# CANADA'S OFFSHORE CAPABILITY

# CANADA'S OFFSHORE PETROLEUM AND OCEANOLOGY CAPABILITY



Ocean Industries Division • Transportation Industries Branch • Department of Industry, Trade and Commerce
112 Kent Street • Ottawa, Ontario K1A 0H5, Canada

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# INTRODUCTION

Hunting for oil under millions of square miles of ocean — and extracting it when found — is one of the most pressing and formidable tasks facing today's industrialized nations.

Few have excelled in this arena better than Canada.

A maritime nation bounded by three oceans, Canada has for years steered a steady course toward a progressive, scientific exploration and development of its rich continental shelves.

Experience gained through exploitation of its vast land reserves, the knowledge of oceanology obtained from its renowned research establishments, plus modern and dependable equipment from the hundreds of companies comprising its offshore industry, have all combined to assist Canada in this vital endeavour.

As a result, Canada now offers the world equipment and expertise capable of tackling any offshore project from start to finish. As well, Canadian equipment has been built and tested to withstand the severest of Arctic conditions and therefore its durability and dependability can be relied on regardless of offshore location.

Services and products from Canada encompass the entire spectrum of marine activity, from oceanographic and seismic surveys, consultancy, bottom profiling and drilling, to shipbuilding and repair, construction of huge drilling platforms and rigs, supply vessels, manned submersibles, tankers, air-cushioned vehicles, navigation and communication systems.

At present, Canada is leading all countries in the development of a total subsea oil production system that will provide the most economical means of exploiting deep water wells below the ocean floor.

This directory, "Canada's Offshore Petroleum and Oceanography Capability", introduces some of Canada's foremost offshore companies to potential customers and to distributors seeking successful companies with which to do business.

The products and services described are only a sampling of what Canada has to offer the world's oceanographic community. More information may be obtained from the nearest Canadian Government Trade Office or by contacting the:

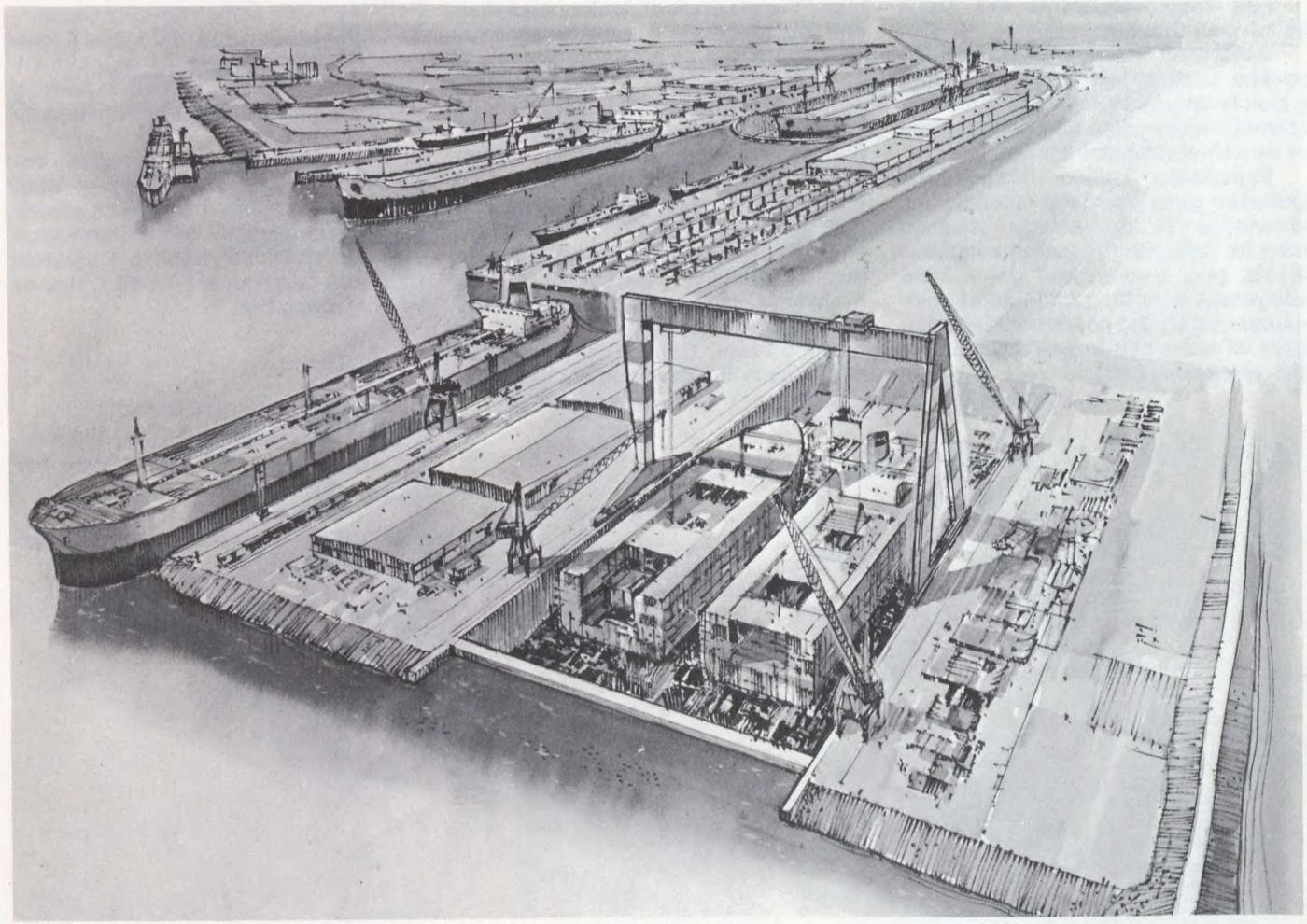
Ocean Industries Division
Transportation Industries Branch
Department of Industry, Trade and Commerce
112 Kent Street
Ottawa, Ontario K1A 0H5, Canada

# ACRES INTERNATIONAL LIMITED

World-wide maritime and allied projects are undertaken by Acres International Limited which has a staff of more than 1,000 and 25 years experience in marine technology.

The company's engineers and construction experts offer a complete range of services from total design to project management for the marine industry:

- Oil-drilling exploration platforms, production platforms and other offshore structures
- Harbours, wharfs, docks, jetties, breakwaters, causeways
- Shipyards, including drydocks, synchrolifts, railways and the building and outfitting of berths with shops for construction of all types of vessels, including supertankers, bulk carriers and concrete barges
- Complete terminals, including all materials handling facilities
- Planning, estimating and scheduling for marine design, construction and project management
- Bridges, with various types of special foundation
- All ice-resisting structures including lighthouses and wave deflectors
- Hydraulic studies of waves and currents
- Dams, cofferdams, breakwaters
- Dredging
- Underwater pipelines and cables
- Underwater tunnels using various methods of construction
- Ship salvage and appraisals of damage to piers and dams using divers with underwater cameras or television



*Typical harbour and shipyard projects undertaken by Acres International Limited are represented in artist's sketch.*

Division of Acres Consulting Services Limited • 20 Victoria Street • Toronto, Ontario M5C 1Y1, Canada
Tel: (416) 362-6131 • Telex: 06-217815 • Cable: ACRESCAN

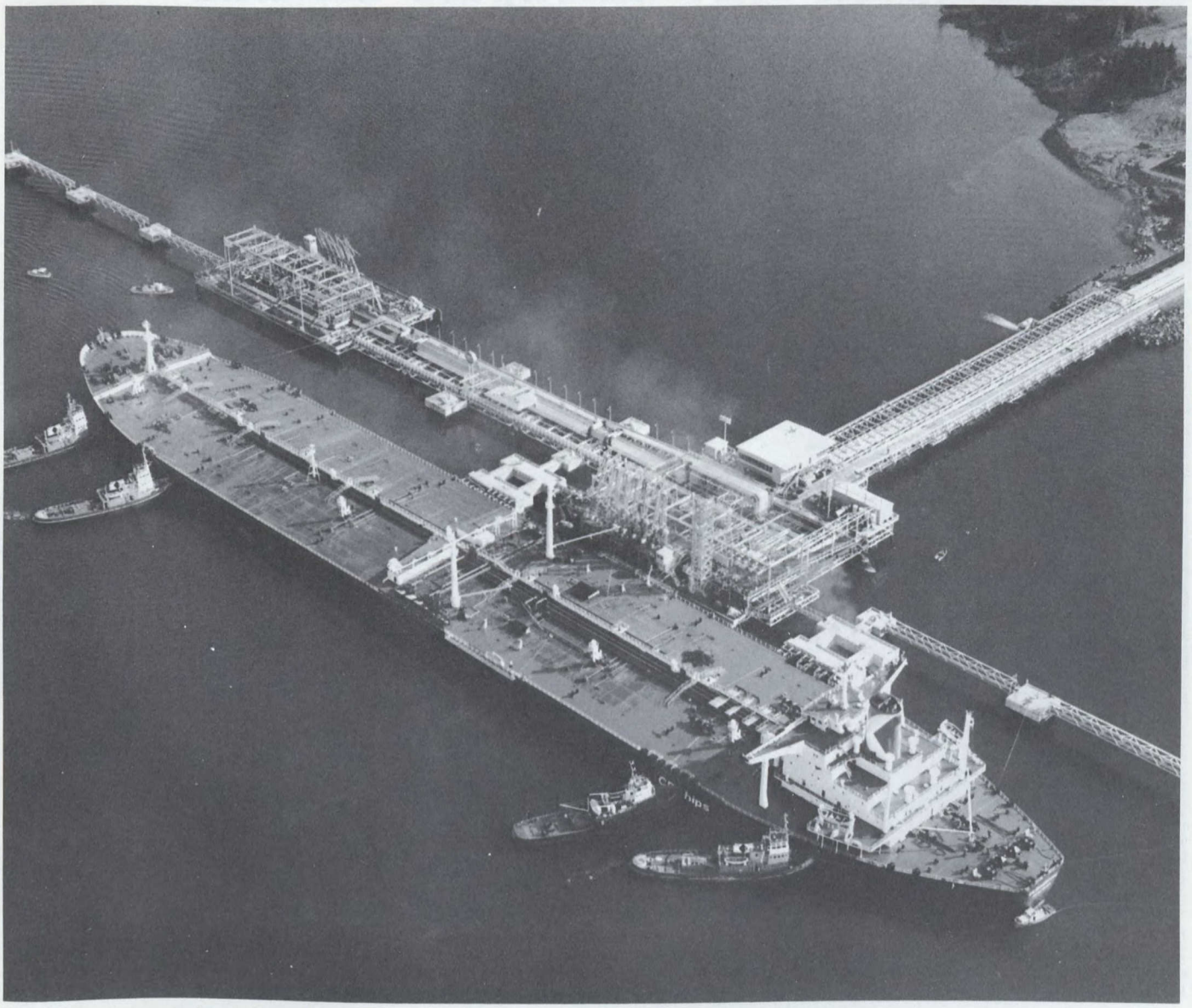
# ALBERY, PULLERITS, DICKSON & ASSOCIATES LTD.

The design and construction management of oil terminals for super tankers is one facet of professional services offered by Albery, Pullerits, Dickson & Associates Ltd. in the marine field.

Economic and technical feasibility studies including requirements for intermodal transportation systems to ensure high efficiency of overall harbour and port developments, as well as the design and project management of such developments, are further services offered by this consulting engineering company.

In 1969, the company completed extensive studies covering all modes of transportation, and the actual costs of moving different commodities by such different modes, in order to determine future port requirements in Western Lake Ontario. The predictions of shipping patterns in the report have since proved to be very close to the actual patterns that have been established.

Other activities of the company in the marine field cover the design of shipyards and floating cranes, marine salvage, economical solutions of construction problems and the design of marine elevators.



*A 250,000 ton super tanker docks at the Point Tupper oil terminal wharf in Nova Scotia. Albery, Pullerits, Dickson & Associates Ltd. played a key role in the development of this terminal facility.*

29 Gervais Drive • Don Mills, Ontario M3C 1Y9, Canada • Tel: (416) 429-2920

# ROBERT ALLAN LTD.

The unusual or innovative in ship design is a standard service at Robert Allan Ltd. As well, the company offers technical assistance to shipyards, supervision of construction, marine engineering and computer-oriented studies of transportation economics.

Since incorporation in 1964, Robert Allan Ltd. has produced many noteworthy designs for service vessels for the petroleum industry, tugs, barges, ferries, fishing boats and government vessels. These designs include most of the innovations that have established the towboat industry of British Columbia as a world leader in tug and barge transport. Included are the first self-dumping log barge, the first successful ocean barge system for the Pacific, the introduction of Kort-ducted propulsion, the first successful self-unloading barges for aggregate transport, the introduction of B.C. tugs to ocean towing, and the first scheduled barge service between British Columbia and California.

The firm has recently designed a unique transportable mothership for submersibles, four quadruple screw, 4500 BPH shallow-draft tugs, an 84-foot (25.6 m) yarding tug and four, 102 ft. (31.09 m) by 35 ft. (10.6 m) "thruster" barges for Northern Transportation Co. Ltd. for use in servicing oil and gas explorations in the Mackenzie River/ Beaufort Sea areas.


*Robert Allan Ltd. designed these four quadruple screw, shallow-draft tugs for use in the Mackenzie River/Beaufort Sea areas by Northern Transportation Ltd. The vessels measure 155 ft. (47.3 m) o.a., 52 ft. (15.85 m) in breadth, 10 ft. (3.05 m) in depth and have a maximum loaded draft of 4 ft. (1.22 m). Two of the tugs have nozzle propulsion and two feature open tunnel propulsion. They can handle barge trains of 9,000 tons (8,916 metric tons).*

1496 West 72nd Avenue • Vancouver, British Columbia V6P 3E2, Canada • Tel: (604) 266-6285 • Cable: NAVILUS

# ALLIED SHIPBUILDERS LTD.

Construction of vessels for remote places, involving knock-down and re-erection, is a specialty of Allied Shipbuilders Ltd.

The company also builds supply ships, barges for all trades, ferries, tugs, and passenger vessels.

Its facilities include a side-launching berth 400 ft. by 80 ft. (121.92 by 24.38 m) which can accommodate non-propelled vessels to 10,000 DWT tons (10,160 mt) and propelled vessels to 2,000 DWT tons (2,033 mt). The company also has complete facilities for steelwork, piping, joiner and electrical work, and machinery installation.

Allied Shipbuilders is associated with Burrard Shipyard and Marine Ways Ltd., ship repairers, and Coast Engineering Works Ltd., machinists specializing in stern gear work.


*The "Lady Alexandra" slips into the water from the side-launching berth at Allied Shipbuilders.*

1870 Harbour Road • North Vancouver, British Columbia V7H 1A1, Canada • Tel: (604) 929-2465
Telex: 04-352612 • Cable: FORWARD

# APPLIED MARINE RESEARCH LIMITED

Applied Marine Research Limited (AMR) integrates research and development in the fields of marine and aquatic biology. The company is equipped to work with consultants and government agencies in any multi-disciplinary project involving utilization, manipulation or alteration of renewable resources in bodies of water.

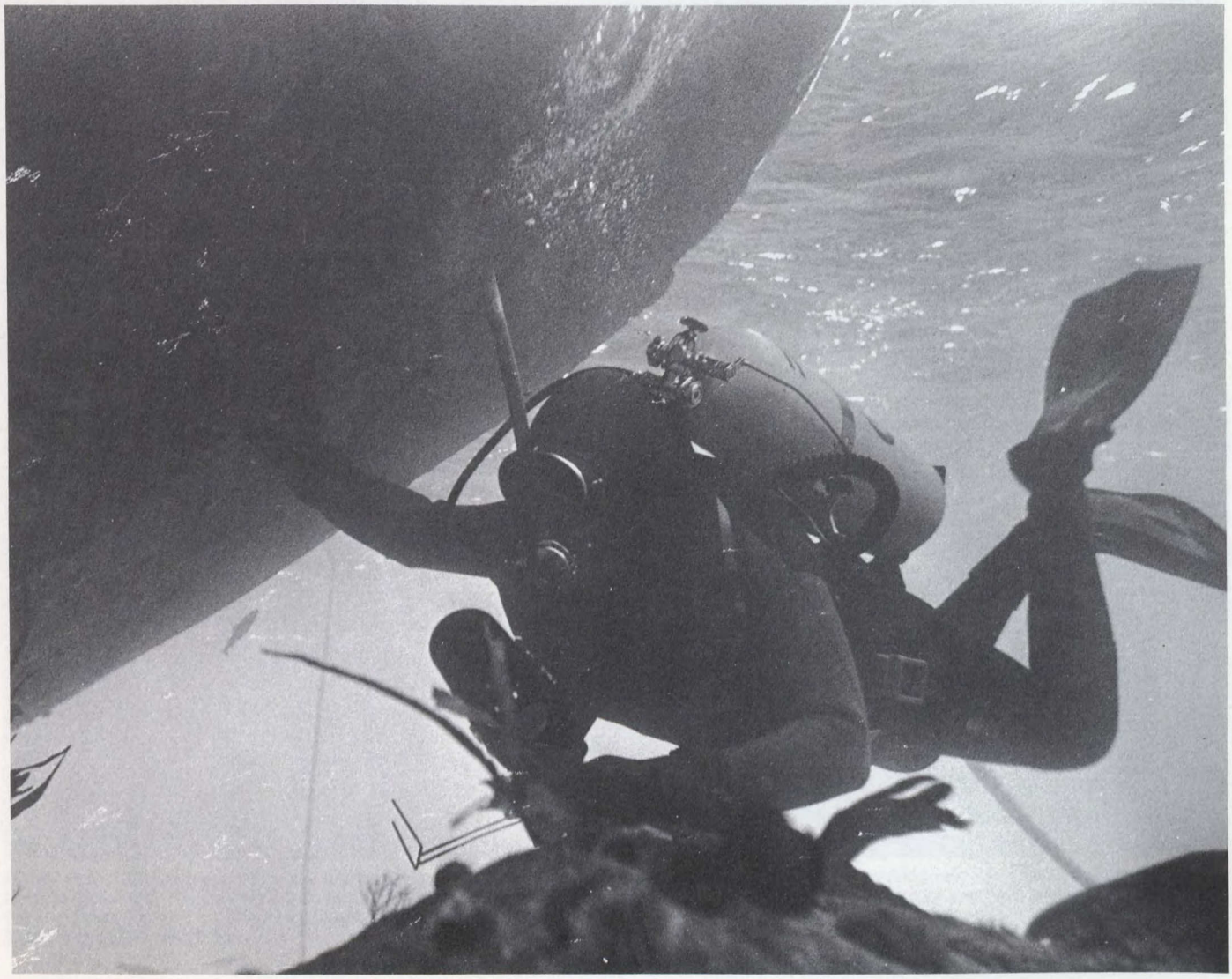
A specialized capability in marine and freshwater ecology is provided by AMR to complement engineering, economic and project-management expertise of engineering consultancy firms.

By drawing on their own expertise and on specialized knowledge within the academic and scientific community, AMR's biologists can provide biological and ecological information according to the requirements of such projects as:

- Ecological baseline studies
- Environmental impact studies
- Marine and aquatic resource inventories
- Fisheries development
- Mariculture and aquaculture development
- Harvesting strategies
- Resource utilization
- Underwater parks

In addition to these services, AMR provides engineering support services to assist in relaying environmental biological knowledge to engineers and planners according to their objectives and deadlines. Technical services include: data reduction, diving, drafting and illustration.

AMR's services have been used throughout North America, the Middle East and the Far East.



*The Underwater Technical Services Division of Applied Marine Research provides support for its biological and engineering staff. Customers also use the services of this division.*

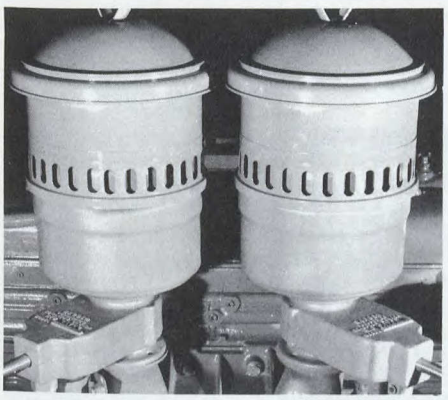
P.O. Box 11 • 5112 Prince Street • Halifax, Nova Scotia B3J 2L4, Canada • Tel: (902) 422-1438 • Telex: 019-21828

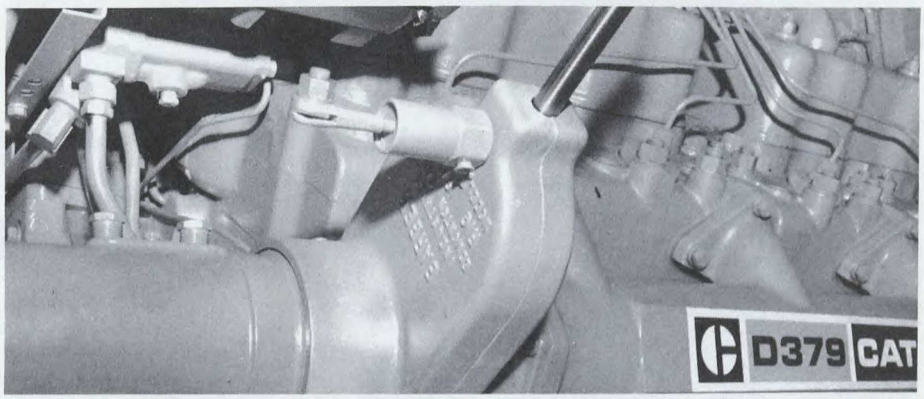
# BARBER INDUSTRIES

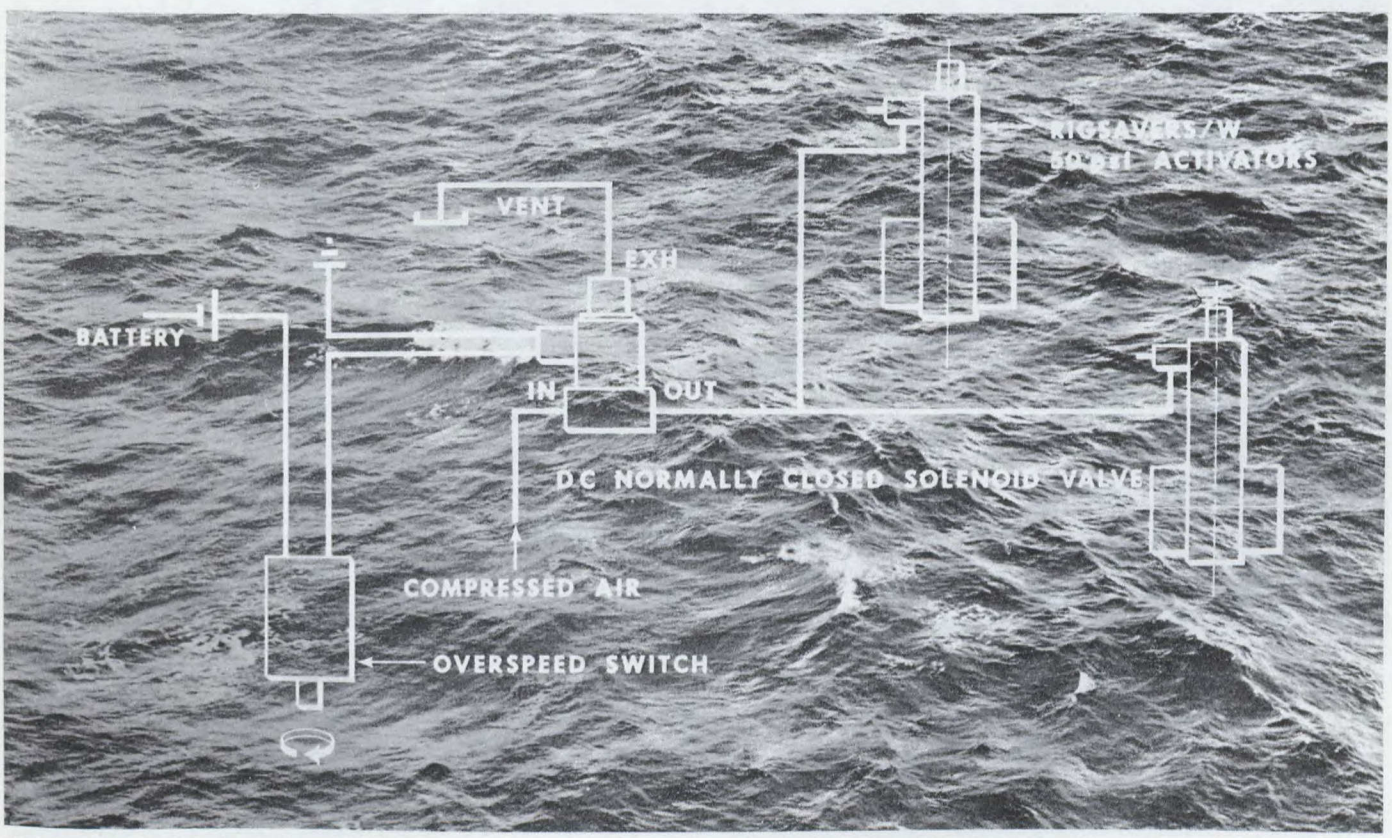
Products of Barber Industries are used in all the world's major oil-producing areas including the U.S.S.R. where Barber Industries has supplied 100 pressure control switches operating in a Camco Gas lift system.

Barber Industries has plants in Calgary and Edmonton and has an expert staff of 350. An incorporated company, it has an aluminum product facility that designs and fabricates support equipment for the Lockheed Hercules aircraft, used to supply services and equipment to Arctic oilfields, and in moving rigs between the Arctic islands.

The high performance Barber Rig Saver is typical of the company's many quality products. Permitting automatic operation from a remote location, the Barber Rig Saver ensures positive cut-off of air intake and, because of its durable, non-rusting materials, gives long, trouble-free service under all climatic conditions.






*Barber Industries' Rig Saver gives vital protection when needed. In an emergency, it ensures engine stop by positive air shut-off preventing damage and fire hazard when natural gas or crude oil spray cause engine runaway. The basic design of the Rig Saver allows for application to all engine models.*

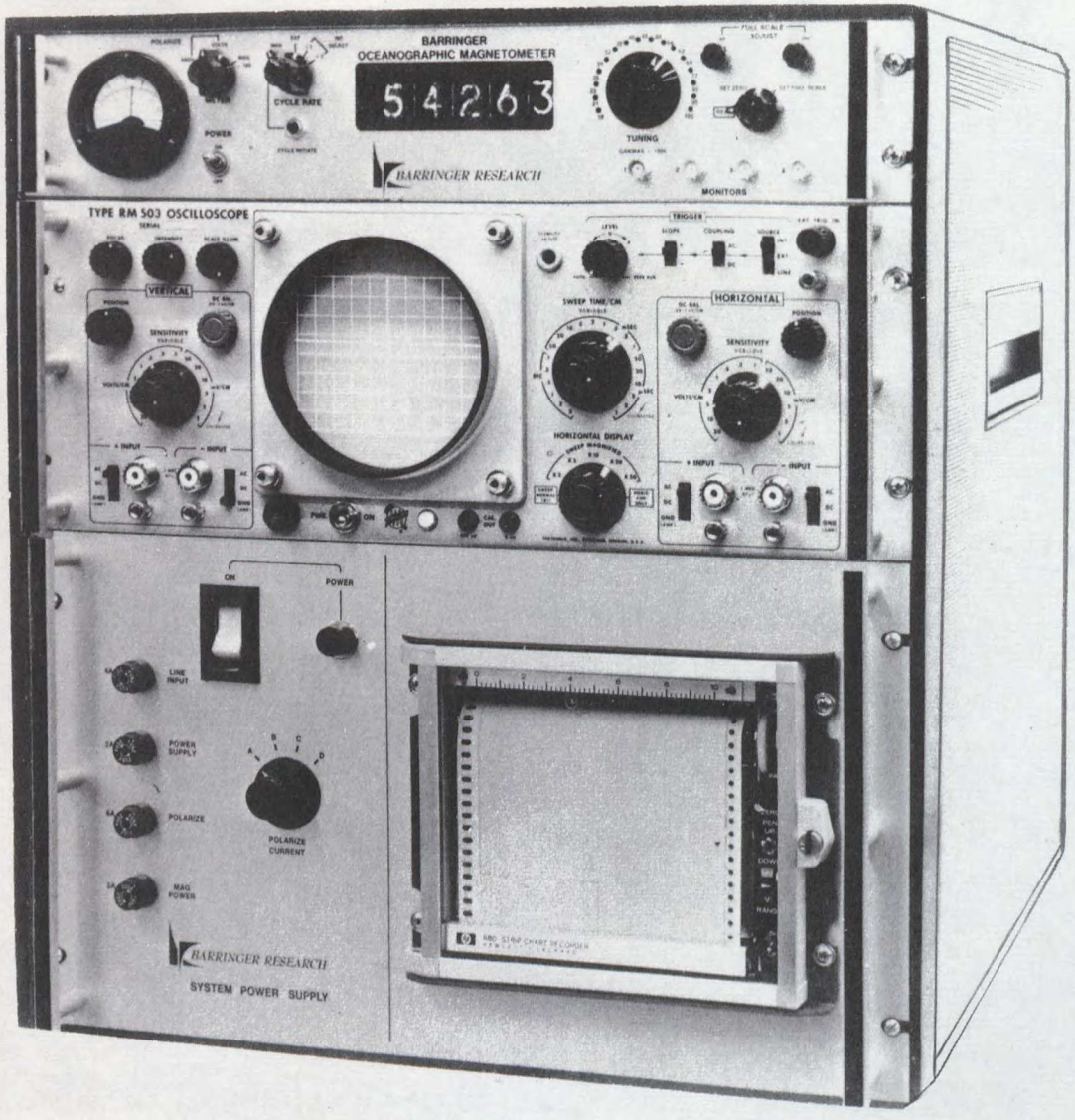
P.O. Box 4609 • South Edmonton, Alberta, Canada • Tel: (403) 434-1441 • Telex: 037-2151 • Cable: BARBER

# BARRINGER RESEARCH LIMITED

A young company, but one with a solid 12-year record of reliable performance, Barringer Research Limited has become a proven expert in the field of oceanographic magnetometers.

Designed for use in marine environments, Barringer's magnetometer systems measure and record the earth's total magnetic field intensity. A number of configurations are available to meet a variety of needs ranging from simple salvage systems for small boats to full-scale standard oceanographic packages used by large ocean-going vessels. Ancillary equipment, designed for specific needs, includes multi-channel chart recorders and computer compatible digital data logging systems. Barringer magnetometer systems are easy to install and operate and come equipped with a maintenance manual and spares kits so long-term projects can be undertaken without fear of failure.

Recent development work has increased the ease of operation and the sensitivity of the systems. Specifications on the latest equipment, featuring high sensitivity and versatility, are now available and interested persons may place their names on Barringer's mailing list to receive them and a continuing series of technical bulletins on the firm's capabilities.




*This onboard instrument console and new field serviceable proton sensor are features of all oceanographic magnetometer systems from Barringer Research Limited.*

304 Carlingview Drive • Rexdale, Ontario M9W 5G2, Canada • Tel: (416) 677-2491 • Telex: 06-968743
Cable: BARESEARCH

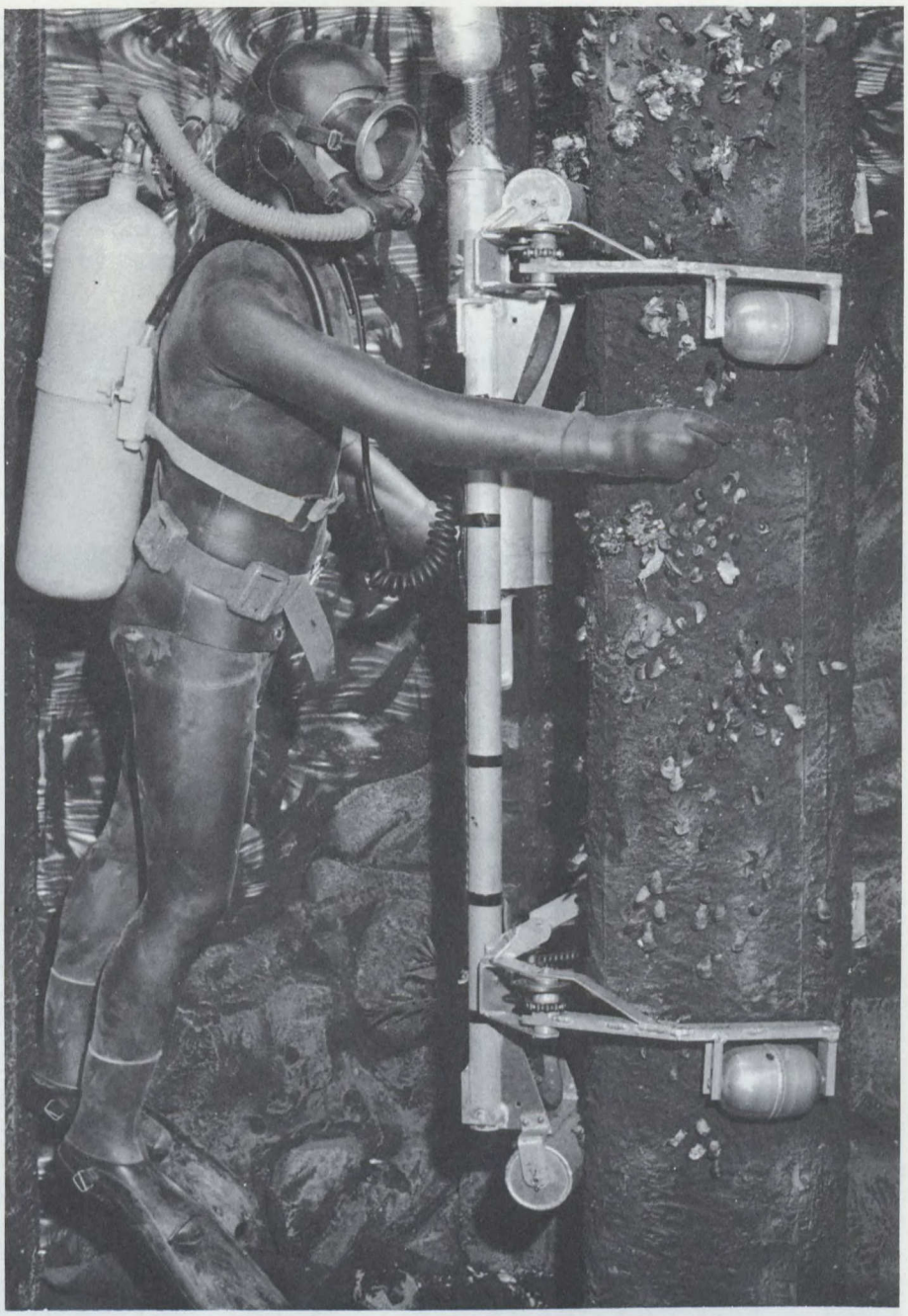
# B.C. RESEARCH

Almost every service required by marine industries, from research to production and marketing, is supplied by the multi-faceted operations of B.C. Research, its Ocean Engineering Centre and its associate Techwest Enterprises Ltd.

B.C. Research is a non-profit industrial research organization which conducts research, development, laboratory and field services in Canada and many other countries. It applies engineering, physical, chemical, biological and management sciences to the solution of industrial problems.

The organization's Ocean Engineering Centre co-ordinates a wide range of engineering activities into a cohesive program. The Centre's activities include measurement, analysis, science of materials and innovative design.

The ocean engineering activities of B.C. Research are greatly enhanced by association with Techwest Enterprises Ltd., which works on development, production and marketing. This affiliation enables the extensive resources and experience of both organizations to be co-ordinated and brought to bear on a program. If necessary, this extends through all stages of design, testing and manufacture.



*B.C. Research diver uses an underwater sonic detector to determine marine borer damage and residual strength of a piling.*

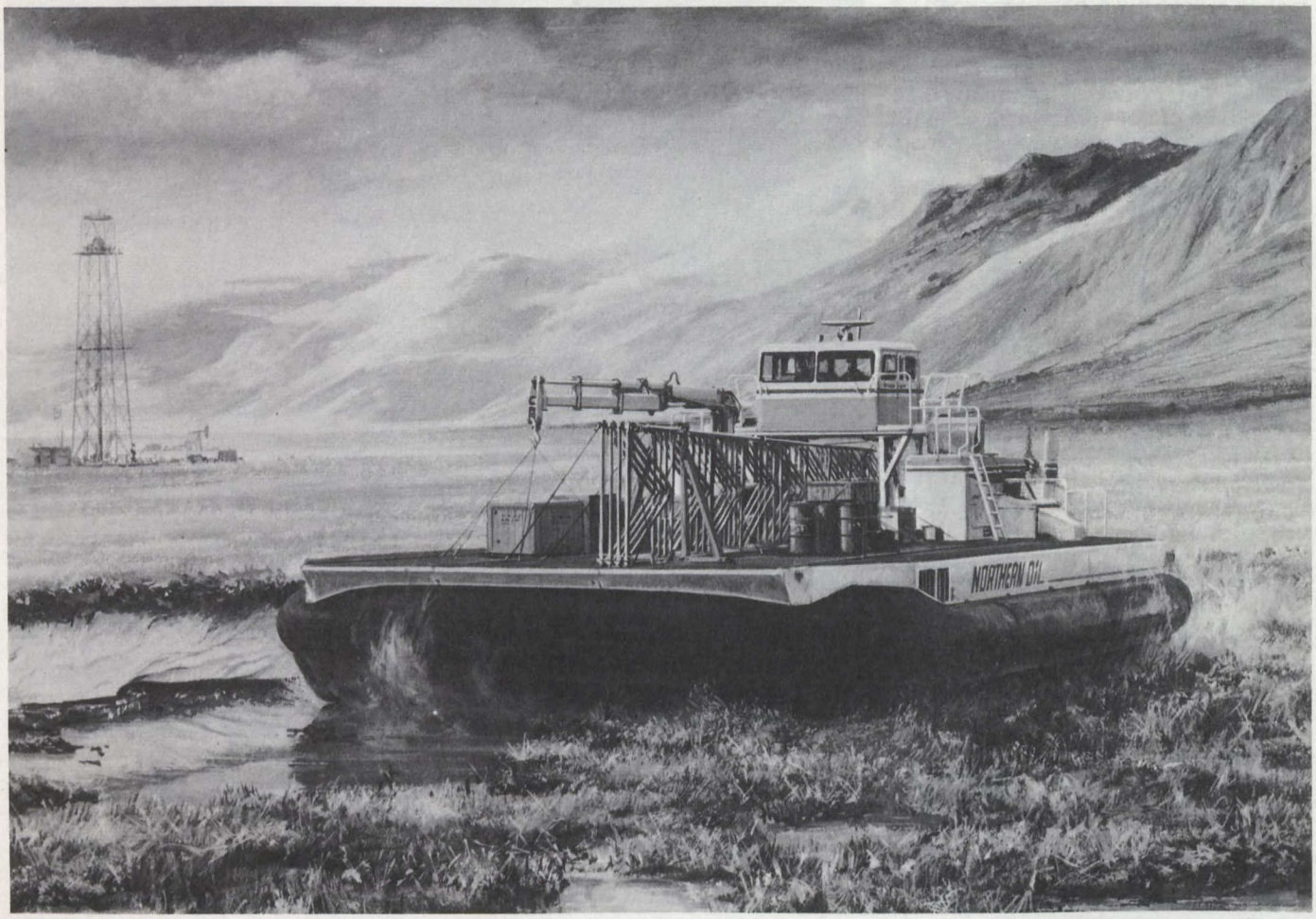
3650 Wesbrook Crescent • Vancouver, British Columbia V6S 2L2, Canada • Tel: (604) 224-4331
Telex: 04-507748 • Cable: RESEARCH BC

# BECLAWAT LTD./LTÉE

All transportation systems require doors and windows but Beclawat Ltd. is the only company in North America that specializes in their manufacture. Concentration on these and related specialized products has resulted in the company creating designs that combine simplicity of installation, reliability, economy and good style.

An excellent example of how Beclawat incorporates these features is its pioneering and manufacturing of Weld-In Marine Windows in North America.

Custom design is part of the company's service and, because it makes its own tempered safety glass, Beclawat can also provide prompt delivery. These two features are becoming more important as activity in the world-wide marine industry increases.




*This air cushion vehicle, operating year round in Canada's Arctic, uses Beclawat Ltd. windshields which are electrically heated for de-icing. The glass, composed of two pieces of toughened safety glass, is single density tinted to reduce glare and is glazed into Beclawat heavy-duty marine frames.*

171 Hymus Boulevard • Pointe Claire, Quebec H9R 1E9, Canada • Tel: (514) 695-8611 • Telex: 05-821667
Cable: BECLAWAT Montreal

# BEL-AIRE SHIPYARD LTD.

The growing demands of offshore drilling, as well as those of regular commercial shipping, are served by Bel-Aire Shipyard in the port of Vancouver. Construction and repair of wooden and steel vessels of all types have earned Bel-Aire a reputation for dependability and quality workmanship. It builds offshore supply and survey vessels, tugboats, wood chip barges, self-loading cement barges, beach landing craft, commercial fishing vessels, yachts and other pleasure craft.

The company's facilities include two building berths capable of handling craft up to 300 feet (91.44 m) in length; marine ways; a marine elevator for vessels up to 150 tons (136 metric tons) and 100 feet (30.48 m) in length; a full range of service shops; and direct access by water and rail.

To help meet the demand for supply vessels to service offshore drilling rigs, the shipyard has completed four, 185-foot (56.39 m) ice-strengthened supply vessels during 1972 and 1973. A 191-foot (58.22 m) ice-strengthened offshore survey vessel is scheduled for delivery in 1974. It will be under charter to the Canadian Government for undersea survey operations off both coasts.


*Built by Bel-Aire Shipyard Ltd., the 185-foot (56.39 m) "Hudson Service" plows through the waters of Vancouver harbour during trial runs. The ice-strengthened offshore supply vessel is powered by four General Motors EMD diesel engines producing 6,560 hp.*

1667 Columbia Street • North Vancouver, British Columbia V7J 1A5, Canada • Tel: (604) 985-8781 • Telex: 043-52678

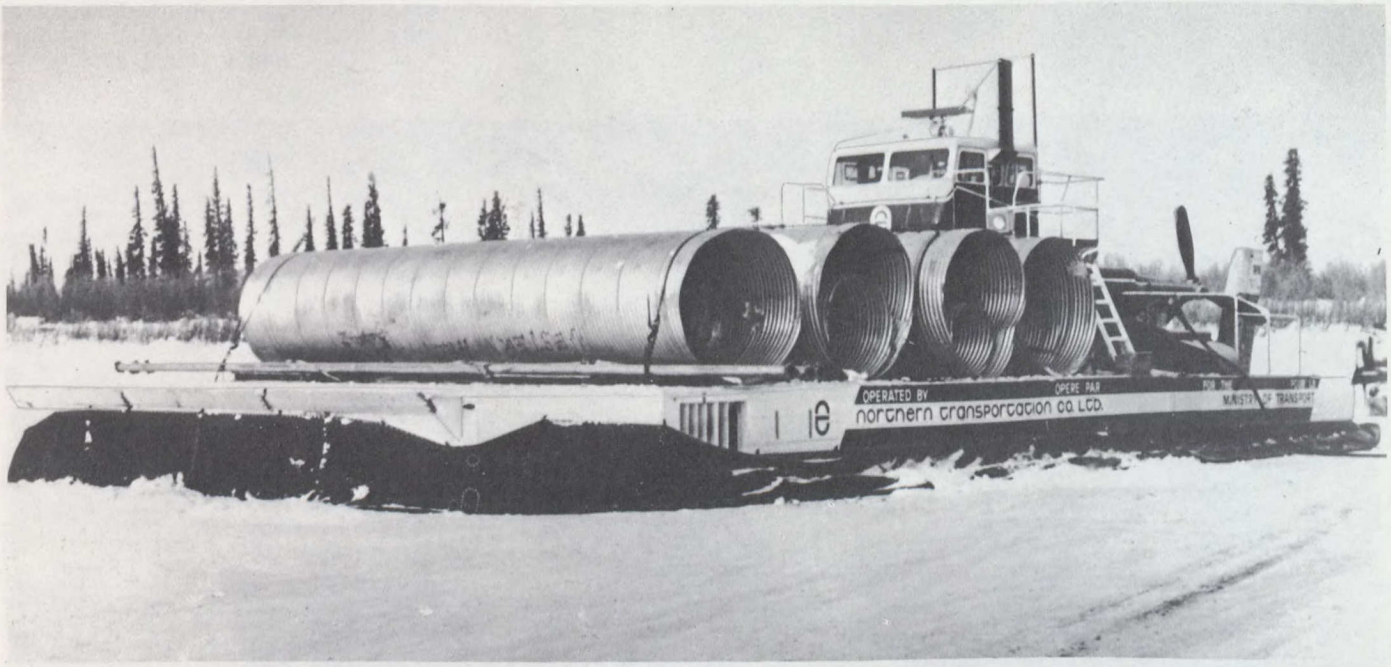
# BELL AEROSPACE CANADA

In designing and constructing that most versatile form of transport, the air cushion vehicle, Bell Aerospace is without rival in Canada. Both its large Voyageur and the smaller Viking have been created to carry heavy payloads over virtually every kind of surface, from ocean to lake, from beaches to marshland to snow and ice. To meet the demands of Canada's developing northland, these vehicles have been designed by Bell Aerospace in association with the Canadian Department of Industry, Trade and Commerce. Bell Aerospace specifically markets to India and to some seven Latin American countries. The company has also done business in the Middle East, West Africa and Southeast Asia.

The Bell Aerospace Voyageur is fully amphibious, offering economical year-round mobility over shallow and deep water, land, ice, snow, and marginal terrain such as beaches, marshland, sand and mud banks, tundra and scrubland.

Its adaptable flatbed construction accommodates a wide range of payloads, specialized superstructures and equipment. This gives Voyageur a multi-mission capacity for commercial and military uses. Voyageur's payload of 25 tons (23 metric tons) is comparable with that of many cargo aircraft, large trucks, railway cars and container units. The vehicle thus offers an extension of existing cargo-hauling facilities. It carries an operating crew of two.

Modular construction enables the Voyageur to be readily disassembled into 12 easily-handled units for deployment by road, rail, sea or air, and quickly reassembled on site. Maximum module weight is 4,500 lbs. (2,041 kg).




