.

English — 166 pages.

Copies may be obtaining for $18.00 from: Subscription Department, Canadian Datasystems Reference Manual, 481 University Avenue, TORONTO, Ontario, M5W 1A7

Employees of the Department of Industry, Trade and Commerce may obtain copies free of charge from: Technical Services, Public Information Branch (98), Department of Industry, Trade and Commerce, 235 Queen Street, 2nd Floor West (98), OTTAWA, Ontario, K1A 0H5, Telephone: (613) 995-8900, ext. 55

CAD/CAM PRODUCTS AND SERVICES IN CANADA

This second edition of the CAD/CAM Directory produced by Corpus Information Services and the Department of Industry, Trade and Commerce provides information concerning companies and organizations in the fields of automated design and manufacturing technologies which have business addresses in Canada and are capable of supplying complete systems, major equipment, components or services related directly to these fields.

Separate sections of this brochure are devoted to CAD/CAM associations and societies, research organizations, and educational institutions and list their activities, the services they supply, and how they may be contacted.

English — 51 pages

French — 53 pages

For copies contact: Jack Scrimgeour, Technology Branch, Department of Industry, Trade and Commerce, 235 Queen Street, 2nd Floor West (61), OTTAWA, Ontario, K1A 0H5, Telephone: (613) 593-7861

THE CATALOG

The April 1982 edition of this directory is now available — an updated list of the members of the Canadian Advanced Technology Association, their qualifications, products and services.

English — 138 pages

Inquiries and requests for copies should be directed to: The Administrator, Canadian Advanced Technology Association, 275 Slater Street, Suite 803, OTTAWA, Ontario, K1P 5H9

Employees of the Department of Industry, Trade and Commerce should direct their requests to: Technical Services, Public Information Branch, Department of Industry, Trade and Commerce, 235 Queen Street, 2nd Floor West (98), OTTAWA, Ontario, K1A 0H5, Telephone: (613) 995-8900, ext. 55

ILAP
INDUSTRY AND LABOUR ADJUSTMENT PROGRAM

A fold-out brochure describing the procedures necessary to participate in this program administered by the Department of Industry, Trade and Commerce and designed to alleviate the distress created in a Canadian community by lay-offs resulting from permanent, large-scale industry dislocation.

Bilingual

For copies contact: Department of Industry, Trade and Commerce, ILAP (78/1), Att: Carol Butt, 235 Queen Street, 8th Floor East, OTTAWA, Ontario, K1A 0H5, Telephone: (613) 593-5084

Multilateral Project Opportunities

The following list of multilateral project opportunities has been prepared by the Bureau of Pacific, Asian, African and Middle Eastern Affairs (PAM), a merger of the former Office of Overseas Projects, the Bureau of Asian and Pacific Affairs and the Bureau of African and Middle Eastern Affairs. The objective of this list is to inform Canadian companies of the projects being considered or already approved for financing by the international financing institutions such as the World Bank, the Asian Development Bank and the Inter-American Development Bank.

PLEASE NOTE that further information is available on approved projects only and may be obtained from the respective geographical divisions of PAM listed below.

In order to capitalize on these export opportunities, experience has shown that getting in on the ground floor by advance marketing activities or use of local agents has increased the probability of success. Smaller companies may wish to consider participating as sub-suppliers or as part of a consortium bidding on equipment packages.

Projects Under Consideration

Due to a reorganization in the Department, certain names and telephone numbers are subject to change. Sorry for any inconvenience this may cause.

The Bureau of Pacific, Asian, African and Middle Eastern Affairs is prepared to assist companies in formulating their bids, and to suggest the appropriate contacts for companies interested in obtaining insurance, bonds and performance guarantees which are often required as part of tender specifications.

In addition, our Trade Commissioners abroad are ready to assist you in pursuing business, such as arranging meetings with personnel at the executing agencies. The Department also maintains liaison officers in Washington and Manila, who are prepared to undertake enquiries on your behalf. However, we recommend that you initially contact the appropriate officer listed below.

