OPPORTUNITIES IN OCEAN SCIENCE AND TECHNOLOGY IN THE ATLANTIC REGION

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By: Roy M. Campbell

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June 25, 1973

Mr. L. E. Poetschke
Senior Advisor (Atlantic)
Coordination & Liaison Division
Department of Regional Economic Expansion
Ottawa K1A 0M4

Dear Mr. Poetschke:

I enclose two copies of my report "Opportunities in Ocean Science and Technology in the Atlantic Region". This report was prepared in accordance with my interpretation of the Agreement entered into between the Department of Regional Economic Expansion and myself.

The formation of the Corporation - North Atlantic Marine Development Corporation - in Section III of the report is a long range but very necessary objective. However, as an interim step, and in order to get positive action on the first two functions of the Corporation:

1. Inventory Present Capabilities and resources in region in context of this paper.

2. Determine the deficiencies and establish priorities for overcoming.

It may be necessary to form an Interdepartmental Steering Committee and engage the services of consultants to determine priorities and initiate necessary feasability studies.

Respectfully submitted,

Roy M. Campbell

RMC:db

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JUNE, 1973

Roy M. Campbell, B.Comm., C.A.

".....Fishery has steadily declined in relative importance in this country in spite of the wealth of the resource. So, too, has almost all other activities related to the ocean. We now have virtually no merchant marine in spite of the huge volume of trade shipped to and from our ports. Furthermore, we have little of the expertise and technological ability required for any of the exploratory, development, production and transportation activities required to find, establish, and retrieve the mineral and petroleum wealth that may well be in our vast continental shelves, or throughout the islands of our Arctic archipelago, in spite of the vastness of the resources long suspected to lie there."

Dr. A. A. Bruneau - "Engineering in a Cold Ocean".
2nd International Ocean Development Conference
Japan - October, 1972

INDEX

I - CURRENT STATUS

The Government Research Laboratories in the Atlantic Region have a record of achievement recognized worldwide. However, by and large, a very minor portion of their work has found its way into industry. The principal exception being the work of the Fisheries Research Board working with the Fishing Industry. Some very effective pieces of equipment have been developed by F.R.B. and Marine Ecology Laboratory. The Nova Scotia Research Foundation has been working with industry in a number of fields and has developed a new process for the extraction of magnesium and chlorine from sea water that is ready for commercial exploitation.

University personnel, particularly in engineering and commerce, have been working with industry on a growing scale. Specific assignments have been undertaken and carried out either at university premises or in the industry's facilities. There has also been an interchange between universities and the research laboratories.

In July, 1970, the Marine Applications Council was formed in Dartmouth and brought together the scientific community, universities, and high technology industry. Membership is 19, all members and associate members being from Nova Scotia with the exception of some Federal Government departments represented from Ottawa and the College of Fisheries, Navigation, Marine Engineering and Electronics of St. John's, Newfoundland.

One of the principal aims of the Council is to foster continuing development of technological expertise in ocean engineering in accordance with national goals and priorities.

The Council has proven to be a very worthwhile activity and has to its credit the Northwest Atlantic Marine Environmental Data Survey commissioned in early 1972 and jointly financed by the industrial members and Department of Regional Economic Expansion.

The Survey studied data needs, detailed the deficiencies and made recommendations for providing the deficient data. At the request of the East Coast Petroleum Operators Association (EPOA) the Council has undertaken to manage a Baseline Study on Hydrocarbon levels in the ocean that would meet the requirements of both industry and government.

Some technology transfer has taken place in the last few years, the most notable in the Halifax-Dartmouth area being the licensing of two Bedford Institute developments by Hermes Electronics Limited - these were Batfish and Rock Core Drill.

Three drill rigs for oil exploration have been built in Halifax. Two more are presently under construction. Supply boats have also been built in the region.

Memorial University in its Engineering Department and Marine Science Research Laboratory as well as the College of Fisheries, Navigation, Marine Engineering and Electronics, all of Newfoundland, have established a pattern of working with industry. Projects such as iceberg towing have been directly financed by the oil industry.

The Atlantic region has the nucleus of scientific and university people and facilities on which a much expanded Marine Science can be built, but is critically lacking in the high technology industry to exploit the present situation or lay the groundwork for the great expansion that will be required when oil is produced in commercial quantities and our fishing fleets are re-built to exploit our new fishing grounds.