*Amphibious versatility enables the Bell Aerospace Voyageur to solve most transport problems in difficult terrain. Features of this large air cushion vehicle include a payload of up to 50,250 lbs. (22,793 kg), modular construction, fuel capacity of 4,066 U.S. gallons (15,390 litres), maximum range of 550 nautical miles, a cargo deck 40 ft. (12.2 m) by 33 ft. (10.1 m), a maximum calm water speed of 54 mph (87 km/hr.) and the ability to operate in waves as high as 6 ft. (1.8 m).*

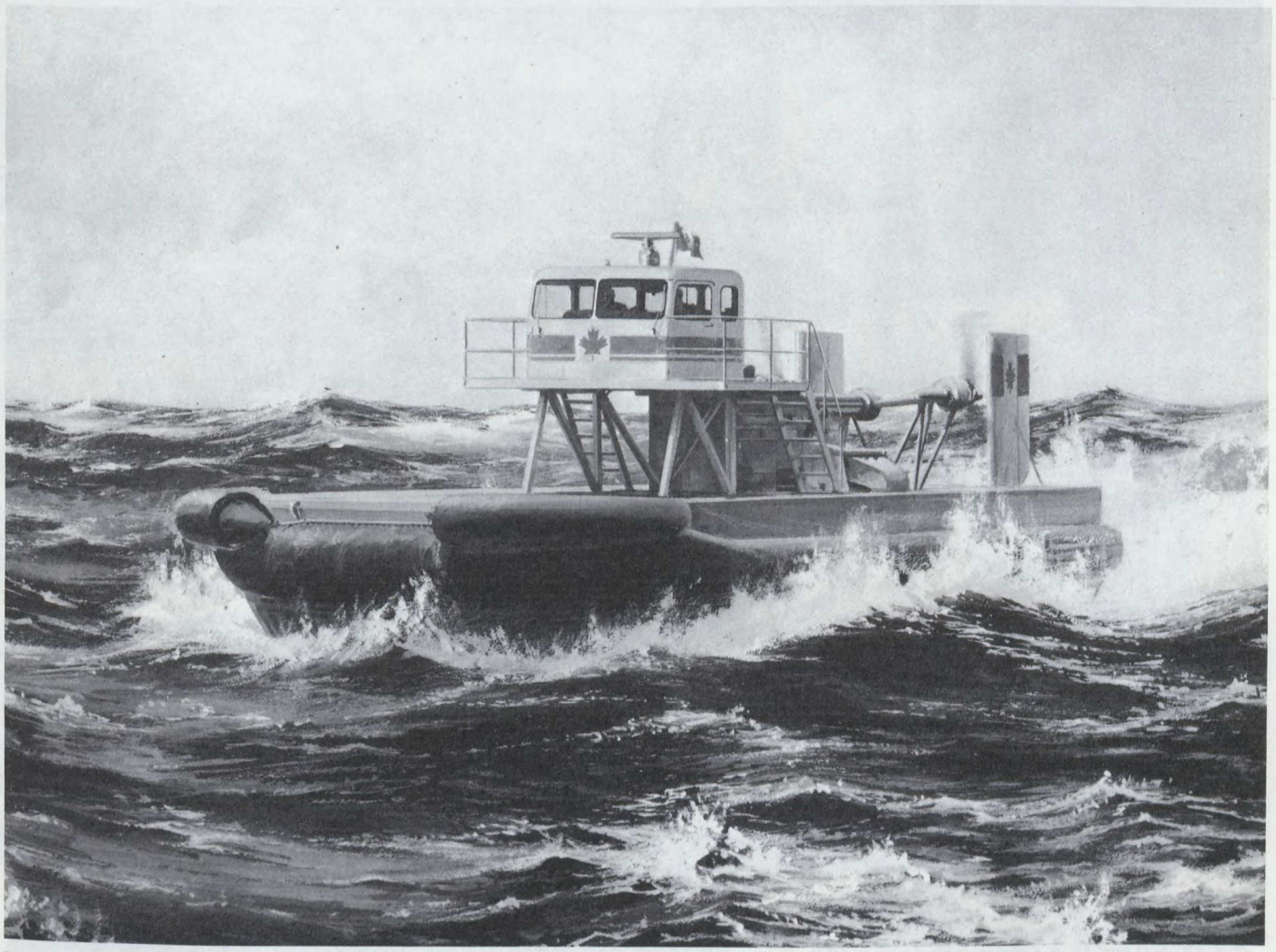
Division of Textron Canada Ltd. • P.O. Box 160 • Grand Bend, Ontario, Canada • Tel: (519) 238-2333 • Telex: 024-7268

# BELL AEROSPACE CANADA

Developed from such proven air cushion vehicles as Bell Aerospace's SK-5 and Voyageur, the Viking incorporates a number of new concepts such as the advanced-design tapered skirt, a more efficient bow thruster system, and a Vee-drive transmission.

The Viking twin drive system reduces propeller speed and noise while affording precise control. As with Bell's Voyageur, a wide variety of payloads can be carried on the flat deck giving Viking a multi-mission capability. Component commonality with the Voyageur simplifies maintenance and spares holdings. Viking retains the modular construction of the Voyageur, and can be disassembled for deployment by ship, road trailer, rail car or cargo aircraft.

Viking also carries a crew of two — commander/operator and navigator/relief operator.



*Sturdy, compact, ready for water and land, the Bell Aerospace Viking carries a payload of up to 11,000 lbs. (4,990 kg) with a maximum calm water speed of 57 mph (92 km/hr.) and a range of 680 nautical miles. Its fuel system, like that of Voyageur, uses kerosene; two generators and two batteries supply its electrical system. With a full load of fuel, the Viking's endurance is 13 hrs. Cargo deck area is 820 sq. ft. (76.2 sq. m).*

Division of Textron Canada Ltd. • P.O. Box 160 • Grand Bend, Ontario, Canada • Tel: (519) 238-2333 • Telex: 024-7268

# BENNETT POLLUTION CONTROLS LTD.

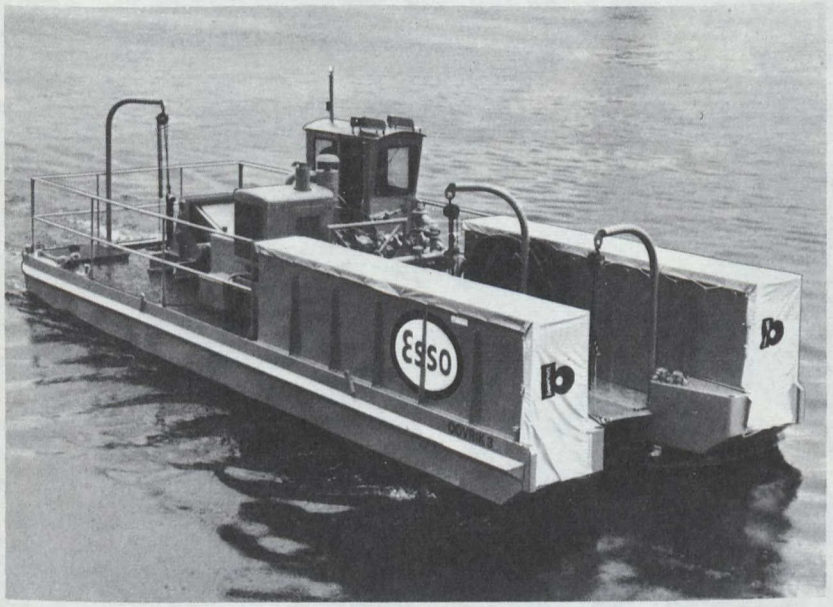
Whether it's an emergency offshore oil spill, a regular program of protecting tanker berths or cleaning up a harbour, Bennett Pollution Controls Ltd. has the equipment to handle the job. Bennett equipment and services are used by government agencies around the world concerned with the control of oil spills and also by major oil companies.

Bennett specializes in preventing and controlling pollution — prevention through a consulting service, storage design, deployment techniques and emergency planning; and control through manufacture of containment booms for use offshore, in harbours and on rivers and through custom-designed skimmers and other oil-removal equipment.

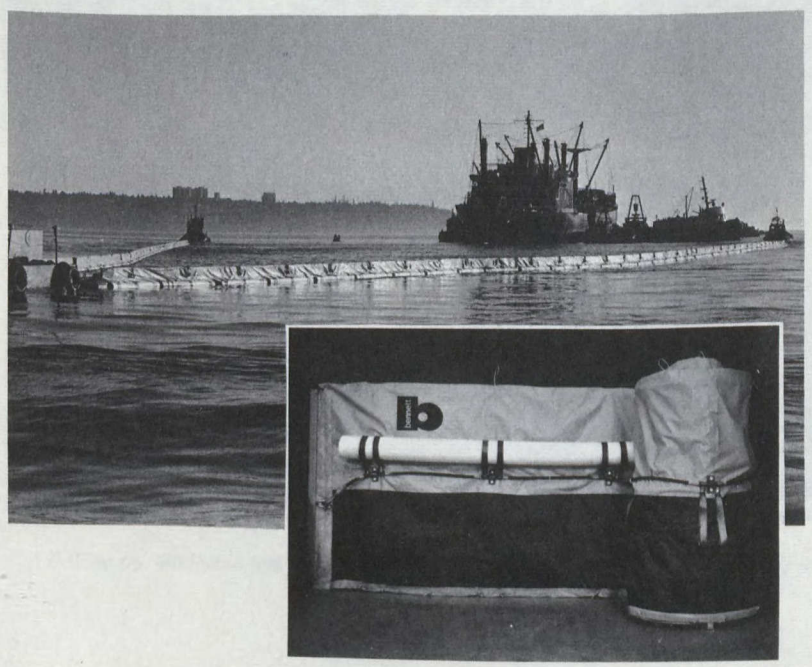

*Inshore oil booms manufactured by Bennett have rapid deployment capability and fully integrated construction, are easy to clean and are compact for ease of storage. Boom sizes are 18 in. (45 cm), 24 in. (60 cm) and 36 in. (90 cm). Freeboard measurements are 6 in. (15 cm), 8 in. (20 cm) and 12 in. (30 cm) with drafts of 12 in. (30 cm), 16 in. (40 cm) and 24 in. (60 cm).*

119 Charles Street • North Vancouver, British Columbia V7H 1S1, Canada • Tel: (604) 929-5451 • Telex: 043-52686

# BENNETT POLLUTION CONTROLS LTD.




*The Bennett Skimmer offers a number of features: dual oil-collecting systems for varying environmental conditions; a belt system with a maximum capacity of 200 GPM and a Weir system with a maximum capacity of 600 GPM; onboard storage of oil containment boom (optional); onboard storage of recovered oil (60 barrels); a versatile pumping system with rotary vane pumps capable of pumping light oils or heavy Bunker C up to 100,000 SSU; twin propulsion including 360 degrees continuous steering mechanical drive; facilities for removing and storing oil-saturated garbage; and enough stability for operation in open sea conditions.*



*This Bennett-designed system for offshore oil containment and removal features a six-foot (1.83 m) Bennett offshore boom and an offshore skimmer. It is shown in operation recently when a badly holed vessel, leaking oil, was towed into port.*

119 Charles Street • North Vancouver, British Columbia V7H 1S1, Canada • Tel: (604) 929-5451 • Telex: 043-52686

# BLACK CLAWSON-KENNEDY LTD.

Propellers for the great inland waterways of North America have long been the specialty of Black Clawson-Kennedy Ltd., Canada's largest and oldest maker of marine propellers. For more than 90 years, the company has designed, manufactured and reconditioned propellers for vessels ranging in size from oil tankers to small pleasure craft. Today the firm's propellers have been installed on a large percentage of Canadian-built ships, both naval and commercial.

Propeller castings are poured in the firm's own foundry and finished in its machine shops in Owen Sound on Georgian Bay. Facilities include a specialized pattern shop, a large up-to-date foundry operated under strict metallurgical control, and special machinery for polishing and balancing the finished propeller.

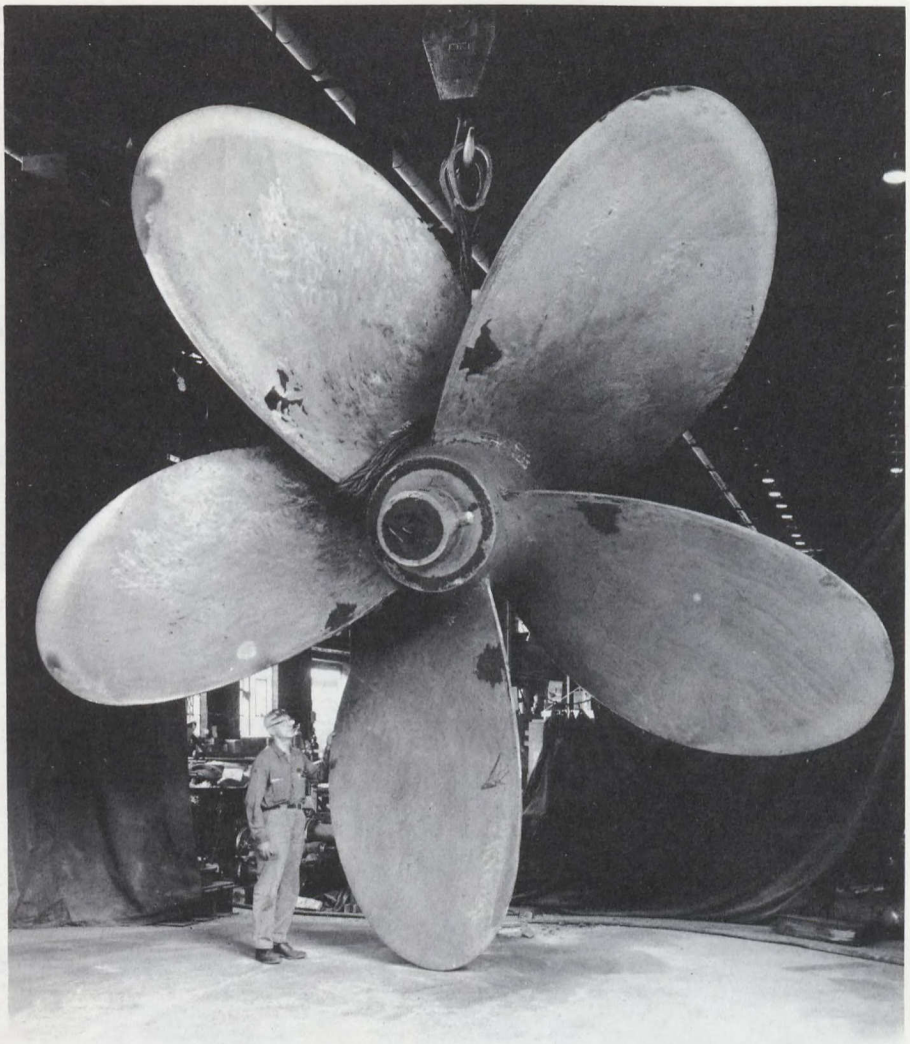
With an established and thriving domestic market, Black Clawson-Kennedy also exports to the United States.

Propeller sizes produced in their respective metals include:

Manganese bronze: up to 20 ft. (6.10 m) diameter — up to 50,000 lbs. (22,680 kg) weight;

Nickel aluminum bronze: up to 12 ft. (3.66 m) diameter — up to 12,000 lbs. (5,443 kg) weight;

Stainless steel: up to 14 ft. (4.27 m) diameter — up to 15,000 lbs. (6,800 kg) weight.



*Rough casting for five-blade bronze propeller 19 ft. 5 ins (5.8 m) dwarfs worker at Black Clawson-Kennedy Ltd.*

1144 First Avenue West • Owen Sound, Ontario N4K 5P9, Canada • Tel: (519) 376-8860 • Telex: (Montreal) 05-267548
TWX: (Owen Sound) 610-354-9602 • (Montreal) 610-421-3552 • Cable: BLACKCLAW OWSD

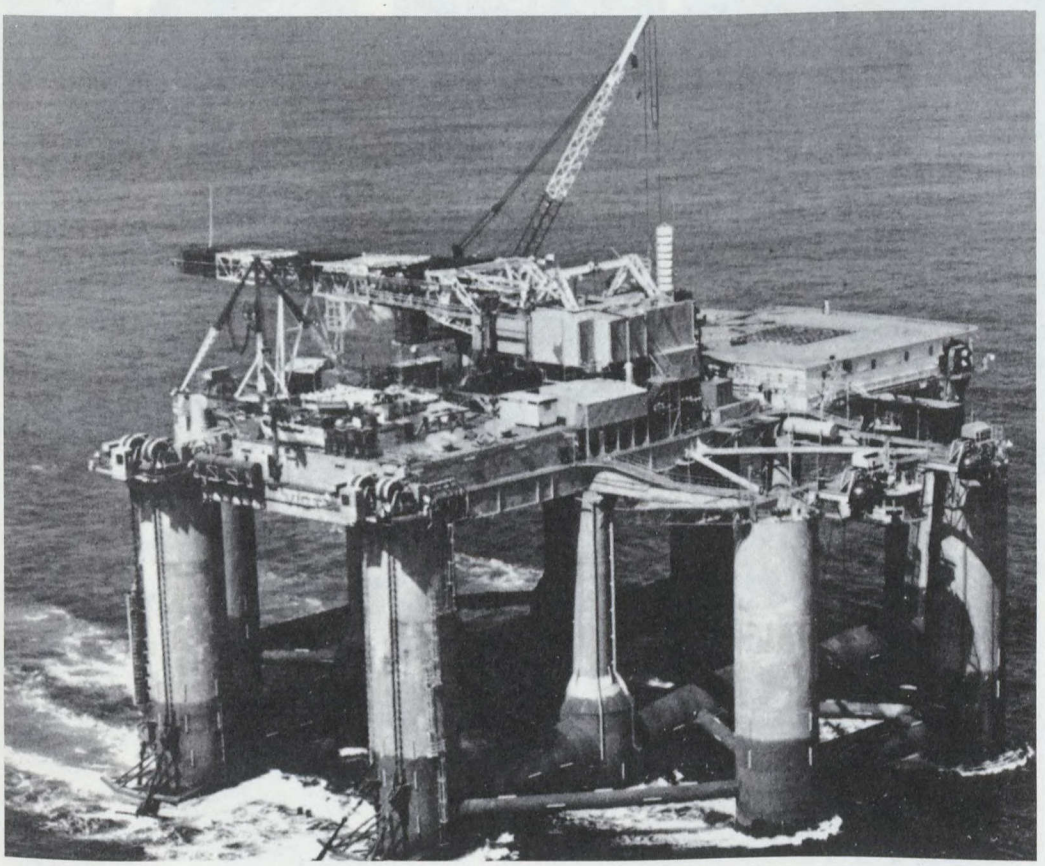
# BOW VALLEY INDUSTRIES LTD.

Bow Valley Industries Ltd., based in Canada's major oil-producing province, offers offshore drilling services in Europe through two registered companies: one in Britain and one in Norway.

The Norwegian company currently has a semi-submersible drilling rig under construction for use in the North Sea. Delivery is expected early in 1974.

Self-propelled, this semi-submersible drilling vessel will have a water depth capacity of 700 ft. (213.36 m) and a rated drilling depth of 25,000 ft. (7,620 m). It will be equipped with the most up-to-date equipment including a heave compensator.

Together with its equity interests, Bow Valley Industries Ltd. supervises and supplies personnel for the operational management of drilling operations.



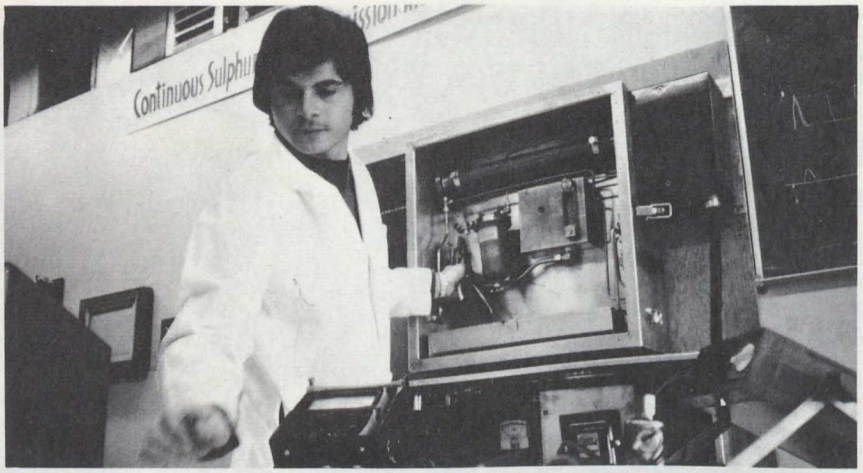
*A drilling rig, similar to this one, has recently been commissioned by Bow Valley Industries Ltd.*

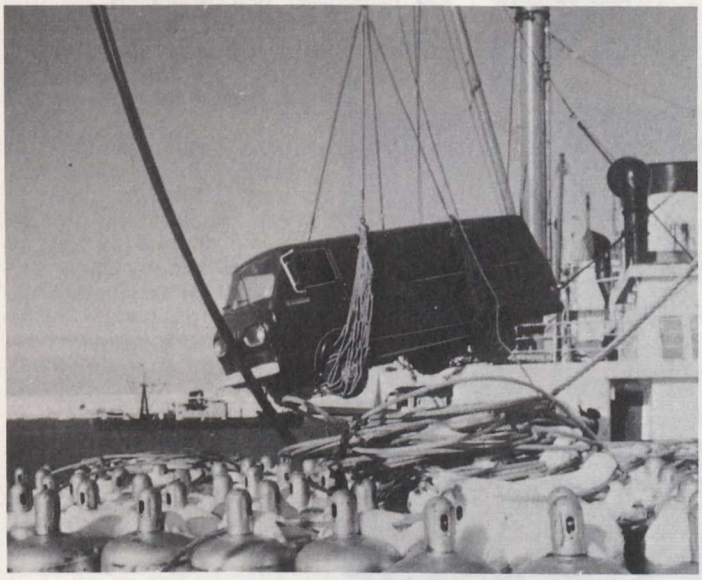
630 - 6th Avenue Southwest • Calgary, Alberta T2P 0T1, Canada • Tel: (403) 264-1550 • Telex: 03-824684
Cable: NARWHAL

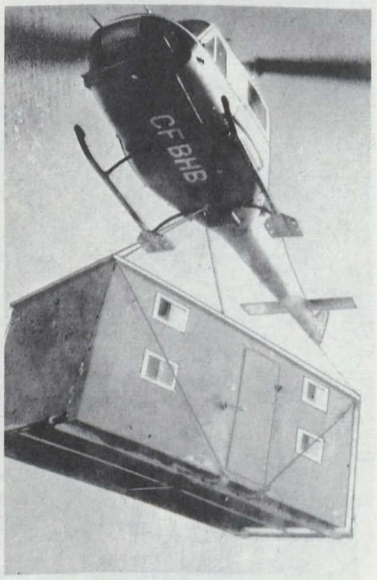
# BOW VALLEY INDUSTRIES LTD.

Bow Valley Industries Ltd. provides the following logistic and support services through its own divisions or an international affiliated company registered in Britain:

- Helicopter services
- Operations base in Scotland
- Supply store
- Machine and fabricating shop
- Manufacturing facilities for oil tools and equipment
- Work boats
- Logistical management
- Rental of oil tools
- Ship chartering
- Mini-submarine for inspection and servicing work





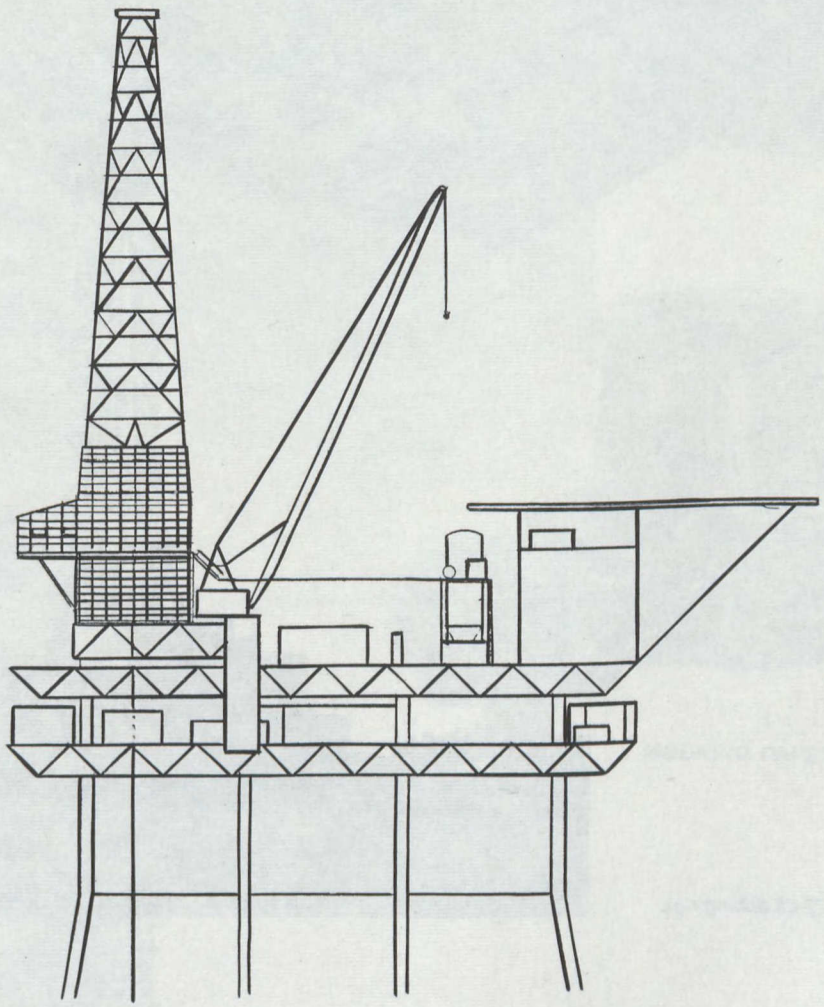




*These are some of the logistics and support services provided by Bow Valley Industries Ltd. to offshore drilling operations.*

630 - 6th Avenue Southwest • Calgary, Alberta T2P 0T1, Canada • Tel: (403) 264-1550 • Telex: 03-824684
Cable: NARWHAL

# BOW VALLEY INDUSTRIES LTD.

Bow Valley's drilling divisions operate some 35 rigs of up to 20,000 ft. (6,096 m) capacity. From these operations, the company will supply Canadian personnel and management for platform drilling services through its British affiliate. Currently, one such drilling division is working on an island platform in the Beaufort Sea, in Canada's western Arctic. In the North Sea area, Bow Valley Industries Ltd. will provide integrated services to its customers along with other services offered through Sea Oil - B.V.I. Ltd.



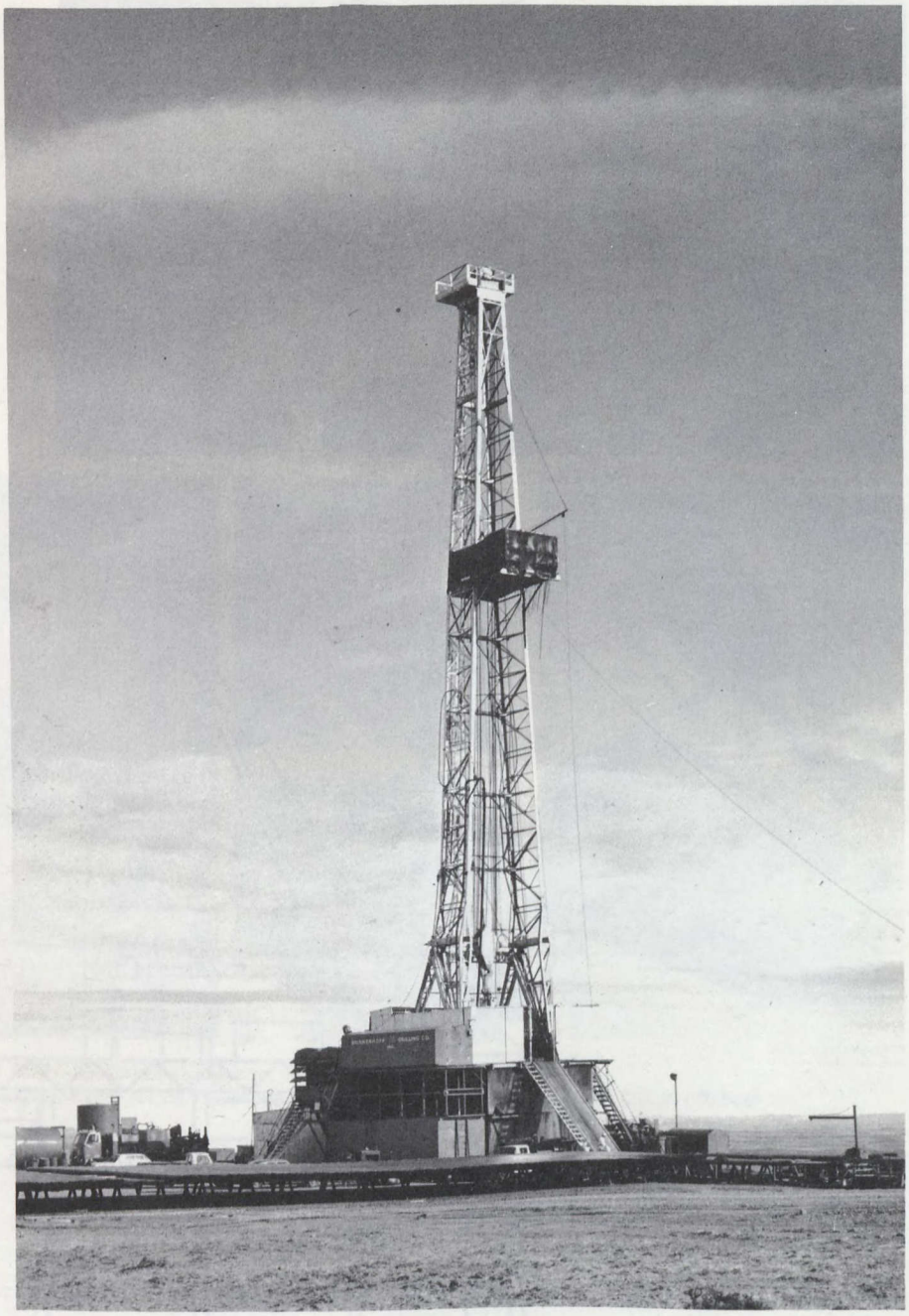
*This design indicates the type of drilling platform for which Bow Valley Industries of Calgary will supply personnel, services and management. Experience in Canadian Arctic waters provides Bow Valley with expertise for use in North Sea operations.*

630 - 6th Avenue Southwest • Calgary, Alberta T2P 0T1, Canada • Tel: (403) 264-1550 • Telex: 03-824684
Cable: NARWHAL

# BRINKERHOFF DRILLING CANADA LIMITED

One of the largest and most experienced oil-drilling contractors in Canada, Brinkerhoff Drilling Canada Limited has supplied services on contract to the oil and gas industry since 1949. Located in the centre of the Canadian gas and oil fields, it has increased its capacity from one rig to 22 with depth capacities from 4,000 ft. (1,219 m) to 19,000 ft. (5,791 m).

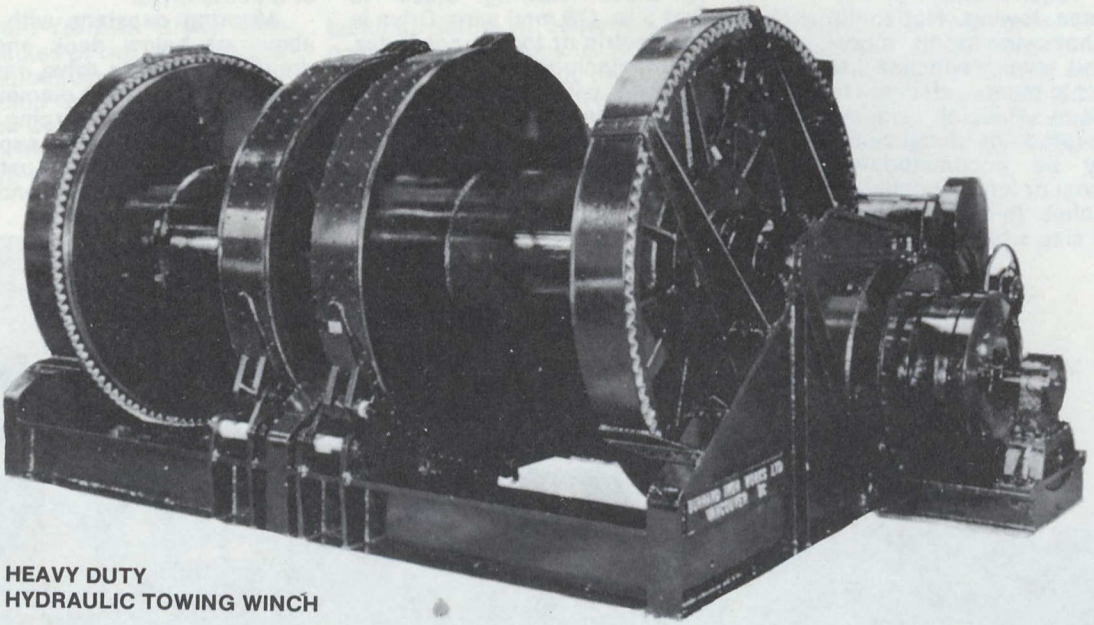
The company's experience ranges from inland and offshore drilling in the interior of Canada to the Arctic Islands. Between May 1967 and April 1972, Brinkerhoff drilled an average of more than 605,000 ft. (184,404 m) a year, in completing an average of 100 wells a year.



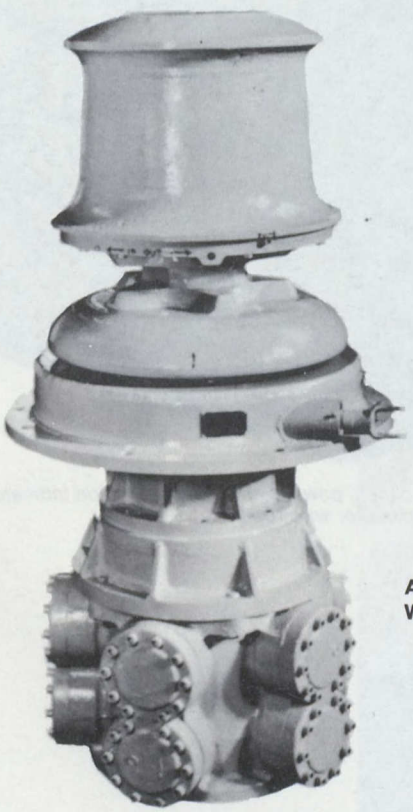
*Just one of Brinkerhoff's 22 oil drilling rigs.*

220 Bentall Building • Calgary, Alberta T2P 0X8, Canada • Tel: (403) 269-3121 • Telex: 038-25576

# BURRARD IRON WORKS, LIMITED



HEAVY DUTY
HYDRAULIC TOWING WINCH



ANCHOR
WINDLASS

MOORING CAPSTAN

220 Alexander Street • Vancouver, British Columbia V6A 1C1, Canada • Tel: (604) 684-2491
Cable: BURRWORK VANCOUVER

# BURRARD IRON WORKS, LIMITED

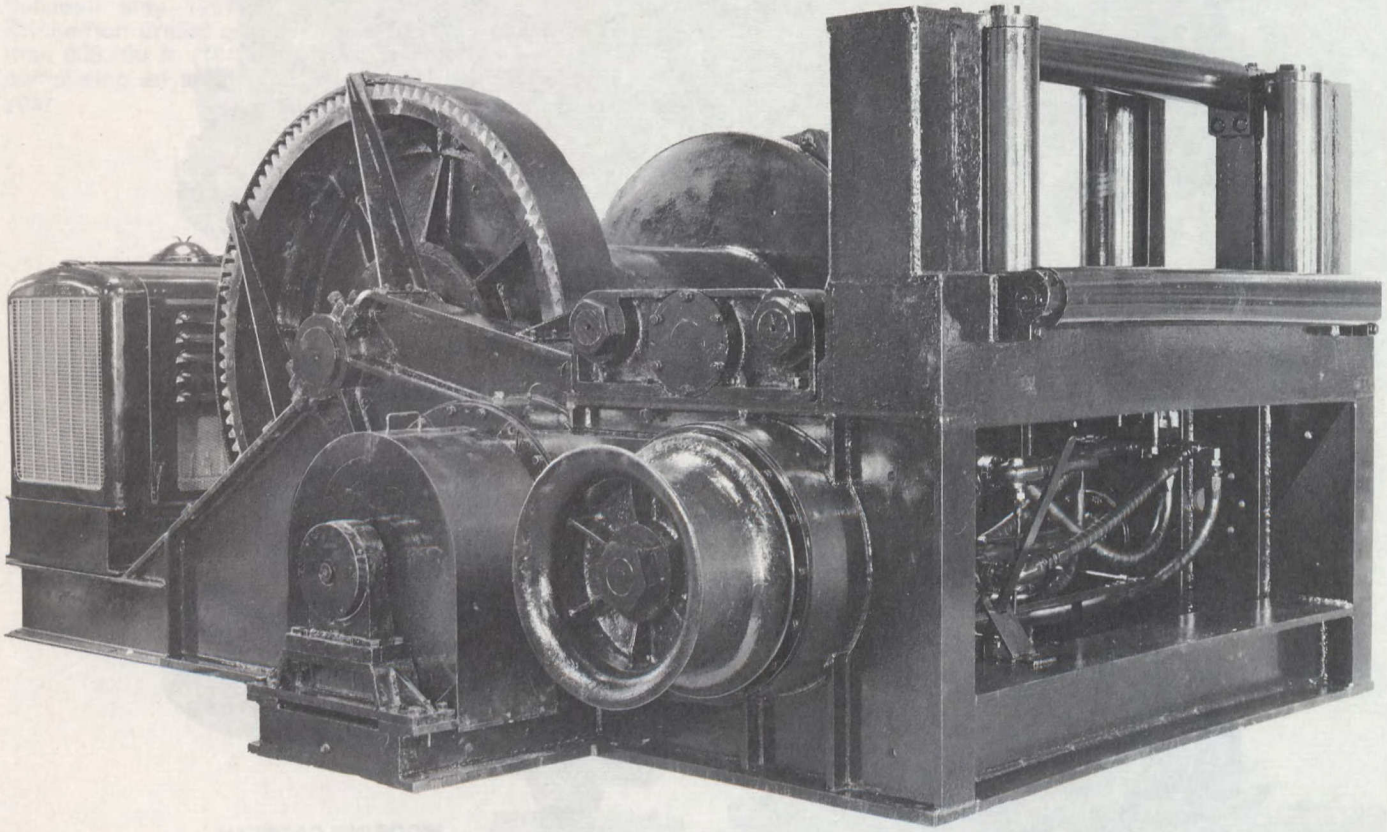
Burrard's heavy-duty winches meet the strenuous requirements of all-weather, deep-sea towing. Horizontal or vertical anchor windlasses, mooring capstans and towing winches are custom-designed to meet each customer's specifications. Special features can be incorporated, or dimensional limitations may be accommodated, without added cost or lengthy delays.

Towing winches (single or multi-drum) range in size from models that stow 1,000 ft. (300 m) of 1 in. (25 mm) wire, to those stowing 3,600 ft. (1,100m) of 3 in. (76 mm) wire. Drive is hydraulic, electric or torque converter. Usual features include air clutch, automatic spooling with staggered guide rollers, manual and power brake.

Horizontal anchor windlasses, or vertical anchor capstans, can be supplied for use with stud-link anchor chain ranging from ¾ in. (19 mm) to 3 in. (76 mm) in diameter, with hydraulic or electric drive.

Mooring capstans with gearboxes above or below deck and with hydraulic or electric drive, range in size from 12 in. (300 mm) diameter to 36 in. (900 mm) diameter warping barrels.

Burrard Iron Works exports to the United States, Mexico, Australia, Hong Kong, Singapore, Japan and Italy.



*Burrard Iron Works produces this towing winch (Model HJ) with diesel-hydraulic drive, air clutch, power brake, brake reaction indicator, clutched automatic spooling and aft rollers. It will stow up to 3,000 ft. (914 m) of 2⅛ in. (54 mm) diameter wire rope. Model HJ weighs 44,000 lbs. (20,000 kg).*

220 Alexander Street • Vancouver, British Columbia V6A 1C1, Canada • Tel: (604) 684-2491
Cable: BURRWORK VANCOUVER

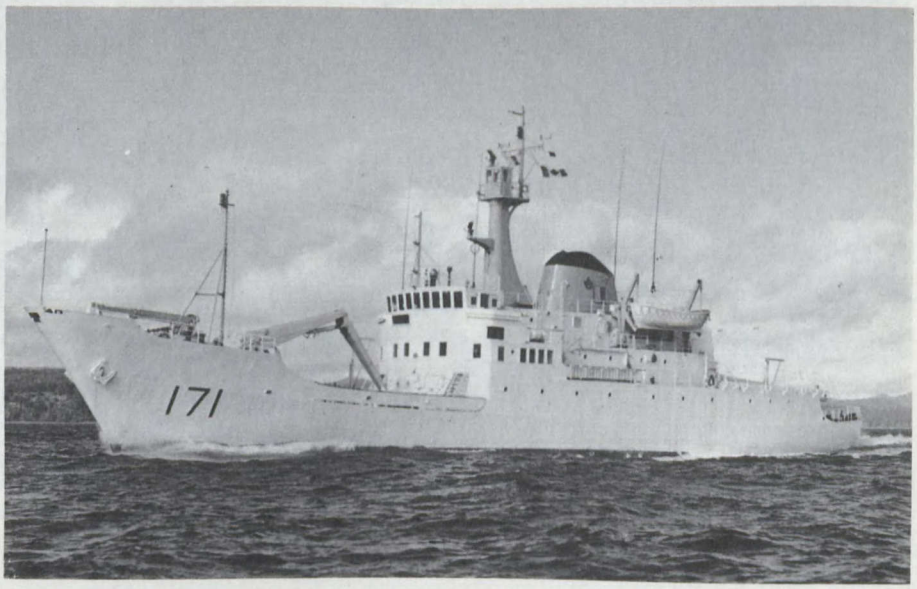
# BURRARD-YARROWS GROUP

The Burrard-Yarrows Group combines the facilities of two of the largest operating shipbuilding companies on Canada's Pacific Coast — one at Vancouver, British Columbia, and the other at Victoria, British Columbia.

The Group currently has five shipbuilding berths in operation, allowing construction of ships up to 480 ft. (146 m) in length and 100 ft. (30 m) in beam. Larger vessels have been constructed in sections and assembled in drydock.

A well-trained and experienced staff operates the complete and up-to-date facilities of the yards. These include shops for steel fabrication, joinerwork, pipe-fitting, sheet metal and machining. The company is currently exporting new products to, among others, the United States and Brazil.

*Coastal oil tanker "Imperial Skeena" and the Defence Research Board vessel "Endeavour" are representative of the wide range of ships produced by the Burrard-Yarrows Group. The tanker is shown as it leaves Burrard Inlet, Vancouver, B.C.*




P.O. Box 86099 • North Vancouver, British Columbia V7L 4J6, Canada • Tel: (604) 988-2111
Telex: 04-352652 • Cable: DRYDOCK Vancouver

# CANADA ROPES, LTD.

Canada Ropes, Ltd. designs and produces an extensive line of Samson braided ropes as well as systems for their applications. Included are systems for single point moorings, pierside moorings, towing, supply vessel moorings, control booms and shiplines. Traction winches, flotation and related hardware are produced by the company as part of these systems.

Canada Ropes also provides the world's largest capability in braided ropes including the world's strongest — a 21-inch (53.23 cm) double braided rope with a breaking strength beyond 1,200,000 lbs. (544,300 kg), made in Richmond, British Columbia.

Samson braided ropes feature such advantages as controlled elongation, high strength to weight ratios, freedom from torque, abrasion protection and dielectric strength.

*Canada Ropes, Ltd. engineers and produces ropes like these to improve operations in sea environments. The company makes all components for its rope systems.*

1320 Vulcan Way • Richmond, British Columbia V6V 1J8, Canada • Tel: (604) 278-1291 • Telex: 04-54588

# CANADIAN ENGINEERING SURVEYS CO. LTD.

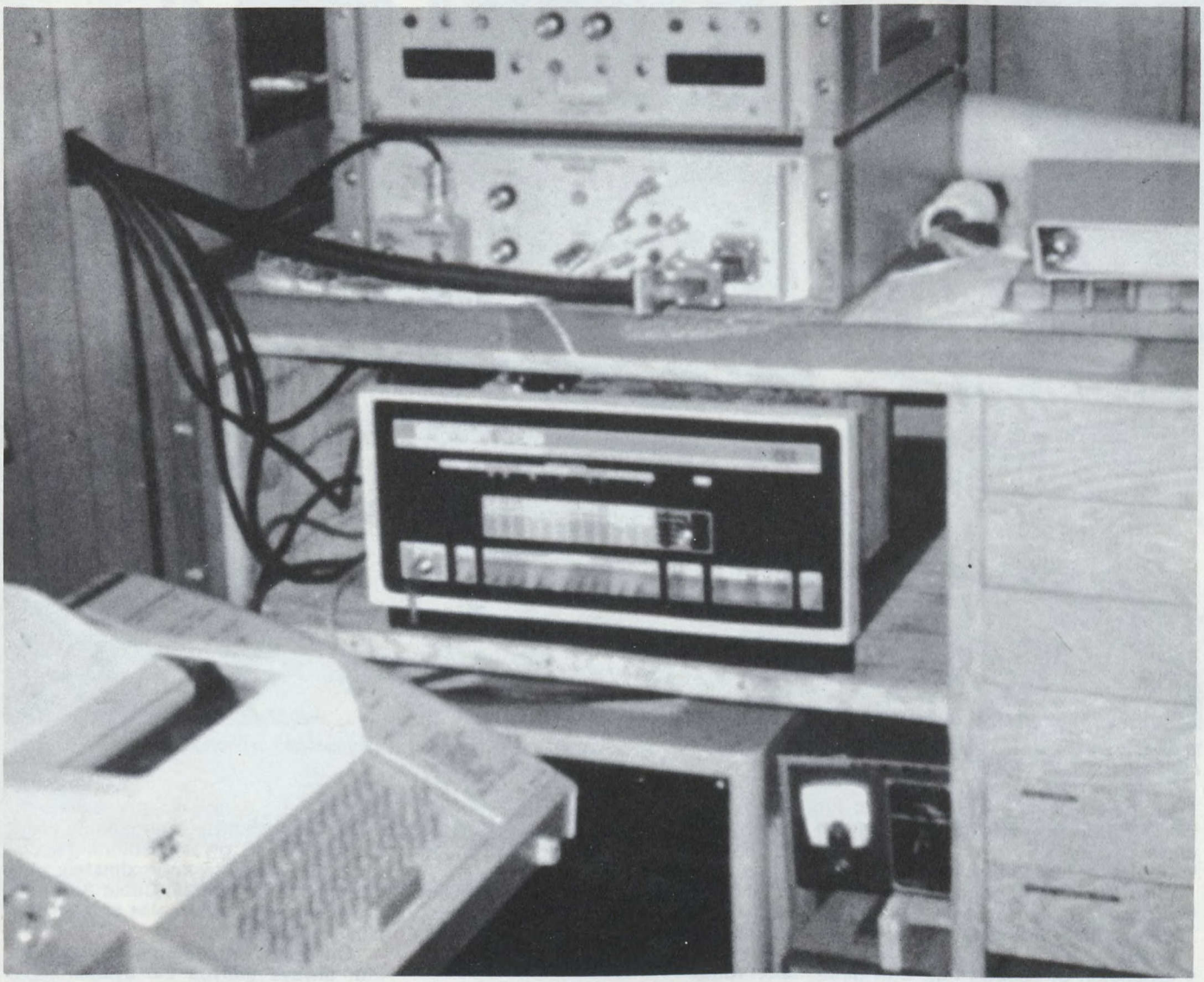
Experience with offshore positioning projects — using the customary range-plotting technique — has proved over the years that a more precise method of navigation was required. Consequently, in 1969, Canadian Engineering Surveys Co. Ltd. (CES) developed its unique SHIFT-DRIFT NAV system.