If any of the approved projects interest you, contact: **The Bureau of Pacific, Asian, African and Middle Eastern Affairs (PAM)**, Department of Industry, Trade and Commerce, 235 Queen Street, 9th Floor East, Ottawa, Ontario K1A 0H5, or cal the telephone numbers which are listed.

The Canadian Commercial Corporation, through the Export Supply Centre, can assist suppliers with bids on Canadian equipment packages for multilateral projects, when required by the private sector. For further information, please call Bob Burwash (819) 997-5715.

Projects Under Consideration

AFRICA (613) 996-8188

CENTRAL AFRICAN REPUBLIC
Contact: *R. Bélanger*
Education II
World Bank (IDA) — $10.0 M.

COMOROS
Contact: *R. Bélanger*
Land conservation and reafforestation and agricultural development
World Bank (IDA) — $6.0 M.

Population
World Bank (IDA) — $3.0

EGYPT
Contact: *L. Fortin*
Fourth Power Project
World Bank (IBRD) — To be determined

GUINEA
Contact: *J. Desjardins*
Technical Assistance
World Bank (IDA) — $10.0 M.

KENYA
Contact: *P. McLachlan*
Urban Water Supply
World Bank (IBRD) — $20.0 M.

MALI
Contact: *J. Desjardins*
Highways V
World Bank (IDA) — $24.0 M.

MAURITANIA
Contact: *J. Desjardins*
Irrigation II
World Bank (IDA) — $8.0 M.

MOROCCO
Contact: *J. Arsenault*
Establishment of about 10 fertilizer blending and distribution centers
World Bank (IBRD) — To be determined

Petroleum Engineering
World Bank (IBRD) — To be determined

NIGERIA
Contact: *P. McLachlan*
Line of credit for various sub-projects
World Bank (IBRD) — $120.0 M.

SIERRA LEONE
Contact: *P. McLachlan*
Power IV
World Bank (IDA) — $4.0 M.

SOMALIA
Contact: *P. McLachlan*
Petroleum Exploration
World Bank (IDA) — To be determined

Technical Assistance
World Bank (IDA) — To be determined

SUDAN
Contact: *L. Fortin*
Power IV
To be determined (IDA)

TANZANIA
Contact: *D. Wynne*
Coal Engineering
World Bank (IDA) — $5.0 M.

Highways VI
World Bank (IDA) — $30.0 M.

TANZANIA
Contact: *D. Wynne*
Sugar Rehabilitation I
World Bank (IDA) — $10.0 M.

Urban III
World Bank (IDA) — $5.0 M.

TOGO
Contact: *J. Desjardins*
Credit to support program of structural adjustment
World Bank (IDA) — $30.0 M.

UPPER VOLTA
Contact: *J. Desjardins*
Volta Noire Agricultural Development
World Bank (IDA) — $6.0 M.

ZAIRE
Contact: *R. Bélanger*
Coffee Project
World Bank (IDA) — $15.0 M.

ZIMBABWE
Contact: *R. Bélanger*
Petroleum Fuels Supply Engineering
World Bank (IBRD) — About $4.5 M.

ASIA (613) 992-0356

BANGLADESH
Contact: *N. Barber*
Bangladesh Shilpa Bank (Third Loan)
No decision made whether consultants will be required
Asian Development Bank (ASDB) — $35.0 M.

Second Tubewell
No decision made whether consultants will be required
Asian Development Bank (ASDB) — $50.0 M.

BANGLADESH
Contact: *N. Barber*
Machine Tool
World Bank (IDA) — $25.0

Second Fisheries Credit (T.A.)
Consultants will be required
Asian Development Bank (ASDB)

BURMA
Contact: *N. Barber*
Coal Development (T.A.)
Consultants will be required
Asian Development Bank (ASDB)

BURMA
Contact: *N. Barber*
Agriculture Sector Strategy Study — T.A.
Consultants will be required
Asian Development Bank (ASDB)

Kun Chaung Hydropower — T.A.
Consultants will be required
Asian Development Bank (ASDB)

INDIA
Contact: *M. Vandenhoff*
Haryana Irrigation II
World Bank (IDA) — $125.0 M.