II - OPPORTUNITIES

OPPORTUNITIES

For some of the opportunities listed below, the technology already exists - some in Canada, particularly in the Atlantic Region. Where the technology exists outside Canada it should be licensed for use in the Atlantic region. For the opportunities that require development of the technology, priority must be given to developing and exploiting the technology in the region. In both cases, the goal will be to satisfy the region's technology requirements and to build up an export industry in these goods and services.

1. Hydrocarbons

   (a) Seismic Studies. All work presently done from outside the region and all data transferred out of region. Equipment presently in use incapable of year-round use, particularly in northern waters.

   (b) Seafloor Geotechniques. Exploitation of offshore mineral resources is critically dependent on knowledge of engineering properties of the seafloor. Offshore structures, production platforms, pipelines, etc. cannot be designed without adequate geology studies.

   (c) Ice Studies - including icebergs. Much more needs to be understood of the characteristics and behaviour of sea ice when the construction of platforms or other fixed installations is considered. The laying, anchoring and protection of submarine pipelines all raise new problems, as does the protection of well head installations, port and shipping facilities.

   (d) Oil Pollution Baseline Studies. With this increasing oil exploration and possible development of oil production and increasing tanker traffic in the region, there is a

definite need for greater understanding of the nature and magnitude of the problems of oil pollution.

(e) Materials. Many of the materials presently in use are adequate for exploration and production in the Southern Newfoundland, Grand Banks and Scotia Shelf. However, it is not known whether they will be adequate for deeper waters off the Shelf and the cold waters of Labrador and Arctic archipelago.

(f) Well Heads, Controls, Pipelines. Technology adequate for continental shelf areas but new techniques will probably have to be developed for off continental shelf and Arctic regions.

(g) Crude Storage. The Jarlan perforated breakwaters would be capable of storing oil in the southern regions. It has been proven at Baie Comeau and appears adequate for Arctic conditions.

(h) Service Centres. Well equipped service centres are required to service all equipment from the most delicate electronics to the rugged drill stems.

(i) Computerized Control Systems. Electronic control systems are required to regulate the flow of oil and gas from well heads to storage areas via pipelines. Similarly, major production centres such as Port Hawkesbury and Come-by-Chance will require systems to control crude being delivered to the refineries as well as refined products from the refineries. This system could control transfer of crude from one oil company to another. This technology exists outside Canada but could be licensed for manufacture in the area. The

same type of systems could be used for the same purpose on bulk materials being transported by pipeline.

2. Fisheries

(a) Science Base. The scientific programmes and facilities for fisheries and mariculture appear to be adequate. Much closer liaison is required between research and industry.

(b) Inventory of Fish Resources. To better manage our current resources, as well as our new areas under ICNAF, a programme to inventory our fish resources and their breeding habits is urgently required.

(c) New Type Trawlers. In order to exploit the areas recently granted under ICNAF, we must develop a new breed of trawlers that will be capable of fishing for extended periods off the Labrador Coast. These trawlers, in addition to being ice strengthened - or icebreakers - must have the latest in fish finding equipment. These new trawlers must have higher Canadian content than existing ones.

(d) Resources Management. If Canada is to demonstrate to the world that we have the capability to manage our fisheries resources, the Gulf of St. Lawrence project should be considered as a baseline study to determine the management methods available.

3. Education

(a) School of Naval Architecture. Canada has requirements for ocean structures that are peculiar to it. No nation

has as yet had to develop structures for exploration, production, supplying and transporting hydrocarbons from the Arctic and Sub-Arctic. The experience of the Scandinavians can be drawn on for Eastern Newfoundland region but North of this is virgin territory. The same conditions will apply to fishing and research vessels. These problems must be worked out by Canadians. This school could be a division of the engineering department of an existing Atlantic region university.

(b) Improved Metallurgical Engineering. It is considered that the depths and cold climate in which hydrocarbon development will take place will require specialty metals especially developed for these conditions.

(c) Applied Research - Oceanography, Marine Biology, etc. The greatly increased activity will require many more personnel trained in all branches of marine science. It may be necessary to have separate facilities for those personnel continuing in academic and institutional research from those going into industrial or applied research.