A particular feature of the system is that it can be interfaced to any range-range electronic distance measuring equipment such as: Autotape, R.P.S., M.R.S., Lorac, Shoran and Raydist.

Other features are that the navigation co-ordinates show how far ahead or behind (Shift), and how far left or right (Drift) the vessel is in relation to a station on line. And since the computer outputs position every eight seconds (using R.P.S.), a close check on boat location is possible and the required correction in navigation can be made immediately.

Components of the CES SHIFT-DRIFT NAV system are:

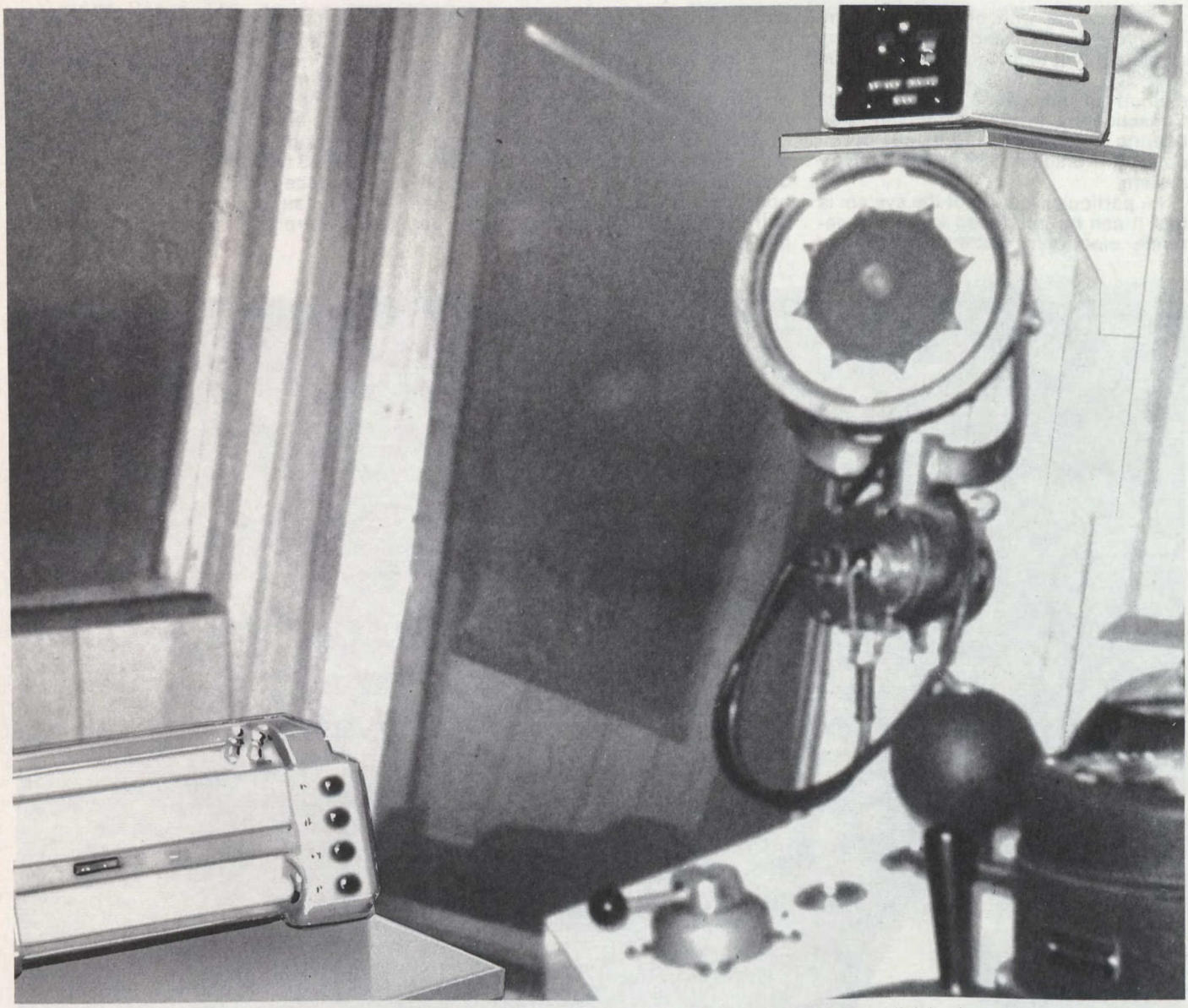
- Range-range electronic, distance-measuring equipment
- PDP-8e computer
- Calcomp strip plotter
- Left-right indicator
- ASR-33 teletype
- Interface unit
- Power supply unit
- Software



*Part of Canadian Engineering Survey's SHIFT-DRIFT NAV system is the PDP-8e computer shown in centre of photo directly above teletype.*

10310 Jasper Avenue • Edmonton, Alberta T5J 1Y8, Canada • Tel: (403) 424-7385 (Edmonton) (403) 264-2151 (Calgary) • Telex: 037-3850

# CANADIAN ENGINEERING SURVEYS CO. LTD.



*Two integral parts of Canadian Engineering Survey's SHIFT-DRIFT NAV system are the calcomp strip plotter (left in photo) and the left-right indicator shown above compass.*

Various provisions of software for the CES SHIFT-DRIFT NAV system allow for:

- Choice of suitable plotter scale and left-right indicator scale.
- Co-ordinates in metres or feet — data printed automatically or on request
- Extension of desired line with uninterrupted operation
- Change of shore-station locations with uninterrupted progress along a line
- Running a new line parallel to a preplotted line
- Choice of ship's direction of movement along a line

If it is necessary to divert from a line (e.g. under adverse ice conditions), actual co-ordinate locations of the vessel are recorded throughout the diversion route.

Accuracies of positioning obtained with the CES SHIFT-DRIFT NAV system directly relate to the electronic distance-measuring equipment used. Motorola R.P.S. gives positioning accuracy of a vessel to approximately plus or minus three metres. Cubic Autotape provides range accuracies of 0.5 metre plus 1:100,000.

Canadian Engineering Surveys Co. Ltd. always utilizes the system most suited to the project when providing a navigation and positioning service.

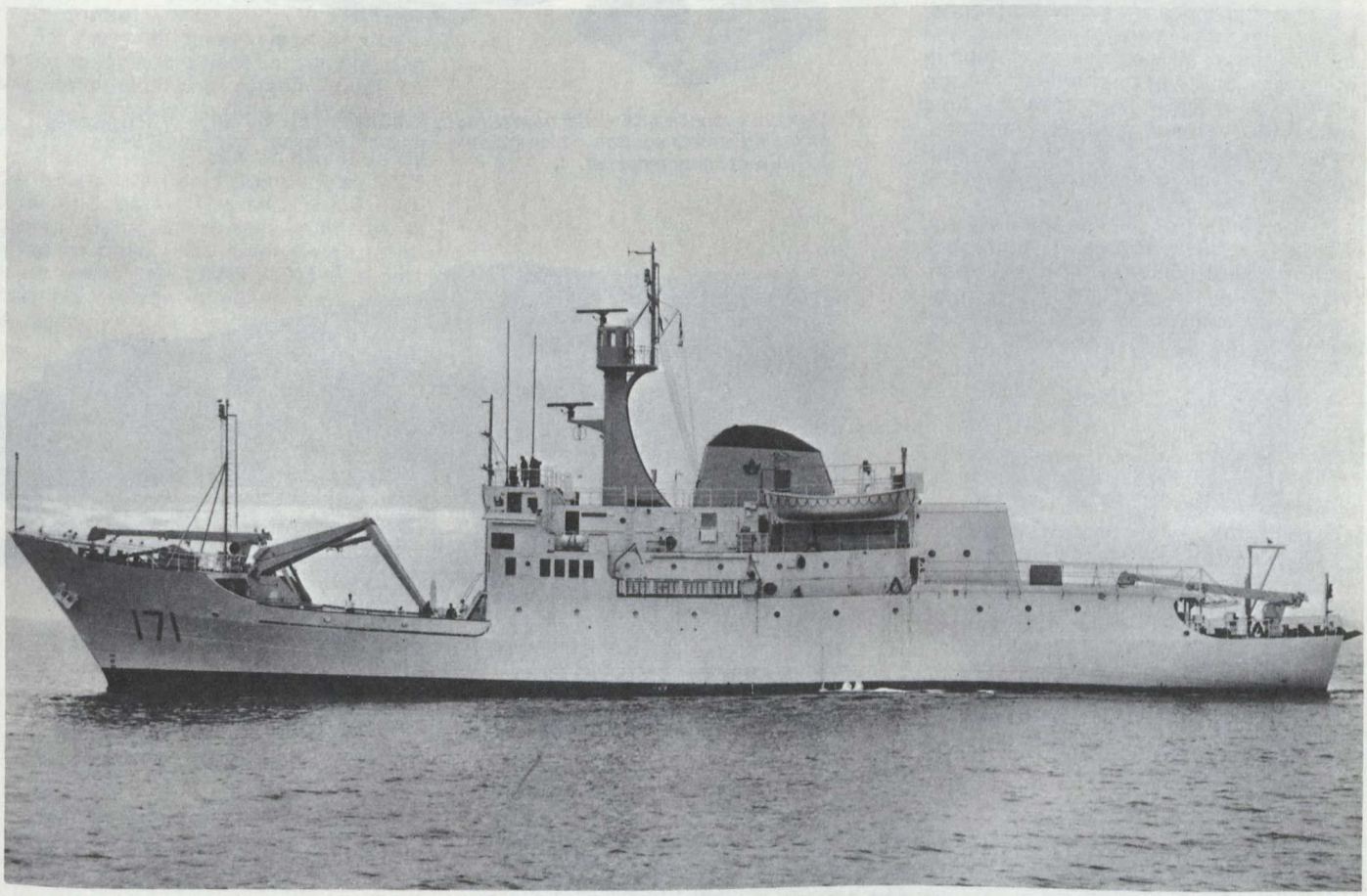
10310 Jasper Avenue • Edmonton, Alberta T5J 1Y8, Canada • Tel: (403) 424-7385 (Edmonton) (403) 264-2151 (Calgary) • Telex: 037-3850

# CANADIAN GENERAL ELECTRIC COMPANY LIMITED

Canadian General Electric, Canada's largest electrical manufacturer, supplies electrical equipment and systems for supply and other vessels used in offshore drilling and exploration.

Among the systems and products produced by the company are:

- Propulsion systems
- AC generators
- Power distribution equipment
- Thyrister power supplies
- DC motors and generators
- AC motors
- Control equipment
- Power and control cables




*Offshore exploration supply vessel is outfitted with Canadian General Electric equipment and systems.*

1900 Eglinton Avenue West • Scarborough, Ontario M1L 2M1, Canada • Tel: (416) 751-3220 • Telex: 06-23408
Cable: C G EXPORT Toronto

# CANADIAN MARCONI COMPANY

Pioneers in the field of communications, the Canadian Marconi Company continues to develop innovative and highly efficient equipment for use around the world.

Marconi products, renowned for their reliability, operate in every type of environment: on land or sea, in the sky, or in conjunction with satellites in space.

The company's Marine and Land Communications Division makes available a wide variety of proven equipment for onshore and offshore projects. Two of the most prominent pieces are its Mobile SSB transceiver CH25 and portable SSB transceiver CP34.

The CH25 is a single side band, high-frequency transceiver designed for use under all weather conditions in marine or land environments. It is completely solid state except for the final transmitter stages and has a transmitter output power of 100 watts PEP covering a range of 1.6 to 17 MHz in 12 channels.

The CP34 has similar features and has been designed as a man pack portable unit which can be used conveniently in a mobile role. The transmitter output power is 20 watts PEP covering a range of 2 to 18 MHz in 36 channels.


*Marconi's mobile SSB CH25 transceiver is available with a full range of accessories including remote controls, voice-operated squelch, antennas and tuners, and a 1,000-watt linear amplifier.*


*Modular construction of Marconi's SSB CP34 permits easy maintenance and channellizing. The internal adjustable antenna tuner provides simplified transmitter tune-up.*

Marine and Land Communications Division • 2442 Trenton Avenue • Montreal, Quebec H3P 1Y9, Canada
Tel: (514) 343-3411 • Telex: 05-267563 • TWX: 610-421-3564 • Cable: ARCON MONTREAL

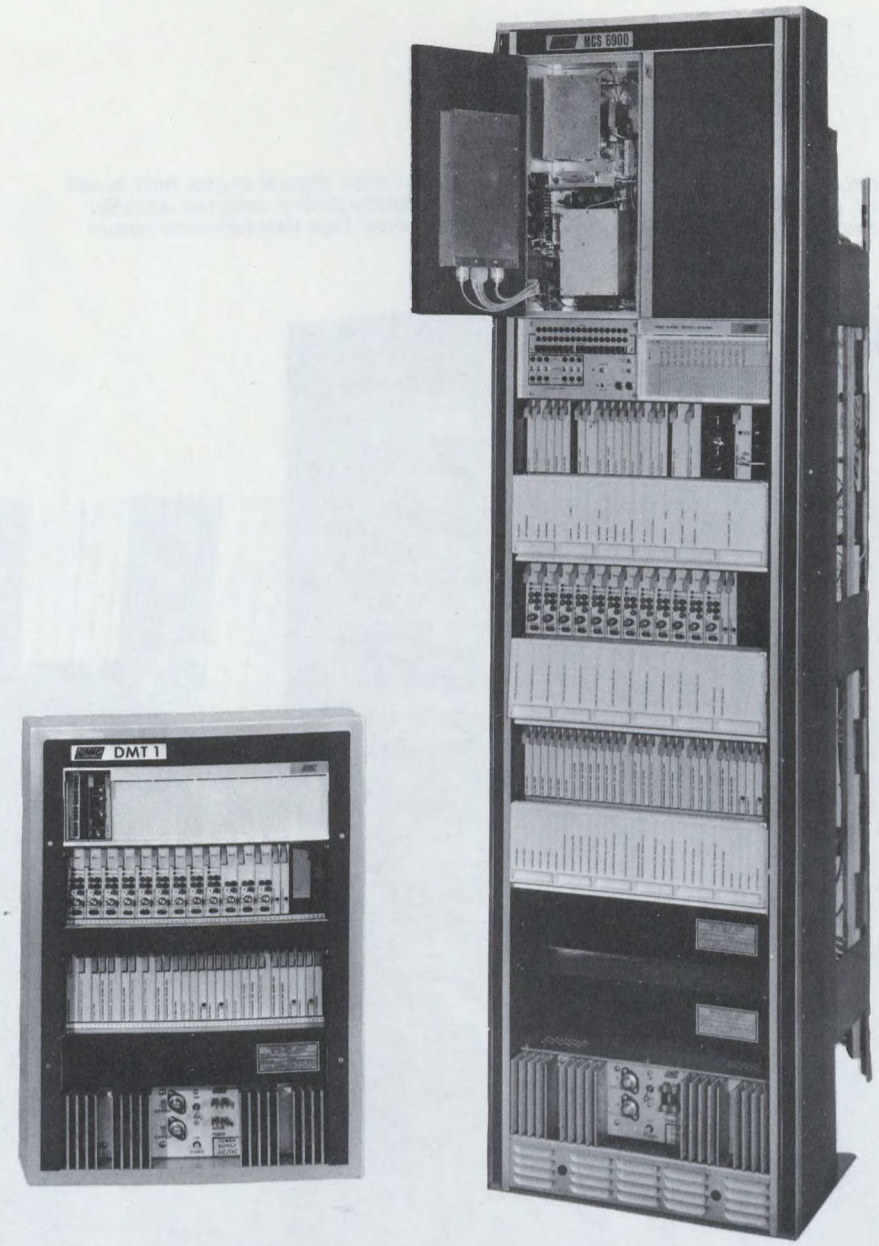
# CANADIAN MARCONI COMPANY

The efficient and safe operation of today's offshore pipeline system demands a flexible and reliable telecommunications facility particularly in view of the increasing trend towards fully-automatic system dispatching. The optimum objective is to have total remote control operation of the entire system from a single control centre.

Such operation requires sophisticated data and peripheral equipment, all connected to the control centre via high-quality data circuits of various speeds. It is also necessary to interconnect land-based facilities and offshore platforms with various voice circuits which may include administration, operations, maintenance and VHF radio control.

To carry all these types of traffic in the most cost-effective manner, the telecommunications system must be efficient, reliable, flexible and require a minimum of maintenance.

Such a facility can be provided by Canadian Marconi Company's MCS 6900 and DMTI. The MCS 6900 integrated digital microwave/multiplex is ideal for radio relay (line-of-sight) systems while the DMTI TDM-multiplex can be utilized effectively on cable systems.




*Marconi offers microwave/multiplex for offshore voice and data communications; the DMTI Multiplex for cable systems, and the MCS 6900 integrated Microwave Radio/Multiplex for radio relay systems. Both pieces of equipment give flexible voice and data handling and single-channel, drop-and-insert capabilities.*

Telecommunications Division • 2442 Trenton Avenue • Montreal, Quebec H3P 1Y9, Canada
Tel: (514) 343-3411 • Telex: 05-267563 • TWX: 610-421-3564 • Cable: ARCON MONTREAL

# CANADIAN MARCONI COMPANY

*Marconi's CMA-722 features modular construction, short doppler counts, built-in self test, precision reference oscillator with 10-hour standby battery, computer-assisted acquisition and tracking, velocity and speed interfaces. Tape data collection feature.*

Canadian Marconi Company, Avionics Division presents the CMA-722, Satellite Position Location/Navigation System, an accurate position-fixing device for ocean research, exploration and survey.

This precise navigation system provides all-weather, world-wide day or night position fixes without the aid of maps or charts. It is fully automatic, dual channel receiving equipment that uses the U.S. Navy Transit satellite system. Navigation accuracies of 40 metres can be expected with precise velocity and heading information available.

Canadian Marconi offers a complete systems integration capability for systems such as CMA-722, Loran, Decca, Speed Log, Gyro and Auto Pilot.

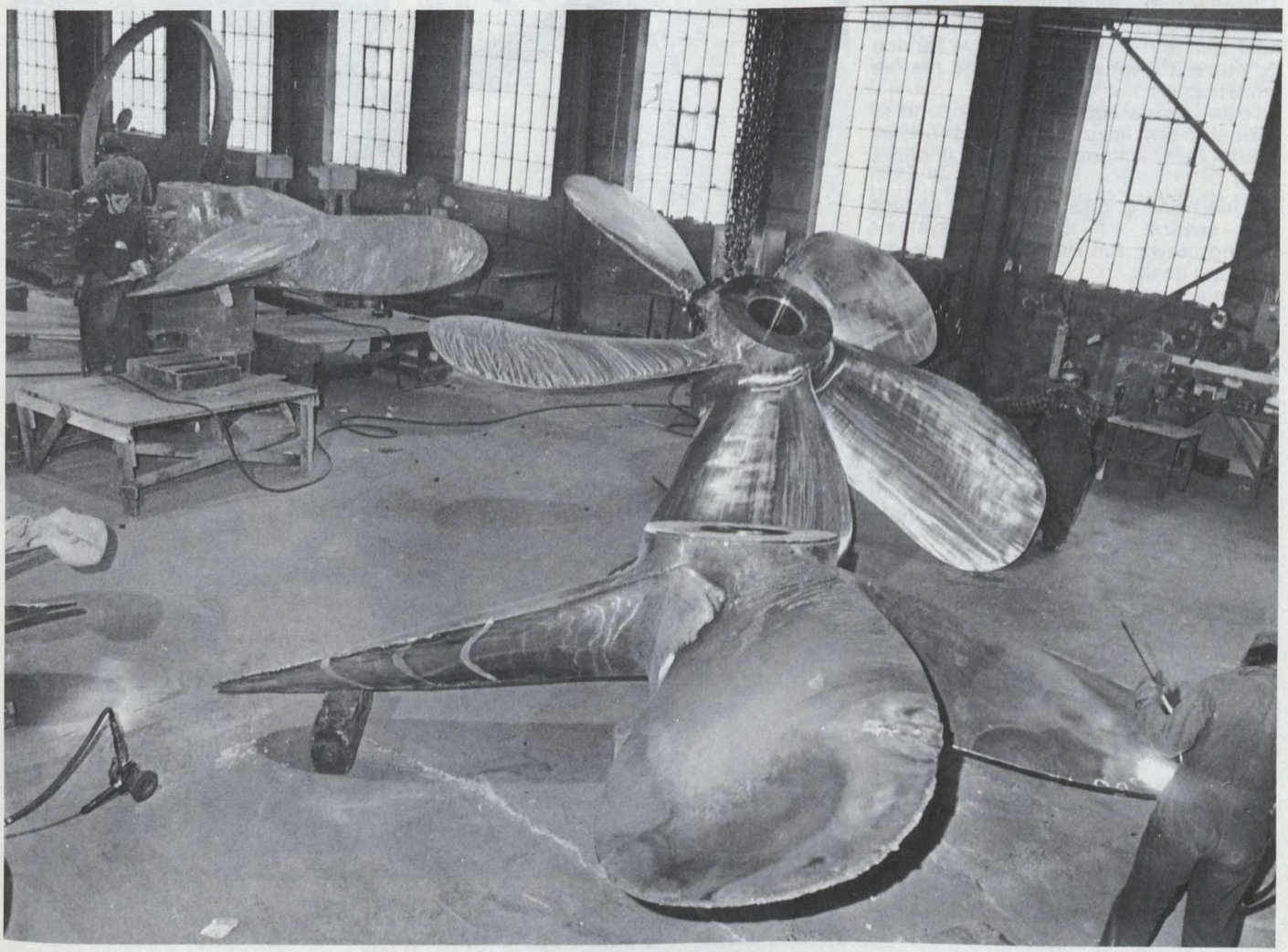
World-wide support, including installation, service, maintenance and training, is also available from Marconi's Avionics Division.


Avionics Division • 2442 Trenton Avenue • Montreal, Quebec H3P 1Y9, Canada • Tel: (514) 341-7630 • Telex: 05-267563
TWX: 610-421-3564 • Cable: ARCON MONTREAL

# CANADIAN STONE MARINE LIMITED

Canadian Stone Marine is conveniently situated near the St. Lawrence Seaway where it services both seagoing and inland vessels. Since its founding in 1967, Canadian Stone Marine's expertise and high quality workmanship have catapulted this young but dynamic company into rapid expansion.

It now has machine shops and melting capacity for making propellers with cast weight of 80,000 lbs. (36,500 kg). Repairing and servicing of damaged propellers is carried out regularly and the company's association with Stone Manganese Marine Ltd. of London, England, provides a backup of technical support in the form of design and metallurgical advice.



*Skilled craftsmen in the production of large ship propellers, some weighing up to 80,000 lbs. (36,500 kg), apply the finishing touches to their product at the Iberville, Quebec, plant of Canadian Stone Marine Limited.*

420 Ninth Avenue, P.O. Box 86 • Iberville, Quebec J2X 1K3, Canada • Tel: (514) 347-3789 • Telex: 05-831-556

# CAN-DIVE SERVICES LTD.

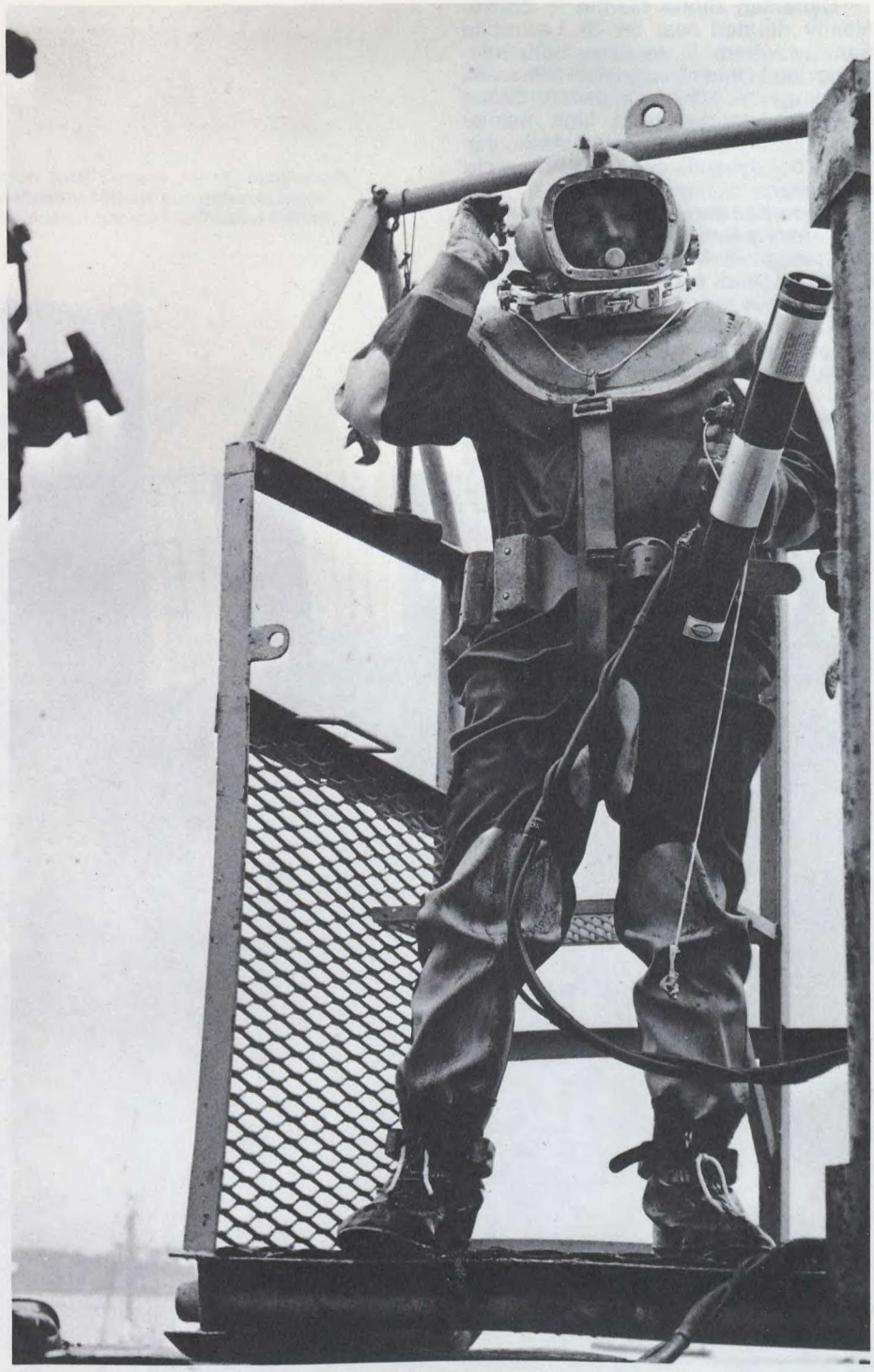
Can-Dive Services Ltd. was incorporated in 1966 to provide advanced diving technology and services to Canadian industry. Subsequently, it provided the first offshore petroleum support service in Canada using bell systems and deep diving $HeO_2$ techniques.

In 1969, Can-Dive was one of the three founding companies of Oceaneering International, Inc., now recognized as the largest diving contractor in the world. One major reason for incorporating several independent companies into the Oceaneering entity was to create a state-of-the-art technological pool.

Can-Dive now offers the combined expertise and equipment of all the subsidiaries of the parent company. Oceaneering International operates in some 25 countries, and is proud of its fast, efficient and cost-effective service to the world-wide offshore and marine construction market.

Can-Dive is equipped to respond to virtually any size or type of underwater task. Among the skills it offers are:

- Deep diving and equipment service — several full diving-bell systems and crews; full $HeO_2$ gear on ready-to-go basis.
- Bottom coring — diamond drilling — ballastic coring devices and the diver-operated drilling rig "Subman 2" are in the Vancouver inventory.
- Oceanographic survey division — bottom, sub-bottom surveys; side-scan sonar surveys; also surveys of current, temperature, salinity.
- Photographic and related service — maintains a comprehensive inventory of underwater camera equipment, including still, motion, television (remote and diver-held); videotape recording.
- Marine construction — comprehensive welding services, grouting, excavation, cleaning, coating and painting, X-raying, and diving services connected with construction. An inventory of heavy construction equipment is maintained.
- Consultation, design, fabrication — all types of underwater problems. Machine shop facilities, engineering personnel, low and high pressure test chambers to 10,000 ft. (3,048 m), liaison with almost every major consultant in the underwater field, and computerized decompression formulation schedules.



*Preparing for deep descent, a Can-Dive Services diver adjusts his helium/oxygen supply. Can-Dive provided Canadian industry with the first offshore petroleum support service using the $HeO_2$ deep diving technique.*

250 East Esplanade • North Vancouver, British Columbia V7L 1A3, Canada • Tel: (604) 987-4913 • Cable: CANDIVAN

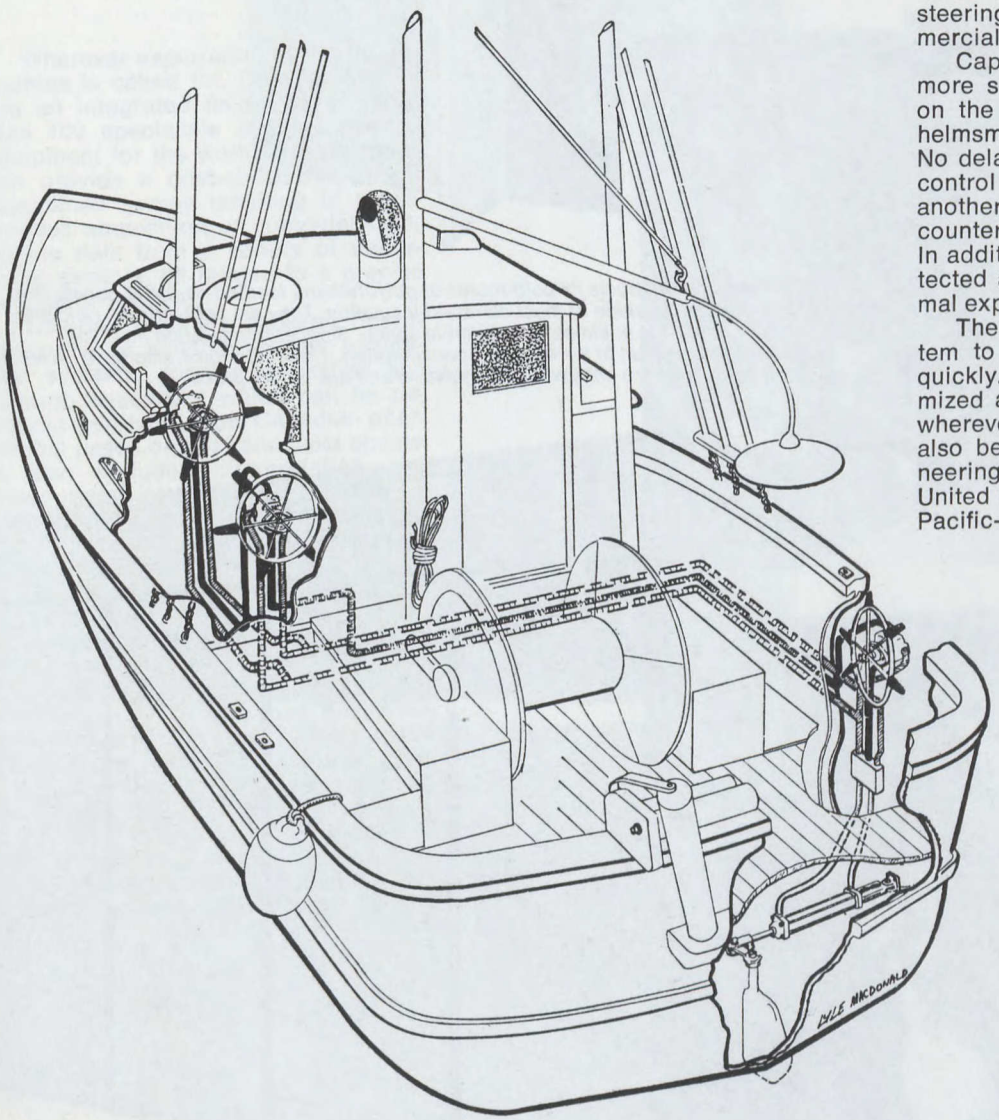
# CAPILANO ENGINEERING CO. LTD.

Capilano Engineering Co. Ltd. manufactures marine hydraulic steering systems and related accessories for vessels 20 ft. to 120 ft. (6.09 m to 36.58 m) in length.

The company offers six models of steering helms and 15 models of cylinders along with a patented "Uniflow Valve". This product range meets the steering requirements of most commercial and pleasure craft.

Capilano steering systems offer more safety features than any others on the market today and enable the helmsman to be in control at all times. No delay is experienced in transfer of control from one steering position to another and steering helms do not counter-rotate to cause rudder drift. In addition, the steering system is protected against rudder shock and thermal expansion.

The "Uniflow Valve" permits a system to be purged of air simply and quickly. Installation costs are minimized and helms cannot be airlocked wherever mounted. The system can also be filled rapidly. Capilano Engineering exports its systems to the United States and most European and Pacific-Asian countries.



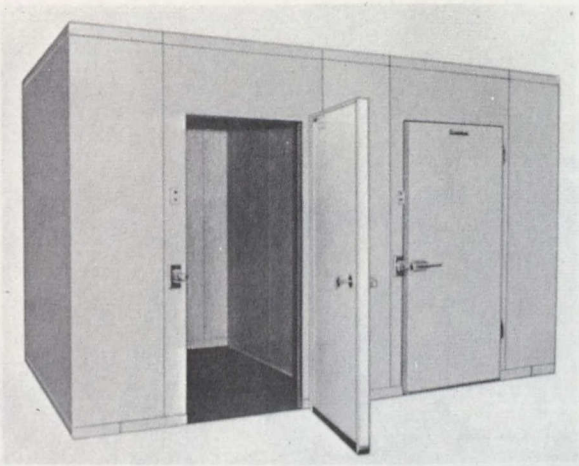

*Capilano Engineering's hydraulic steering system can be used with automatic pilots designed for hydraulic steering.*

1675 West 2nd Avenue • Vancouver, British Columbia, Canada • Tel: (604) 731-0431 • Cable: CAPENG

# COLDSTREAM PRODUCTS OF CANADA LTD.

Anything that needs refrigeration, on drilling rigs, supply vessels or other marine facilities, is provided for by Coldstream Products of Canada Ltd. The company specializes in walk-in cold rooms and refrigerator/freezers. More than 4,000 of its cold rooms are used in Canada, the United States and other countries.

The company is prepared to install refrigerating equipment in all types of facilities operating under marine conditions.



*Coldstream constructs its cold rooms of polyurethane foamed-in-place panels that have double the value of most standard insulation. They are light, strong, rigid and easy to assemble in almost any suitable space. Smaller refrigeration machine requirements result in lower power consumption. The cold rooms also have no wood framing so they are impervious to moisture and are vermin proof.*

*There is more space inside Coldstream refrigerators because the polyurethane foamed-in-place insulation leaves thinner walls. They are completely self-contained and have a packaged lift-off Cold Pack Refrigeration unit mounted on top. A spare unit eliminates the need for a mechanic since the original may be easily replaced with the spare.*

1855 Sargent Avenue • Winnipeg, Manitoba R3H 0E3, Canada • Tel: (204) 775-8274 • Telex: 07-57152

# COMDEV MARINE

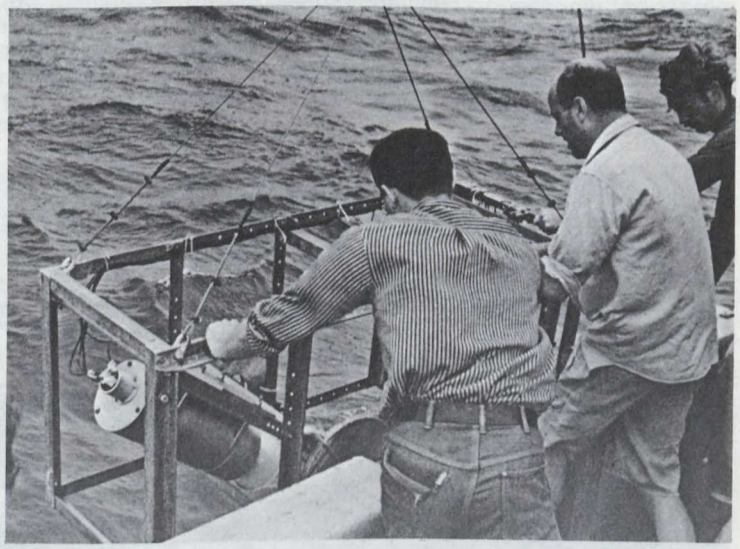
## Computing Devices Company

Wherever exploration of marine resources is called for, ComDev Marine has an integrated field staff of more than 100 specialists and the special equipment for the work. The company can provide a cost-conscious, multidisciplined survey resulting in simultaneous acquisition of computer-compatible data from a variety of underwater sensors, all related to a precise navigation system.

ComDev Marine's package operation provides suitable vessels, navigation systems, surveys, expertise and sensing equipment which can be deployed worldwide from Canadian operational bases on east and west coasts. It also includes interpretation and presentation of field-acquired data — hydrographic, seismic, magnetic or gravimetric — under professional project management.

The company's field staff includes hydrographers, geophysicists, master mariners and electronic engineers and technicians.

ComDev Marine's experience in the seagoing environment has developed over the past 15 years. As an autonomous group, Computing Devices Company, ComDev Marine is supported by an electronic engineering R&D organization long recognized in Canada and abroad as a leader in the field of marine environmental data, signal processing and interpretation.



*A shallow seismic profiler and underwater camera take the plunge.*

Computing Devices Company, A Division of Control Data Canada, Ltd. • P.O. Box 8508 • Ottawa, Ontario K1G 3M9, Canada • Tel: (613) 596-3810 • Telex: 053-4117 • Cable: COMDEVMAR

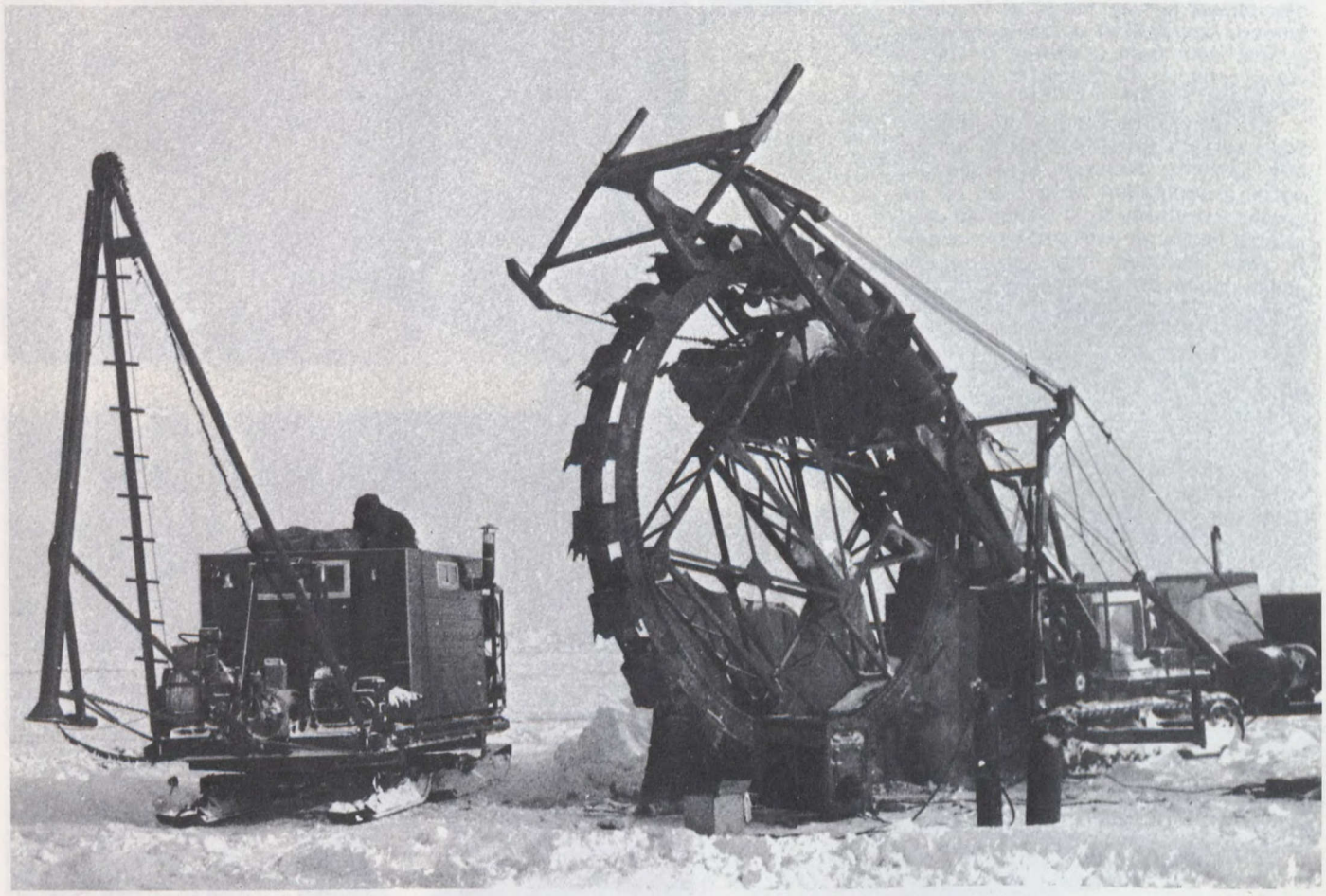
# COMDEV MARINE

## Computing Devices Company

ComDev Marine undertakes such specific surveys as rig foundation studies, pipeline and cable routes, seabed investigations, dredging and harbour development. Expertise includes selecting and operating the right sensors for final presentation of bathymetry, bottom topography and sub-bottom characteristics, in formats that can quickly be assessed by customers for subsequent operations such as rig anchoring, pipe laying and dredging.

For small-area, high-accuracy surveys, ComDev Marine's onboard instrumentation packages comprise: precision-survey echo sounders; side-scan sonar; high-resolution, sub-bottom profilers; sparker systems and recorders. The company also provides gravity coring equipment for correlation of ground truth characteristics with shallow sub-bottom profiling data.

ComDev Marine's survey experience also spans 15 years of diversified operations in the Arctic. It has pioneered new equipment and techniques to secure bathymetric and seismic data on, through and under the ice canopy. Its operations are supported by its own marine electronic engineering organization and also by the R & D and heavy computer facilities of Computing Devices Company, a Division of Control Data Canada, Ltd.



*Trench cutter and ComDev Marine survey equipment sled rigged for data acquisition through ice 10 ft. (3 m) thick.*

Computing Devices Company, A Division of Control Data Canada, Ltd. • P.O. Box 8508 • Ottawa, Ontario K1G 3M9, Canada • Tel: (613) 596-3810 • Telex: 053-4117 • Cable: COMDEVMAR

# COMDEV MARINE

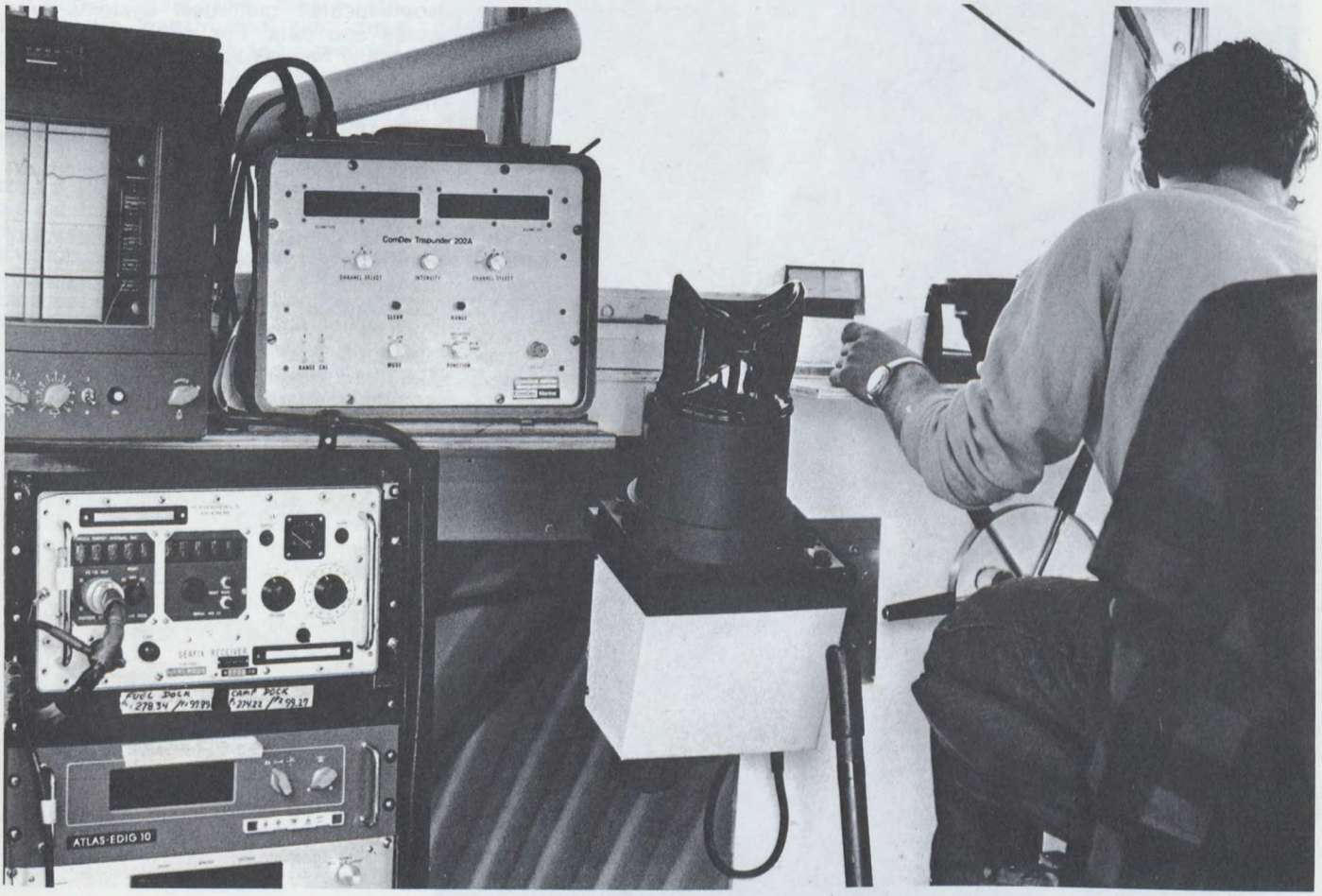
## Computing Devices Company

As government and industry become more concerned with offshore resources, survey activity increases and extends farther than ever from Canada's coastlines. This growth demands not only more precise navigation and position-fixing, but more accurate navigation at greater distances offshore.