KOREA
Contact: *A. Pacher*
National Urban Land Development and Housing II
World Bank (IBRD) — $125.0 M.

KOREA, Republic of
Contact: *A. Pacher*
Second Provincial Water Supply (Tech. Asst. Loan)
Consultants will be required
Asian Development Bank (ASDB) — $3.5 M. (approx.)

Small Towns Water Supply Sector
No decision made whether consultants required
Asian Development Bank (ASDB) — $50.0 M. (approx.)

Vocational Education Sector
Consultants will be required
Asian Development Bank (ASDB)

NEPAL
Contact: *M. Vandenhoff*
Village Fuelwood Plantation (T.A.)
Consultants will be recruited by Asian Development Bank (ASDB)

NEPAL
Contact: *M. Vandenhoff*
Feeder Roads Improvement
Consultants will be required
Asian Development Bank (ASDB) — To be determined

PAKISTAN
Contact: *N. Barber*
Agro-Industries Credit
No decision made whether consultants will be required
Asian Development Bank (ASDB) — $30.0 M.

Foodgrain Storage — T.A.
Consultants will be required
Asian Development Bank (ASDB)

PAKISTAN
Contact: *N. Barber*
Oil Seeds Development — T.A.
Consultants will be required
Asian Development Bank (ASDB)

Pipri Thermal Units 3 and 4
Consultants will be recruited by executing agency
Asian Development Bank (ASDB) — $2.0 M. [approx.]

Port Qasim Maintenance Dredger — T.A.
Consultants will be required
Asian Development Bank (ASDB)

SRI LANKA
Contact: *N. Barber*
Aquaculture Development
No decision made whether consultants will be required
Asian Development Bank (ASDB) — To be determined

S.E. ASIA (613) 996-8661

INDONESIA
Contact: *J. Brenchley*
Brackish Water Aquaculture
No decision made whether consultants will be required
Asian Development Bank (ASDB) — To be determined

Education XIV (Non-formal Education)
World Bank (IBRD) — $90.0 M

Power XIII
World Bank (IBRD) — $215.0 M

Roads Sector — T.A.
Consultants will be required
Asian Development Bank (ASDB)

Tulungagung II and Baro Raya[3] — T.A.
Consultants will be required
Asian Development Bank (ASDB)

LAO PEOPLE'S DEMOCRATIC REPUBLIC
Contact: *P.A. Rolland*
Vietiane Plain Rural Electrification Program (Phase II)
Consultants will be required
Asian Development Bank (ASDB) — $6.0 M

PHILIPPINES
Contact: *J. MacLeod*
Industrial Tree Plantation — T.A.
Consultants will be required
Asian Development Bank (ASDB)

Oil and Gas Exploration
World Bank (IBRD) — $25.0 M

Sorsogon Integrated Area Development — T.A.
Consultants will be required
Asian Development Bank (ASDB)

Telecommunications I
World Bank (IBRD) — $100.0 M

THAILAND
Contact: *T. Greenberg*
Agricultural Credit — T.A.
Consultants will be required
Asian Development Bank (ASDB)

Cotton Development — T.A.
Consultants will be required
Asian Development Bank (ASDB)

Crop Intensification — T.A.
Consultants will be required
Asian Development Bank (ASDB)

Crop Intensification
No decision made whether consultants will be required
Asian Development Bank (ASDB) — $25.0 M (approx.)

Education VII
World Bank (IBRD) — $110.0

Smallholder Livestock Development
No decision made whether consultants will be required
Asian Development Bank (ASDB) — $20.0 M

Songkhla Lake Regional Environmental Plan (Tech. Assist. Loan)
Consultants will be recruited by executing agency
Asian Development Bank (ASDB) — $1.2 M (approx.)

LATIN AMERICA & CARIBBEAN (613) 996-5357

BARBADOS
Contact: *J. Snyder*
Technical Assistance
World Bank (IBRD) — $2.5 M.