4. Data Services

(a) Collection Services. The Northwest Atlantic Marine Environmental Data Survey, commissioned by the Marine Applications Council in 1972, highlighted the gaps in marine data that must be filled. A data buoy system is recommended for Canada. Data buoy systems have been designed and launched and have proven to be cost effective. The sensors and instrumentation used are adequate for the Gulf of Mexico and possibly as far north as Nova Scotia and the Gulf of St. Lawrence. However, for operations further north, new, more rugged sensors and instrumentation

must be developed. Each buoy would carry sensors to measure: air temperature, air pressure, wind speed and direction, water temperature profile (0 to 600 ft.), wave height, current speed and direction, salinity, oxygen, pH. Buoys will transmit on command from data centre.

(b) Ships of Opportunity. Trawlers, tankers, drill rigs, production platforms should all be equipped with sensors and transmit information on a regular basis to data centre on command from data centre.

(c) Data Centre. A data centre should be established in the Atlantic region that would receive not only data transmitted by data buoys and ships of opportunity but would also receive data on all seismic, geological and other exploratory work carried on in the region. The centre would convert data into useful information for interested parties and would build up a library of knowledge now leaving the area.

5. Shipyards. Shipyard or shipyards capable of building drill rigs, platforms, supply boats, tankers and trawlers are required. Repair facilities should be included.

6. Steel Mill. Mill capable of producing the specialty steels required for building ships and platforms in (c) above as well as for pipelines is required.

7. Environmental Equipment Design and Manufacture. In addition to the sensors in 4 (a) and (b), pollution monitoring sensors for ocean use are not yet developed. The technology for transmitting data from buoys is very well developed in the Atlantic region.

8. Coastal Zone Management. There is a pressing need to develop a systems approach to management of our coastal zone. A great potential for private companies to develop technical capabilities in the areas of systems and simulation modelling. At the moment most of this expertise resides in the United States.

9. Energy. There is a critical energy shortage developing in the United States. The Atlantic region could make a major contribution to alleviating this problem by:

   (a) Development of tidal power in the Bay of Fundy.

   (b) Building of atomic powered electric generating plant off the coast either on natural or man-made islands.

10. Communications. As exploration and production move further north, communication problems will increase. More sophisticated communication systems will have to be employed. These will require satellite and ionospheric sounding systems. These technologies are well developed in the Atlantic region. Communication here is to be interpreted broadly as the transfer of all data and information including that from data buoys.

11. Ocean Minerals. Encouragement should be given to Canadian geophysical companies to intensify mineral resources exploration in Canadian offshore areas. Potential mineral resources include sand from beaches and near shore environment, placer gold and heavy minerals. In order to develop proper management policies it is necessary to intensify exploration for inventory purposes.

III - NORTH ATLANTIC MARINE DEVELOPMENT CORPORATION

To ensure an orderly development of the industrial potential, a crown corporation should be established in the Atlantic region. It would be fashioned after the CoDevCo concept but would be much broader in its scope. It would be operated as follows:

(a) Board of Directors

Provincial Governments

Federal Government:
- Department of the Environment
- Department of Energy, Mines & Resources
- Department of Industry, Trade & Commerce
- Department of Regional Economic Expansion
- Ministry of State for Science and Technology
- Ministry of Transport
- Treasury Board
- Canada Development Corporation

Industry

Scientific Community

(b) Functions

1. Inventory present capabilities and resources in region in context of this paper.
2. Determine deficiencies and establish priorities for overcoming.
3. Co-ordinate and control government funding on all applied research in marine science and technology.
4. Establish long range objectives to provide continuity of development in new areas required as current resources depleted.
5. Assist in the expansion of existing companies and the establishment of new companies to develop our resources.

(c) Method of Financing

1. Grants from both Federal and Provincial Governments in lieu of IRAP, PAIT, etc. grants for industry.
2. Royalties from industry, on a basis to be determined, for the use of technology developed with corporation funds.
3. Fees from users of data services.
4. Funds from Canada Development Corporation and Provincial Corporations required for expansion or establishing business.
5. Annual grants from Federal and Provincial Governments.

(d) Operations

The Corporation would be operated by a Chief Executive Officer reporting to the Board. Staff will consist of administrative personnel plus limited number of specialists in various disciplinaries to be advisors to C.E.O. and Board. Will not be staffed to do feasibility or other studies - this will be contracted out.