Since 1960, ComDev Marine has supplied, operated and maintained survey navigation control systems used by the Canadian oil industry for offshore geophysical explorations. It has positioned and re-located the majority of the drilling rigs in use off the Canadian coastline and has also conducted surveys for various agencies of the Canadian Government concerned with geological, hydrographic and environmental studies.

ComDev's systems for inshore and offshore navigation cover a range of from 50 m to 500 km with shore-based references. Positioning services are available worldwide on a 24-hour basis using the Navigation Satellite System.

The company's systems are supported by a highly qualified and integrated field staff, comprising engineers, master mariners, hydrographers and technicians. Periphery services include pre and post survey data analysis, post plotting, cartography and report presentation.

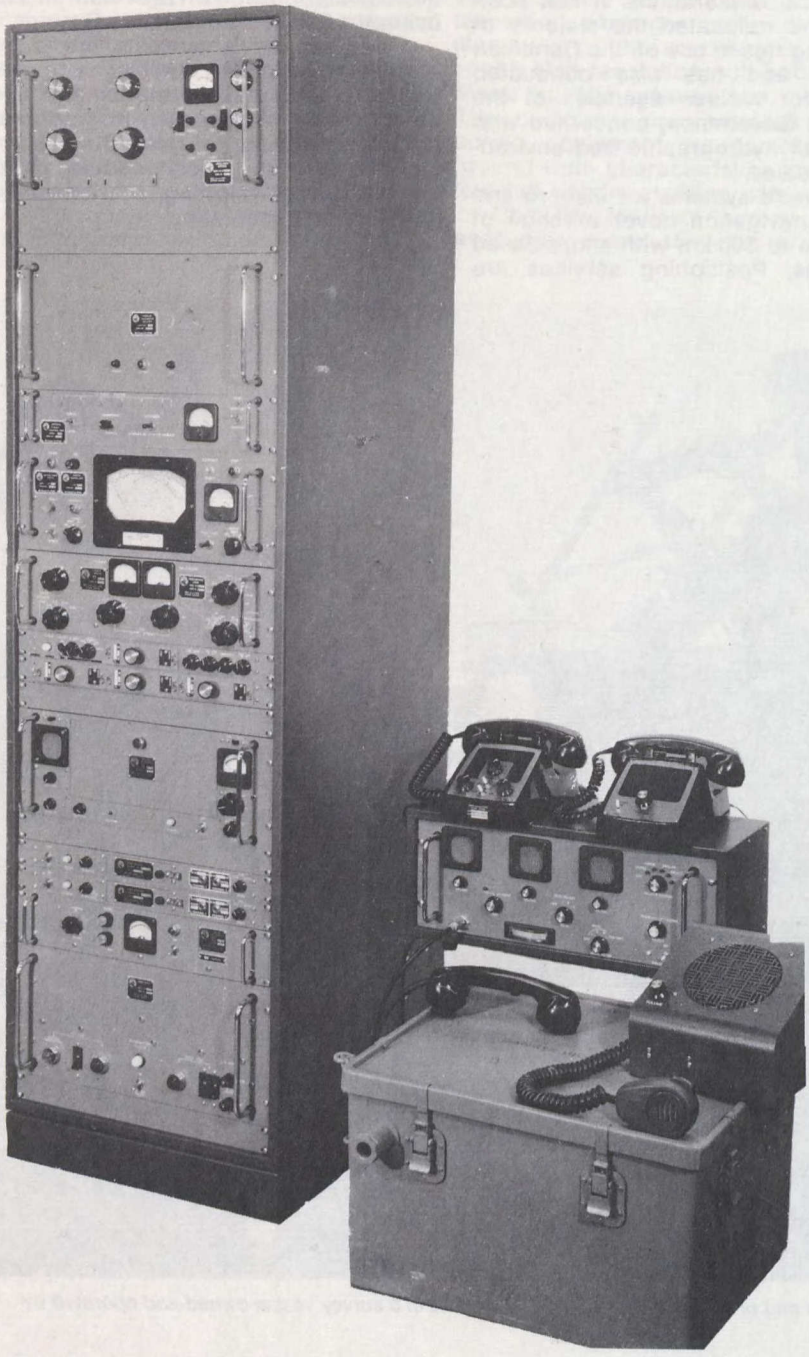



*ComDev Marine equipment for navigation, data acquisition and precision echo sounding installed in a survey vessel owned and operated by the company.*

Computing Devices Company, A Division of Control Data Canada, Ltd. • P.O. Box 8508 • Ottawa, Ontario K1G 3M9, Canada • Tel: (613) 596-3810 • Telex: 053-4117 • Cable: COMDEVMAR

# COMDEV MARINE

## Computing Devices Company



*Main components of a high-powered communications system for a drilling rig installed and maintained by ComDev Marine.*

In all phases of an offshore exploration operation, there must be reliable communication — between the drilling rig and the company's head office, the geophysical vessel and the shore-based navigation station, and between the hydrographic survey ship and the operation's field office. Transmission of messages and data require a variety of forms including voice, teletype and/or facsimile.

ComDev Marine meets these communication demands, both for simple point-to-point networks and for more sophisticated multi-user systems for voice and data. For many years the company has tested and evaluated its products in the field and, as a result, has designed unique systems for specific requirements. For conventional marine communication, economical radiotelephones have been installed in several hundred coastal, survey and government vessels.

The ComDev radiotelephone system uses a 12½-watt, 12-channel VHF transceiver and a 100-watt, 8-channel SSB transceiver.

The company's 32 coastal installation and service depots along Canada's coastline are supported by communication engineers, design staff and technicians at the main plant in Ottawa.

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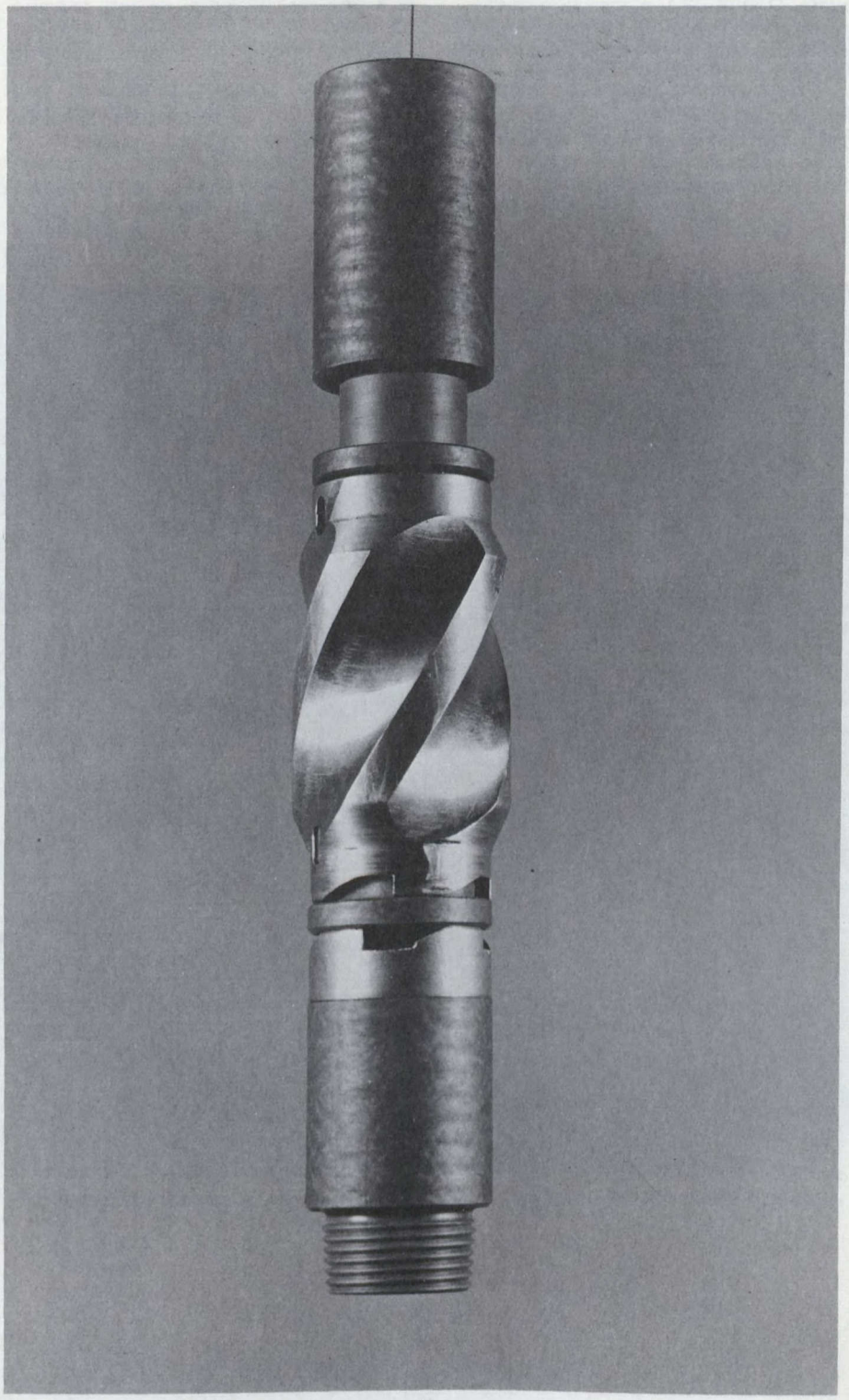
# COUGAR TOOL CO. LTD.

Cougar Tool Co. Ltd. specializes in developing innovative ideas in downhole drilling tools for the oil and gas industry. One new development is the Cougar Cub Stabilizer. Non-rotating, it eliminates unnecessary reaming of the wall of the well bore and centres the drill collars in the well bore to reduce possible differential wall sticking.

Another recent introduction from Cougar is the Shock Tool which dampens downhole vibrations caused by the drilling bit as it rotates. The use of the Shock Tool allows more weight to be carried on the bit causing less tooth and insert breakage and longer bearing life and bit savings.

Cougar replaceable sleeve stabilizers are constructed with three sleeves and fit on a splined mandrel. The sleeves can be changed one at a time or, depending on the wear, all three together right on the drilling site without replacing the complete tool.

The Cougar Bumper Sub is basically a slip-joint, simple in design yet rugged enough to withstand the severe bumping, shock, tension and torque to which it may be subjected. The inner workings are completely enclosed to keep out drilling fluid and solids, and ensure longer spline life. The spline is fully engaged in all positions in the travel. If necessary, the packing element can easily be changed at the drilling site.



*The Cougar Cub non-rotating stabilizer eliminates unnecessary reaming of a well bore wall and centres the drill collars in the well bore.*

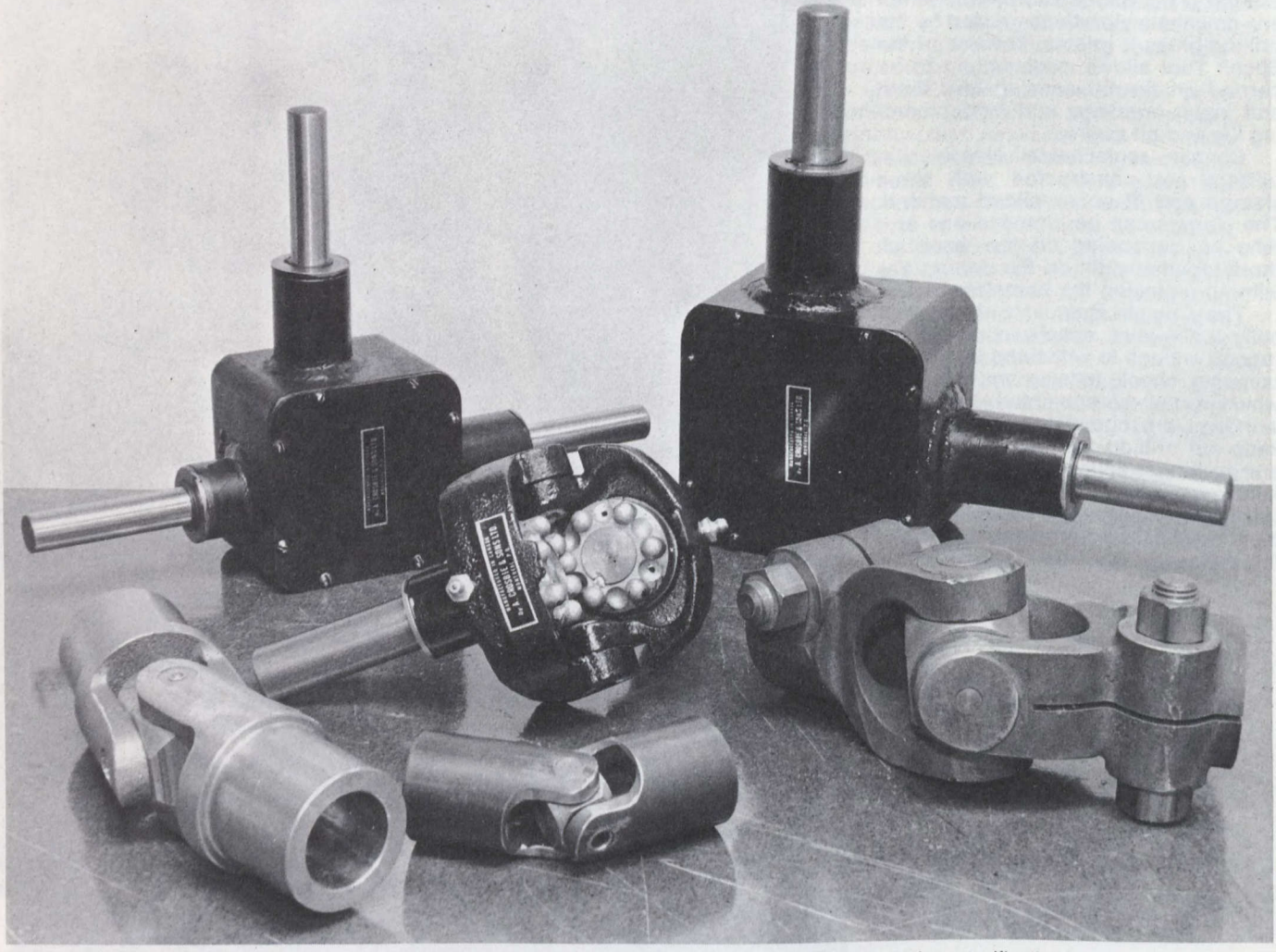
9929 - 60th Avenue • Edmonton, Alberta T6E 0C7, Canada • Tel: (403) 435-3763 • Telex: 037-2392

# A. CROSBIE & SONS LIMITED

A Crosbie & Sons Limited has been filling the special requirements of shipbuilders for more than 30 years.

The company meets the most exacting specifications for spindle support equipment and its foundry is equipped to produce bronze and aluminum castings in a wide range of sizes.

Spindle support equipment produced by the company includes deck stands, scupper valves and strainers. It also manufactures inverted vents, deck drains, deck access boxes and other fittings – all to exact customer requirements.



*A. Crosbie & Sons Limited supplies shipbuilders with a variety of transmission equipment built to exacting specifications.*

2955 Sartelon Street • St. Laurent, Quebec, Canada • Tel: (514) 332-2206 • Telex: 05-826647 • Cable: SHIPTELREG

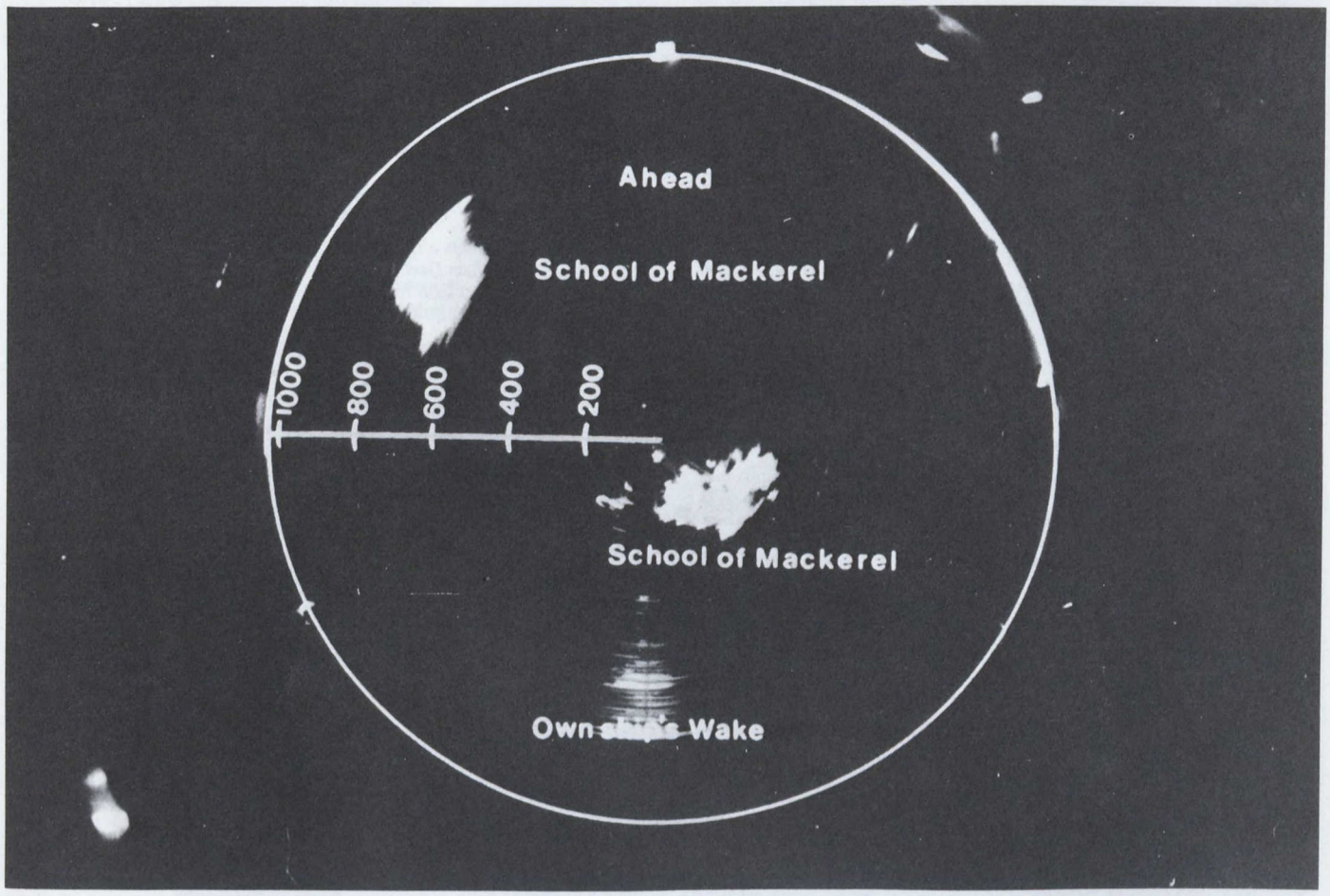
# C-TECH LTD.

C-TECH LTD., situated on the St. Lawrence Seaway west of Montreal owns and operates the only commercial, fully instrumented, underwater acoustic test barge and shore-based laboratory in Canada. This facility is just one of many services offered by this employee-owned company to shipowners, industry and governments around the world.

C-TECH activities include the development, design, manufacture and sale of sonar equipment, low-frequency electronics, electro-acoustic and electro-mechanical apparatus and components for both commercial and military markets in Canada and abroad.

Products include digital depth sounders, verifying depth digitizers, omni and net sonars, electronic transducer scanners and underwater acoustic transducers.

The company's LSS-30(PT) Omni Sonar provides high-speed omnidirectional scanning as well as searchlight operation. The display, on a 10-inch (25.4 cm) cathode-ray tube, produces an all-round picture of the underwater scene with each echo-ranging ping. Size, shape and exact position of all targets can be easily determined with minimum interpretation.




*C-TECH LTD.'s LSS-30(PT) Omni Sonar display is clear, easy to read and presents a continuous, all-round picture of the underwater environment.*

1150 Montreal Road • Cornwall, Ontario K6H 5S2, Canada • Tel: (613) 933-7970 • Telex: 0181-538

# DARTMOUTH MACHINE COMPANY / ATLANTIC OFFSHORE SERVICES

As divisions of the A.B.C.O. Group of Companies, Dartmouth Machine and Atlantic Offshore Services work together to serve the oil drilling industry.

Based in Dartmouth, Nova Scotia, their oil field facilities handle threads (IF, API and H90) up to 9½ in. (24 cm) in diameter. Other services include straightening drill pipes, collars and kelleys and the inspection of magnaflux and magnaglow. Complete machine shop services are also available for design and fabrication.

Among the standard products produced are watertight insulated food containers, cargo containers and baskets, marine riser racks, jerkline rollers and hydraulic racking arms.

For the offshore drill rig, the companies offer a "weaklink" design so that a rig can release itself without help from a supply ship in emergencies such as when icebergs threaten. Related items including paint, wirelines, nylon ropes and towing lines are available and the companies provide round-the-clock service seven days a week.

*When icebergs threaten a drilling rig at sea, this "weaklink" design from Dartmouth Machine Company and Atlantic Offshore Services enables it to release itself without help from a supply ship.*

P.O. Box 605, 1 Parker Street • Dartmouth, Nova Scotia, Canada • Tel: (902) 466-2412 • Telex 019-21576

# DICKINSON MARINE PRODUCTS LTD.

That essential component of most marine operations, the stove, is the specialty of Dickinson Marine Products Ltd. Its oil-fired marine stoves and heaters have warmed and helped feed the fishing fleets, commercial and pleasure vessels off the Pacific coast of North America for more than 40 years.

The company manufactures four models of high quality stoves and two of heaters, fabricated almost entirely of stainless steel which have special features of safety, convenience and dry heat. They are safe since fuel oils in their natural state will not explode. Heat is dry since the exhaust is vented outside the living area. And for convenience, the stoves provide both heating and cooking facilities from a single source.

In addition, each unit can be fitted with a coil to produce hot water and vessels using diesel engines can use the same fuel for heating and cooking.

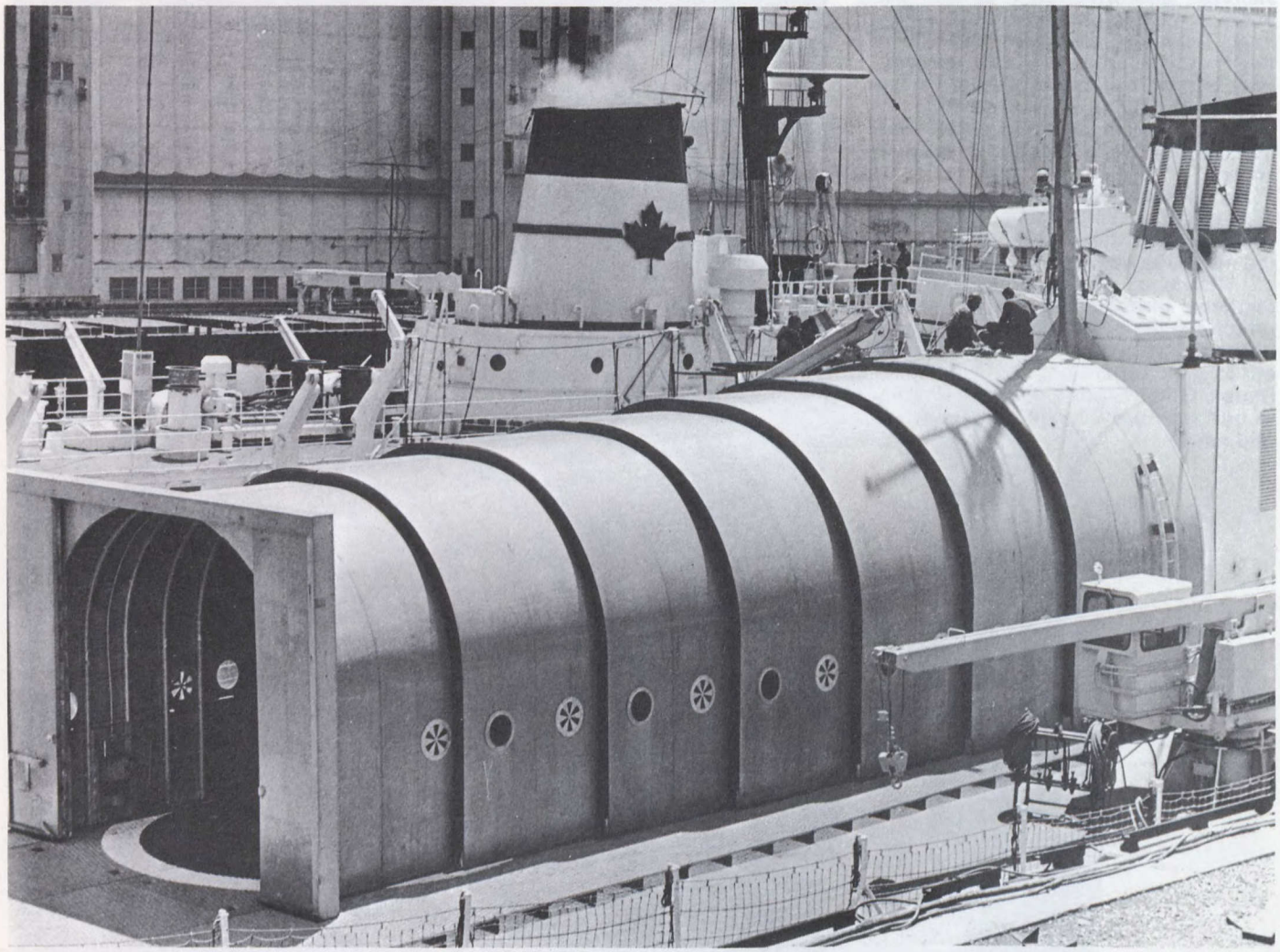
Dickinson Marine products are marketed through a number of jobbers on the Pacific coast. Some 40 per cent of the company's production is exported to ship operators in the United States. Other exports are sold directly to users on the Atlantic coast, Europe and Asia.


*Dickinson Marine Products supplies stoves and heaters for fishing, commercial and pleasure vessels. Easily portable, the heating units provide safe, convenient dry heat.*

3737 Napier Street • Burnaby, British Columbia V5C 3E4, Canada • Tel: (604) 291-9651

# DOMINION ALUMINUM FABRICATING LIMITED

For all survey and exploration operations using helicopters, the problem of returning the helicopter to the ship and housing it is eliminated with specialized gear manufactured by Dominion Aluminum. It makes two essential pieces of equipment for these operations: the telescopic retractable hangar, and the shipboard flydown. Currently, the company is developing the hangar principle further for such uses as submarine drydocks, on-site heliports and ship-to-terminus passageways.



*Dominion Aluminum's seven-section telescopic hangar on Canadian Coast Guard ship "John Cabot". Note helicopter circle inside.*

136 The East Mall • Toronto, Ontario M8Z 5M2, Canada • Tel: (416) 239-4855 • Telex: 06-967667 • Cable: DAFCOL

# DOMINION ALUMINUM FABRICATING LIMITED

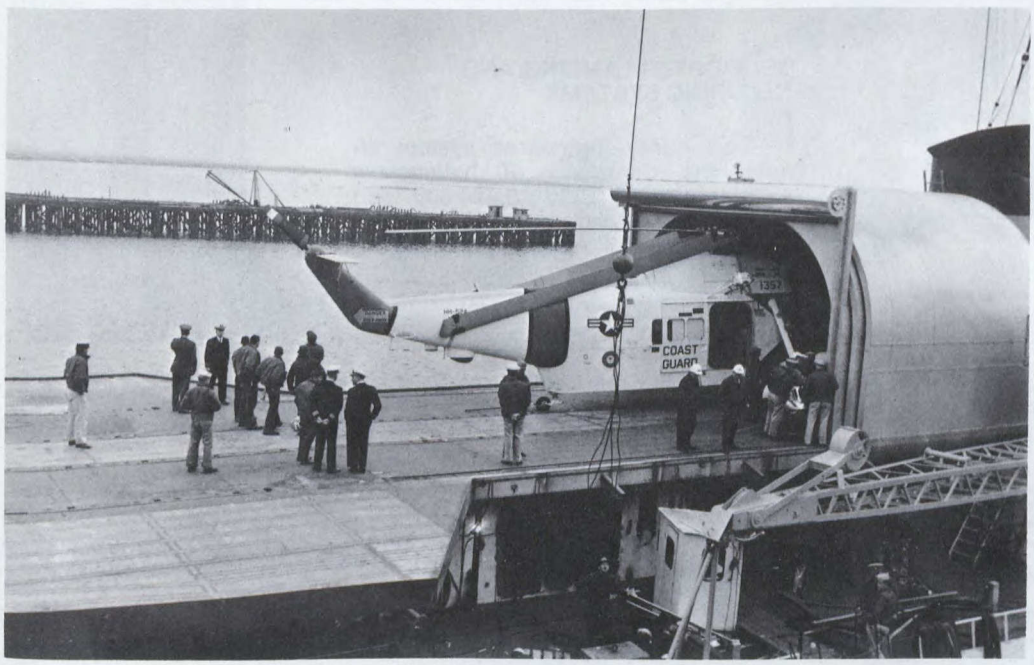
*Telescopic hangar on U.S. Coast Guard Cutter "Edisto" has an extended length of 56 ft. 9 in. (17.37 m), a width of 30 ft. 4 in. (9.2 m) and a height of 17 ft. 2 in. (5.18 m).*

## TELESCOPIC HANGAR

With the Dominion Aluminum Fabricating's (DAF) telescopic helicopter hangar, the smallest ship can provide hangar facilities. Retracted, the hangar frees its own deck space for takeoff and landing. Extended, it provides a heated, lighted space for storage and maintenance. Extension and retraction on a recessed track are powered by electric drives. Manual operation is also provided. Special lighting, heating, ventilation and firefighting equipment, developed by DAF, are integral parts of the hangar system. Use of high-strength, low-weight aluminum minimizes the ship's top weight.

Dominion Aluminum telescopic hangars range in size from 3.6 m wide x 7.6 m long x 3.6 m high (12 ft. x 25 ft. x 12 ft.) to 24 m wide x 91 m long x 18 m high (80 ft. x 300 ft. x 60 ft.).

DAF hangars are in use with the navies of Canada, the United States, India, Iran and Italy, and with the Canadian and U.S. Coast Guards.




*Parked Coast Guard helicopter helps show the retracted Dominion Aluminum telescoping hangar.*

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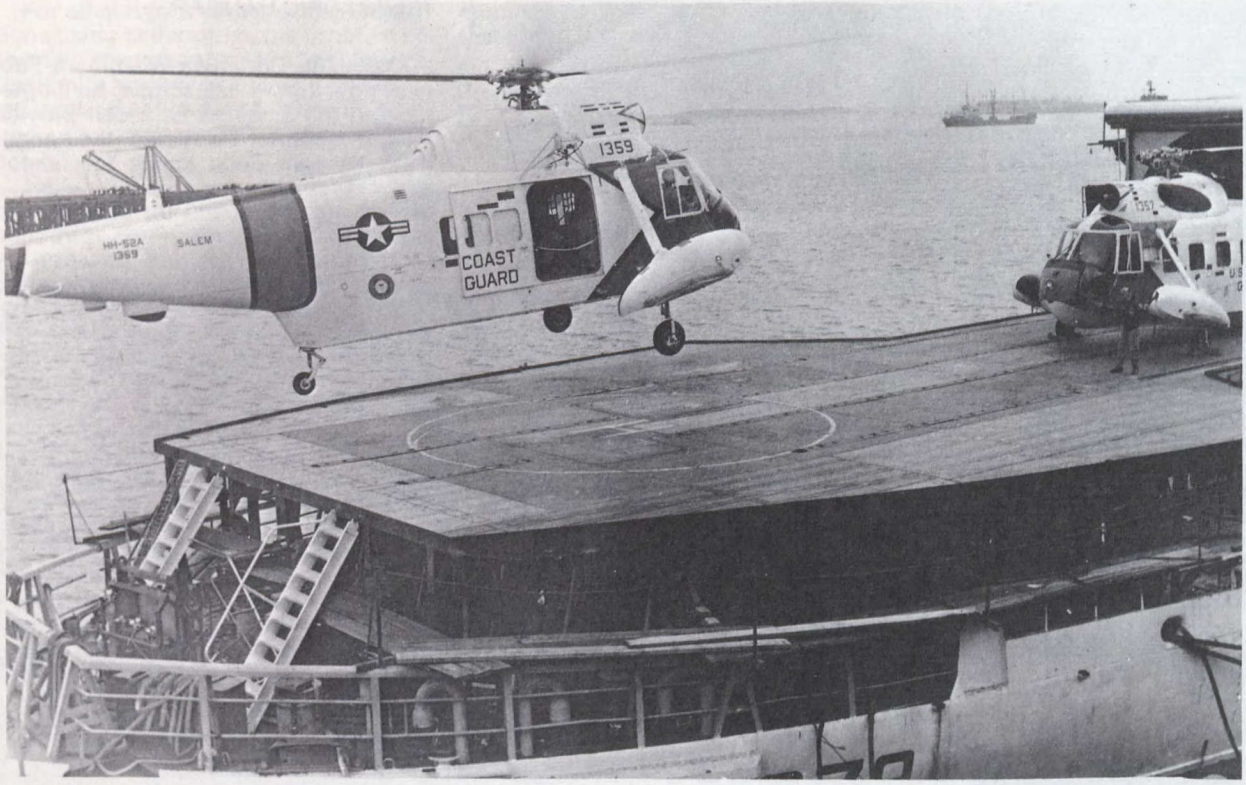
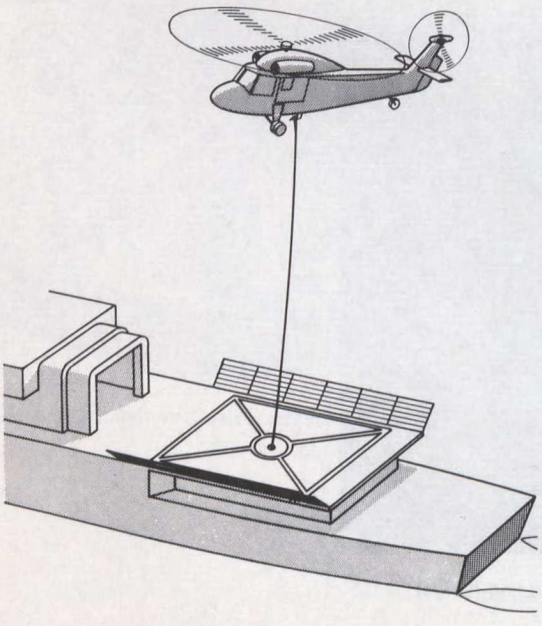
# DOMINION ALUMINUM FABRICATING LIMITED




*Landing Sikorsky HH-52A helicopters on United States Coast Guard Cutter "Eastwind" with the hangar retracted to a length of 18 ft. 9½ in. (5.79 m).*



## HELICOPTER LANDING AND SECURING SYSTEMS

This newly-engineered system allows the operation of helicopters weighing up to 9,000 kg (20,000 lbs.) from ships rolling as much as 25°, pitching 8°, and heaving 5 m (16 ft.) per second.

*Dominion Aluminum's helicopter and securing system enables helicopters to operate at sea from small flight decks in rough weather. A helicopter flying as high as 18 m (60 ft.) over a landing platform is manually or automatically connected to a flydown cable which guides it down to a fixed position on the landing platform and secures it instantly. The system maintains the helicopter in a centered position over the platform at all times, minimizing the danger of hitting fixed objects around the platform. The pilot is always in complete control of the helicopter. Use of a constant-tension cable compensates for the motion of the ship. The pilot may free the flydown cable by an emergency lock release.*

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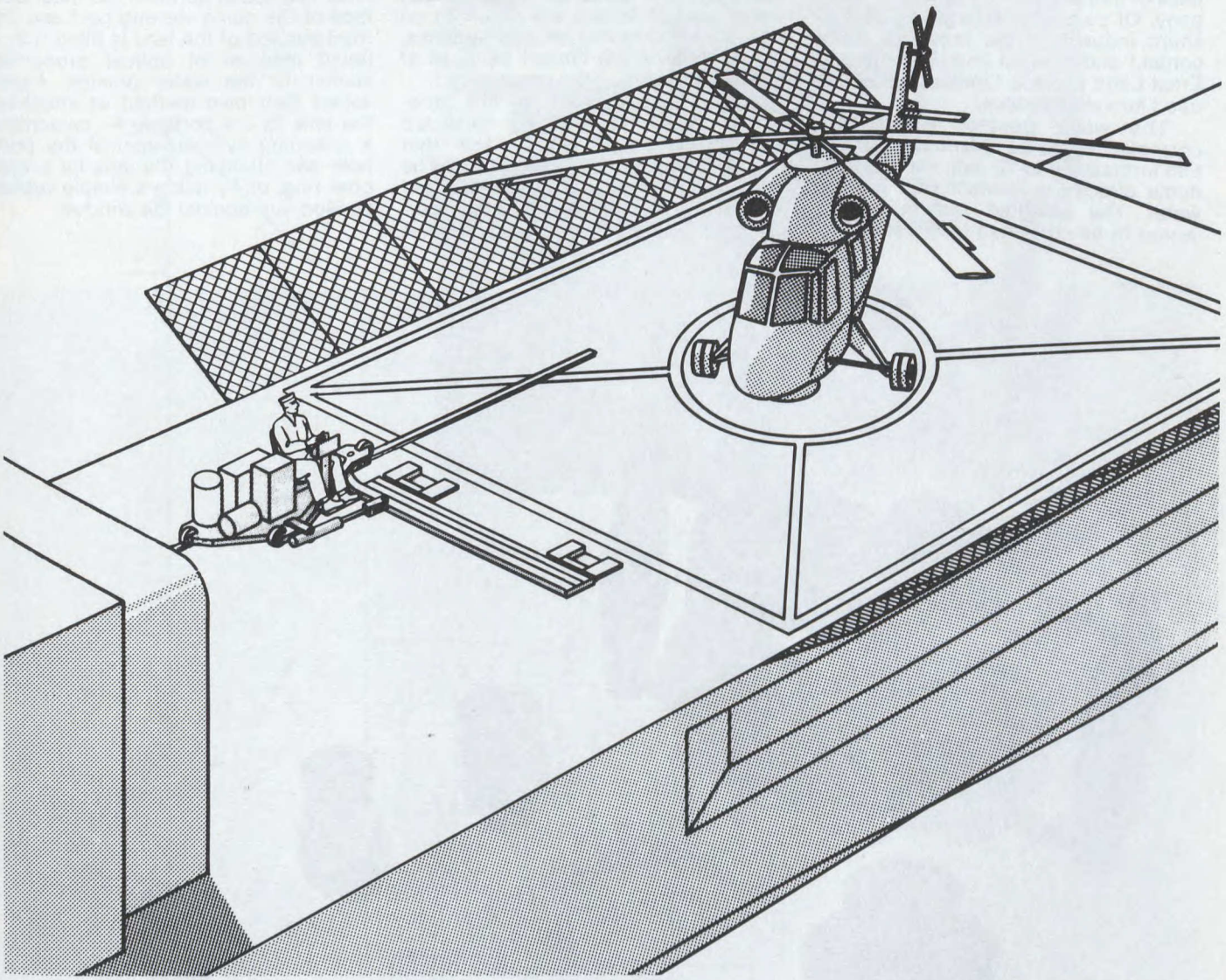
# DOMINION ALUMINUM FABRICATING LIMITED



*Upon landing, the helicopter is instantly made secure against ship movement and wind. It can then be brought to the hangar by the Aircraft Manipulator (ACM), a traversing device consisting of a hydraulically-powered arm with two wheel jack plates. ACM runs on a track at the side of the flight deck and may also be used during free landings.*

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# ERNST LEITZ CANADA LIMITED

High-quality, dependable photographic equipment is one of the major lines of this 20-year-old Canadian company. Of particular interest to the offshore industry is the family of water contact and internal immersion lenses Ernst Leitz Canada Limited has developed for submersibles.

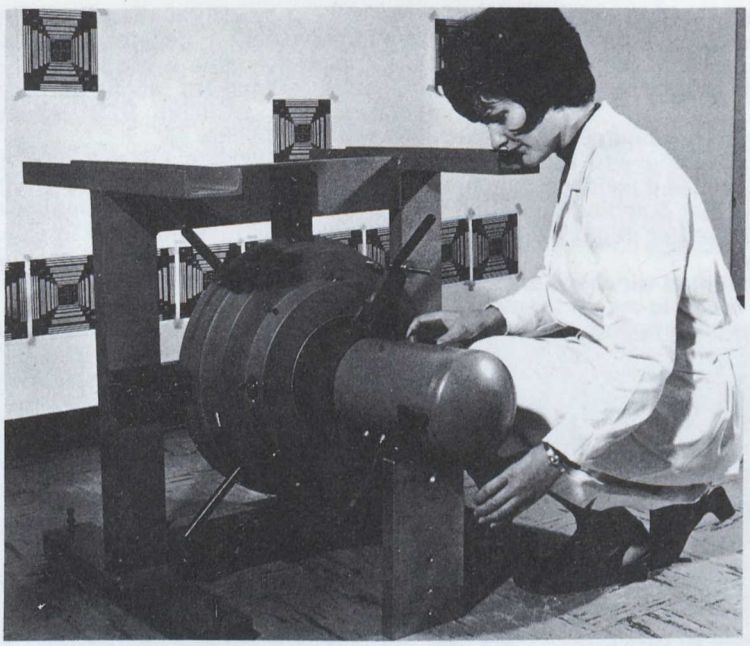
The water contact fully water-corrected lenses accommodate various film formats, 16 to 70 mm, using a front dome directly in contact with the sea water. The patented system permits lenses to be corrected to the same degree of performance obtainable in aerial lenses. In conventional deep sea photography, cameras using these water contact lenses are mounted on rigs or the exteriors of submersibles, but operations are limited because of the film capacity of the camera.

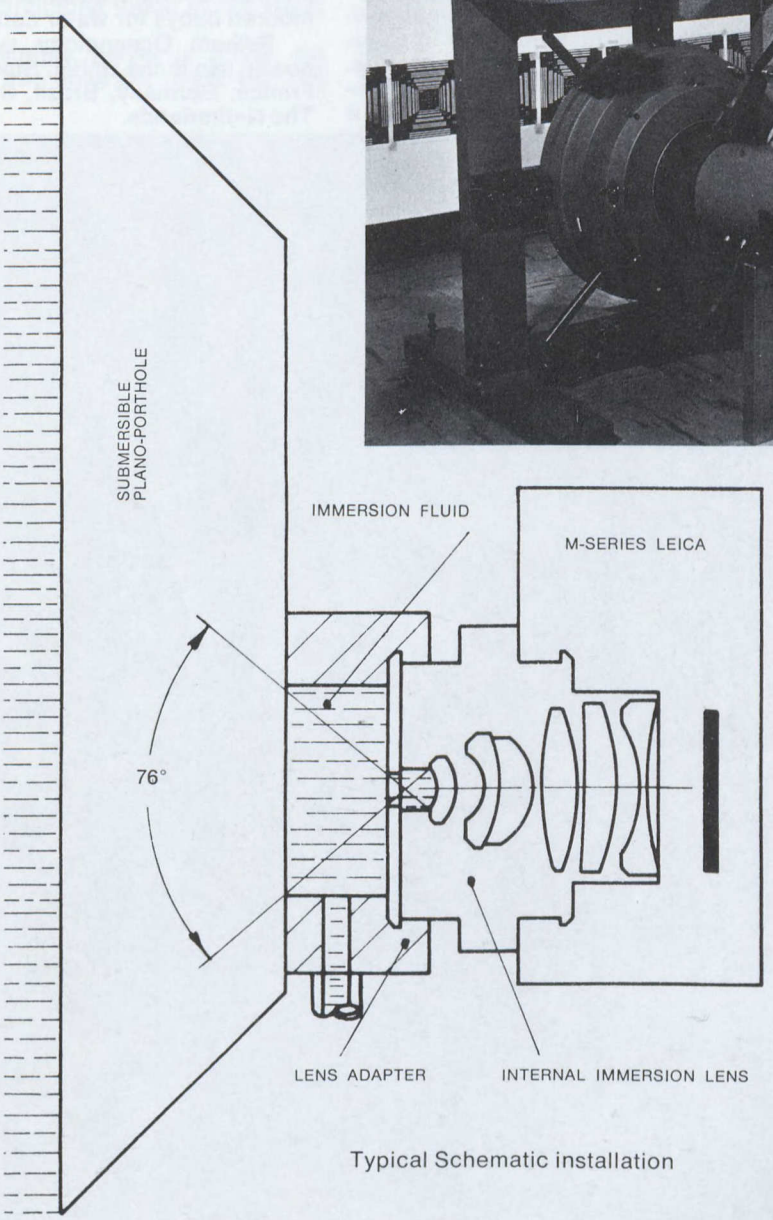
Leitz Canada overcame this problem by developing a water-corrected internal immersion lens system that can be used inside a submersible. The lens diameter remains small while giving maximum field of view to the operator. Necessary correction and angular coverage is achieved because the lens has been designed as an immersion lens. The space between the inner surface of the plano viewing port and the front surface of the lens is filled with a liquid medium of optical properties similar to the water outside. Users select their own method of attaching the lens to the porthole — cementing a mounting cylinder against the porthole and attaching the lens by a bayonet ring, or by using a simple rubber suction cup against the window.

*Ernst Leitz's patented underwater photography system has the front lens element in contact with sea water.*

P.O. Box 38, 328 Ellen Street • Midland, Ontario L4R 4K6, Canada • Tel: (705) 526-5401 • Telex: 06-875561 ELCAN MID • Cable: ELCAN MIDLANDONT

# ERNST LEITZ CANADA LIMITED






Typical Schematic installation

*Perfection in deep sea photography from inside a submersible with a water-corrected immersion lens from Ernst Leitz Canada Limited.*

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# FATHOM OCEANOLOGY LIMITED

Underwater towing systems by Fathom Oceanology Limited are currently being used by the oil industry and research establishments around the world.

The company has had particular experience in launching and recovering towed "fish" and has developed a number of systems that combine operating efficiency with greater depth capability and versatility.

Its deck-mounted winch system, for example, is a ready-to-mount assembly that can be installed on the aft end of a ship without structural alterations. The hydrodynamically designed towed "fish" accommodate a wide variety of detecting equipment such as side-scan, bottom profiling, STD sensing and water-sampling.

Fathom Flexnose fairings play an important part in maintaining the high level of efficiency built into Fathom towing systems by minimizing drag to increase depth and towing performance.

Other components of Fathom systems include a patented winch for multi-layer cable storage, an automatic passive cable tension stabilizer, electrical signal takeoff without slip rings, custom-designed towed body, a floating saddle assembly and optional high deck mounting.

In addition to its deep towing systems, Fathom also produces submarine antenna towing systems and stationary moored buoys for water data sampling.

Fathom Oceanology systems are now in use in the United States, Britain, France, Germany, Brazil, Sweden and The Netherlands.