BRAZIL
Contact: *K. Roeske & M.L. Lambert*
Integrated Rural Development in the Alto Pajeu Valley
Inter-American Development Bank (IADB) — $25.0 M

COLOMBIA
Contact: *F. Spoke*
Construction of roads
Inter-American Development Bank (IADB) — $80.0 M.

Construction of storage facilities & market in Bucaramanga, Barranguilla & four other localities
Inter-American Development Bank (IADB) — $20.0 M.

COSTA RICA
Contact: *F.R. Harris*
Construction of infrastructure for two industrial parks
Inter-American Development Bank (IADB) — $10.0 M.

DOMINICAN REPUBLIC
Contact: *J. Snyder*
Construction & equipping of 182 health centers
Inter-American Development Bank (IADB) — $25.5 M.

DOMINICA
Contact: *J. Snyder*
Emergency Roads
World Bank (IDA) — $5.0 M.

HONDURAS
Contact: *F.R. Harris*
Expansion of the cultivation, investigation, industrialization & marketing of the Calaguala fern for medical use
Inter-American Development Bank (IADB) — $9.0 M.

PERU
Contact: *C. Hartman*
Oil Refinery Engineering
World Bank (IBRD) — $7.0 M.

Preparation & development of the Andaychagua mine
Inter-American Development Bank (IADB) — $25.0 M.

Urban Water Supply (Stage IV)
Inter-American Development Bank (IADB) — $40.0 M.

SOUTH AMERICA (613) 996-5546

ARGENTINA
WORLD BANK
Contact: *J.G. Carson*
Ministry of Commerce and Maritime Affairs. $105 milllion. Ports I — expansion and modernization of Bahia Blanca port facilities for grain exports. Total Cost: $180 million.

Ministry of Public Works and others. $50.0 million. Water supply and sewage in the province of Mendoza and Santa Fe.

Yacimientos Petroliferos Fiscales (YPF). $150 million. Oil and gas development.

ARGENTINA
INTER-AMERICAN DEVELOPMENT BANK
Empresa Provincial de Energia de Cordoba. $110 million. Generation, transmission and distribution of electricity in the province of Cordoba.

BOLIVIA
INTER-AMERICAN DEVELOPMENT BANK
Contact: *C. Hartman*
Republic of Bolivia (YFPB). $97 million. Gas pipeline to Altiplano. Total cost: $135.7 million.

Republic of Bolivia (ENDE). $15 million. Rural electrification.

Republic of Bolivia (ENDE). $75 million. Sakhahuaya hydroelectric project. Total cost: $106 million.

CODETAR. $8.8 million. Water and sewage system for Tarija. Total cost: $11 million.

BOLIVIA
Contact: *C. Hartman*
Oil and Gas Development — Vuelta Gas Field — YPFB
World Bank (IBRD) — $60 million
Total Project Cost: $74 million

ENDE — Santa Isabel Electrification
World Bank (IBRD) — $35 million
Total Project Cost: $57.3 million

BRAZIL
Contact: *M.L. Lambert*
Carajas Iron Ore Mine — Companhia Vale do Rio Doce
World Bank (IBRD) — $300 million
Total Project Cost: $4.9 billion

Power Distribution — Electrobras
World Bank (IBRD) — $182.7 million
Total Project Cost: $710.2 million

Rural Electrification — Republic of Brazil
World Bank (IBRD) — $150 million

CHILE
Contact: *J.G. Carson*
Highways Reconstruction II — Ministry of Public Works
World Bank (IBRD)

CHILE
INTER-AMERICAN DEVELOPMENT BANK
Contact: *J.G. Carson*
Banco Unido de Fomento. $18.5 million. Private education global loan. Total cost: $30 million.

COLOMBIA — WORLD BANK
Contact: *F. Spoke*
Ferrocarriles Nacionales de Colombia. $77.0 million. Railways VII — track and equipment rehabilitation. Total Cost: $176.8 million.