(e) Reporting

IV - PERSONS & ORGANIZATIONS CONTACTED

Letters Written to the Following:		Response
East Coast Petroleum Operators Association	Mr. E. Hopkin	M
Hawker Siddeley - Halifax Shipyards	Mr. J. Marsters	T
Dept. of Development-Province of N.S.	Mr. F. Wood	T
College of Fisheries, Navigation, Marine Eng. & Electronics	Mr. R. Kingsley	L
Hermes Electronics Limited	Mr. D. N. Kendall	L
Atlantic Geoscience Centre, Bedford Institute	Dr. B. Loncarevic	M
Marine Ecology Laboratory, Bedford Institute	Dr. R. Trites	M
Atlantic Oceanographic Lab., Bedford Institute	Dr. C. Mason	T
Nova Scotia Research Foundation	Dr. J. E. Blanchard	M
Nova Scotia Technical College	Dr. O. Cochkanoff	M
Dalhousie Univ.-Department of Oceanography	Dr. G. A. Riley	-
Defence Research Establishment Atlantic	Dr. D. Scofield	T
Nautical Electronic Laboratories Limited	Mr. D. H. Covill	L
Beak Consultants Ltd.	Mr. S. G. Jackson	-
Montreal Engineering Co. Ltd.	Mr. N. Rivington	T
Dept. of the Environment	Mr. N. J. Campbell	T
Dept. of Industry, Trade & Commerce	Mr. M. J. Colpitts	L
Dept. of Regional Economic Expansion	Mr. R. Harper	M
Atlantic Fishing Vessel Association	Mr. F. Spindler	T
Minister of Mines & Energy, Newfoundland	Hon. Leo Barry	M
Legal Advisor to Minister of Mines & Energy, Newfoundland	Mr. Cabot Martin	M
Memorial Univ.-Dean of Engineering	Dr. A. A. Bruneau	M

Offshore Petroleum Industrial Advisory Council (OPIAC)	Mr. R. Emberley	M
Memorial University - Marine Sciences Research Laboratory	Dr. G. Fletcher	M

Response to Letters: M - Meeting
T - Telephone or Telegram
L - Letter

V - BIBLIOGRAPHY

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2.	Icebergs Over The Canadian Continental Shelf, 1973 C.S.E.G. National Convention "Canada's North. An Information Update", April, 1973	Dr. A. A. Bruneau
3.	Recommendations for Oceanographic Programs and Objectives. May, 1973 to Dr. A.E. Collin, Chairman, Federal Government Interdepartmental Task Force on Ocean Science and Technology	Marine Applications Council
4.	Northwest Atlantic Marine Environmental Data Survey	Marine Applications Council/Acres/Ocean Science
5.	Paper to Southwest Offshore Conference, Torquay, March 9/73	John Hutton, O.B.E.
6.	Systems for Delivery of Oil From Ocean Well Heads - Paper Resources of the Sea, May 17, 1973	S. M. Millan
7.	Maximizing Returns From the Fisheries - Requirements in Terms of Research, Finance, Organization, Planning - Paper - undated	A. D. Moore
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9.	Science Dimension - April, 1973 re Perforated Breakwater/North Sea Oil Storage Island	
10.	Submission to the Commission to Study the Rationalization of University Research by Marine Science Research Laboratory	Dr. D. R. Idler
11.	Quest for the Optimum - Report of a Commission to Study the Rationalization of University Research - Vol. 1, 1972	
12.	The Forties Development - Paper Scottish Council (Development and Industry) forum for Scots businessmen at Renfrew, 13 March, 1972	M. M. Linning
13.	The Onshore Consequences of Offshore Development - Paper Atlantic Petroleum Offshore Seminar, May/73	Cabot Martin

14. The Potential for Science-Based Industry in the Halifax-Dartmouth Area for the Department of Regional Economic Expansion - Economic Analysis Branch, January, 1971 A. Vanterpool

15. Science Council of Canada - Report No. 10, 1970 Canada, Science and the Oceans

16. Science Council of Canada - Special Study 15, June 1971 Scientific Activities in Fisheries and Wildlife Resources

17. Science Council of Canada - Report No. 15, October, 1971 Innovation in a Cold Climate

18. Science Council of Canada - Special Study 16 - September, 1971 Ad Mare: Canada Looks to the Sea