*After completing a high-speed, deep underwater survey in the Great Lakes, a fully instrumented Fathom towed "fish" is brought aboard an SRN6 Hovercraft.*

863 Rangeview Road • Port Credit, Ontario L5E 1H1, Canada • Tel: (416) 274-1551 • TWX: 610-492-2539

# FEDERAL OFF-SHORE SERVICES LIMITED

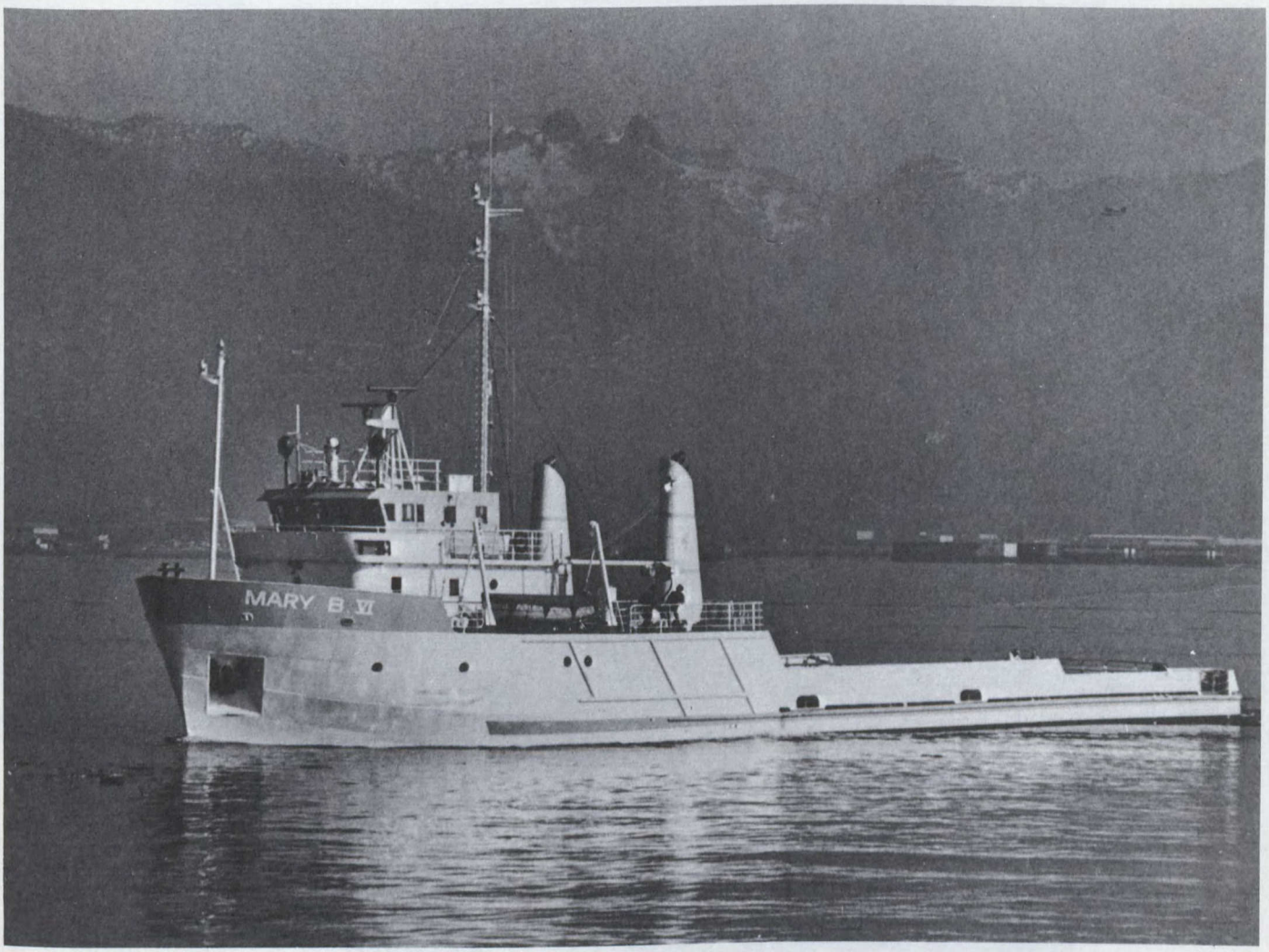
Federal Off-Shore Services Limited operates a fleet of offshore supply vessels on the Eastern Seaboard of Canada, servicing the offshore industry in its quest for increased energy supplies.

Vessels are designed and fully equipped to cope with the severe weather conditions found in the North Atlantic.

Each supply vessel is A.B.S. Ice Class A1. Two units are 184 ft. (56.7 m) O.A., 45 ft. (13.71 m) beam, 5,280 hp and fitted with a double drum anchor winch of 300,000 lbs. (136,077 kg) capacity. Other features include: gantry crane, bowthruster, accommodation for 29 persons, radio and electronic equipment.

A further three units are 171 ft. (52.12 m) O.A., 38 ft. (11.58 m) beam, 3,280 hp and fitted with a double drum anchor winch of 300,000 lbs. (136,077 kg) capacity. All other equipment is similar to the larger vessels except there is no gantry crane. There is accommodation for 23 persons. These vessels can be readily converted to seismic operations as required.

Federal Off-Shore Services, through its parent company, Federal Commerce & Navigation Company Limited, have offices or agents worldwide.




*The "Mary B VI" is part of the fleet of offshore supply vessels operated by Federal Off-Shore Services Limited.*

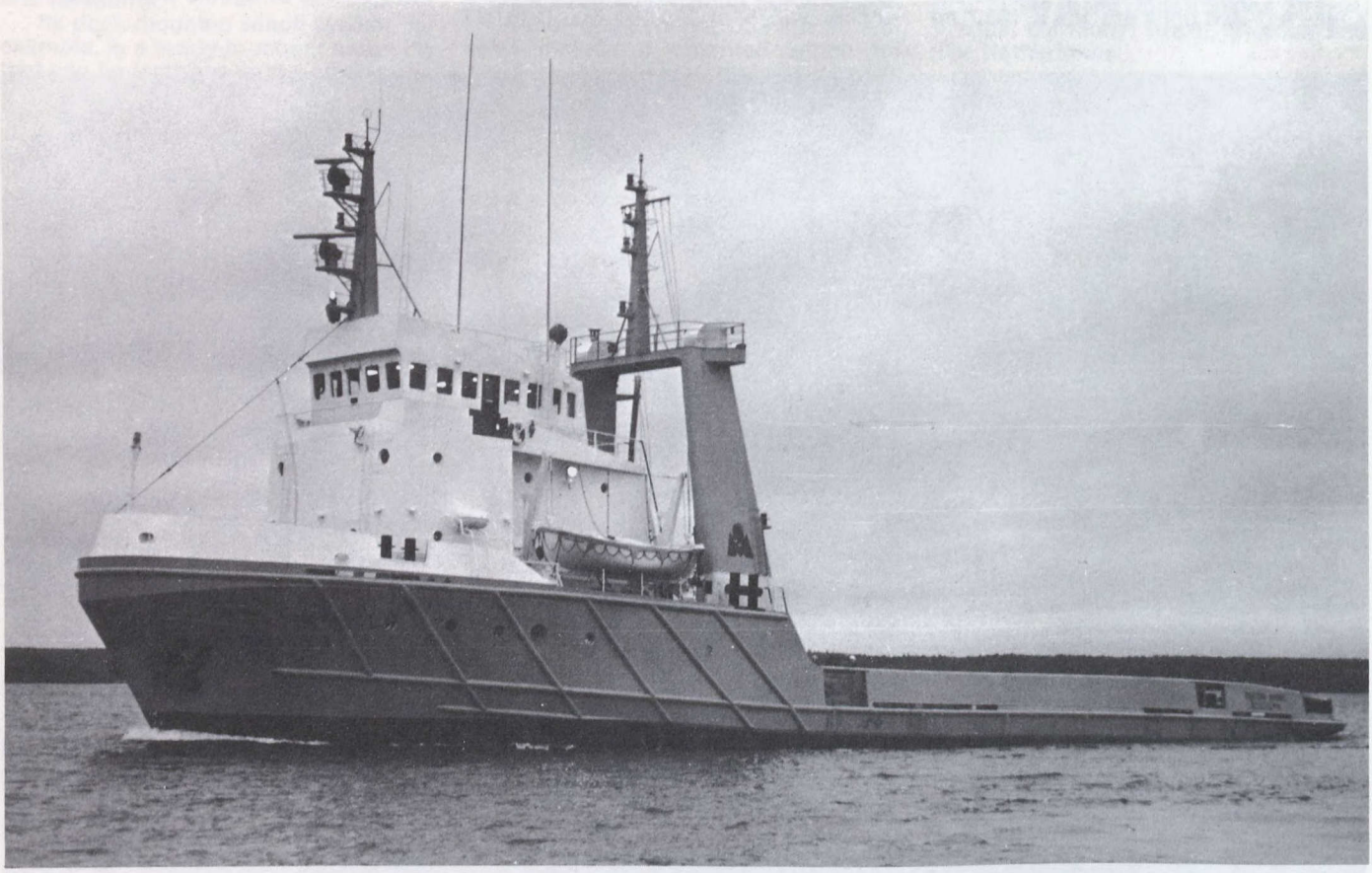
112 Woodlawn Road • Dartmouth, Nova Scotia B2W 2S9, Canada • Tel: (902) 434-1710 • Telex: 019-22674
Cable: FEDOFF DRT

# FERGUSON INDUSTRIES LIMITED

The services of highly efficient tug/supply vessels are essential to the operation of offshore drilling rigs. Ferguson Industries Limited is the only shipyard on Canada's Atlantic coast with proven ability in the construction of such vessels. Ferguson has lived up to its reputation just recently by delivering two of these vessels to offshore drilling operations.

Ferguson was established in 1950 on Nova Scotia's north shore, a region with more than 150 years of tradition in shipbuilding. Through a combination of its shipbuilding experience and marine expertise, the company can assure customers of quality and skilled workmanship.

Ferguson's tug/supply vessels meet the demands of offshore drilling rigs from the Gulf of Mexico to the ice-packed Arctic Ocean.



*Built by Ferguson Industries Limited to Lloyds Ice Class II specifications, this rugged tug/supply vessel is designed for use in the Atlantic, North Sea and other northern waters.*

74 Front Street • Pictou, Nova Scotia B0K 1H0, Canada • Tel: (902) 485-4313 • Telex: 019-36535 • Cable: FERGIE

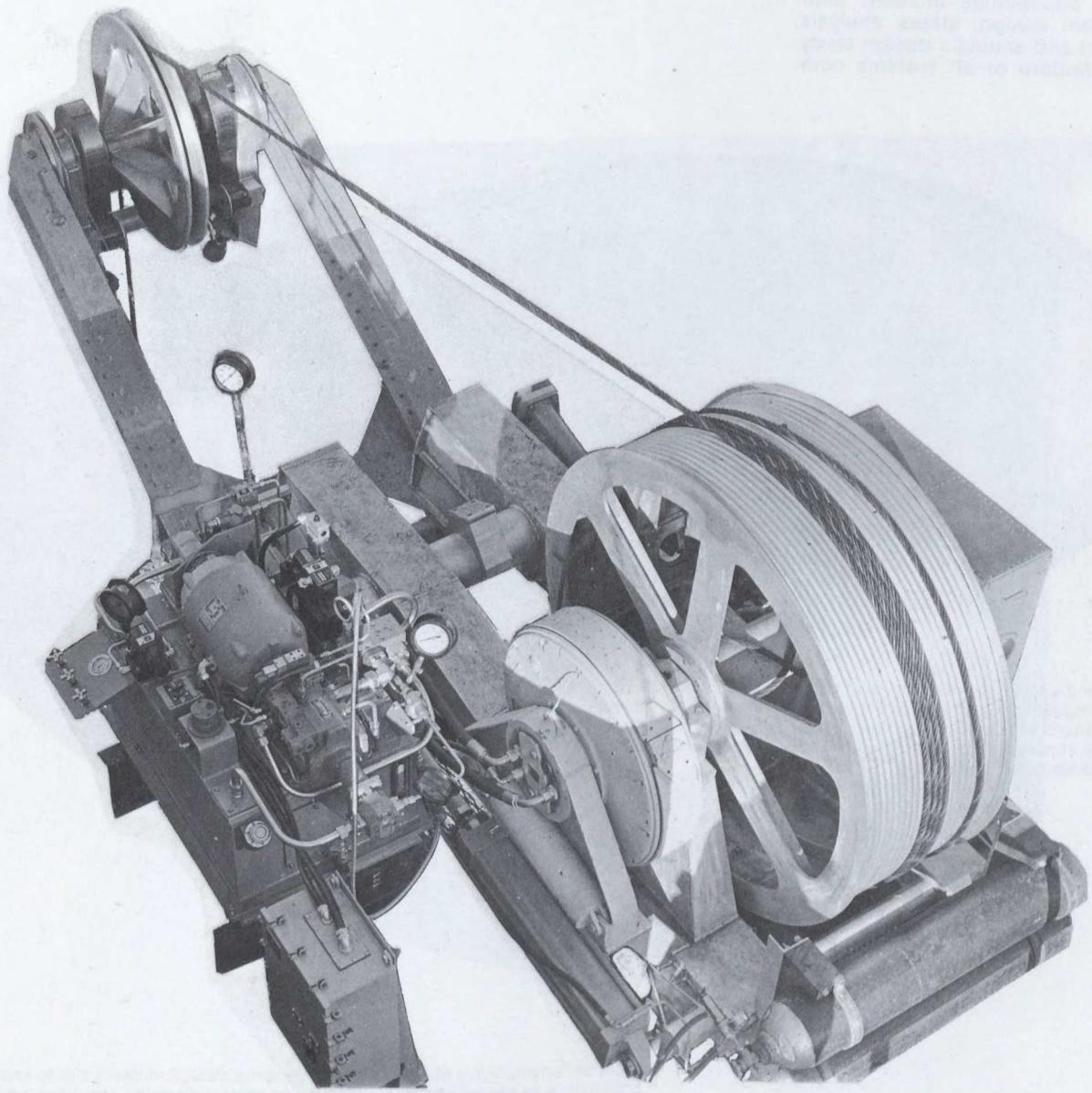
# FLEET INDUSTRIES

Fleet Industries, a division of Ronyx Corporation Limited, entered the sonar mechanical equipment field in 1958 when it set up repair and overhaul facilities and redesigned and modified equipment used by the Royal Canadian Navy.

A highly skilled and specialized staff, in design, engineering and production, has developed since then and operates from Fleet's plant in Fort Erie, Ontario.

The company now offers a complete line of mechanical underwater detection systems. These include fixed hull-mounted, retractable hull-mounted, and towed devices with mechanisms for handling variable depths.

The most recent design program of Fleet Industries is a variable depth towing system for small ships. The towed body is 108 in. (248.92 cm) long, has a compass heading system and weighs approximately five tons including the tow cable. The system also includes a small ship fixed-dome and transducer system.



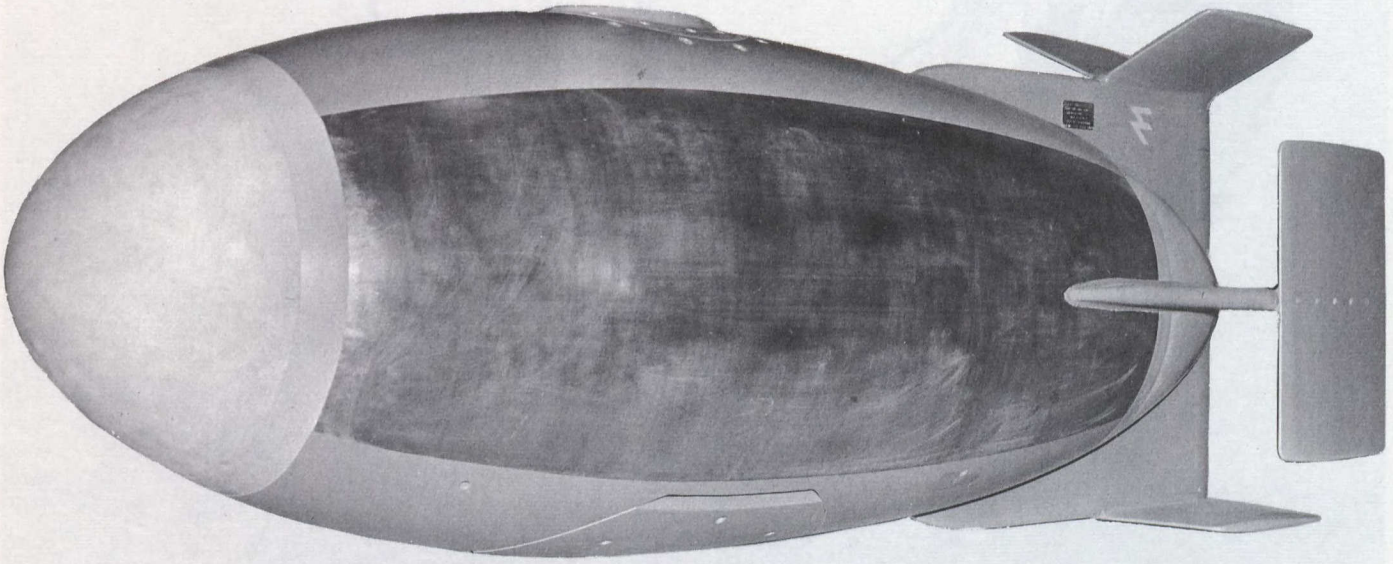
*Produced by Fleet Industries, this variable depth towing mechanism launches, tows and recovers the underwater vehicle. It carries 328 ft. (100 m) of wetted 61 conductor faired tow cable. One man can operate the system with a limited number of controls. The boom is driven by a single hydraulic rotary actuator; the winch by a hydraulic motor with integral band brake.*

P.O. Box 400 • Fort Erie, Ontario L2A 5N3, Canada • Tel: (416) 871-2100 • Telex: 021-5165 • TWX: 610-373-0101

# FLEET INDUSTRIES

Since entering the sonar field in 1958, the staff of Fleet Industries has designed and manufactured many handling systems. Among them is the retractable, hull-mounted sonar on the Canadian icebreaker CCGS MacDonald. Other systems, for Canadian naval vessels, include vertical and rotating lift, hull outfit, and hoist mechanism designs.

Fleet's capabilities include: complete system design, stress analysis, mechanical and acoustic design study, and manufacture of all systems components.



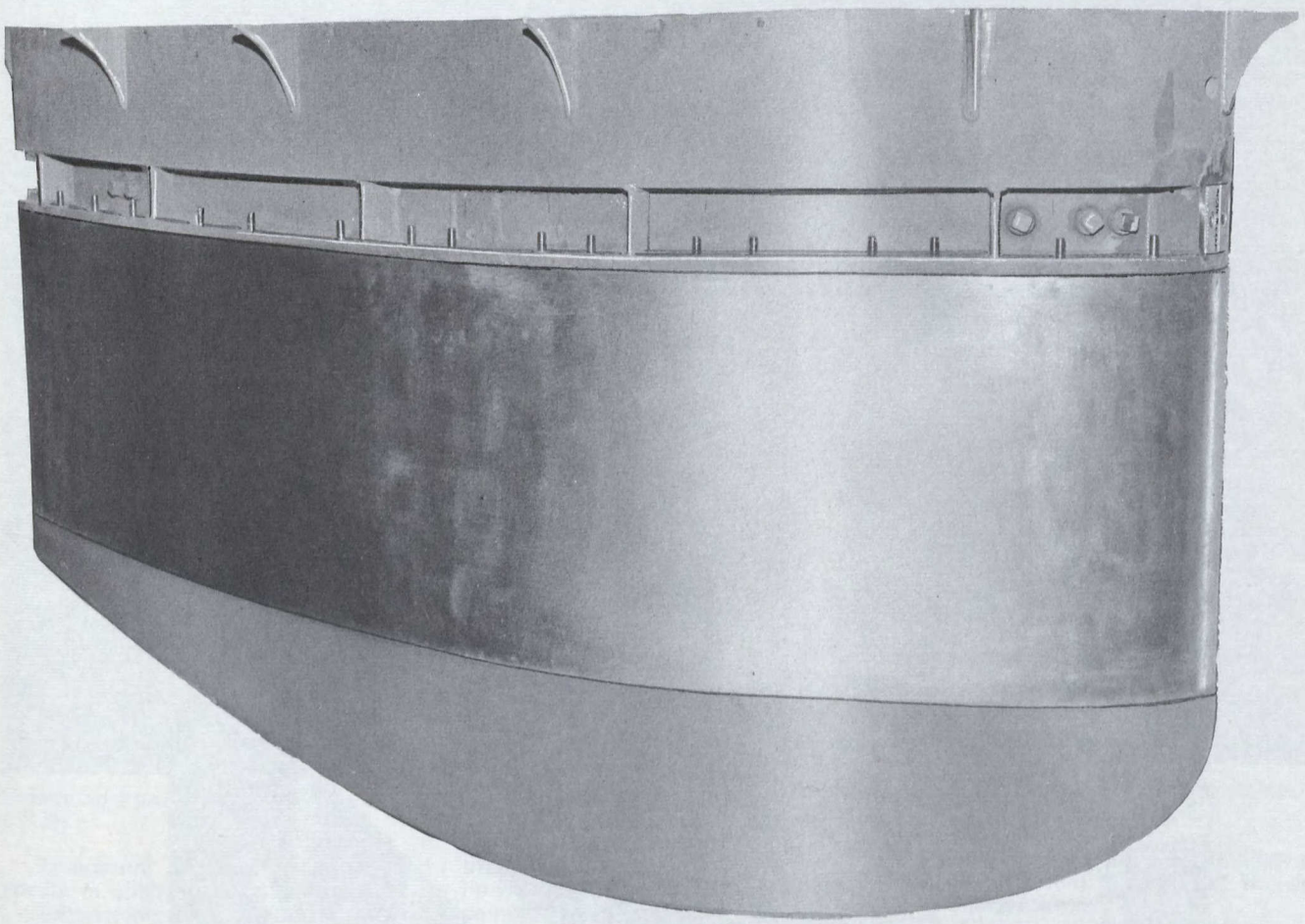
*Underwater towed body, designed and fabricated by Fleet Industries, allows 360 degrees acoustic transmission and reception. Called a body of revolution acoustic, it is constructed in sizes ranging from 1.5 ft. (.305 m) to 18 ft. (5.48m) long. The vehicle contains a transducer which is hydrodynamically faired by the towed body to reduce noise generation.*

P.O. Box 400 • Fort Erie, Ontario L2A 5N3, Canada • Tel: (416) 871-2100 • Telex: 021-5165 • TWX: 610-373-0101

# FLEET INDUSTRIES

As part of its line of mechanical underwater systems, Fleet Industries offers a patented low-drag "No gap" cable fairing system that reduces noise, increases body depth, improves stability and reduces the ship's horsepower requirement.

Recently, Fleet designed and built fixed-dome, retractable transducer systems and bow-mounted transducers for export.

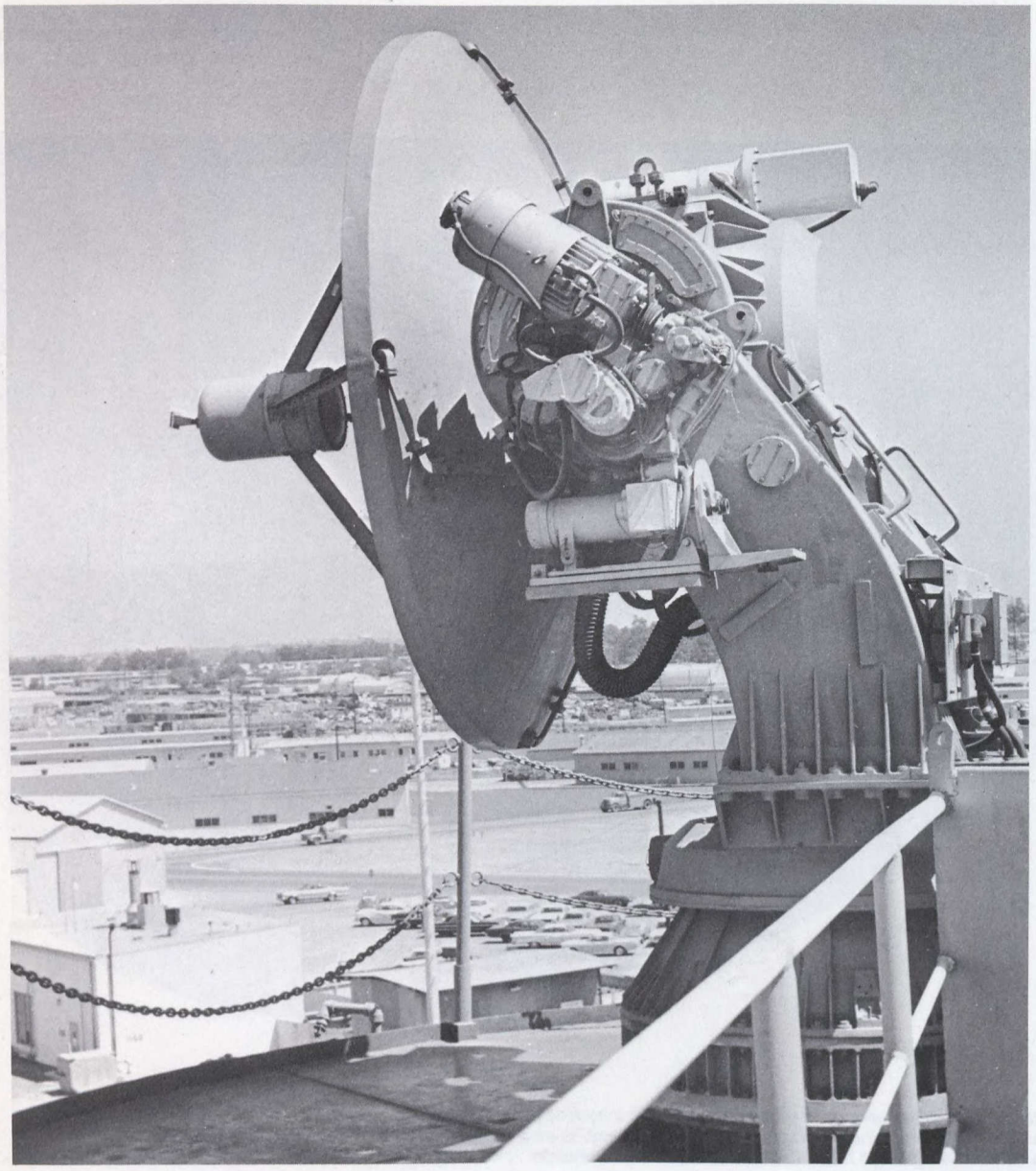


*The purpose of this Fleet Industries sonar dome is to provide a hydrodynamic fairing around the transducer which eliminates noise generation and serves as a mounting base on the ship's hull. This design has excellent acoustic transmission. Acoustic and bearing errors are minimal.*

P.O. Box 400 • Fort Erie, Ontario L2A 5N3, Canada • Tel: (416) 871-2100 • Telex: 021-5165 • TWX: 610-373-0101

# FLEET INDUSTRIES

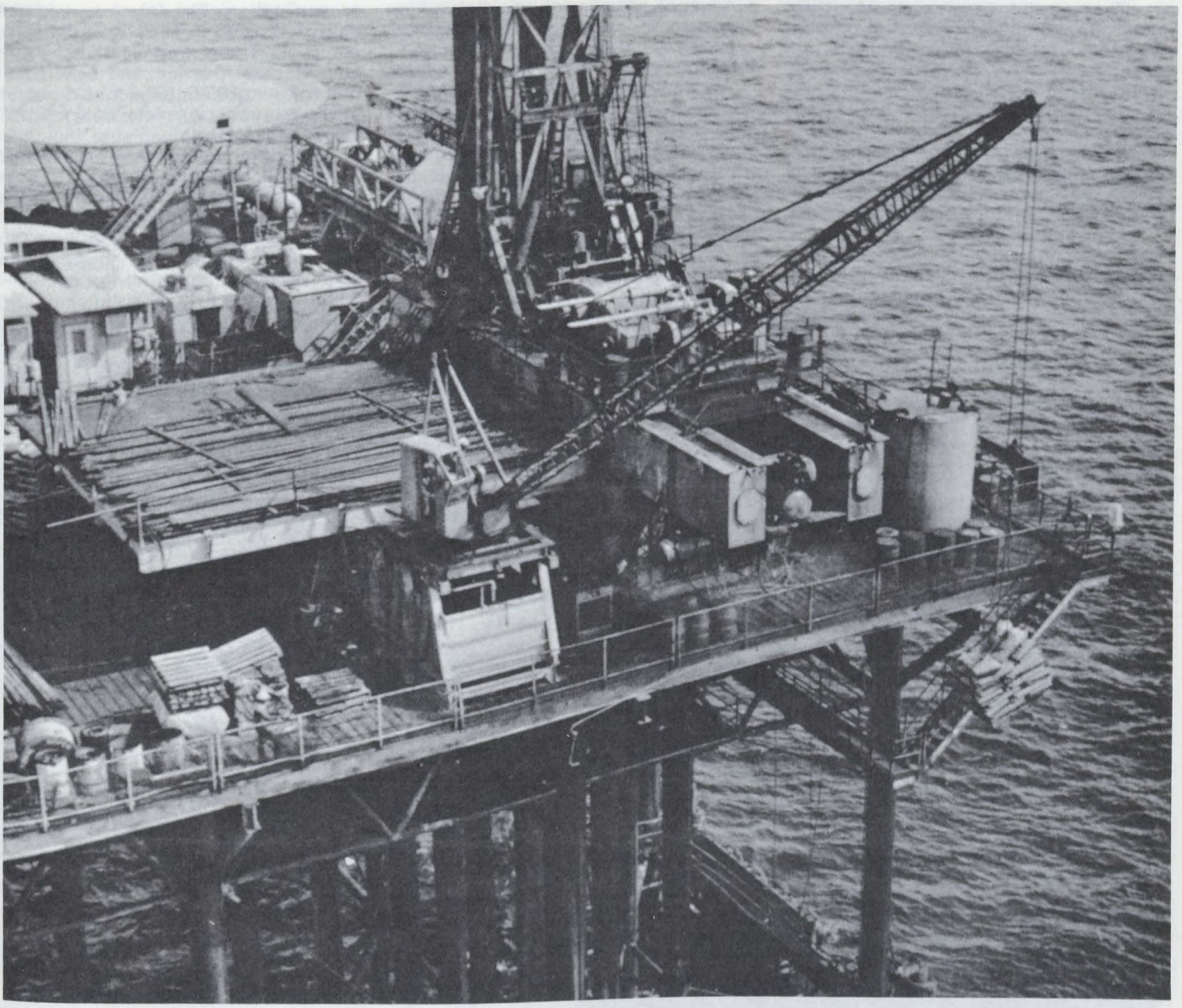
Fleet entered the radar antenna and mechanism field in the late 40s and has produced hundreds of antennas for use in Canada's northland. Its capability includes design and manufacture of radar and communications reflector-type antenna systems. It also supplies mounting and rotating hardware, with electronic shipboard and special cabinetry to support each system. Fleet builds to customer specifications and its antenna systems range from a miniature 11 in. (27.94 cm) diameter subdish to the 45 ft. (13.71 m) parabolic reflector.



*This 7 ft. (2.13 m) diameter Fleet Industries reflector, produced for the U.S. Navy, includes a radome-housed rectangular parabolic.*

P.O. Box 400 • Fort Erie, Ontario L2A 5N3, Canada • Tel: (416) 871-2100 • Telex: 021-5165 • TWX: 610-373-0101

# GEARMATIC CO. LTD.



*The drill rig is just one type of offshore installation for which Gearmatic hydraulic winches are designed. Three Model 11E winches are used on this rig.*

Gearmatic winches are part and parcel of offshore installations.

Extensively used in dock, deck and mobile applications they are built for smooth, trouble-free operation under rigorous conditions.

Gearmatic winches deliver line pulls from 1,500 lbs. (680 kg) to 44,000 lbs. (19,960 kg). The modular design of the hydraulic winches allows a selection of quality components to be assembled in countless combinations to meet specific customer performance requirements.

Gearmatic features a variety of drum configurations, a wide selection of gear ratios, automatic brakes and optional controlled free-fall, high-speed reverse, high or medium-pressure hydraulic motors and two-speed primary drives.

Clean, compact designs make Gearmatic winches more adaptable.

Gearmatic products are available from distributors throughout North America and in many countries around the world.

7400 - 132nd Street • Surrey, British Columbia V3T 4X4, Canada • Tel: (604) 596-7111 • Telex: 04-351220
Cable: GEARMATIC NEW WESTMINSTER B.C.

# GENERAL PROPULSION SYSTEMS LTD.

The newly developed "ANKER" controllable pitch propeller system from General Propulsion Systems Ltd. presents a new concept in marine controllable pitch propellers that offers many exclusive features. These include:

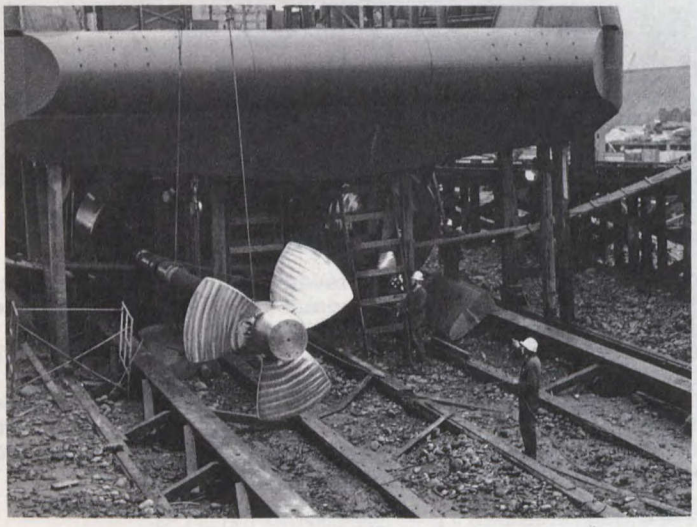
- The locating of all the pitch changing mechanism in the hub to provide a sealed and compact unit.
- Solid tailshaft for easier replacement and repairs.
- No mechanical pitch changing linkage between the hub and oil distribution unit for easier installation and servicing.
- Advance design of oil distribution system for rapid pitch change; full ahead to full astern in six seconds.
- Pitch-locking mechanism for positive "come home" feature.

The exact propeller pitch-locking mechanism in the propeller hub is exclusive to the ANKER system. This results in reduced control effort expended by the control system and also acts as a fail-safe device to hold fast the propeller pitch setting in the event of loss of air, electric or hydraulic power on board.

The ANKER controllable pitch system is also not limited to horsepower or application. The latest and largest units, delivered in 1973, were 3,500 hp per shaft. These were installed in the M.V. Hudson Service and M.V. Baffin Service, two 190-ft. (57.9 m) twin screw offshore supply vessels designed for ice class 1-A service.

In addition to the many new and exclusive mechanical features in the solid shaft design of the ANKER controllable pitch propeller system, General Propulsion Systems offers a drilled tailshaft model for high horsepower applications which retains all the exclusive features of the ANKER solid shaft controllable pitch propeller system.


*This offshore supply vessel, M.V."Hudson Service," is equipped with an ANKER controllable pitch propeller system from General Propulsion Systems Ltd. The vessel has 3,500 hp per shaft.*



*The elimination of the mechanical linkage between the hub and oil distribution unit in the ANKER controllable pitch propeller system simplifies installation and servicing; the hub assembly can be installed or removed from the shaft without disassembling the hub or oil distribution unit.*

1755 West Third Avenue • Vancouver, British Columbia V6J 1K7, Canada • Tel: (604) 731-6171

# GEOMARINE ASSOCIATES LTD.

Geomarine Associates Ltd. incorporates the expertise of geoscientists with major research and operational experience in marine and petroleum geology and geophysics. Based in Canada's Atlantic port of Halifax, the company provides operational and interpretative services in:

- Petroleum geology
- Seismic reflection (shallow and deep) and refraction surveys
- Gravity surveys
- Magnetic surveys
- Side-scan sonar surveys
- Bathymetric surveys
- Sediment analysis
- Surface geological studies
- Undersea photography

Geomarine Associates has recently carried out, or contributed to, such projects as:

Examination of marine pipeline routes in the Canadian Arctic;

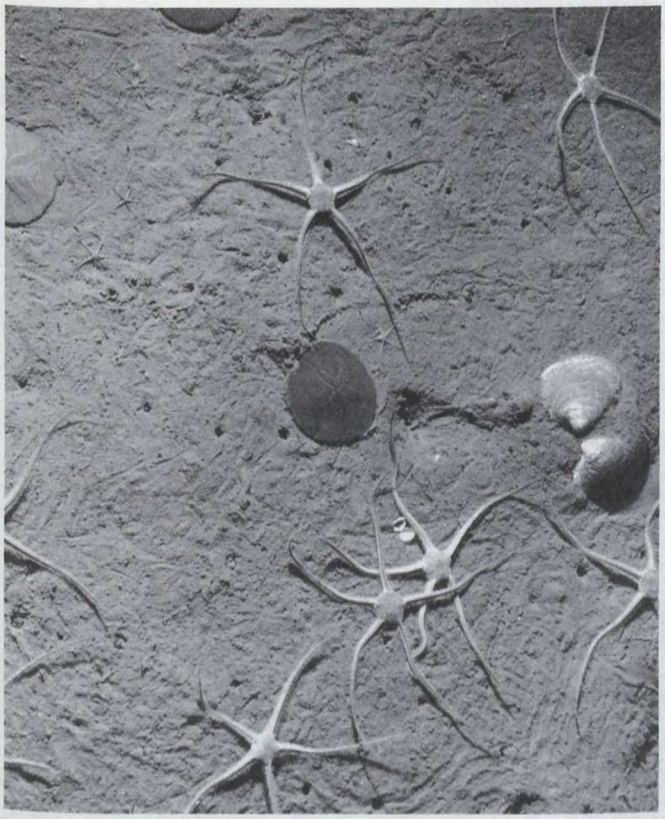
Pre-anchoring survey for a semi-submersible oil rig in the Gulf of St. Lawrence;

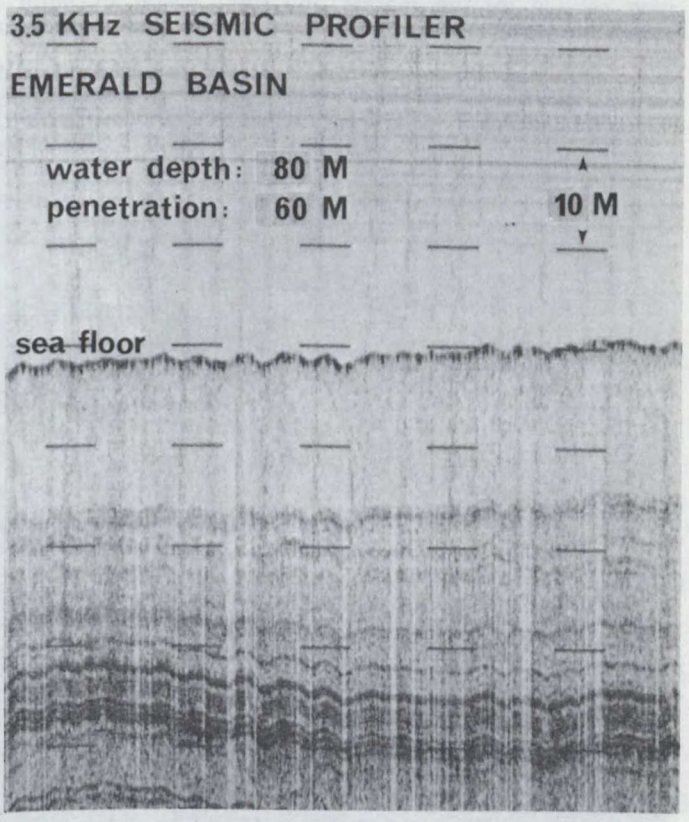
Survey of surficial deposits of Hamilton Bank on the Labrador Shelf;

Geological interpretation of a side-scan sonar survey off Canada's East Coast;

Supervision of the Maritime Office of the Canada Centre for Remote Sensing; and

A study of offshore areas for Canada's national parks system including Baffin Island.






*The seafloor of the Gulf of St. Lawrence (left) was photographed by Geomarine Associates to correlate sediment type with a side-scan sonar survey during a pre-anchoring survey for an oil rig. The photo to the right shows a record of a continuous seismic profile of the Emerald Basin of the Scotian Shelf illustrating the structure in the sediments below the seafloor.*

P.O. Box 41 • 5112 Prince Street (third floor) • Halifax, Nova Scotia B3J 2L4, Canada • Tel: (902) 422-7932
Telex: 19-21639

# GERMAN + MILNE

The name German + Milne means innovation plus dependability in all areas of marine design and consulting.

German + Milne relates marine transportation problems to the total environment and designs marine systems in terms of shore-side systems, docks, terminals and pipelines.

The wide diversity of ship designs, most of them prototypes in their class, the far-reaching program of research and development, the use of computer techniques — are all hallmarks of a company that offers a highly specialized service for the marine and offshore industries.

Included in German + Milne services are marine transportation studies (especially Arctic), design and systems analyses, detailed working drawings, feasibility and economic studies, ship appraisal and brokerage, owner's representation, ship construction supervision, ship and cargo surveys, business data processing, model testing, vessel deliveries, research and development.

The company's familiarity with Canadian East Coast waters has led to the design and construction supervision of large ice-capable trawlers and offshore vessels such as the CGS Hudson. The company also designs offshore search and rescue vessels and, patrol boats for inshore work.

In the increasingly important area of Arctic transportation, German + Milne also has access to the environmental data of Marsaw Investments Ltd., an associate firm, and the expertise of Northern Associates Reg'd. and PROCOM Systems & Computations Ltd.


*Built to German + Milne design specifications, the limnological research vessel CGS Limnos features a clear working deck with portable equipment, good on-deck laboratory space and precise station-keeping by means of a bowthruster and rotatable propellers.*

Suite 401, Dominion Square Building • Montreal, Quebec H3B 1G2, Canada • Tel: (514) 866-7373
Telex: 05-268812 GERMIL • Cable: VALVE

# GREENING DONALD LTD.

Rotary drilling lines produced by Greening Donald Ltd. have established such an enviable reputation that every major oil field in Canada uses them.

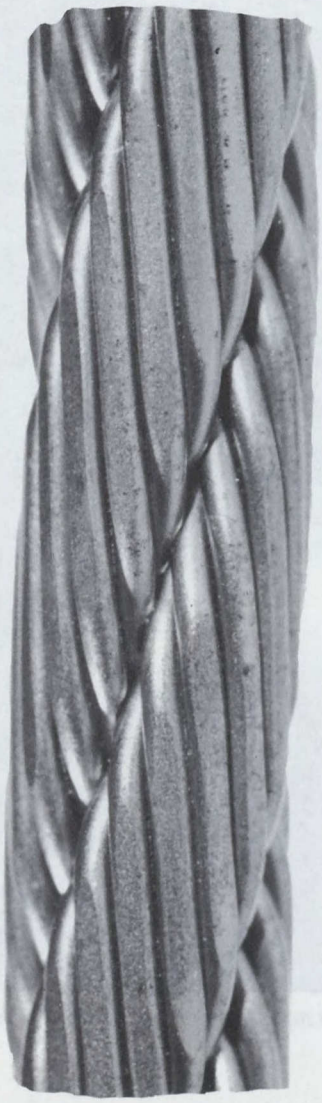
Company engineers work constantly to produce better lines that will give the maximum safe ton-miles per week that a location will allow.

The special "Arctic Lubricant" used during their manufacture stays plastic in temperatures as low as –70°F (–56.7°C). This lubricant does not lose body under high summer temperatures either so lines have adequate lubrication throughout all Canadian climatic conditions. Dirty rig troubles or poor line life are eliminated. All Greening Donald rotary drilling lines carry API certification and are readily available in improved plow or extra improved plow steel in diameters from 7/8 to 1 5/8 in. (22 to 42 mm).

Greening Donald produces two constructions of sand lines. The 6 x 7 is constructed with a polypropylene fibre core for ruggedness and dependability. The 3 x 19 SWAGED, a Greening Donald specialty product, has a breaking strength greater than the next larger diameter of conventional 6 x 7 construction permitting more to be spooled on the drum.

The extremely smooth surface of the 3 x 19 SWAGED gives easier spooling, less drum abuse and less rope wear in the hole.

Sand lines are available in the following diameters: 3/8 to 5/8 in. (10 to 16 mm).



*Greening Donald Ltd. rotary drilling line (6 x 19 SEALE).*

*The 3 x 19 SWAGED sand line from Greening Donald Ltd.*

P.O. Box 430 • 55 Queen Street North, Hamilton, Ontario, Canada • Tel: (416) 528-5971 • Telex: 021-601
Cable: GREENDON HAMILTON

# GUILDLINE INSTRUMENTS LIMITED

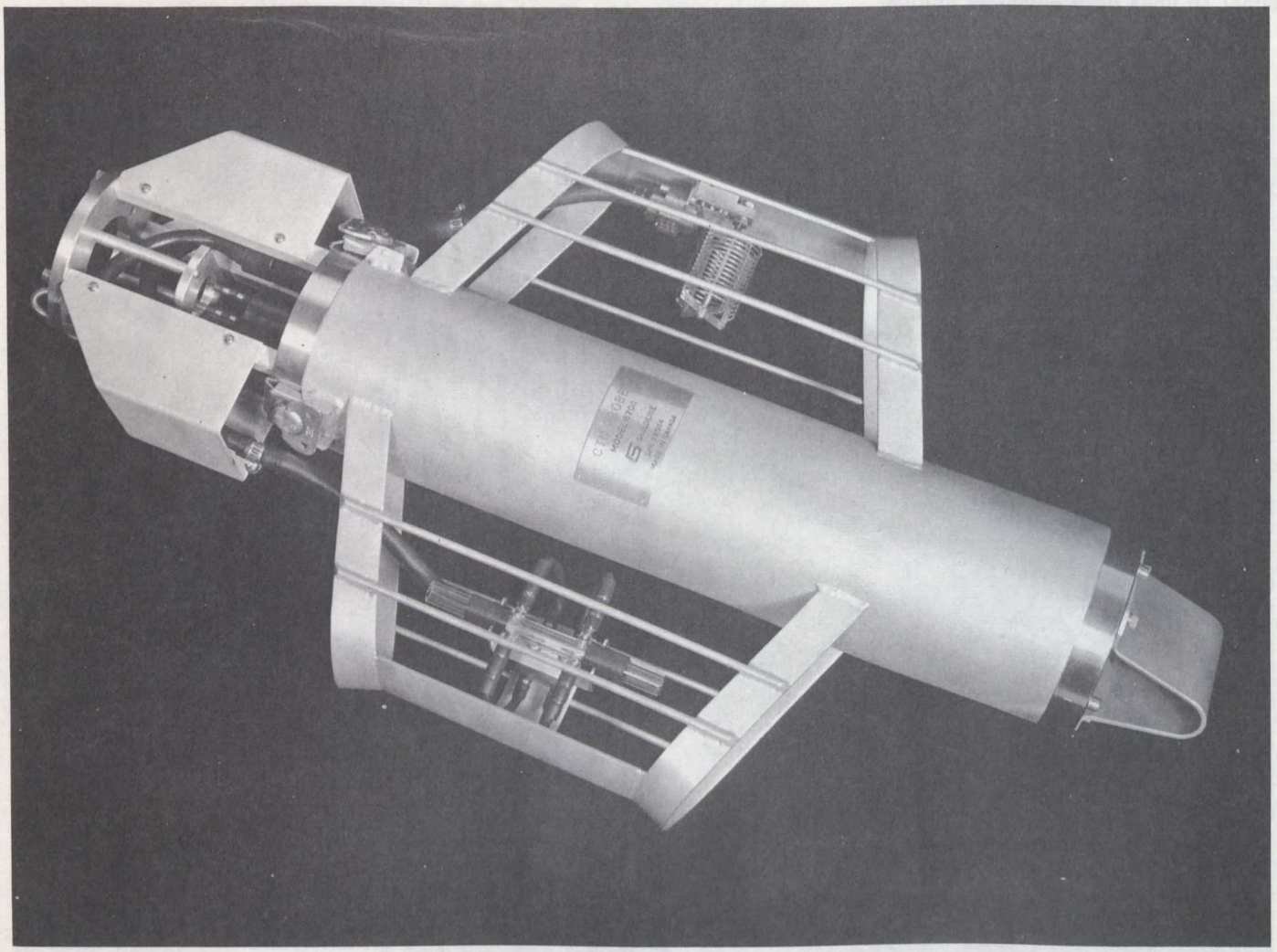
Guildline is a new name to the world oceanographic community but not to metrologists and others around the globe who have been carrying out electrical and temperature measurements at the highest levels of accuracy and precision.