Ministerio de Obras Publicas y Transporte. $150 million. Highways VIII — construction and rehabilitation of roads. Total Cost: $260 million.

Colpuertos. $45.0 million. Ports — modernization of existing ports and installation of container terminals.

COLOMBIA
Contact: *F.J.N. Spoke*
Road Construction — Fondo Vial Nacional
Inter-American Development Bank (IDB) — $95.5 million
Total Project Cost: $273 million

Hydroelectric — Corporacion Electrica de la Costa Atlantica — Sinu River
Inter-American Development Bank (IDB) — $150 million

Coal Engineering — survey of coal deposits
World Bank (IBRD) — $12 million

Highway VIII — Ministry of Public Works
World Bank IBRD — $152.3 million
Total Project Cost: $1.23 billion

Rio Grande Hydroelectric — EPM
World Bank (IBRD) — $50 million

ECUADOR
Contact: *C. Hartman*
Petroleum I — CEPE
World Bank (IBRD) — $70 million

Education III — SECAP
World Bank (IBRD) — $16 million

ECUADOR
WORLD BANK
Contact: *C. Hartman*
CEPE. $70.0 million. Petroleum I — project components include water injection in oil fields.

Servicio Ecuatoriano de Capacitacion Professional (SECAP). $16.0 million. Education III — vocational training. Total Cost: $32.7 million.

ECUADOR
INTER-AMERICAN DEVELOPMENT BANK
Municipality of Quito (Empresa Municipal de Agua Potable — EMAP). $33 million. Quito potable water system. Total cost: $45.2 million.

PARAGUAY
WORLD BANK
Contact: *J.G. Carson*
Ministerio de Transportes y Communicaciones. $93.0 million. Roads VIII — rehabilitation. Total Cost: $186 million.

PARAGUAY
Contact: *J.G. Carson*
Ports II — ANNP
World Bank (IBRD) — $13 million

PERU
Contact: *C. Hartman*
Stage IV of Urban Water Supply — Republic of Peru
Inter-American Development Bank (IDB) — $40 million

Mining II — Centromin — polymetallic mines expansion
World Bank (IBRD) — $50 million

Lima Water Supply (SEDAPAL)
World Bank (IBRD) — $40 million
Total Project Cost: $92.8 million

Roads VIII — Ministry of Transport and Communications
World Bank (IBRD) — $93 million
Total Project Cost: $186 million

PERU
WORLD BANK
Contact: *C. Hartman*
PETROPERU. $80 million. Petroleum II — primary recovery in Talara. Total Cost: $245 million.

ELECTROPERU. $80.0 million. Power VI — total cost $255 million.

URUGUAY
WORLD BANK
Contact: *J.G. Carson*
ANCAP. Amount to be determined. Oil exploration.

Administracion Nacional de Usinas y Transmisiones Electricas. $20.0 million. Power VI (Thermal) — 27 MW.

CARIBBEAN AND CENTRAL AMERICA (613) 992-0384

BAHAMAS
WORLD BANK
Contact: *J. Snyder*
Ministry of Finance. $5.8 million. Urban Development — improvement of low-income area of Nassau. Total Cost: $24.6 million.

BAHAMAS
INTER-AMERICAN DEVELOPMENT BANK
(Bahamas Electricity Corporation). $485,000. Bahamas power expansion plan and prefeasibility studies. Total cost: $609,000.

COSTA RICA
INTER-AMERICAN DEVELOPMENT BANK
Contact: *F.R. Harris*
Republic of Costa Rica (Oficina de Planificacion y Politica Economica). Amount undetermined. Preparation of social development program.

Republic of Costa Rica (Ministerio de Educacion Publica). $425,000. Creation of an intersectoral office on human resources.

DOMINICA
WORLD BANK
Contact: *J. Snyder*
Ministry of Communications, Works and Tourism. $5.0 million. Emergency roads — rehabilitation and maintenance. Total cost: $8.0 million.

DOMINICAN REPUBLIC
WORLD BANK
Contact: *M. Belanger*
Corporacion Dominicana de Electricidad. $15.0 million. Coal pier.

Ministry of Education. $15.0 million. Education III — support and expansion of rural primary education facilities.

Corporacion Dominicana de Electricidad. $60.0 million. Rio Blanco Power — distribution system for Santo Domingo.

DOMINICAN REPUBLIC
INTER-AMERICAN DEVELOPMENT BANK
Corporacion Autonoma del Acueducto de Santo Domingo — CAASD. $151.4 million. Second stage Santo Domingo potable water (Madrigal dam).

SESPAS. $22.5 million. Construction and equipping of 182 health centres in rural areas. Total cost: $25 million.

GUATEMALA
WORLD BANK
Contact: *F.R. Harris*
Empresa Guatemalteca de Communicaciones (GUATEL). Amount to be determined. Communications III — further expansion of telephone network.

GUATEMALA
Contact: *F.R. Harris*
Empresa Guatemalteca de Communicaciones (GUATEL) — rural telecommunications
Inter-American Development Bank (IDB) — $18 million
Total Project Cost: $30 million

Power V — Distribution expansion of Guatemala City
World Bank (IBRD) — $25 million

GUYANA
INTER-AMERICAN DEVELOPMENT BANK
Contact: *J. Snyder*
(Mahica — Mahaicony — Abary Agricultural Development Authority). $30 million. Secondary drainage and irrigation in Abary Region.

HAITI
WORLD BANK
Contact: *J. Snyder*
Office National du Logement. $10.0 million. Urban Development I — Port-au-Prince.

Ministry of Education. $15.0 million. Education III — construction, furnishing, equipping of primary and vocational schools. Total Cost: $16.8 million.

Ministry of Public Works, Transportation and Communications. $15.0 million. Highways VI — bridge reconstruction and rehabilitation of roads. Total Cost: $21.0 million.

Electricité de Haiti. $26.0 million. Power III — generation, transmission and distribution in Port-au-Prince area. Total Cost: $36.3 million.

HONDURAS
INTER-AMERICAN DEVELOPMENT BANK
Contact: *F.R. Harris*
Corporacion Nacional de Inversiones. $675,300. Program of research and trade evaluation of the major maritime fishing grounds of the Northern region.

JAMAICA
Contact: *J. Snyder*
Urban Transport
World Bank (IBRD) — $12 million

Power III — Jamaica Public Service
World Bank (IBRD) — $20 million

JAMAICA
WORLD BANK
Contact: *J. Snyder*
Port Authority of Jamaica. $13.5 million. Kingston Free Zone — construction of buildings and infrastructure for free trade zone area, and technical assistance. Total Cost: $22.6 million.

Ministries of Education and Youth and Community Development. $6.8 million. Technical and vocational training. Total Cost: $11.3 million.

MEXICO
WORLD BANK
Contact: *J. Pearce*
Banco Pesquero y Portuario (BANPESCA). $50.0 million. Fisheries.

NAFINSA. $100.0 million. Installation of foundry forge in Lazaro Cardenas.

NAFINSA. $60.0 million. Pollution Control. Total Cost: $142 million.

$100.0 million. Industrial Ports.

NICARAGUA
WORLD BANK
Contact: *F.R. Harris*
Instituto Nicaraguensa de Agua y Alcantarillados. Amount to be determined. Expansion of Managua's water supply system.

Fondo Especial de Desarrollo. $20.0 million. Line of credit for agriculture. Total Cost: $30.0 million.

NICARAGUA
INTER-AMERICAN DEVELOPMENT BANK
(Instituto Nicaraguense de la Pesca — INPESCA).
$30 million. Rehabilitation of fisheries. Total cost: $40 million.

INPESCA. $640,000. Support for INPESCA. Parallel to loan. Total cost: $840,000.

NICARAGUA
Contact: *F.R. Harris*
Asturias Hydroelectric Project
Inter-American Development Bank (IDB) — $40 million

PANAMA
WORLD BANK
Contact: *F.R. Harris*
Instituto de Acueductos y Alcantarillades Nacionales. $20.0 million. Water Supply and Sewerage II. Total Cost: $45.0 million.