As a result of its close association with the National Research Council of Canada and the Canadian oceanographic community, Guildline now offers a fully proven alternative to existing techniques for measuring salinity/conductivity temperature and depth. The company's STD system evolved from the principle used in the Isolating Potential Comparator and is extremely accurate, reliable and offers great versatility.

Guildline's Series 8700 system for conductivity/salinity, temperature and depth measuring may be adapted for horizontal or hybrid profiling in towed bodies. Response is fast — less than 50 milliseconds on all channels (5 milliseconds optional).

The system is serviceable at sea, and has plug-in sensors and circuit boards. It can withstand severe shock, vibration and temperature conditions. Sensors are precalibrated and constants are independent of the probe.

The Series 8700 is compact and weighs 26 lbs. (12 kg) in air. Accuracy is ±0.01 PPT equivalent salinity from 28 to 40 PPT, ±0.01 from –2 to 30°C.



*Guildline Series 8700 data collection systems provide unparalleled convenience, speed, ruggedness and reliability for the acquisition of high accuracy and resolution CTD/STD profiles.*

P.O. Box 99 • Smiths Falls, Ontario K7A 4S9, Canada • Tel: (613) 283-3000 • Telex: 053-3028

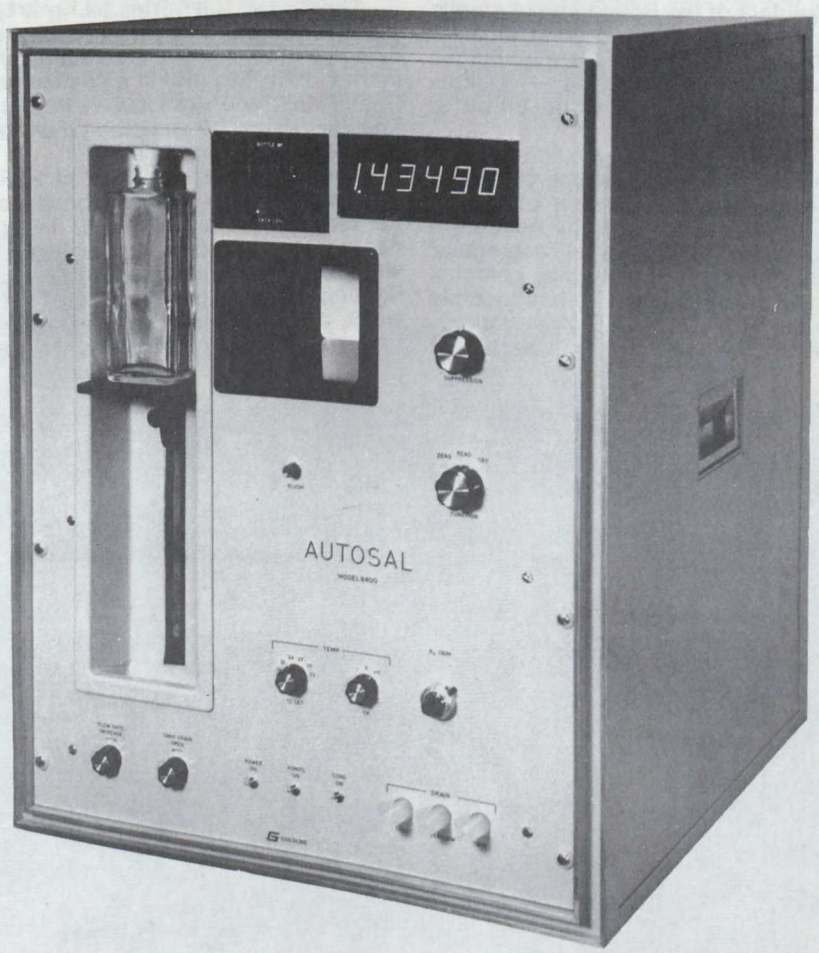
# GUILDLINE INSTRUMENTS LIMITED

Guildline's "Autosal" Model 8400 Laboratory Salinometer offers speed and simplicity of measurement together with unparalleled accuracy and long-term stability.

This new instrument utilizes a square wave potential comparator technique to compare continuously the conductivity of sea water at a precisely defined constant temperature with an integral reference conductance (standard resistor). Readout includes both BCD output and digital display of the ratio of conductivity of the sample to that of standard sea water with a resolution equivalent of better than 0.0002 PPT.

Other features of Model 8400 are:

- Automatic operation with digital readout
- Rapid measurements — in less than two minutes
- Accuracy of better than 0.003 PPT equivalent salinity
- Short-term stability — 0.001 PPT equivalent salinity for 24 hours
- Small sample volume — maximum 100 millilitres total including flushing
- BCD output and bottle logger available as options




*"Autosal" Laboratory Salinometer, Model 8400 from Guildline analyzes Nansen bottled sample.*

P.O. Box 99 • Smiths Falls, Ontario K7A 4S9, Canada • Tel: (613) 283-3000 • Telex: 053-3028

# HALIFAX SHIPYARDS DIVISION

## Hawker-Siddeley Canada Ltd.

Builders of the Sedco line of mobile semi-submersible oil drilling rigs — among the largest and most advanced of their kind in the world — Halifax Shipyards has reason to be proud of its capabilities.

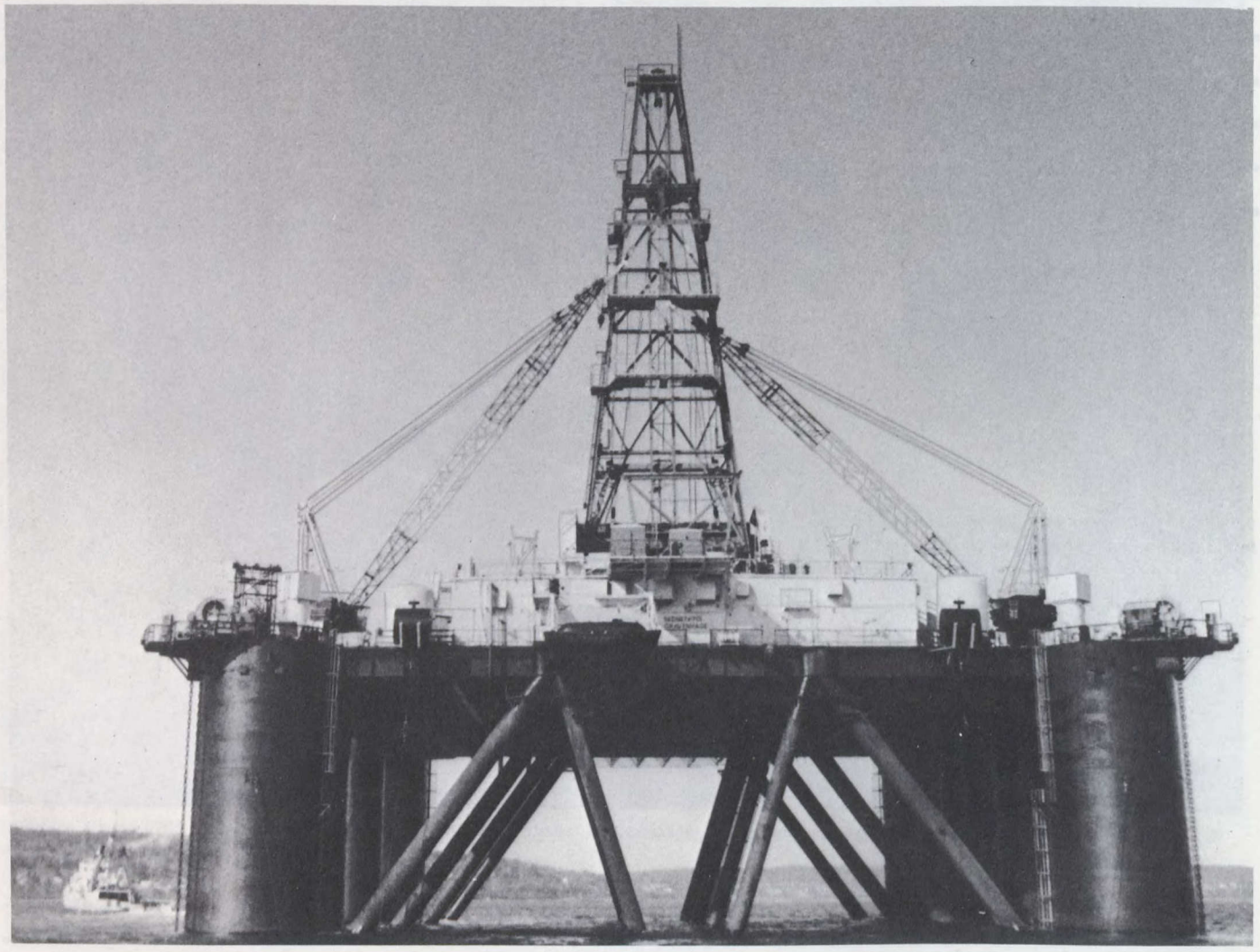
To date the company, the leading Canadian expert in this type of marine construction, has built four of the gigantic rigs and is currently building a fifth and sixth which will be rectangular in configuration and more complex than their predecessors. It has recently acquired a 140-ton (127 mt) capacity floating crane to help in rig assembly.

The Sedco 700 Series oil rig is typical of Halifax Shipyards' capability. This rig, when equipped with a buoyant marine riser, can drill in a floating position in depths up to 2,000 ft. (609.6 m) and is designed to withstand the severest of marine conditions.

Year-round construction at Halifax Shipyards is also possible because of its location in a sheltered, ice-free, deep water harbour. The shipyard is well equipped with graving dock and floating drydock facilities, marine railways, craneage and shop facilities for undertaking major refits or repairs, overhauls or routine maintenance in addition to new construction. Ships flying the flags of almost every maritime nation are regular visitors.

Besides building and outfitting offshore exploration and production rigs, platforms and associated workboats, the company produces other made-to-order lines including an extensive series of large, stern-ramped fishing vessels.

Halifax Shipyards is a division of Hawker-Siddeley Canada Ltd. and has a reputable history of marine business dating back more than 100 years.



*Among the largest and most advanced of its type in the world is the Sedneth 701 mobile offshore drilling rig constructed by Halifax Shipyards.*

P.O. Box 640 • Halifax, Nova Scotia, Canada • Tel: (902) 423-9271 • Telex: 019-21827 • Cable: HALSHIP

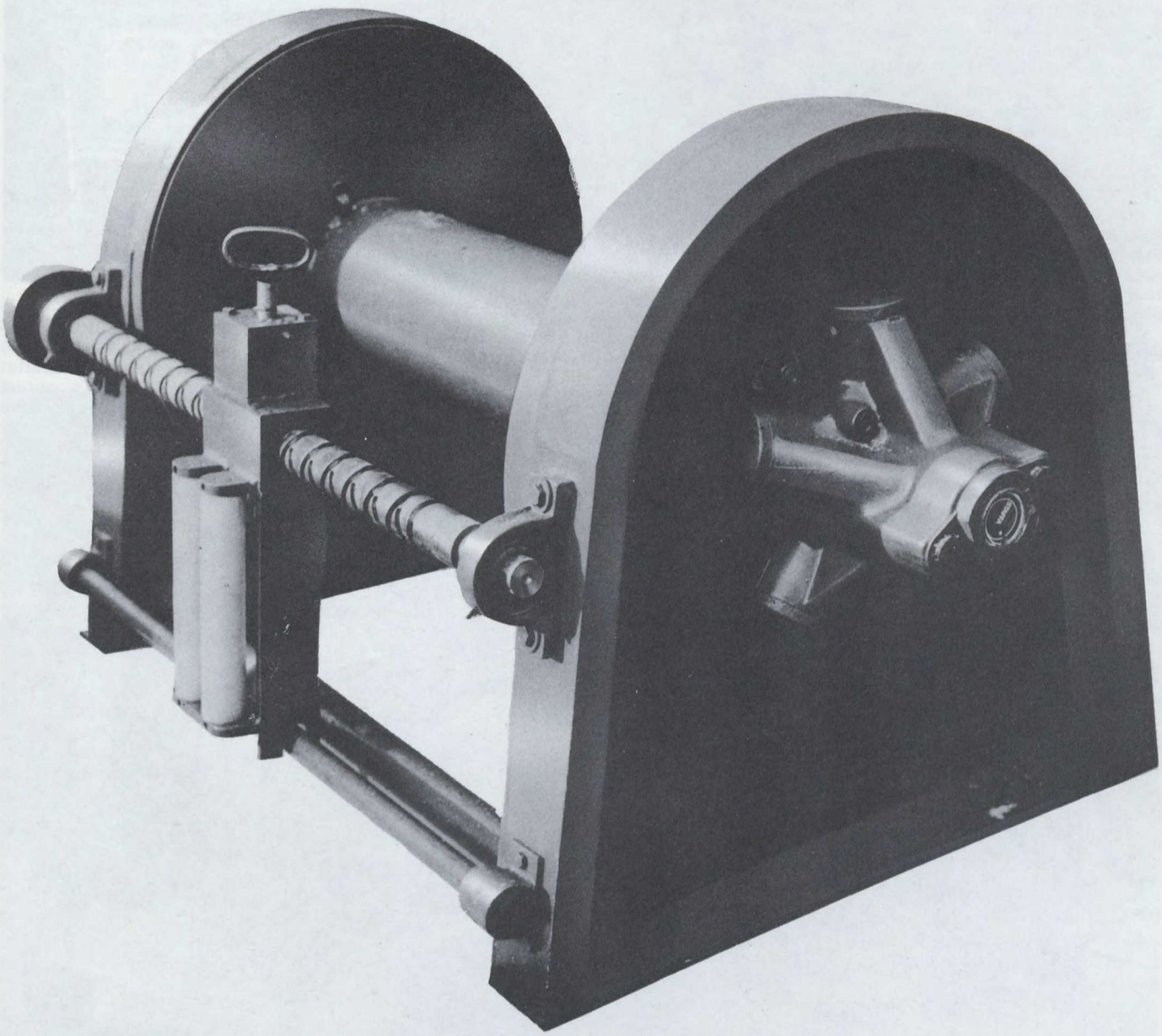
# HAWBOLDT INDUSTRIES LIMITED

Providing for the needs of small-craft operators on the oceans is the concern of Hawboldt Industries Limited.

While this Nova Scotia company also makes propellers, water pumps and other marine equipment, about 75 per cent of its output is in the hydraulic field. This includes vessel steering gear, capstans, windlasses, and trawl winches with a torque to 16,000 foot-pounds (2,200 kgm) and beyond.

Typical of the company's production is the netsounder electric cable winch which meets the demand of small boat operators for a net-sounder system to match their deck space, power supply and budget.

Hawboldt Industries is a custom shop with facilities that include a non-ferrous foundry, welding shop and machine shop. It has recently increased its manufacturing space by 50,000 sq. ft. (4,450 sq/m).



*Small vessels using Hawboldt's HW72 netsounder cable winch are able to compete in mid-water fishing operations.*

P.O. Box 80 • Chester, Nova Scotia B0J 1J0, Canada • Tel: (902) 275-3513 • Telex: 019-22603 • Cable: HAWBOLDT CHTR

# JOHN T. HEPBURN, LIMITED

Designing and constructing marine and heavy industrial equipment for domestic and export markets has been the specialty of John T. Hepburn, Limited for many years.

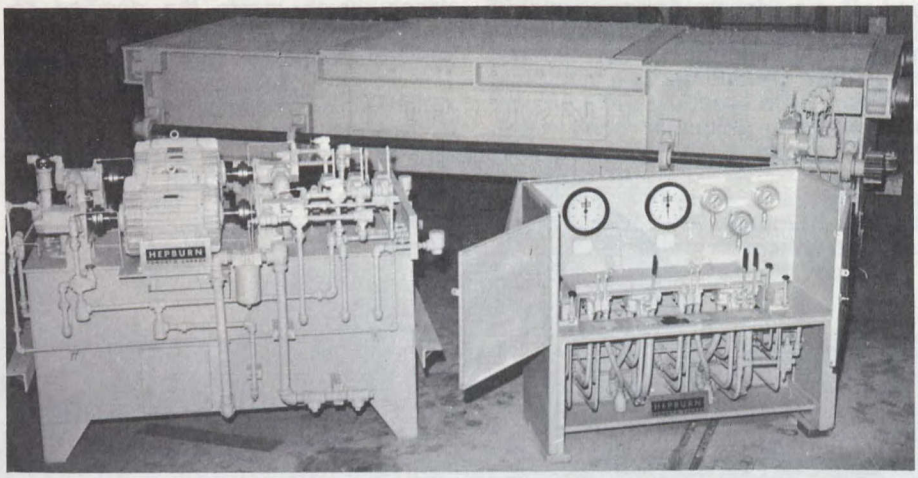
The company's oceanographic equipment, offshore oil rig machinery, "Replenishment at Sea" systems, and other types of Hepburn winches, windlasses, capstans, cranes, elevators and ancillary equipment, have all been rated by customers as highly satisfactory for their day-to-day requirements under all weather conditions.

Technical assistance is also available, without obligation, to help customers determine general specifications in marine engineering especially as they relate to climatic conditions from the Arctic to the tropics.

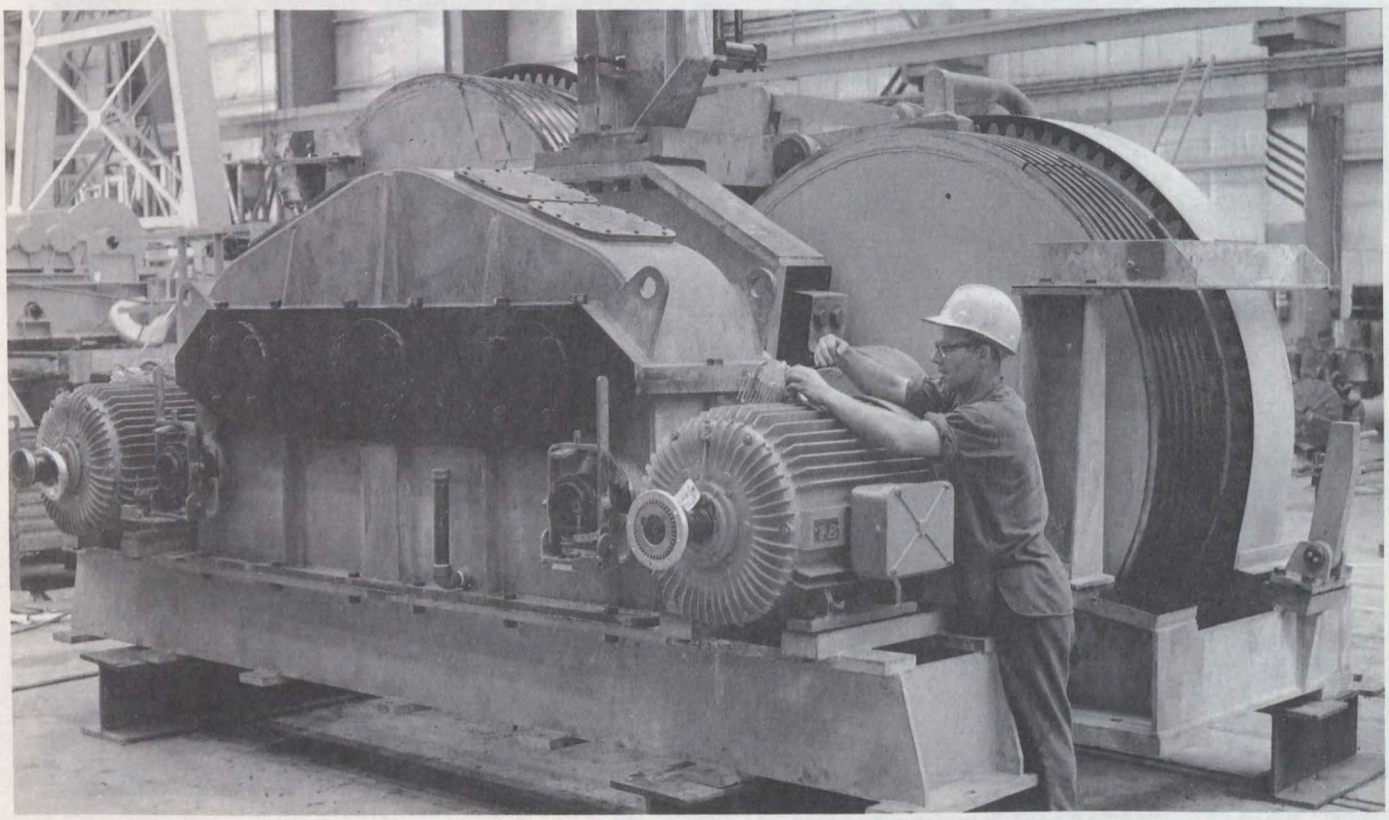
The company's highly skilled and experienced marine engineering staff constantly works to produce creative and functional designs consistent with economical manufacturing methods, bearing in mind the severe operating conditions of marine equipment.

Hepburn's engineering expertise extends through structural, mechanical, casting, hydraulic, electrical and metallurgical design of marine machinery and equipment.

The company's mechanical division has its own comprehensive fabrication, machining, assembly, electrical, hydraulic, test and inspection departments. The foundry division supplies gray iron, ductile and Meehanite castings.




*Deck-mounted console (at right) permits one operator to control all motions of a Hepburn Blowout Preventer (B.O.P.) crane. An individual load gauge is included for each hoist and responsive manual valves give the operator sensitive control and feel of the load for accurate positioning.*



*Line pull of this 70-ton (63,504 kg) Hepburn winch is 50,000 lbs. (22,680 kg) at 140 fpm (42.7 mpm).*

914 Dupont Street • Toronto, Ontario M6H 1Z2, Canada • Tel: (416) 534-8871 • Telex: 06-23270
Cable: HEPBURN, TORONTO

# HERMES ELECTRONICS LIMITED

For 16 of its 26 years in business, Hermes Electronics Limited has been engaged in the design, instrumentation and launching of shallow and deep ocean moorings. Most of the work during this time has been on classified military programs but the company does handle non-military projects and is one of the most experienced in the world in this particular field.

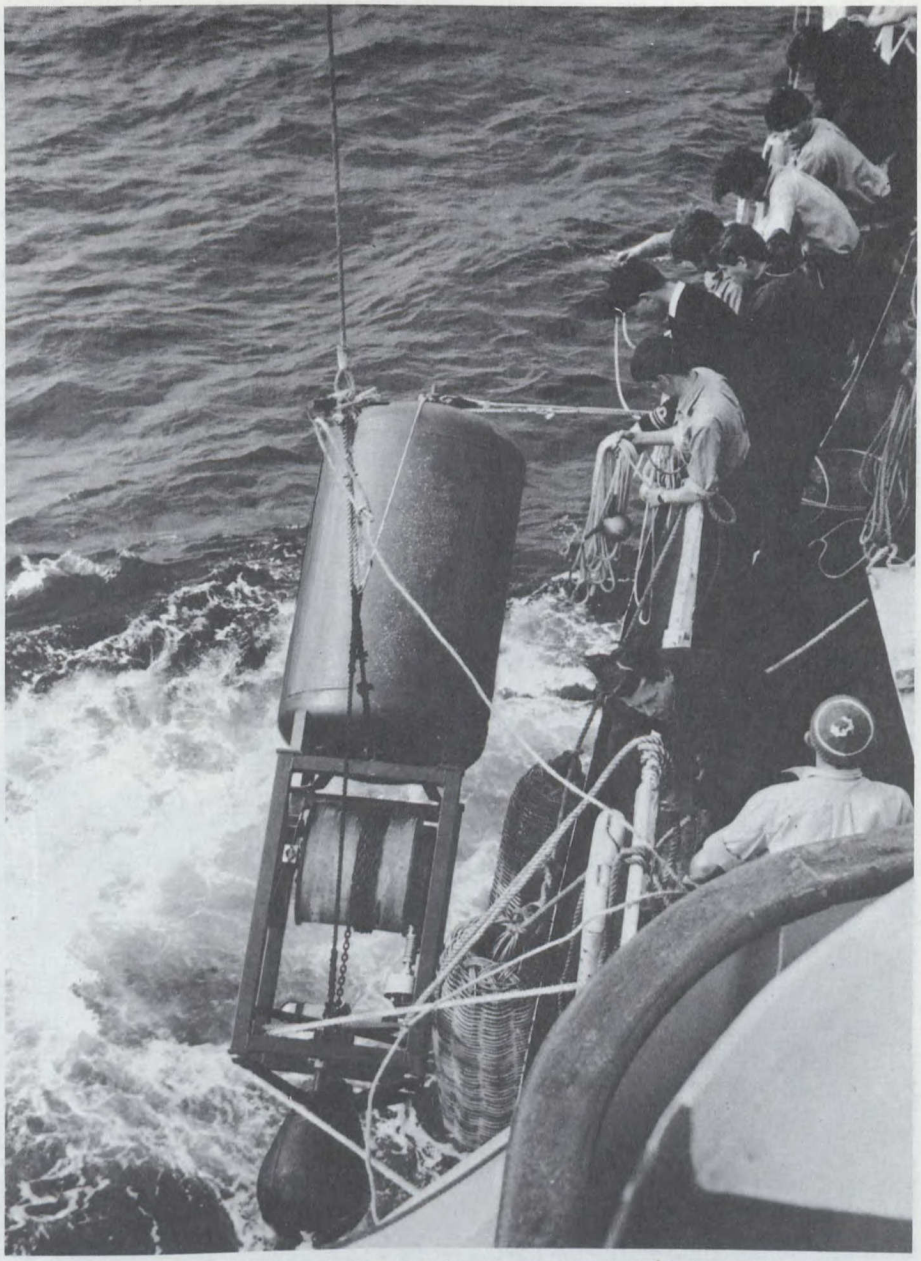
Over the years, Hermes Electronics has handled a number of major projects. On one program alone, 300 automatic deep ocean moorings were established in water depths to 18,000 ft. (5,486 m).

Another project involved placing ocean moorings in 22,000 ft. (6,705 m) of water. Of the 70 systems established, all demonstrated the ability to survive a year in those depths. The company has also established three-stage instrumented moorings with instrument packages down to 3,000 ft. (914.4 m) in 20,000 ft. (6,096 m) of water.

In addition to the above programs, Hermes Electronics has designed and supplied buoys, with diesel generators as a power source, for use as base reference points for a hydrographic survey system. These buoys were particularly complex involving both an active winch and a passive inertia-controlled winch. They had to maintain their position within 20 ft. (6.09 m) in 200 ft. (61 m) of water in varying sea conditions.

Among Hermes Electronics customers are the Canadian Armed Forces, the Royal Navy, the U.S. Navy, and Britain's Institute of Oceanography.

International contracts include the supplying of a buoy system and high-frequency data link to General Electric Company for use in the Gulf of Mexico. Hermes' newly designed meteorological and oceanographic data acquisition buoy/shore station system is just one of the major ocean systems currently being developed by the company's scientific and engineering research staff. The company holds world-wide patents on ocean mooring systems giving it a decisive lead in this field.



*Hermes' MB 2500 medium-weight, deep sea buoy is put to work. This is an automatic, two-stage system capable of mooring itself in sea depths to 18,000 ft. (5,864 m).*

P.O. Box 1005 • Dartmouth, Nova Scotia, Canada • Tel: (902) 466-7491 • Telex: 019-21744 • TWX: 610-271-1973

# HERMES ELECTRONICS LIMITED

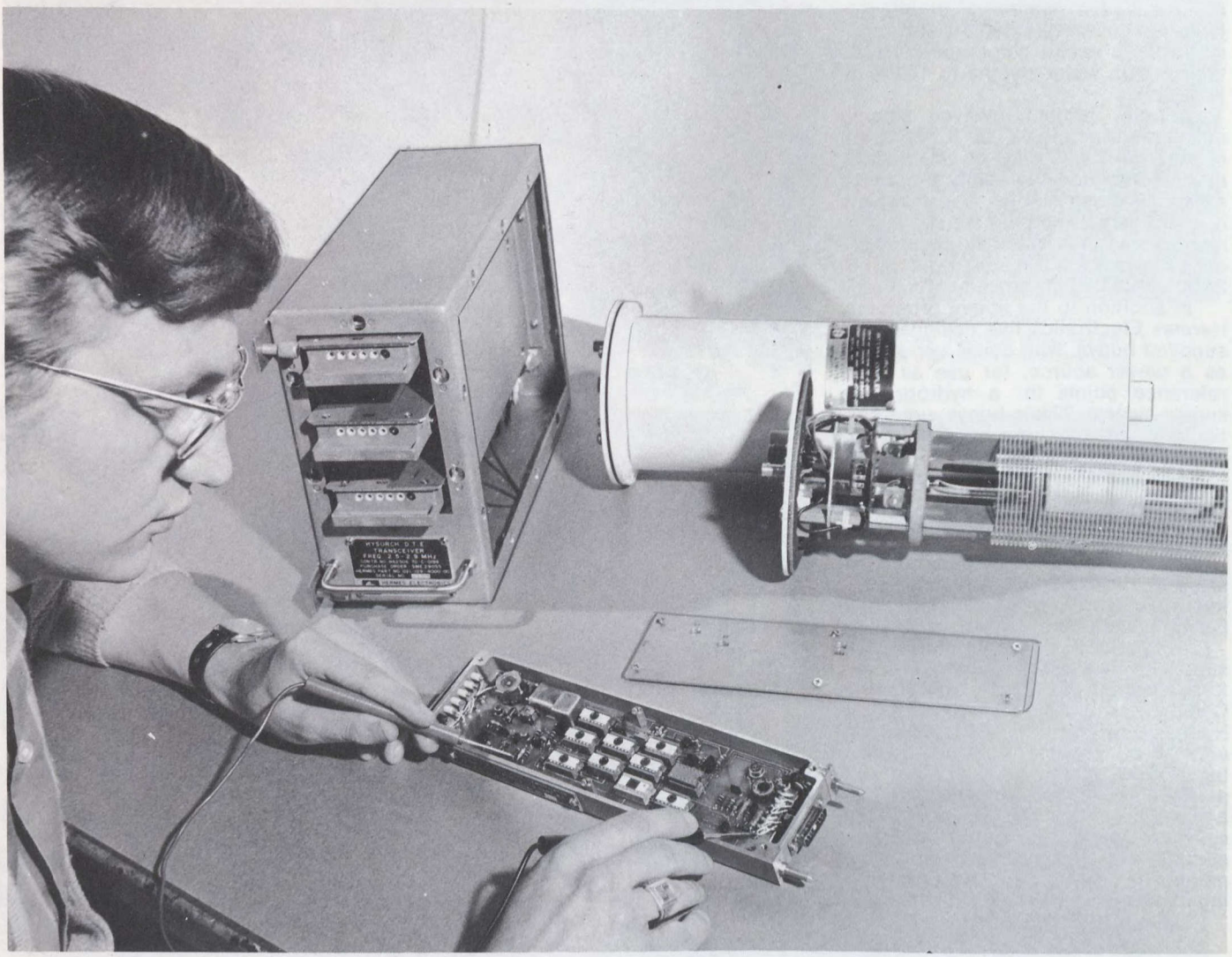
New on the HF Data Link scene are the latest developments from Hermes Electronics, a result of two years of intensive research and field testing.

Hermes HFD1, a single-channel, short-range unit, and the HFD4, a four-channel, long-range unit, are designed for use at remote weather stations, field-survey sites and offshore oil rigs. Both units transmit scientific data including temperature flow, tidal changes, wind speed and direction, pollution information and data related to other programs.

The HFD1 operates over 2.2 to 3.5 MHz on a pre-selected channel and transmits to a maximum of 200 miles (321.86 km) across water.

The longer range HFD4, operating from 4 to 22 MHz, uses four pre-selected channels and will transmit up to 2,000 miles (3,218.6 km).

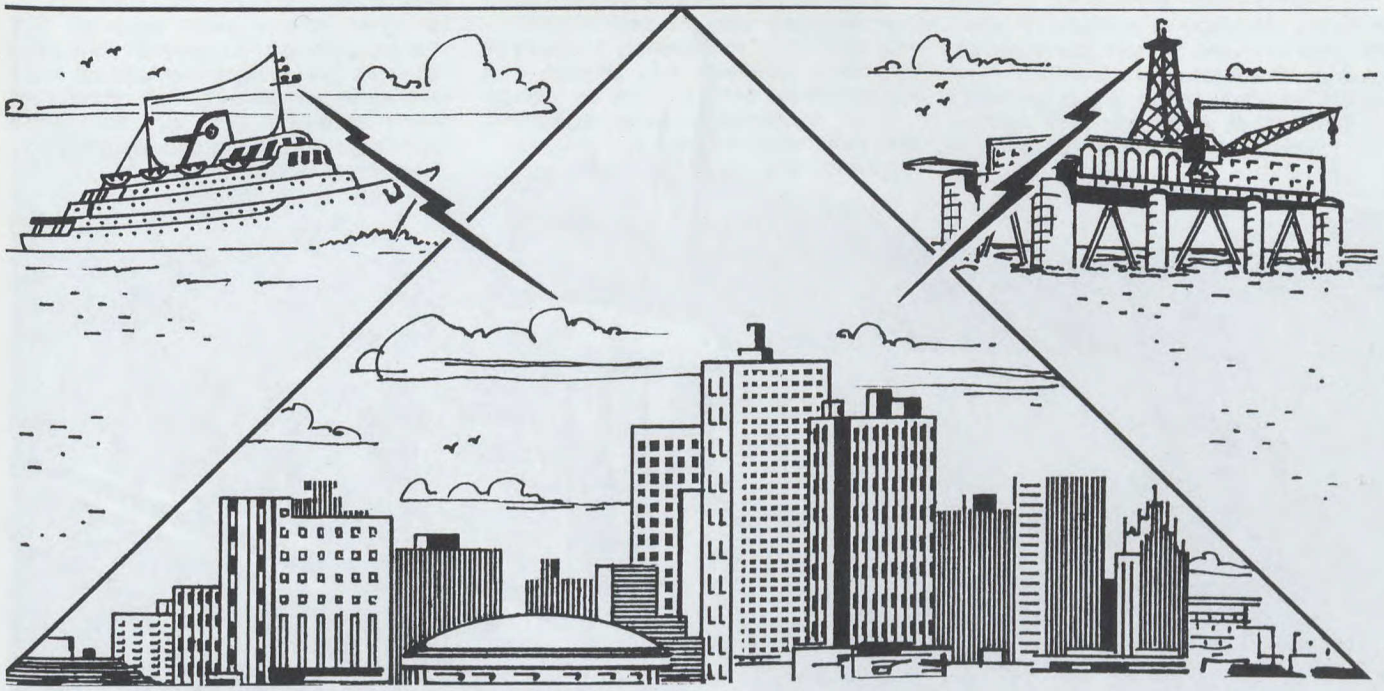
These highly efficient units are adaptable to any electronic system and transmit the data in digital form. Lightweight for easy transport and installation, both models are designed for low-power, DC operation.



*A Hermes Electronics technician tests one of the company's new HF Data Links.*

P.O. Box 1005 • Dartmouth, Nova Scotia, Canada • Tel: (902) 466-7491 • Telex: 019-21744 • TWX: 610-271-1973

# HERMES ELECTRONICS LIMITED



*Ship to land, land to oil rig, Hermes' HF systems assure the best in communications.*

Developed by Hermes for use on warships, the Direct Line Telephone System has since proved ideal for offshore drill rigs and shore establishments where reliability is essential. It incorporates solid-state switching for all logic and audio circuits to ensure reliable, trouble-free operation under arduous conditions.

The direct line between stations provides a high usage factor during peak traffic periods, simplifies the calling procedure, and avoids a central switching exchange. Maximum number of stations in present systems is 100 and is limited only by power supply. Each station has facilities for calling up to 29 others. A "conference call", involving 10 stations, can also be set up.

Station boxes, measuring 12 x 10 x 8 in. (30.48 x 25.40 x 20.32 cm), signal incoming calls by flashing buttons and aural signals. In extremely noisy locations, a bright red flashing lamp can be installed. For priority conversations, any designated station can be provided with the facility for overriding an engaged station.

With telephone-type handsets, a duplex circuit is available. With a loudspeaking reproducer, a "push-to-talk" switch is provided. Intercom volume may be adjusted and ease of maintenance is assured by modular construction.

Probably the most significant breakthrough of its kind in the history of HF communications is CHEC — Channel Evaluation and Calling — developed by Hermes Electronics from a Canadian Department of Communications concept.

CHEC improves the operation of existing HF equipment. It "manages" assigned frequencies by continuous analysis of the HF propagation and interference characteristics between/among the base/remote stations, and it automatically selects the best channel on which to communicate.

Hermes' CHEC system overcomes such problems as knowing if base or remote stations are operational, if either station is being monitored by operational personnel, and if the frequency/channel being used is the right one. CHEC assures the signal will be above noise levels, communications will be complete and that both base and remote are in identical frequencies.

By eliminating these problems, Hermes' CHEC system provides a cost-saving communications tool for daily operations. Extra features include ability to choose, as well as the best propagating channel, the one with the best signal-to-noise ratio. In addition to eliminating the need for a skilled operator, inherent in the CHEC system design is Automatic Selective Calling.

P.O. Box 1005 • Dartmouth, Nova Scotia, Canada • Tel: (902) 466-7491 • Telex: 019-21744 • TWX: 610-271-1973

# HORTON MARITIME EXPLORATIONS LIMITED


*Operational features of Horton Maritime Explorations Limited's "Auguste Piccard" are tested outside Vancouver harbour.*

Currently in a development phase, Horton Maritime Explorations Limited is working on a number of projects of major interest to the offshore petroleum and oceanographic industries.

High on the list is the modification of two large submersibles, the Auguste Piccard and the Ben Franklin, to give them expanded operational capabilities. These intermediate-depth submersibles are particularly suited, because of their size, for missions of extended duration or for missions requiring additional manpower and special equipment.

By early 1975, these vessels will be capable of conducting extended geophysical and geological explorations, sea bottom surveys, submerged diver servicing and support operations, and general oceanographic observation and data collection.

Another near-future goal of Horton Maritime is the development of a submersible-borne acoustical exploration system that will be capable of obtaining high-resolution, sub-bottom profiling data and deep-penetrating seismic data. The company plans to have an integrated geophysical system to allow co-ordinated geophysical data collection including gravimetric and magnetometric.

New internal submersible features being developed by Horton Maritime include an advanced propulsion system to give its vessels additional long-range capability; an enhanced navigation and positioning system; a crew escape system; a diver lockout system and mission compatible crew accommodations.

The company is also preparing an external submersible system for eventual operation under permanent polar ice and in areas where general sea ice makes surface exploration impractical.

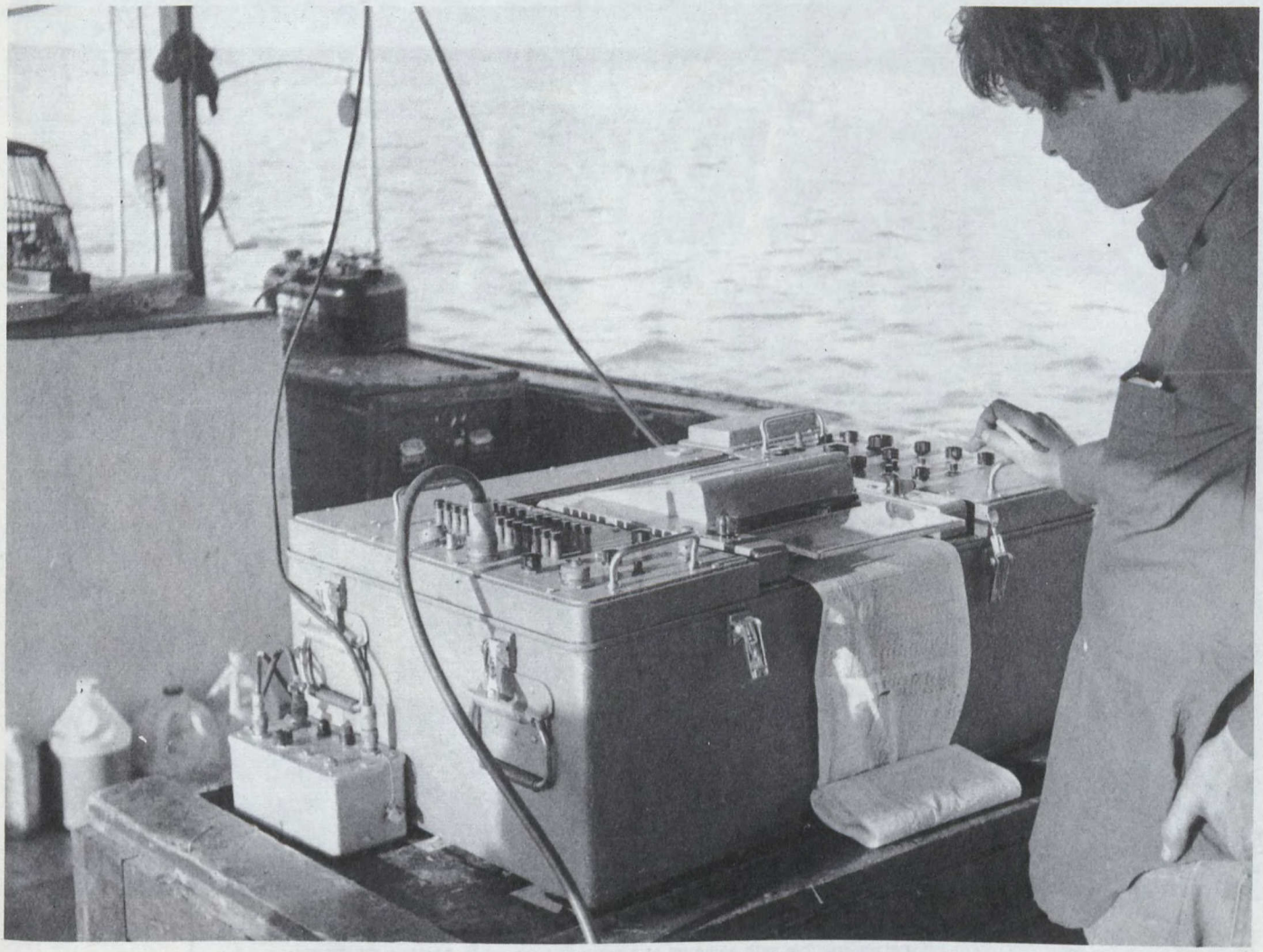
20 Brooksbank Avenue • North Vancouver, British Columbia V7J 2B8, Canada • Tel: (604) 980-8591

# HUNTEC (70) LIMITED

Huntec's Division of Marine Surveys and Services offers a wide range of marine geophysical and geological services for offshore engineering, exploration and search applications. Advanced sub-bottom profiling, side-scan sonar and echo-sounding systems, combined with highly trained survey personnel, provide a comprehensive capability to meet offshore project requirements.

Capabilities include measurement of physical parameters, including current velocity and direction, tides and waves, as well as grab sampling for geological reconnaissance.

Huntec (70) Limited undertakes jobs of any size, from small site investigations to large-scale, multi-system projects. In addition to complete program management, Huntec provides services for any phase of a project, from consultation at the initial planning stage, through field operation, to the final interpretation and analysis of data.



*Huntec's Hydrosonde M-2A Receiver/Recorder is used to study port development in the Bahamas.*

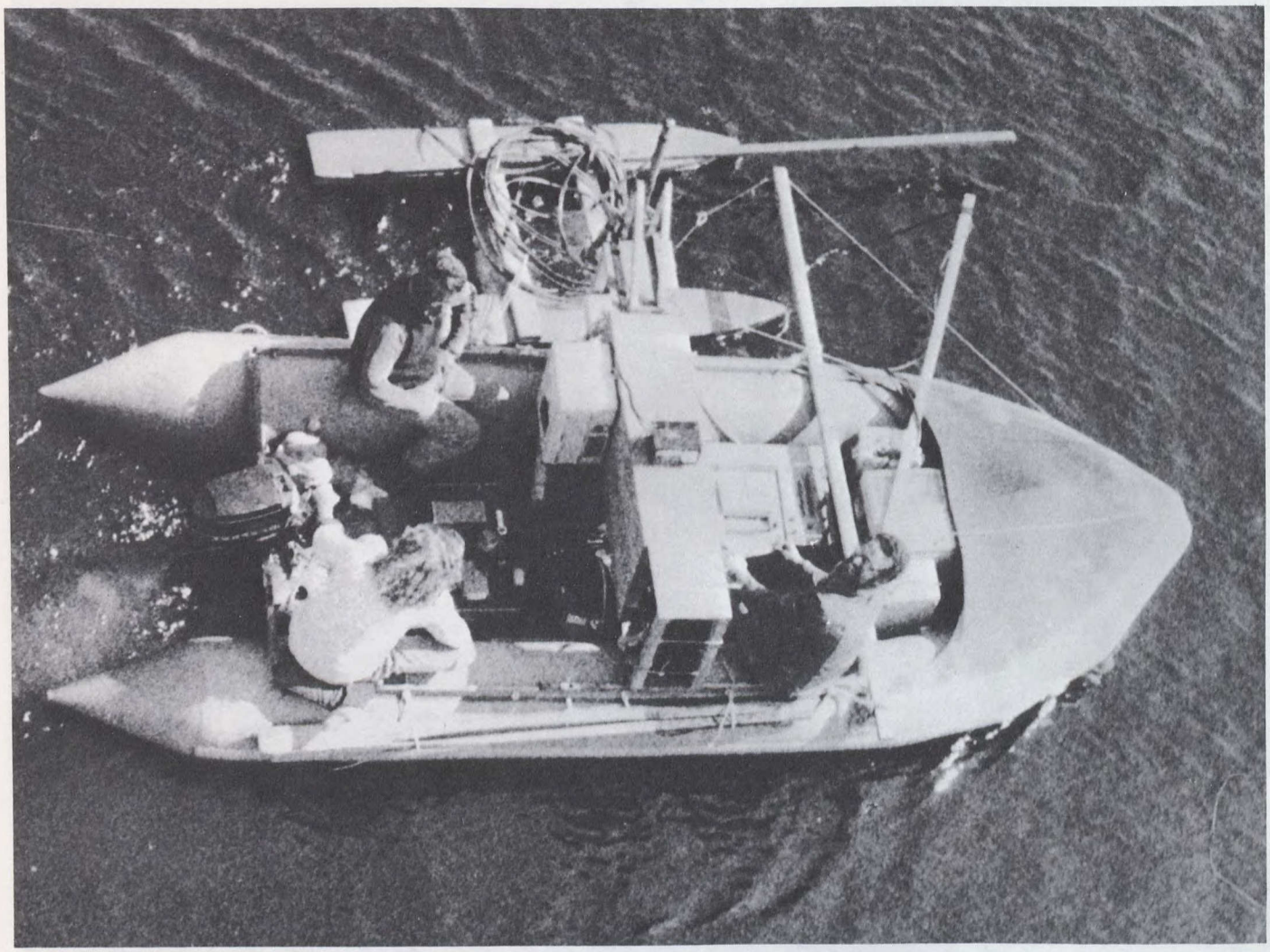
1450 O'Connor Drive • Toronto, Ontario M4B 2T8, Canada • Tel: (416) 751-8055 • Telex: 06-22797
Cable: HUNTOR TORONTO

# HUNTEC (70) LIMITED

More than 10 years of experience in developing profiling equipment and services have put Huntec in a strong position to assist in the prospecting for offshore petroleum and minerals.

Huntec's Hydrosonde line of marine seismic profiling instruments is versatile enough to meet a wide range of requirements — from the deep penetration required in oceanographic and petroleum prospecting to the high resolution of shallow sub-surface geology required for offshore engineering and alluvial mineral exploration.

Hydrosonde instruments are compact and portable enough to be economically transported by air freight and installed on the smallest survey craft. They are fully protected against humidity, salt spray and other hazards.



*An inflatable boat carries Huntec's Hydrosonde system which includes an M-2A Receiver/Recorder, M-2A Transmitter, ED-10 seismic source and a 2.5 kw generator. This equipment is compatible with all types of electrically activated seismic sources.*

1450 O'Connor Drive • Toronto, Ontario M4B 2T8, Canada • Tel: (416) 751-8055 • Telex: 06-22797
Cable: HUNTOR TORONTO

# HUNTEC (70) LIMITED

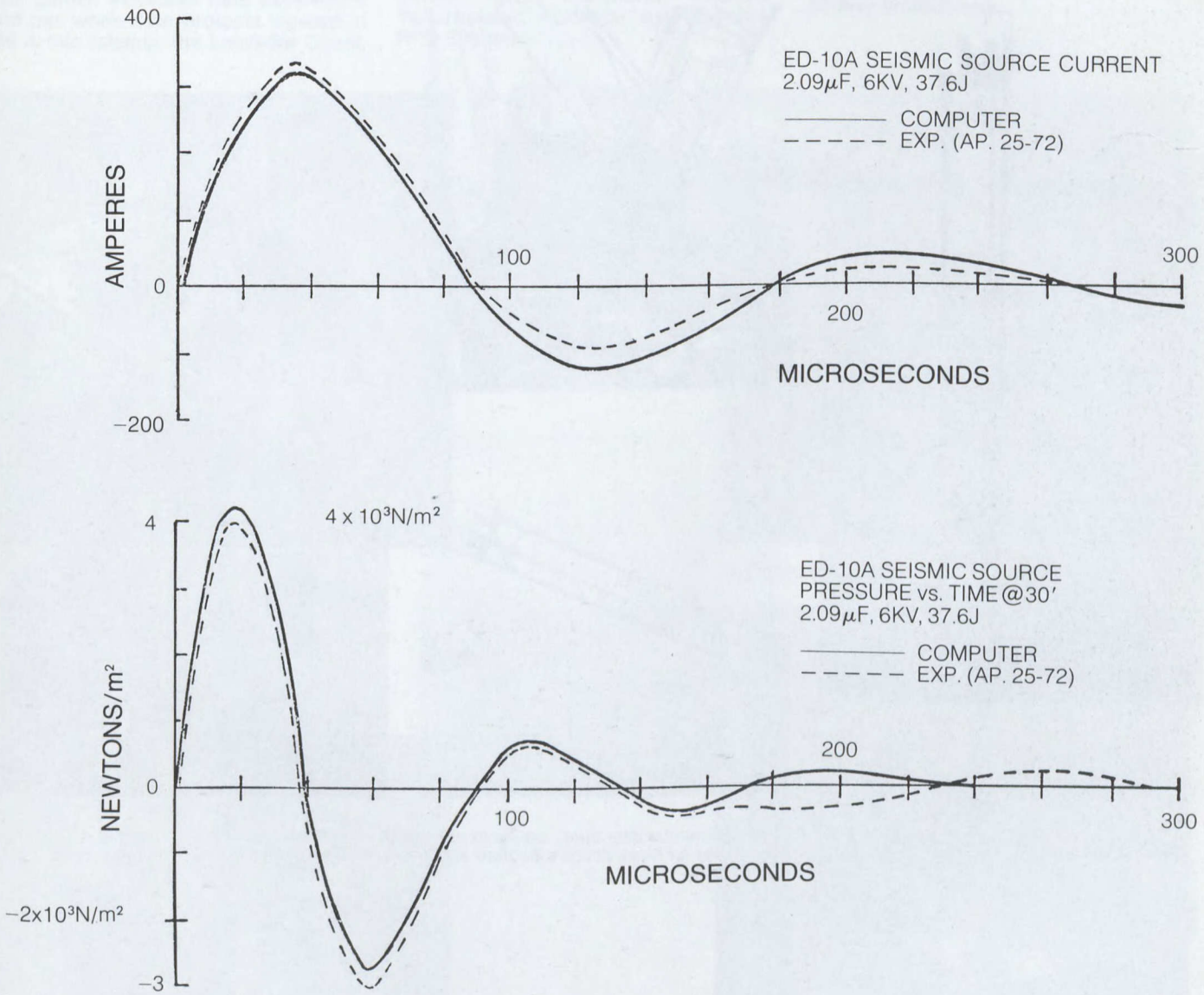
Since 1964, Huntec has maintained an active research program in underwater acoustics and development of improved instruments for marine seismic profiling. The current line of Hydrosonde instruments is the result of these efforts.

Recent research has been directed to electrodynamic source design for very high resolution profiling applications. Computer formulas have been derived to predict the transient behavior of various system configurations. Search procedures have been used to determine system parameters that produce the desired acoustic signatures and maximize the electro-acoustic conversion frequency.

An experimental transducer designed with this procedure produces a pressure signature that is within 10 per cent of the theoretical results and achieves an electro-acoustic conversion efficiency of 20 per cent, or better than 200 times that normally obtained with electrodynamic transducers.

Continuing development is aimed at surface and underwater towed seismic sources for very high resolution profiling in shallow and deep water.

Huntec in recent years has exported products and services to the United States, Britain, Australia, the Soviet Union and some 30 other countries in Europe, Africa and Asia.




*Comparison of computer simulation and actual experimental results of Huntec (70) Limited's Hydrosonde ED-10A underwater seismic source.*

1450 O'Connor Drive • Toronto, Ontario M4B 2T8, Canada • Tel: (416) 751-8055 • Telex: 06-22797
Cable: HUNTOR TORONTO

# INTEGRATED GROUP OF COMPANIES

Specialized technical services in a number of related marine, oceanographic, engineering and geotechnical fields are provided by the Integrated Group of Companies.

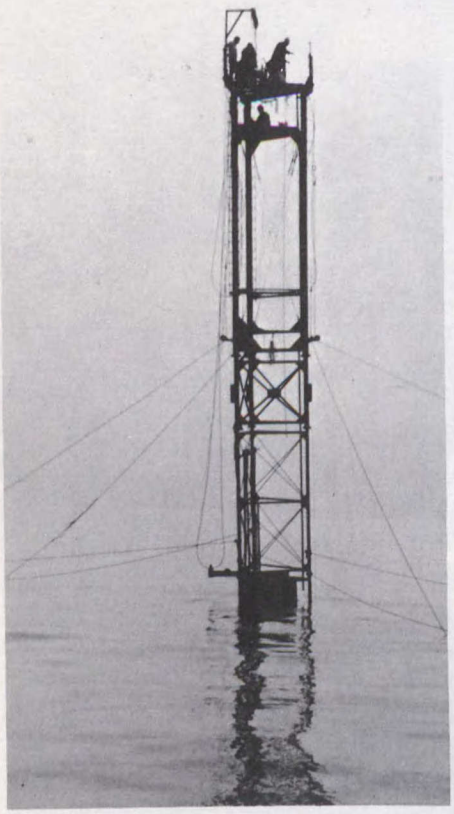
Services range from economic planning and feasibility studies through design, specifications, management and supervision of construction.

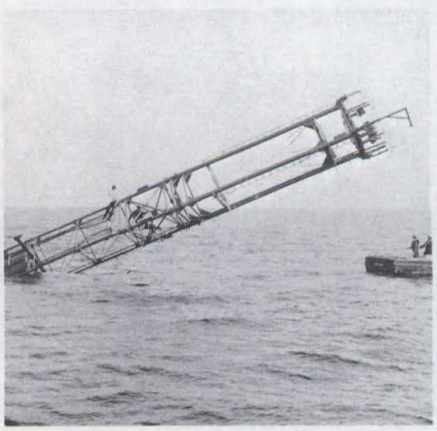
Whitman, Benn and Associates (1969) Limited provides complete engineering services for marine terminals, deep water tanker terminals, offshore platforms and fixed and floating instrumented buoys. This company also provides a back-up engineering service for Group subsidiaries.

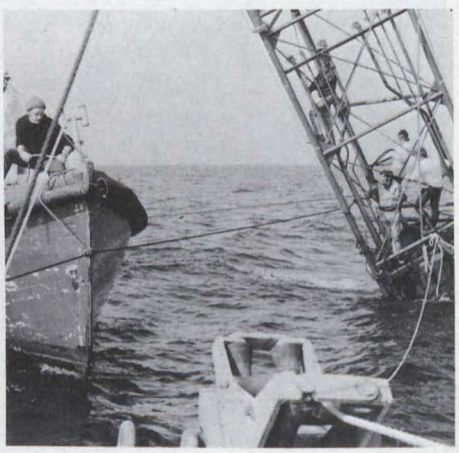
Integrated Survey Systems provides both systems engineering and field services for radiopositioning, hydrographic and control surveys; pipeline, cable and dredging surveys; and complete site investigations for marine terminals, drilling and production platforms.

Offshore Information Limited researches, compiles, edits and disseminates marine and natural resource material for reports, publications and government agencies.

Integrated Management Consultants Limited provides professional construction management services to governments, municipalities and private industry. Services include complete project management, purchasing, calling and awarding of contracts and subcontracts, project co-ordination, lost control and scheduling.







*An instrumented data buoy, similar to one designed and built by Whitman, Benn & Associates for Nova Scotia's Bedford Institute of Oceanography, is positioned in the Atlantic.*

Suite 212, Duke Street Tower • Scotia Square, Halifax, Nova Scotia B3J 1N9, Canada • Tel: (902) 422-9618
Whitman, Benn & Associates (1969) Limited • 422-9619 Integrated Management Consultants Limited • 422-6110
Integrated Survey Systems Limited • 422-9618 Offshore Information Limited • Telex: 019-21594

# INTEGRATED SURVEY SYSTEMS LIMITED

Integrated Survey Systems Limited offers services worldwide to the oceanographic and oil industries. This is a highly competent service group that provides comprehensive surveying and positioning services for land, marine and airborne operations.

The company has attained an enviable record of quality, performance and expertise through dedication to exacting standards and an ongoing training program for all personnel.

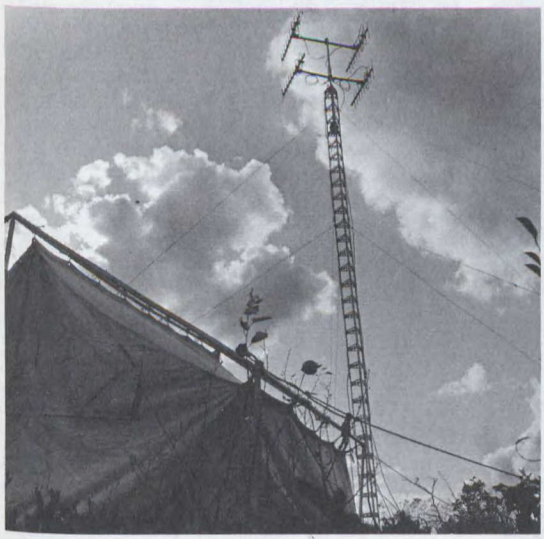
Integrated Survey Systems' staff has also gained extensive field experience and has worked on projects located in the Arctic Islands, the Labrador Coast, Eastern Sea Board of North America, the Bahamas, Latin America and Africa.

## RADIOPOSITIONING SYSTEMS AND SERVICES

Trained and competent crews are available to install, maintain and operate positioning and navigational aids for geophysical, well location, acceptance trials, engineering, photo-mapping, pipelaying, dredging, and oceanographic operations. Positioning equipment operated includes Raydist, Loran, Decca, Toran, XR-Shoran, Satellite, Tellurometer, Autotape, and Motorola RPS Systems.

## HYDROGRAPHIC AND CONTROL SURVEYS

Fully integrated hydrographic surveys, tidal and current measurements for new harbour developments, navigational approaches, harbour improvements, obstacle location and clearance, are conducted by fully experienced hydrographic survey teams. The most advanced equipment available is used on control surveys for photo-mapping, well location, geophysical surveys, plant sites and primary and secondary control nets.



*Shoran base camp*

*Hydrographic surveys*


*Integrated survey systems*

*Control surveys*

Suite 212, Duke Street Tower • Scotia Square, Halifax, Nova Scotia B3J 1N9, Canada • Tel: (902) 422-6110
Telex: 019-21594

# INTEGRATED SURVEY SYSTEMS LIMITED

## PIPELINE, CABLE AND DREDGING SURVEYS

Pipeline and cable routes are located accurately and economically by integrated navigation, side-scan sonar and high-resolution profiling systems. Pre-dredging and post-dredging surveys utilize latest techniques and equipment, saving time and money.

## COMPLETE SITE INVESTIGATION FOR MARINE TERMINALS: DRILLING AND PRODUCTION PLATFORMS

Comprehensive reports are prepared covering all desired parameters, such as overburden content, depth and bearing capacity, topography, current, tide and wave measurements, anchor holding tests, and geological studies of recent sediments up to 1,000 ft. (304.8 m).

## OTHER SERVICES

Through its own facilities, the company offers survey planning, pre and post-plotting, cartographic, computer processing and systems engineering services.

As an independent consulting firm, Integrated Survey Systems offers services for all projects on a partial or complete turnkey basis.

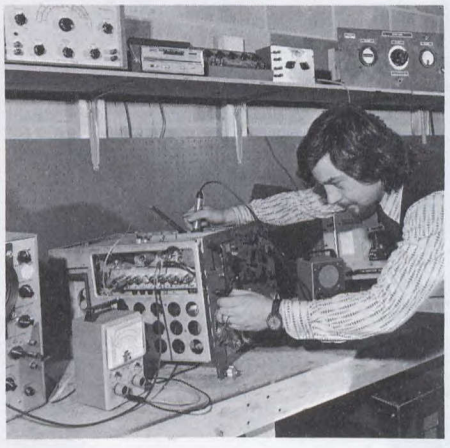
The international experience of the company's personnel, plus the engineering services of the Integrated Group of Companies, and the research and development facilities of Canada's oceanographic community, are combined to offer a cost-effective solution to most marine projects throughout the world.

*Hybrid hydrographic position plotter*

*Rig positioning*

*Dredging surveys*

*Shoran base tent*



*Maintenance shop*

*Site investigations*

Suite 212, Duke Street Tower • Scotia Square, Halifax, Nova Scotia B3J 1N9, Canada • Tel: (902) 422-6110
Telex: 019-21594

# INTERNATIONAL HYDRODYNAMICS COMPANY LTD. (HYCO)

Field experience plus engineering expertise equals practical solutions to ocean tasks, and International Hydrodynamics Company Ltd. (HYCO) has the record to prove the equation.

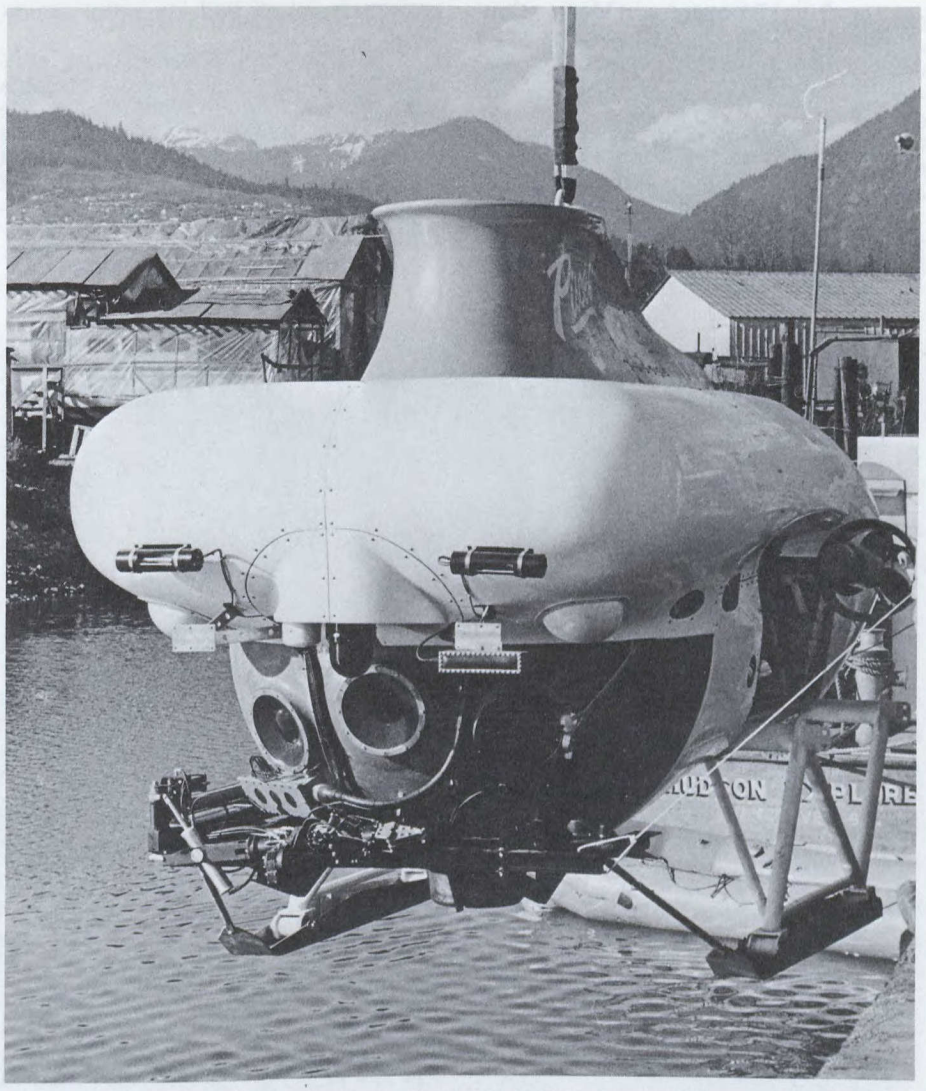
The company, established in 1964, is the only submersible manufacturer in Canada and one of the few in the world with the capability to design, build and operate these vessels.

Submersibles are vital to ocean exploration and exploitation and HYCO's five Pisces models, its SDL-1 and Aquarius-1 are on a day-to-day operational basis to fulfill this role.

Currently, HYCO has an order for two new Pisces and an Aries diver lock-out vessel. An additional order for a dry-transfer Taurus has also been received.

Aquarius and Taurus are not as expensive as the Pisces class mini-sub, and have been designed for operation on continental shelves at depths to 2,000 ft. (609.6 m). Ideal as underwater work platforms for offshore petroleum exploration or marine construction, the Pisces class features high payload or lift capacity and task-designed tools and manipulators. Workhorse of the fleet is Pisces V, operating to 6,600 ft. (2,011.7 m).

Work partner for the Pisces is the Hudson handler, a portable, self-contained, self-powered modular barge which maintains, launches and recovers the submersibles.



*Pisces V, HYCO's recent launching in the deep submersible class, is shown during trials. The vessel has since been engaged in burial of the CANTAT-2 telephone cable in the Atlantic, assisted in the rescue of the Pisces III and has completed 200 dives in its first year of operation.*

P.O. Box 1059, Station "A" • Vancouver, British Columbia V6C 2P1, Canada • Tel: (604) 929-2391 or 688-8607
Telex: 04-55465 • Cable: THINKDEEP

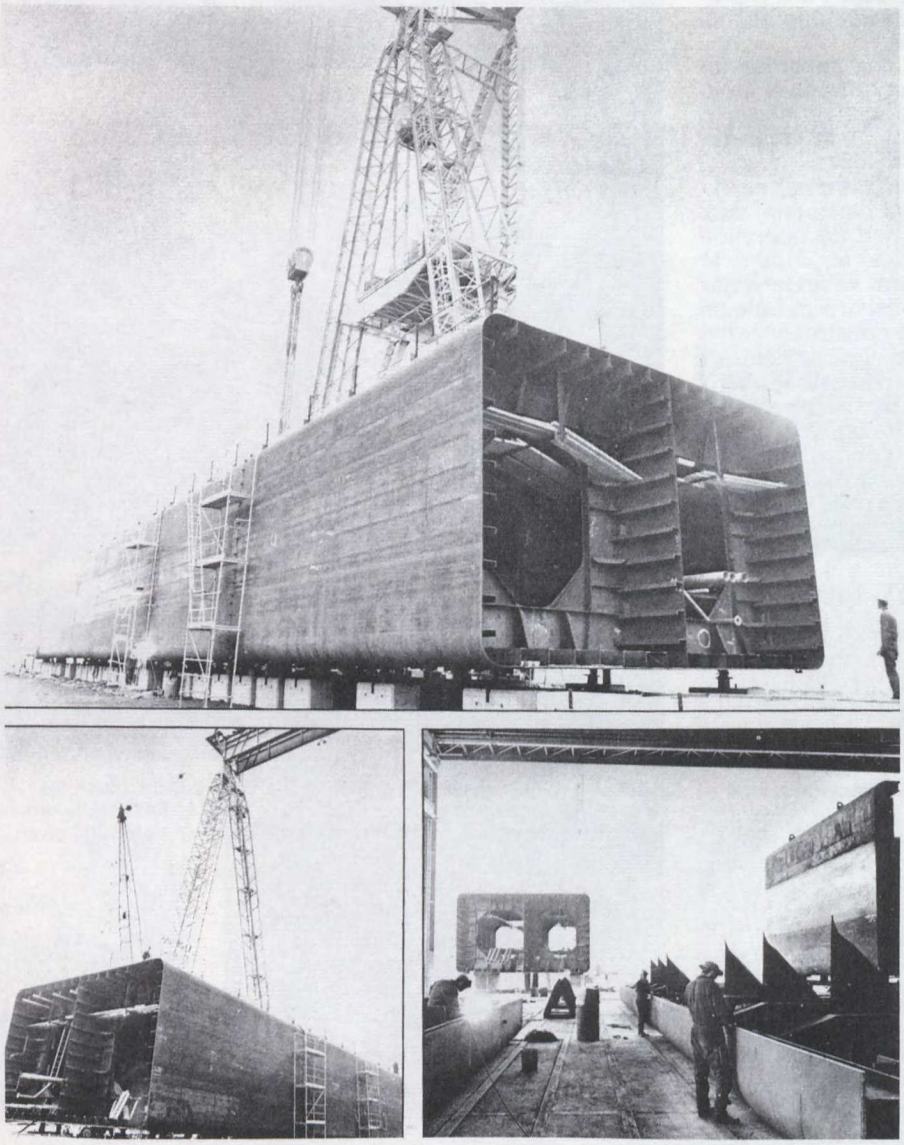
# JAN FURST SHIPYARD AND MARINE CONSULTANTS

Jan Furst Shipyard and Marine Consultants is one of Canada's leading companies providing consulting services in offshore oil exploration and production.

Established in 1968 to offer management and engineering services to marine industries around the world, Jan Furst has become increasingly sought after for assistance in development of offshore projects especially in areas of extremely rough and icy water conditions.

The company developed its considerable expertise in offshore projects from oil exploration ventures in the North Sea where it accumulated a great deal of practical experience in oil rig and drilling platform design and manufacture, and in the services needed by oil rig operators.

Through its association with Shipping Research Services of Oslo — a subsidiary of the Aker Group, the biggest conglomerate of shipbuilders and oil rig builders in Norway — the company has access to all the technical knowledge of the Group members.



*Jan Furst Shipyard and Marine Consultants of Canada has gained considerable expertise in offshore oil exploration and production through its association with a subsidiary of the Aker Group, builders of this H3 semi-submersible drilling rig.*

P.O. Box 745 • 215 Ontario Street • St. Catharines, Ontario L2R 6Y3, Canada • Tel: (416) 684-0281
Cable: YARDCONSULT

# KENTING EXPLORATION SERVICES LIMITED

Kenting Exploration Services Limited, initiator of the widely sold GeoQuest, ArcticQuest, Baffin, Polar and BayQuest multi-disciplinary participation surveys, is a Canadian-owned petroleum marine seismic contractor.

It has met subsea pipeline and well completion requirements for detailed bottom and sub-bottom information by including microprofiling, side-scan sonar, and low-frequency fathometry into its service line.

To complement its geophysical services, Kenting is participating in a joint development marketing venture with the Canadian Government to produce a subsea drill capable of retrieving bedrock cores in water depths of 2,000 ft. (609 m).

The company provides ship's navigation and precise position recovery by integrated satellite navigation, doppler sonar and other electronic systems.

Kenting's petroleum marine seismic capability is augmented by its continuous marine magnetometer and gravity data-acquisition systems. Data processing is performed in Calgary using the most appropriate digital techniques. An evaluation and consulting department of geophysicists provides data interpretation.

An extensive, non-exclusive library is maintained with available data listed in the company's Quest DATALOG.

*M. V. Theta carries Kenting survey equipment into Hudson Bay. Crews recorded continuous gravity and magnetics and acquired microprofiling and side-scan sonar data during the BayQuest program.*

524 - 11th Avenue Southwest • Calgary, Alberta T2R 0C8, Canada • Tel: (403) 263-1701 • Telex: 03-822630

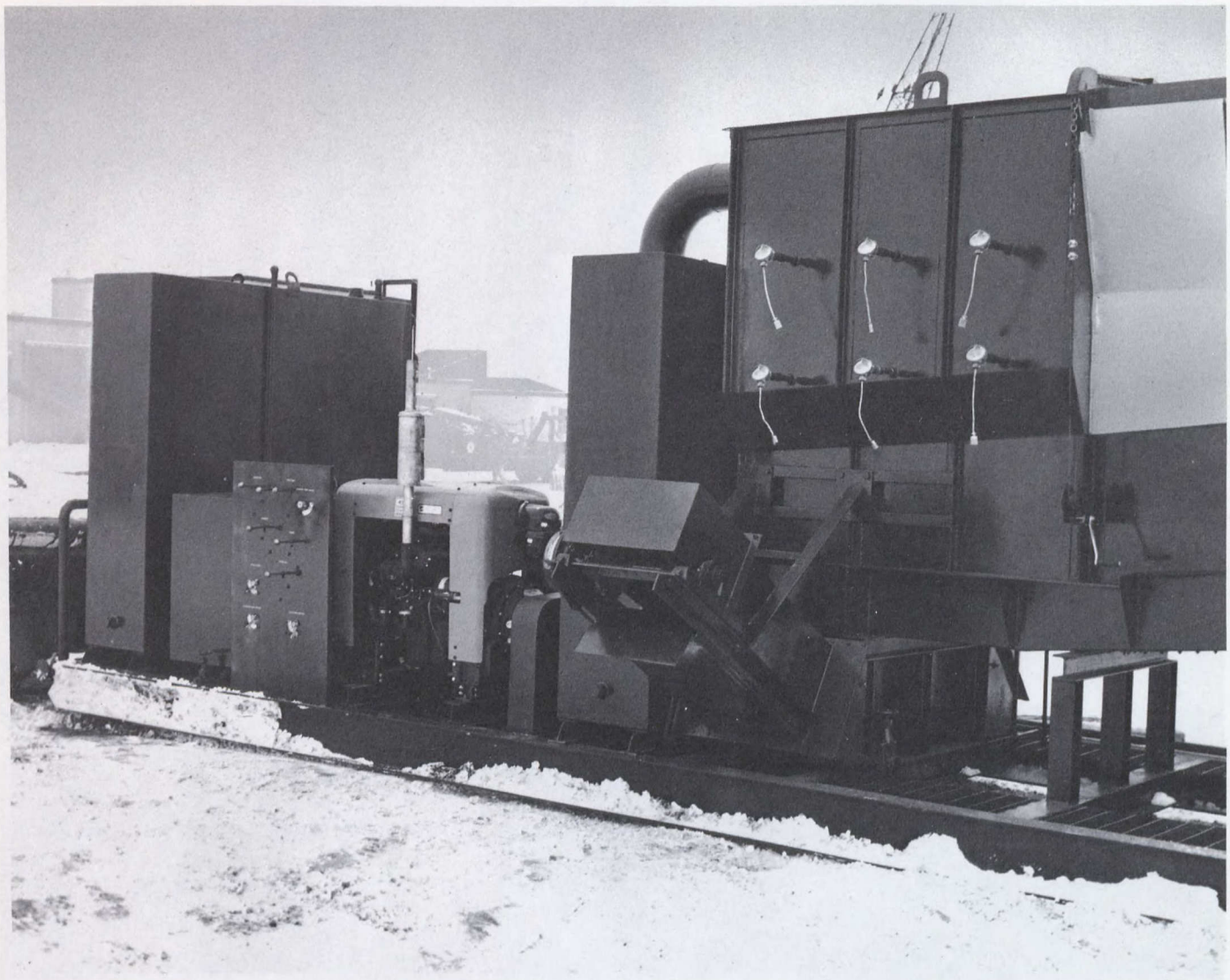
# KENTING OILFIELD SERVICES LTD.

Kenting Oilfield Services Ltd., the pipeline and construction division of Kenting Limited, has developed an economical incineration process capable of effectively cleaning beach materials fouled by spilt oil. The ability to reposition native beach materials after cleaning, removes the cost of importing replacement sands and gravels to a clean-up site.

At present, the company is designing a production unit for its hopper-loaded, continuous-feed incineration system.

Initially, Kenting researched the system to find a way of providing smoke-free, bulk oilfield waste disposal. Then, the Ministry of Transport provided additional research money to redesign the system to provide continuous input-output after it had experienced problems with the oil spill in Chedabucto Bay, Nova Scotia, in 1970. Miles of recreational beach and fishing area coastlines were fouled by Bunker "C" and an alternative to disposing of contamination by burial was seen as a necessity by the clean-up task force.

With the development of the Kenting Kleen-up Incinerator, the coastal engineer now has an effective tool to combat one of the most pernicious problems of coastal zone management.



*Land and coastal oil spills are cleaned up with the help of a Kenting Kleen-up Incinerator.*

384 700 - 6th Avenue Southwest • Calgary, Alberta T2P 0T8, Canada • Tel: (403) 263-4970 • Telex: 038-24542

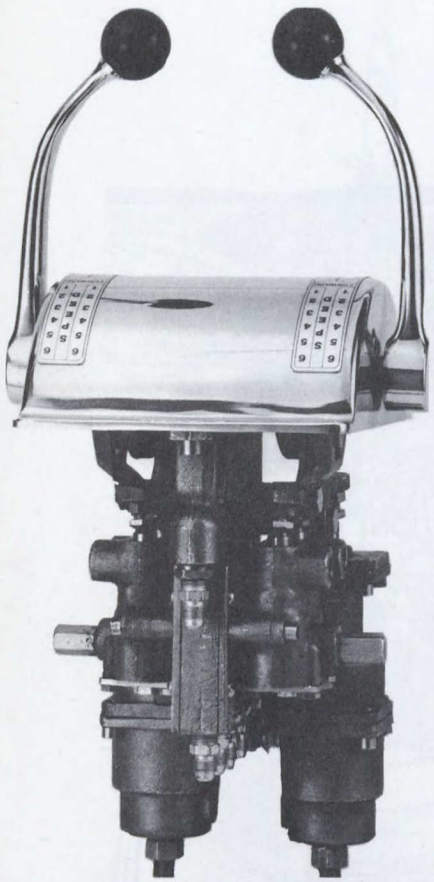
# J. KOBELT MANUFACTURING CO. LTD.

Precision control equipment for the ocean industry is the specialty of J. Kobelt Manufacturing Co. Ltd.

This Vancouver-based company designs and produces pneumatic and mechanical remote control systems for marine propulsion and deck machinery. It also produces a wide range of pneumatically operated and fail-safe disc brakes for propeller shafts, winches and many other brake applications.

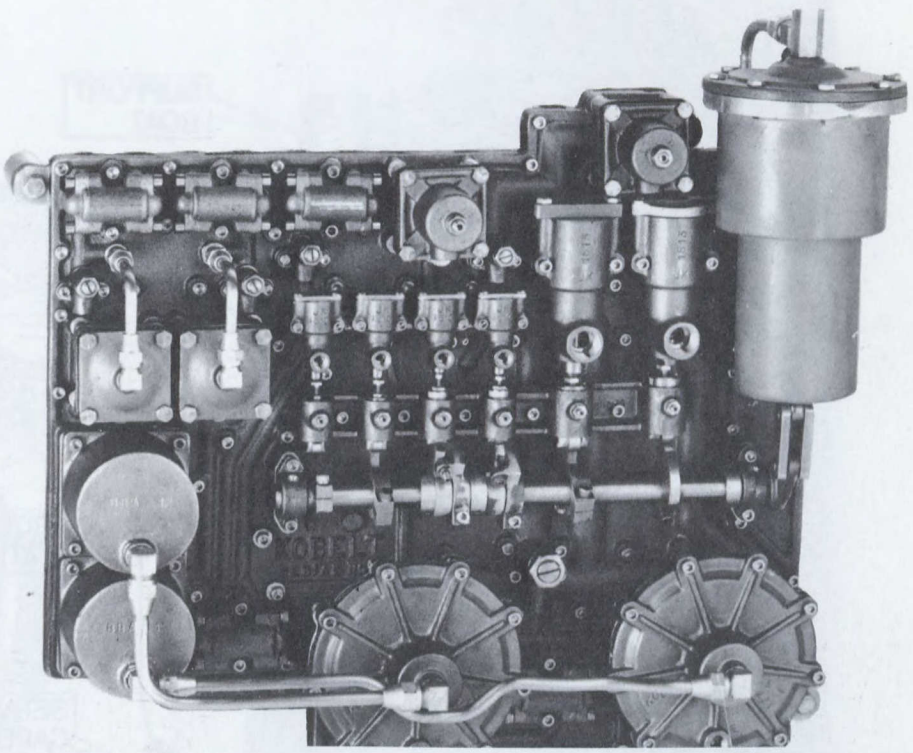
Kobelt Manufacturing has supplied disc brakes to offshore oil pipe-laying barges and they are now used successfully throughout the world. Braking force of the Kobelt disc brake ranges from a few inch-pounds to 400,000 foot-pounds. The brakes are suitable for dynamic and static applications and vary in sizes from a 9-inch (22.86 cm) disc to 96 inches (243.84 cm).

Kobelt controls benefit supply vessels, and other related means of transportation exposed to salt water, because of their high standard of performance and the non-corrosive materials employed in their construction. Kobelt controls can be provided for any size of ship or any type of propulsion machinery such as CP propellers with automatic load control, reversing gear boxes (hydraulic or pneumatic) and direct reversing engines.



PNEUMATIC · CONTROL HEAD

*Single lever, twin-screw control of ships' propulsion machinery is possible with this control head made by J. Kobelt Manufacturing Co. Ltd.*



*J. Kobelt Manufacturing Co. Ltd. produces this B.B.A. automatic propulsion sequencing device for pneumatically operated reverse gear.*

235 East 5th Avenue • Vancouver, British Columbia V5T 1H2, Canada • Tel: (604) 879-2968 • Telex: 04-5540
Cable: KOBTROL

# LOCKHEED PETROLEUM SERVICES LTD.

To the offshore oil industry, Lockheed Petroleum Services (LPS), a subsidiary of Lockheed Aircraft Corporation, offers on a world-wide basis a total subsea oil and gas well completion and production system.

The LPS system places men and hardware on the ocean floor, where standard oilfield techniques are used in completing each subsea well and in linking it with subsea manifolding and production facilities. Lockheed equipment meets customer specifications with the company assuming full responsibility for design, engineering, installation and service.

Each wellhead and each manifolding and production unit is enclosed in an individual man-rated pressure chamber. Control valves, piping and production equipment are assembled in these chambers by men working in shirtsleeves in a normal one-atmosphere environment, using regular tools and techniques.

Flowlines, interlinking the various chambers, are drawn into ports in each chamber wall using a dry pull-in technique.

Transportation between the surface and each subsea chamber is provided by a one-atmosphere service capsule.

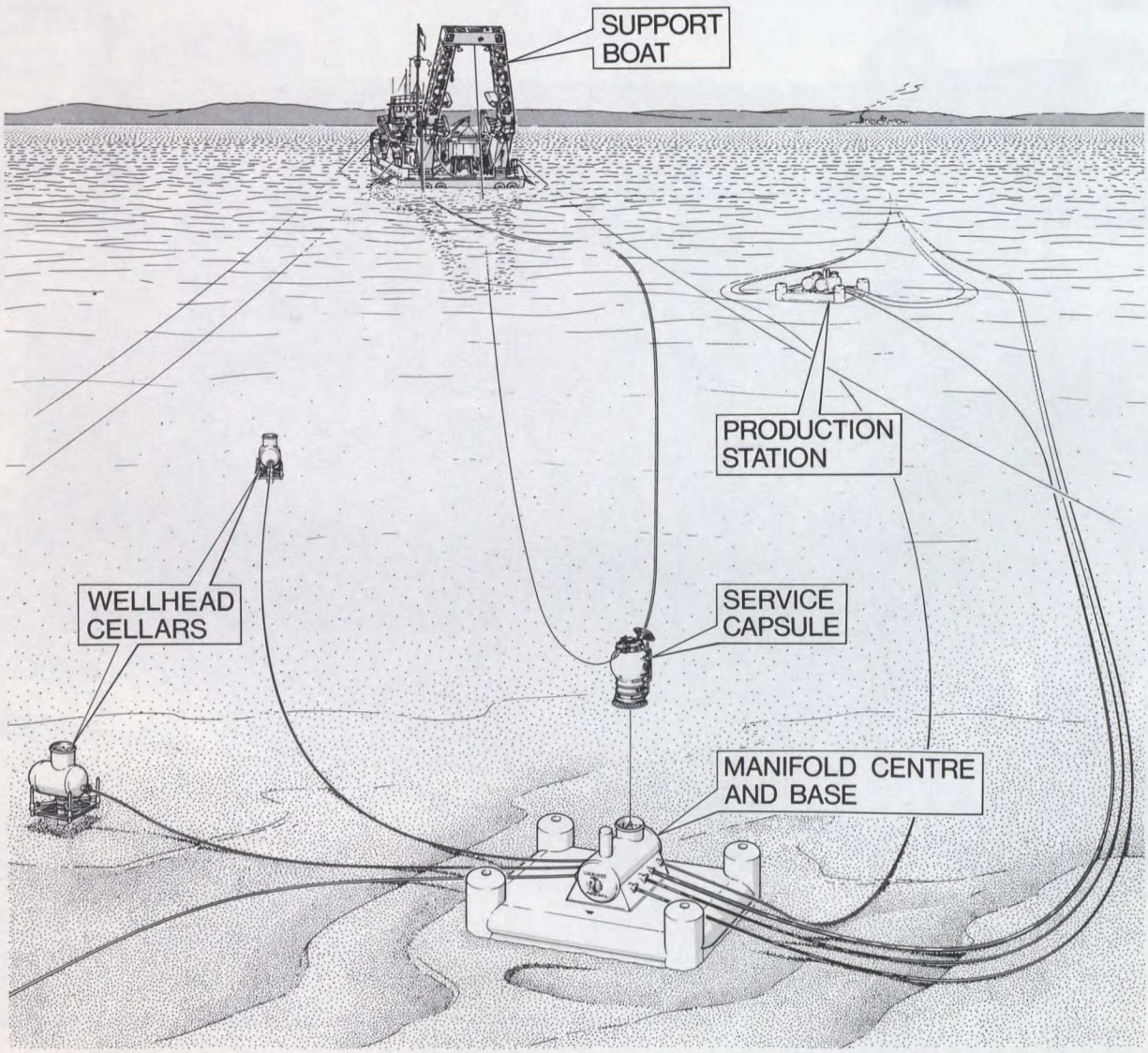



*Diagram illustrates Lockheed's total subsea oil and gas well completion and production system.*

610 Derwent Way • New Westminster, British Columbia V3M 5P8, Canada • Tel: (604) 524-4451 • TWX: 610-962-3959
Cable: LOPS

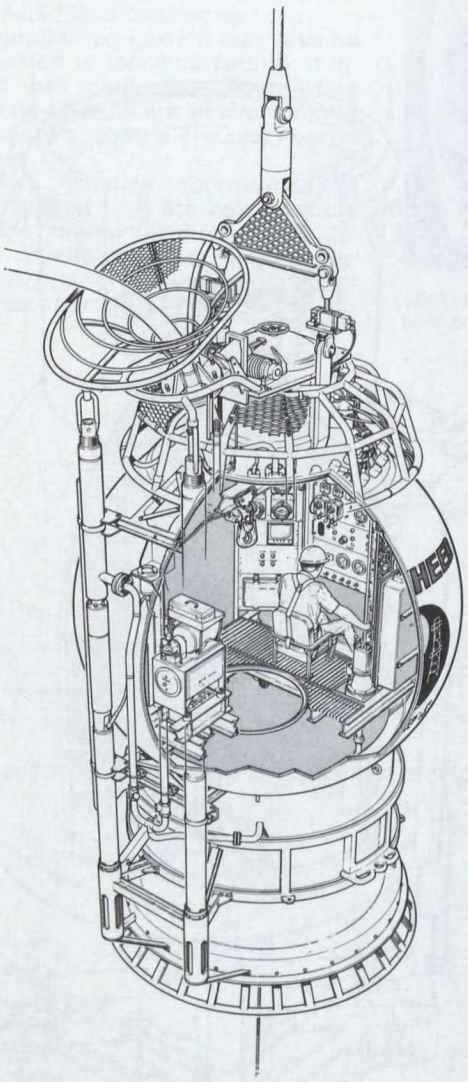
# LOCKHEED PETROLEUM SERVICES LTD.

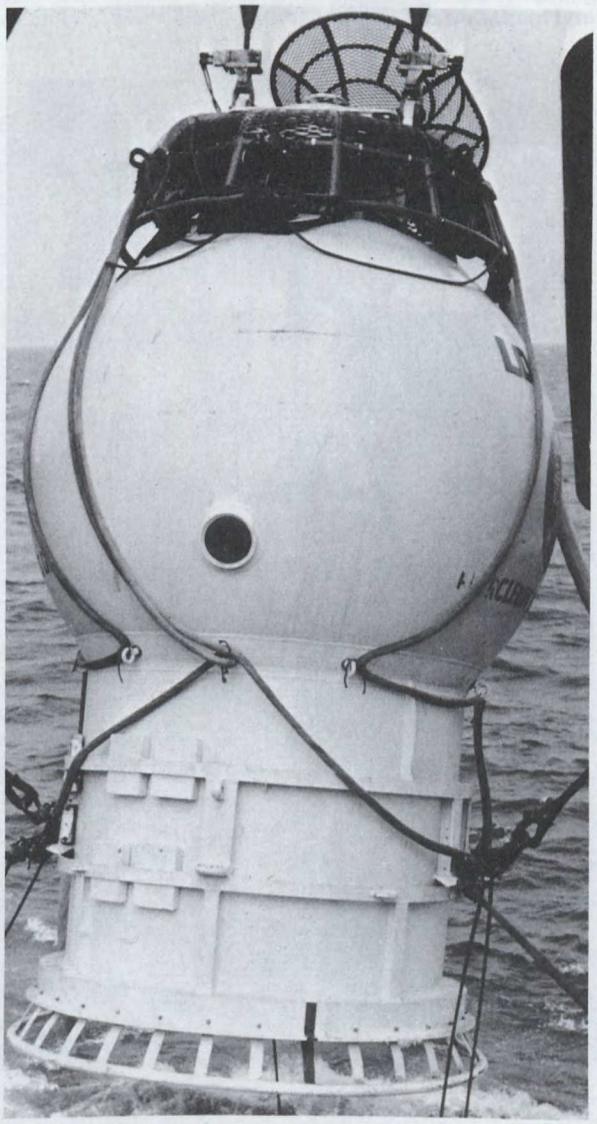
The heart of Lockheed's oil and gas well completion system is the service capsule — a tethered, positively buoyant submersible designed to convey men and equipment from surface to sea floor and back in a one-atmosphere environment.

Life support is normally provided by a buoyant, multi-cored umbilical which forms a permanent lifeline between the capsule and its surface support ship.

The umbilical continuously provides fresh air, exhausts stale air and supplies electric power, telephone, TV and instrumentation requirements.

The capsule incorporates numerous safety backup features. Should the umbilical be accidentally damaged, or deliberately severed by emergency cutters, automatic valves prevent entry of sea water into the capsule. A primary emergency breathing system purifies air trapped in the capsule, while a secondary emergency system supplies bottled air through breathing masks.