Autoridad Portuario Nacional. $19.0 million. Improvements of ports of Balboa, Cristobal and Coco Solo Norte. Total Cost: $33.6 million.

Instituto de Recursos Hidraulicos y Electrificacion (IRHE). $25.0 million. Fortuna II hydroelectric power.

CENTRAL AMERICA SUBREGION
INTER-AMERICAN DEVELOPMENT BANK
Contact: *F.R. Harris*
Servicio Nacional de Acueductos y Alcantarillado (SNAA). $1,157,000. Program to strengthen the operations of the potable water and sewage systems of Central America, Panama and the Dominican Republic.

JAPAN & SOUTH PACIFIC (613) 995-7752

FIJI
Contact: *R.G. Beare*
Tree Crops
World Bank (IBRD) — $20.0 M.

PAPUA NEW GUINEA
Contact: *R.G. Beare*
Artisanal Fisheries
No decision made whether consultants required
Asian Development Bank (ASDB) — $4.0 M (approx.)

Kimbe, Wewak and Oro Bay Ports (T.A.)
Consultants will be required
Asian Development Bank (ASDB)

Third Papua New Guinea Development Bank
No consultants required
Asian Development Bank (ASDB) — $8.0 M

PAPUA NEW GUINEA
Contact: *R.J. Rutherford*
Agricultural Support Services
World Bank (IBRD) — $10.0 M

VANUATU
Contact: *R.G. Beare*
Vanuatu Development Bank
No decision made whether consultants required
Asian Development Bank (ASDB) — $1.0 M (approx.)

Approved Projects

AFRICA (613) 996-8188

BENIN
Contact: *J. Desjardins*
Petroleum Development
World Bank (IDA) — $8.0 M.

BOTSWANA
Contact: *D. Wynne*
III Education Project
World Bank (IDA) — $20.0 M.

CAMEROON
Contact: *J. Desjardins*
Develop Forestry with World Bank Assistance
World Bank (IBRD) — $17.0 M.

EGYPT
Contact: *E. Gorn*
Abu Qir Gas Development
World Bank — $90.0 M.

KENYA
Contact: *D. Wynne*
Petroleum Exploration
World Bank (IDA) — $4.0 M.

KENYA
Contact: *P. McLachlan*
Third Forestry
World Bank (IBRD) — $21.5 M.
World Bank (IDA) — $16.0 M.

MADAGASCAR
Contact: *R. Bélanger*
Second Village Livestock and Rural Development
World Bank (IDA) — $15.0 M.

MAURITANIA
Contact: *J. Desjardins*
Second Education
World Bank (IDA) — $5.7 M.

MOROCCO
Contact: *L. Fortin*
Pilot Project for Small Scale Mining
World Bank — $9.5 M

Forestry
World Bank — $27.5 M.

RWANDA
Contact: *R. Bélanger*
Technical Assistance to Rwanda
World Bank (IDA) — $5.0 M.

TANZANIA
Contact: *D. Wynne*
Petroleum Exploration
World Bank (IDA) SDR — $17.4 M ($20 M)

TANZANIA
Contact: *D. Wynne*
Technical Assistance to Increase Agricultural Production
World Bank (IDA) — $12.0 M.

TUNISIA
Contact: *L. Fortin*
Tunisia Fifth Highway (Rural Roads)
World Bank — $35.5 M.

ZAMBIA
Contact: *D. Wynne*
Agricultural Development
World Bank (IDA) SDR $15.9 M ($18M)

ASIA (613) 992-0356

BANGLADESH
Contact: *N. Barber*
Agricultural Support Services
World Bank (IDA) — $27.0 M.

First two wells linked with Bakhrabad Gas Project
World Bank (IBRD) — $85.0 M.

INDIA
Contact: *M. Vandenhott*
Agricultural Credit
World Bank (IBRD) — $350.0 M.

SRI LANKA
Contact: *N. Barber*
Seventh Power Transmission Project
World Bank (IDA) — $36.0 M.

S.E. ASIA (613) 996-8661

INDONESIA
Contact: *J. Brenchley*
Second Teacher Training
World Bank (IBRD) — $80.0 M.

Second Textbook
World Bank (IBRD) — $25.0 M.

THAILAND
Contact: *T. Greenberg*
Assist Economic Adjustment
World Bank (IBRD) — $150.0 M.

JAPAN & SOUTH PACIFIC (613) 995-7752

SOLOMON ISLANDS
Contact: *R.J. Rutherford*
Primary Education
World Bank (IDA) — $5.0 M.

MIDDLE EAST (613) 593-4362

JORDAN
Contact: *B. Budny*
Inauguration of Potash Project
World Bank (IBRD) — $35.0 M.

TURKEY
Contact: *B. Budny*
Erzurum Rural Development
World Bank (IBRD) — $40.0 M.

Promote Export-oriented Industries
World Bank (IBRD) — $100.0 M.

YEMEN, ARAB REPUBLIC
Contact: *G. Shannon*
Explore Energy Resources
World Bank (IDA) — $2.0 M.

SOUTH AMERICA (613) 996-5546

ARGENTINA
INTER-AMERICAN DEVELOPMENT BANK
Contact: *J.G. Carson*
(Electricidad de Misiones S.A.) $66 million
Hydroelectric Urugua. Total cost: $181 million.

ECUADOR
INTER-AMERICAN DEVELOPMENT BANK
Contact: *C. Hartman*
INECEL $27.5 million. Rural electrification program. Total cost: $34.4 million.

Republic of Ecuador — INECEL — $140 million Phase C of Paute Hydroelectric project. Total cost: $360 million.

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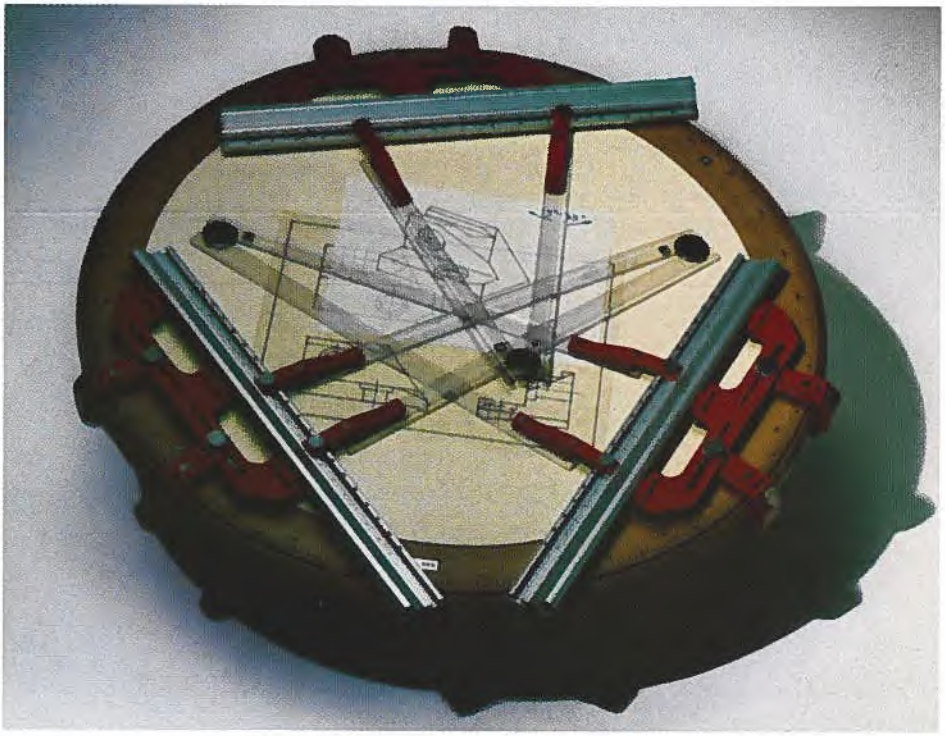

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