*On its way to service an underwater wellhead, an LPS capsule is lowered from a surface support vessel.*

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Cable: LOPS

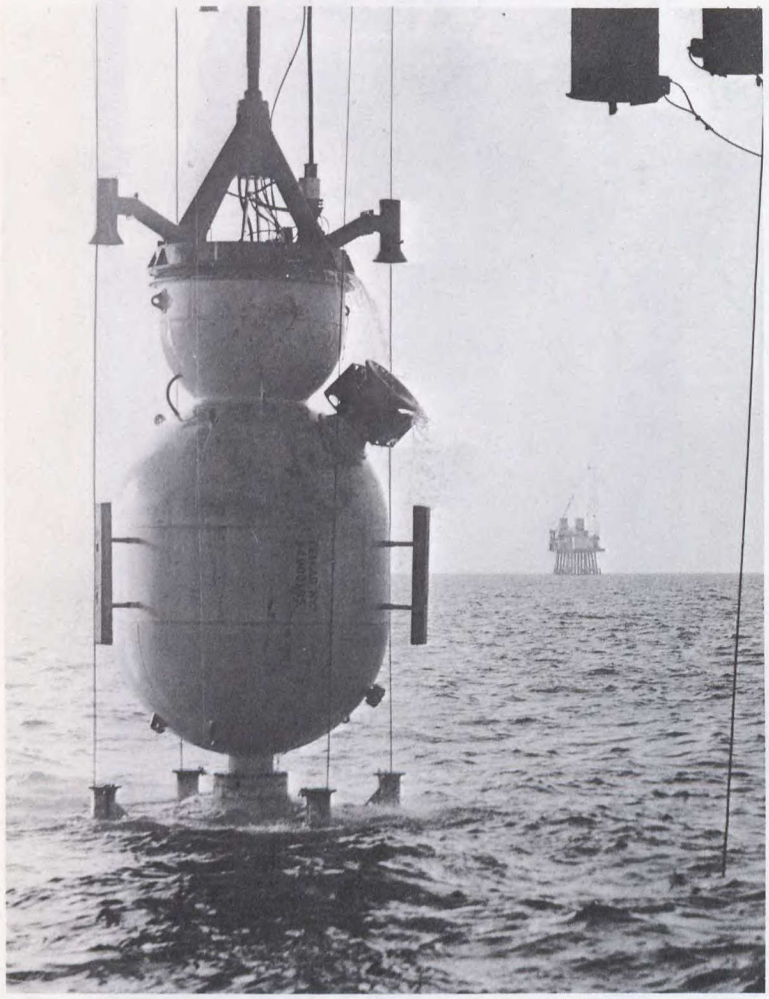
# LOCKHEED PETROLEUM SERVICES LTD.

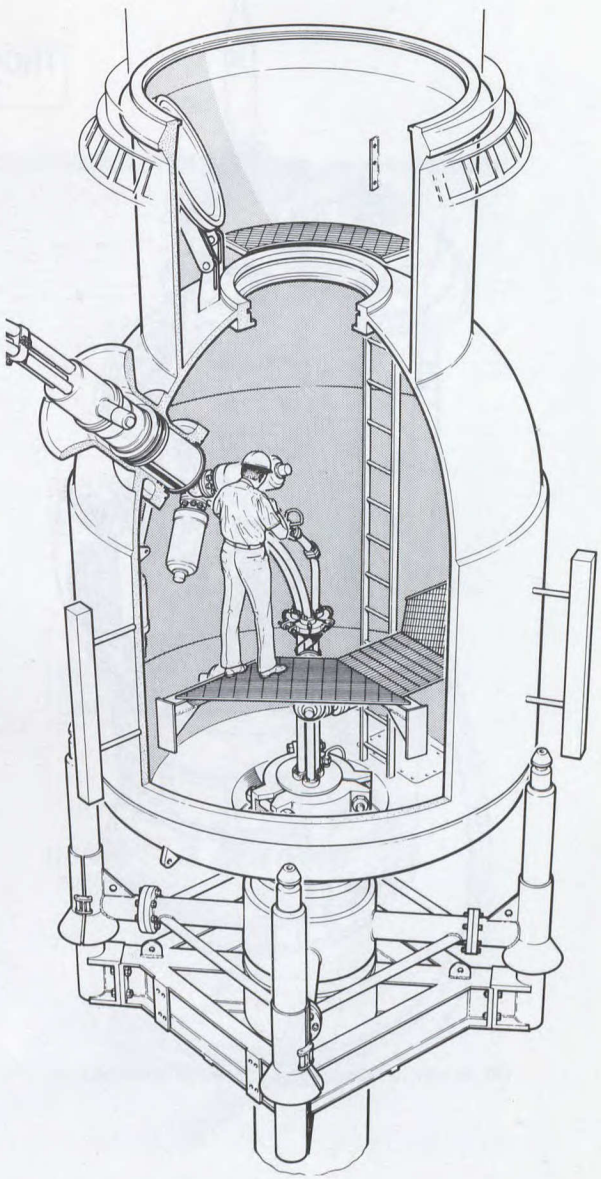
The LPS wellhead cellar is essentially a steel pressure vessel that encapsulates a "dry land" type of wellhead valve assembly in a dry one-atmosphere environment on the ocean floor.

Service personnel work within the wellhead cellar breathing air from the surface supplied by the service capsule umbilical. No special gas mixes or breathing apparatus are required and no time limit is placed on bottom operations which are performed in much the same way as those on land installations.

The wellhead cellar is made in four standard models, however, specific requirements of the customer can be accommodated. The range of standard wellhead cellars encompasses several options: TFL and non-TFL applications, cylindrical hulls oriented vertically or horizontally, and permanent or temporary encapsulation.

A vital function, the connection of flowlines, is accomplished by a proven LPS cable and winch pull-in method. The end of the flow-line, terminated by a bullet-shaped plug, called the "bull-nose", is drawn into a bell-mouthed port in the hull. All operations are performed without divers.





*The LPS wellhead cellar permits service personnel to work in a land-type environment below the surface.*

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Cable: LOPS

# LOCKHEED PETROLEUM SERVICES LTD.

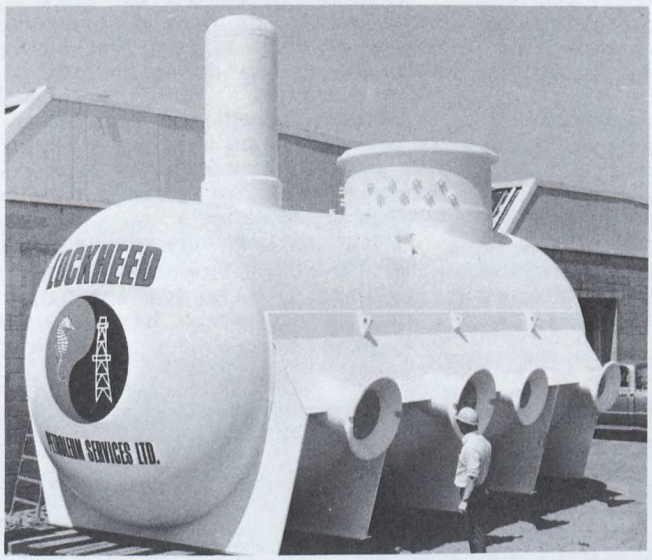
Lockheed's manifold centre is an ocean-floor habitat comprising:

- a man-rated, one-atmosphere steel pressure chamber, entered by means of the service capsule; and
- a base that forms the means of floating the chamber to a site and supporting and anchoring it on the ocean floor.

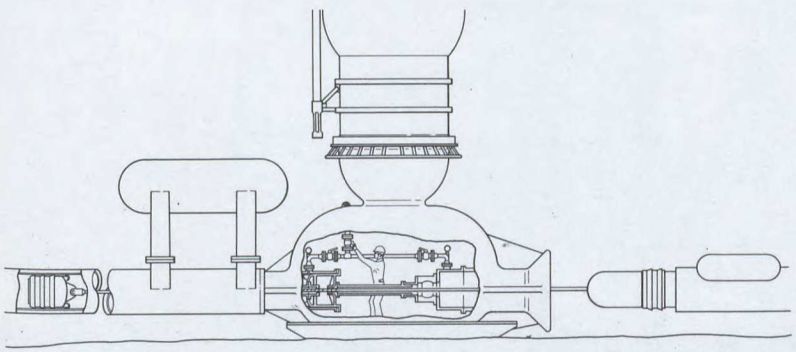
Manifold centres may be supplied to accommodate throughput from any reasonable number of wells compatible with specific field conditions.

Separation equipment may also be incorporated to facilitate testing of individual well production. By utilizing a dry, one-atmosphere environment, a wide variety of control systems may be employed.

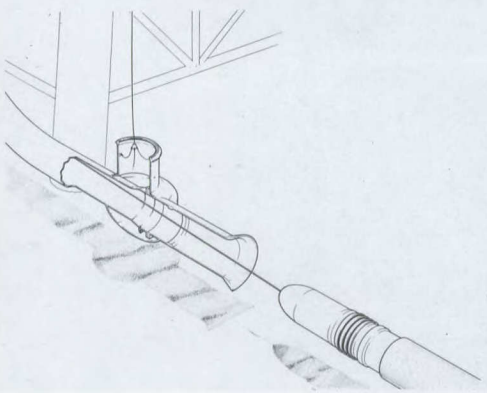
Subsea pipeline connections of larger diameter pipe are now possible using the one-atmosphere principle. Subsea pipe-to-pipe connections are accomplished by use of a pipe-pull connector chamber.



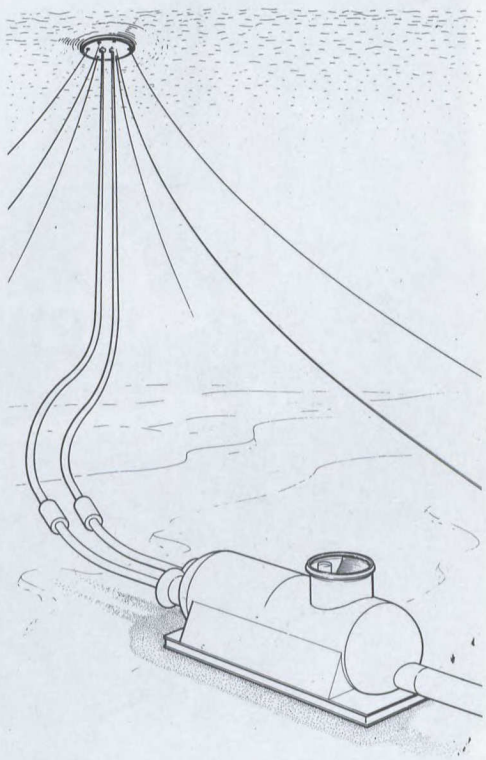

*Lockheed Petroleum's manifold centre houses valves, piping and controls for production from several subsea wells.*



*The pipe-pull connector chamber makes subsea pipe-to-pipe connections possible.*



*A man-rated connector chamber, structurally connected to the base of a platform riser, facilitates welding of large-diameter pipelines to the riser.*



*The chamber facilitates tie-in and replacement of single-point moor hoses without divers.*

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Cable: LOPS

# MARITIME INDUSTRIES LTD.

Operators of work barges and ferry fleets can put their propulsion and steering units into one compact, economical package, thanks to Maritime Industries Ltd.

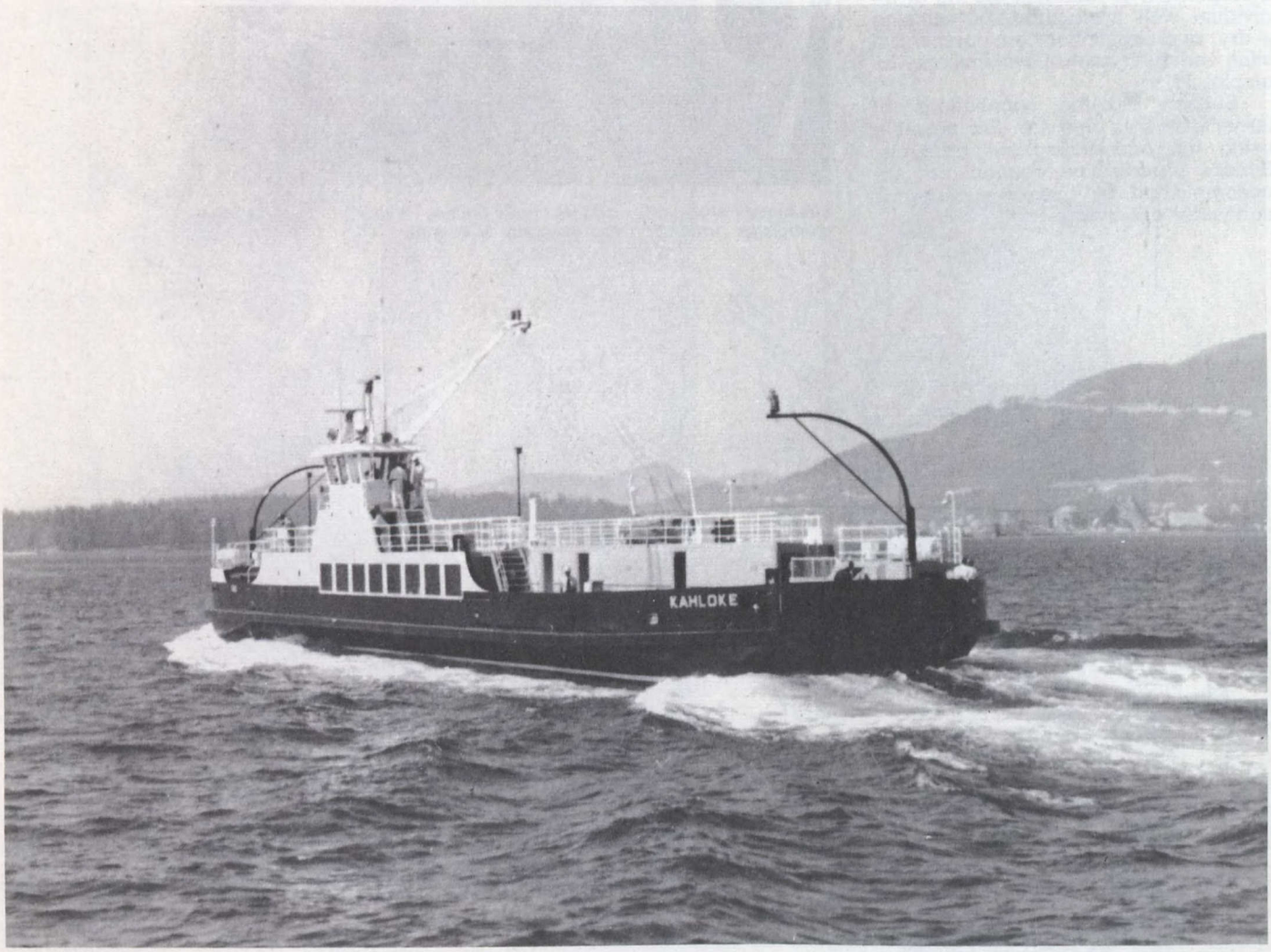
The company designs and manufactures a wide range of heavy-duty outboard propulsion systems and bowthrusters for a variety of marine applications. They range in power up to 800 hp with 360° infinite steering on a 1:1 ratio and are supplied in through-hull or over-stern configurations.

Over-stern types have 180° cockup, permitting full on deck maintenance without drydock support. This saves time and money during periods of heavy workloads.

Maritime Industries packaged steering and propulsion units are provided with detailed accessories for overseas bolt-on. Electric or hydraulic remote controls are available.

The propulsion units eliminate expensive engine room and steering system installations because the power plant, propeller shaft and steering system are incorporated in the package. New construction costs for scow-type load carriers are reduced while increasing payload per invested dollar.

Maritime Industries also produces 80 to 120 hp, 360° positioning units for floating cranes, dredgers, pontoon handling and other waterborne equipment. The bowthrusters deliver up to 9,000 lbs. (4,082 kg) of thrust.




*M.V. "Kahloke", a B.C. coastal ferry, uses two Maritime Industries' 365 hp Model L-295 outdrives. It carries one unit per side at opposite ends.*

6307 Laurel Street • Burnaby, British Columbia V5B 3B3, Canada • Tel: (604) 299-7591 • Telex: 043-54799
Cable: MARITAIR

# MLW INDUSTRIES

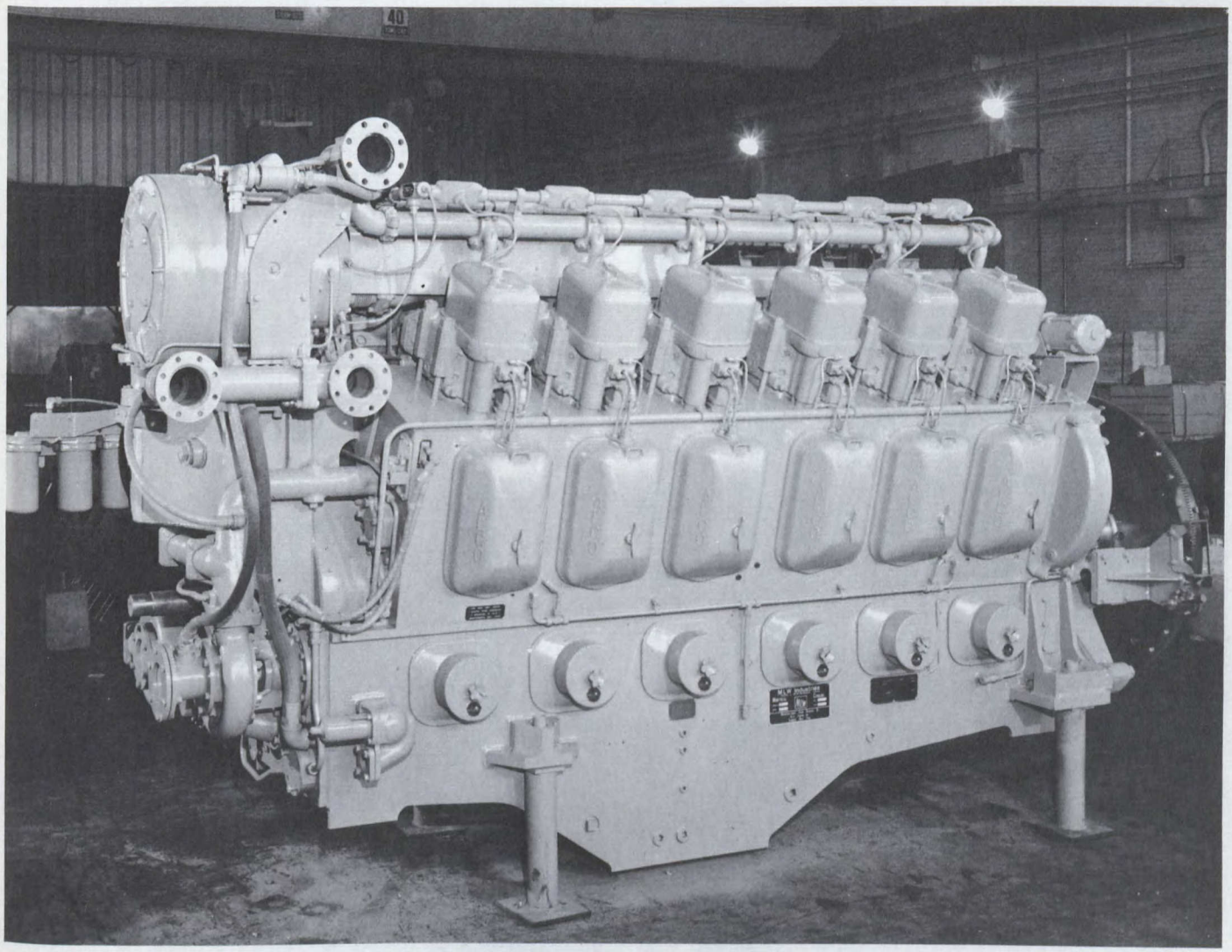
The Model 251 turbocharged, 4-cycle diesel engine manufactured and developed by MLW in Canada is an established power package used in such diverse fields as locomotive prime power units, electric power generation and marine propulsion units. More than 6,000 of these units are in use throughout the world with some 400 in marine service.

The marine version has an established record of reliability in a field even more varied than its land-based counterpart. It powers fishing vessels, ferries, supply ships, tugs, naval and Coast Guard ships, oil drilling rigs and Polar icebreakers. Nearly one million BHP of Model 251 marine engines are currently in operation or under construction.

The Model 251 is built in five sizes — 6, 8, 12, 16 and 18 cylinders with power ratings from 875 BHP to 4,000 BHP (887 CV to 4,055 CV). Principal features include: fully fabricated steel construction; rugged frame, block and components; fuel economy; simplicity of installation and servicing; compact dimensions and lightweight; and an established world-wide spare parts and service organization. MLW engines are in service in more than 33 countries.

The new Canadian Government "R" Class Icebreaker will be powered with six, 16-cylinder 251s and the same engines will provide main propulsion and ship service power for two large U.S. Polar icebreakers.

MLW's customer services are as world wide as the location of its engines and include application studies, technical assistance, technical liaison, spare parts supply, overhaul and repair facilities and a service school.



*The MLW Industries model 251 V 12F marine diesel engine has an output of 2,430 BHP at 1,000 rpm.*

1505 Dickson Street • Montreal, Quebec H1N 2H7, Canada • Tel: (514) 255-3681 • Telex: 01-20241 • Cable: MONLOCO

# NAUTICAL ELECTRONIC LABORATORIES LIMITED (NAUTEL)

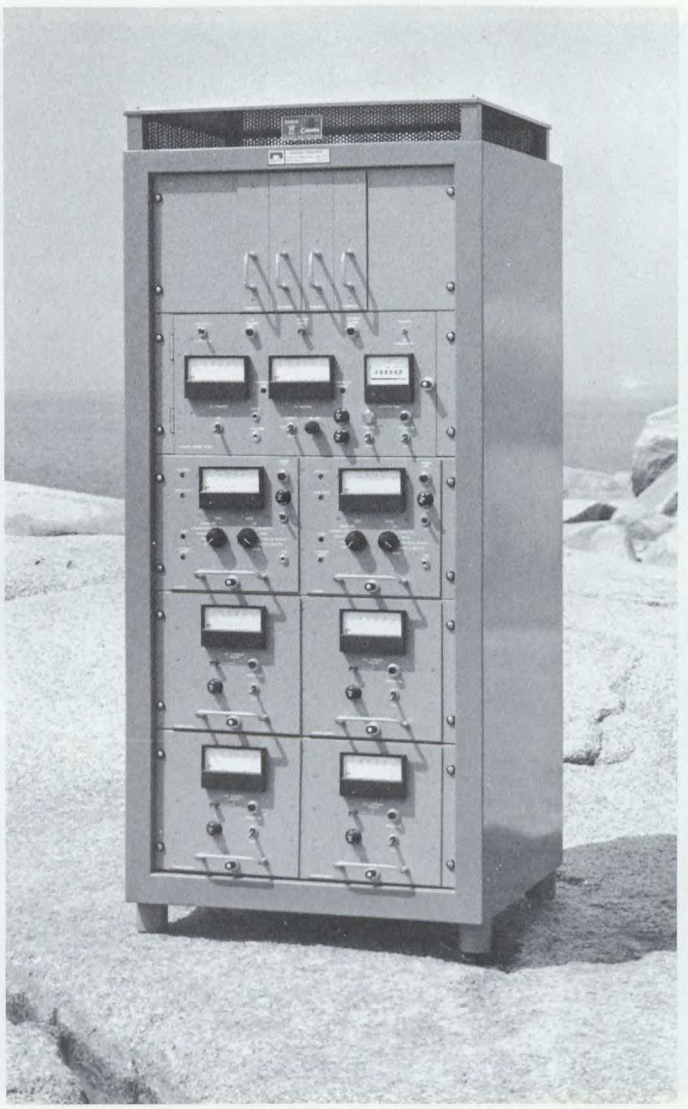
Radio transmission across rugged terrain in remote regions is no problem to Nautical Electronic Laboratories. This young company, founded in 1969, is a leader in the design of totally solid-state, high power transmitters. Its beacon systems and transmitters do not use vacuum tubes, resulting in high reliability and low maintenance requirements.

The company's non-directional beacons (NDB's),after official field reliability data was collected by the Canadian Government from 17, 500-watt installations ranging from Arctic tundra to the icebound coast of Labrador, showed an average mean time between failures of well over five years of continuous operation.

Reliability is achieved by NAUTEL through exclusive use of fully hermetic semi-conductor devices, simplicity of design, and the rigid maintenance of all component stresses well below the manufacturer's recommendations. A further powerful technique used in the higher power transmitters is that of producing the final output power from multiple R.F. amplifier modules operated in parallel but isolated from one another. With this arrangement, the rare occurrence of a failure within one module does not affect the others and, therefore, results in only slight reduction in output power.

High reliability and the absence of vacuum tubes to be replaced, drastically reduce both costs and maintenance. Their durability has been tested under varying climatic conditions from the Caribbean to India, from the Middle East to South Africa.

*A complete beacon installation by NAUTEL combines a 25-watt, solid-state locator beacon with the NA41C antenna.*



*NAUTEL's solid-state, non-directional beacon is made for radio transmission across rugged and remote terrain. Five-year continuous operation is normal for these beacons.*

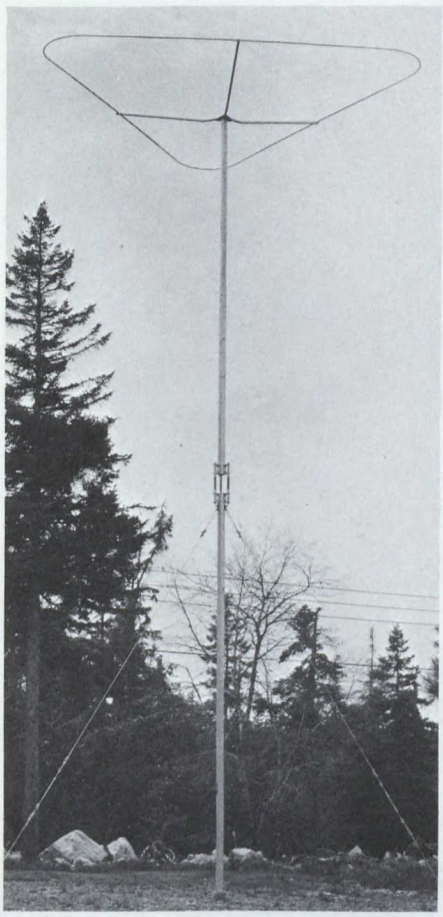
Hackett's Cove • Halifax County, Nova Scotia B0J 3J0, Canada • Tel: (902) 823-2233 • Telex: 019-22552

# NAUTICAL ELECTRONIC LABORATORIES LIMITED (NAUTEL)

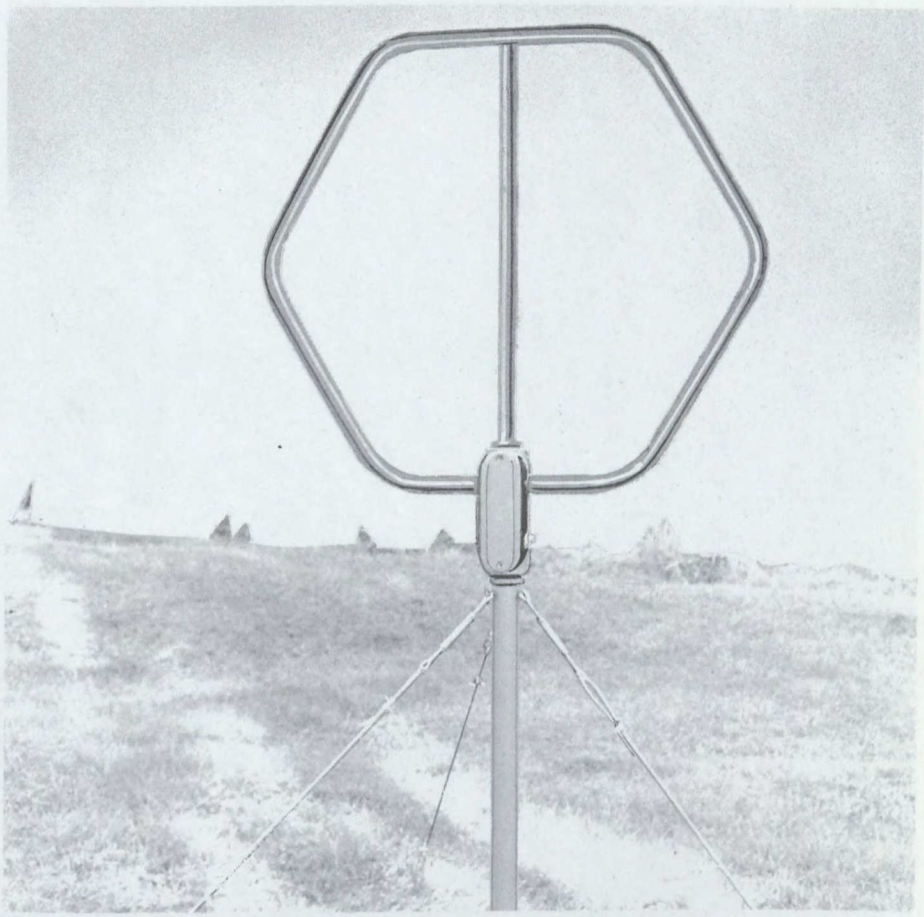
NAUTEL has applied its fundamental design approach to the problems of very long electrical wavelengths which occur in the LF and MF bands and has developed a new range of antenna systems to overcome the impractical dimensions that optimum antenna lengths require.

The tuned vertical radiator antenna, NA41C is designed for operation at low and medium power levels in the LF/MF bands. This top-loaded structure, standing only 41 ft. (12.49 m) high, with a guying radius of 20 ft. (6.09 m), matches the performance of an 80-ft. (24.38 m) whip. It is proof against mistuning due to wind motion and the detuning effects of ice. Danger of shock is reduced by having the lower half of the mast at ground potential. Shorter versions are available for operation in the HF band.

NAUTEL'S loop antenna (NLA) is designed for applications requiring a receiving antenna operating at a fixed frequency in the LF, MF or HF bands. It is ideal for use on drilling rigs because unlike the conventional antenna its operation is almost entirely unaffected by adjacent mechanical structures.



*NAUTEL's vertical antenna NA41C may be combined with the loop type for superior directivity characteristics.*



*This loop antenna (NLA), designed and built by NAUTEL, can be used on drilling rigs without interference from mechanical structures.*

Hackett's Cove • Halifax County, Nova Scotia B0J 3J0, Canada • Tel: (902) 823-2233 • Telex: 019-22552

# NORRIS WARMING CANADA LIMITED

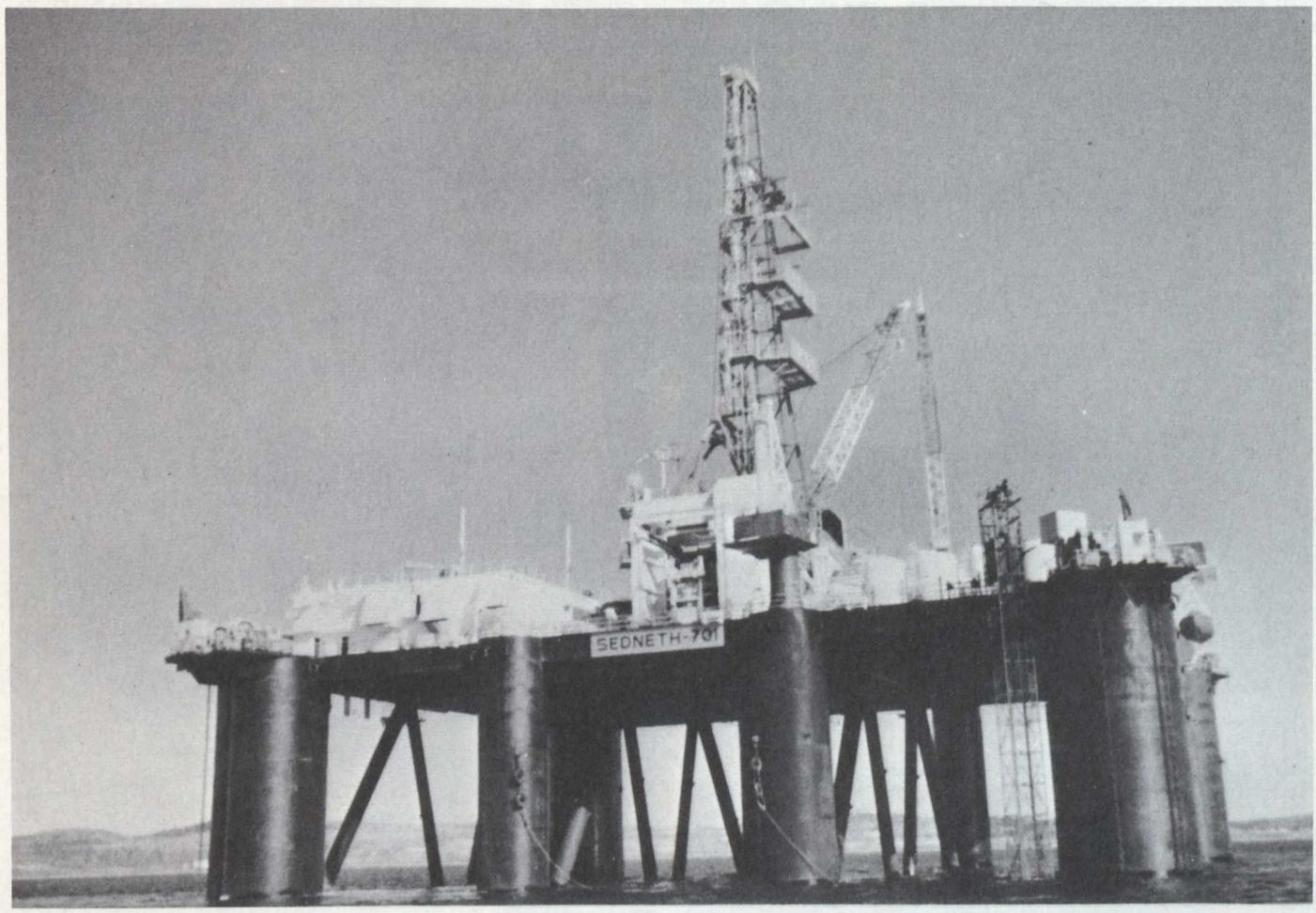
Twenty-eight years of marine experience in heating, ventilating and air conditioning plus engineering excellence have enabled Norris Warming Canada Limited to tackle any problem in environmental control especially in the living quarters or working areas of drilling rigs and ocean-going vessels.

In fact, Norris Warming Canada Limited has, for the past 15 years, supplied designs and equipment for almost all marine construction completed in Canada — a feat that ranks the company first in its field.

Norris Warming has provided equipment for rigs and commercial, government and naval vessels — operating from the Arctic to the tropics in every type of climatic condition. The company's systems and equipment have all been designed to meet special customer requirements.

Equipment supplied by Norris Warming includes air conditioners, filtration units, engine room fans and humidity controls. It also has complete engineering and design facilities.

With offices in the United States and Britain, and with agents in Europe, Australia, South Africa, Hong Kong, Greece, Japan and India, Norris Warming offers excellent service for its equipment throughout the world.




*Norris Warming Canada Limited designed and supplied the heating system for the Sedneth 701 drilling rig built by Halifax Shipyards. All living quarters are fitted with individual thermostats.*

1285 Hodge Street, Suite 315 • Montreal, Quebec H4N 2B6, Canada • Tel: (514) 748-6774 • Telex: 01-20271
Cable: NORRISCAN

# NORRIS WARMING CANADA LIMITED

*Equipment for heating, ventilating and air conditioning was designed and supplied for this offshore supply vessel by Norris Warming Canada Limited.*


*The Canadian Navy's "Quest" carries Norris Warming's electric reheat air conditioning system which is designed to operate during the silent mode of the vessel.*

1285 Hodge Street, Suite 315 • Montreal, Quebec H4N 2B6, Canada • Tel: (514) 748-6774 • Telex: 01-20271
Cable: NORRISCAN

# NORTHERN ASSOCIATES

Northern Associates is a prominent offshore consulting consortium based in Montreal. It includes four major long-established and internationally known companies:

The Tower Company (1961) Ltd. — Cold regions engineering. C. D. Howe Company Limited — Port engineers. German + Milne — Naval architects. ComDev Marine — Ocean systems and surveys.

Northern Associates provides wide-ranging offshore services around the world and in the polar regions, including:

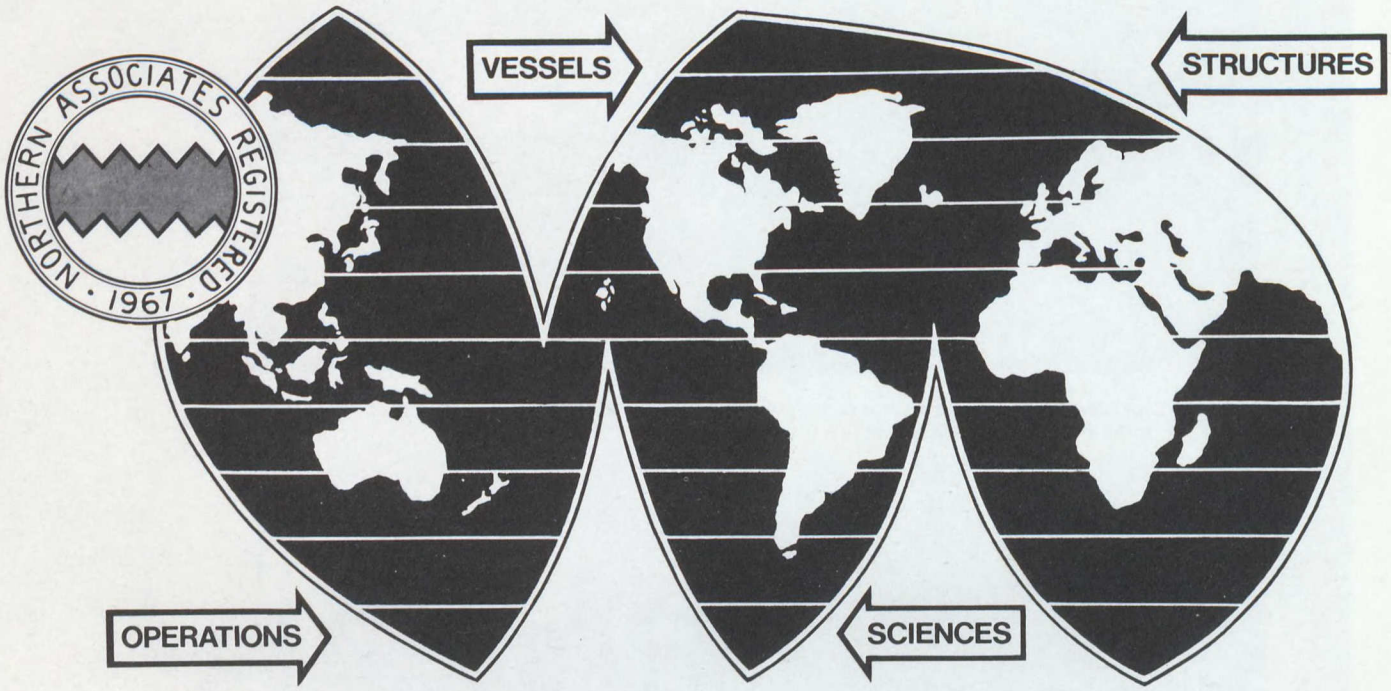
*VESSELS:* Ships, platforms, submersibles, hovercraft, supply craft.

*OPERATIONS:* Exploration, insurance, economics, surveys, nav-aids.

*SCIENCES:* Environment, ecology, oceanography, hydrography, geology.

*STRUCTURES:* Harbours, terminals, drydocks, bulk-handling installations.

Northern Associates is currently providing consulting services in the United States, Britain, other Commonwealth countries, Central and South America, Europe, the Middle East, Africa, India and Southeast Asia.



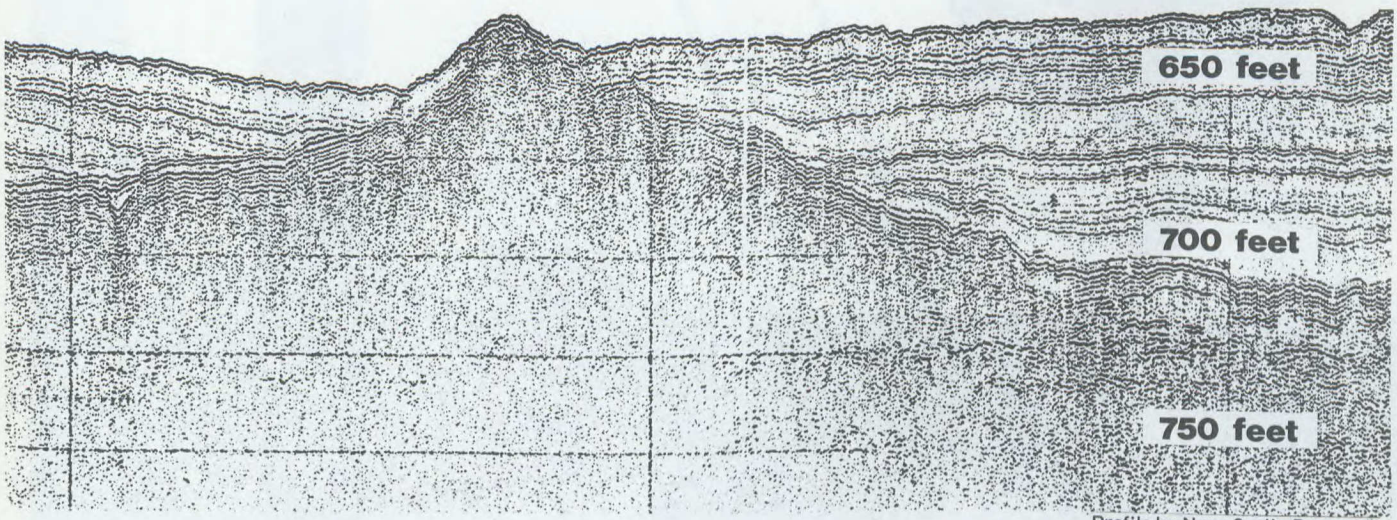

Suite 401, Dominion Square Building, 1010 St. Catherine Street West • Montreal, Quebec H3B 1G2, Canada
Tel: (514) 866-6093 • Telex: 05-268812 GERMIL • Cable: VALVE

# NOVA SCOTIA RESEARCH FOUNDATION

High resolution profiling of the seabed is among the specialized contract services offered to government and industry by the Nova Scotia Research Foundation (NSRF).

Using both commercial and specially developed geophysical equipment, including deep-towed underwater vehicles fitted with acoustic sources and transducers, the Geophysics Division of NSRF undertakes sub-bottom profiling in water depths to 1,000 ft. (304.8 m).

Where high resolution is required for location of pipelines, offshore drills and other bottom structures, the use of a deep-towed system offers substantial advantages in terms of superior resolution, penetration and the ability to operate in sea conditions exceeding 12 ft. (3.65 m).




Profile by Nova Scotia Research Foundation Bottom Profiling System, February 1973, Canadian Atlantic Shelf, Speed 5 Knots, Wave and Swell 12-15 Feet.

*This bottom profile was made by Nova Scotia Research Foundation's Sub-bottom Profiling System at a speed of five knots in sea state six (4.5 m waves).*

Geophysics Division P.O. Box 790, 100 Fenwick Street • Dartmouth, Nova Scotia B2Y 3Z7, Canada
Tel: (902) 424-4189 • Telex: 019-22719

# NOVA SCOTIA RESEARCH FOUNDATION

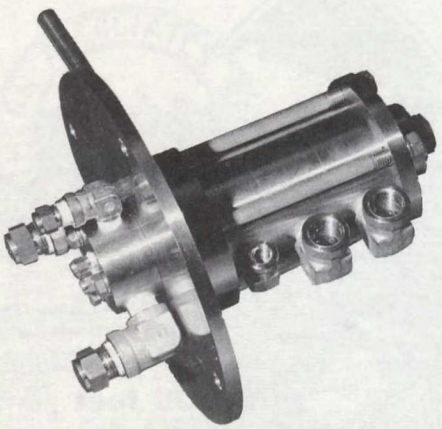
The Nova Scotia Research Foundation has developed several types of slip ring assemblies for winches in towed sensor systems and diving bell applications.

These include a compact rotary gas valve for the transfer of high pressure (1,000 psi) oxygen and helium with extremely low leakage. Rugged construction, low torque, and completely dry (no lubricants) operation ensure high realibility and safety.

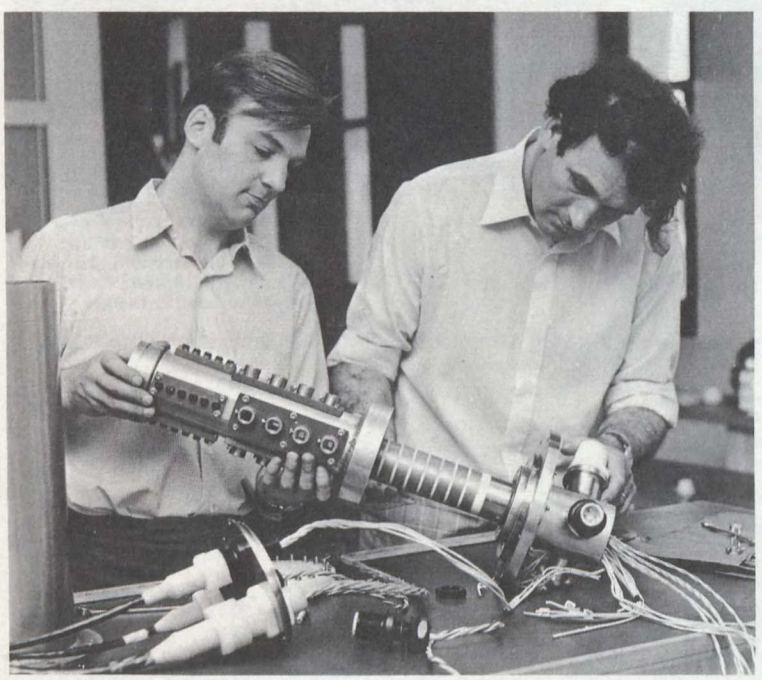
In electrical slip ring designs, Nova Scotia Research has accommodated power levels up to 60 amps, 440V per ring, pulsed power levels up to 800 joules at 10,000V, in addition to low noise signal circuits. Installations in the past three years have included power/signal slip rings on diving bell winches and high voltage/signal slip rings on towed body echo sounding and seismic system winches.

All designs emphasize ruggedness, good sealing, and maintenance-free operation. Accumulated detail design and practical experience can be adapted to meet the individual needs of new systems.

Other ocean-oriented products include a tough, flexible resistance-type wave measuring unit featuring ease of installation and resistance to abrasion and a compact, sealed battery-powered chart recorder capable of six months unattended operation monitoring temperature, pressure, sound level or other suitable parameters in remote or submerged locations.



*Three-port rotary gas valve 9.5 in. long x 5 in. diameter (24.13 cm x 12.7 cm) passes 1,000 psi helium and oxygen to diving bell and has third sampling port.*



*Electrical slip ring assembly has eight power rings carrying 40 amps at 440V per ring for power circuits and 12 signal rings for communication circuits to diving bell.*

Engineering Physics Division P.O. Box 790, 100 Fenwick Street • Dartmouth, Nova Scotia B2Y 3Z7, Canada
Tel: (902) 424-4189 • Telex: 019-22719

# OCEAN ENGINEERING CENTRE

The Ocean Engineering Centre of B.C. Research specializes in various types of analysis, measurement, testing, materials science and innovative design. Major effort is concentrated on problems of working in rough weather and underwater, and on comprehensive evaluation of the properties of ferro-cement.

The Centre is building a ship model laboratory which will include a towing tank and a manoeuvring basin. By mid 1975, it will be able to conduct hydrodynamic tests on models.

The Ocean Engineering Centre provides such services as:

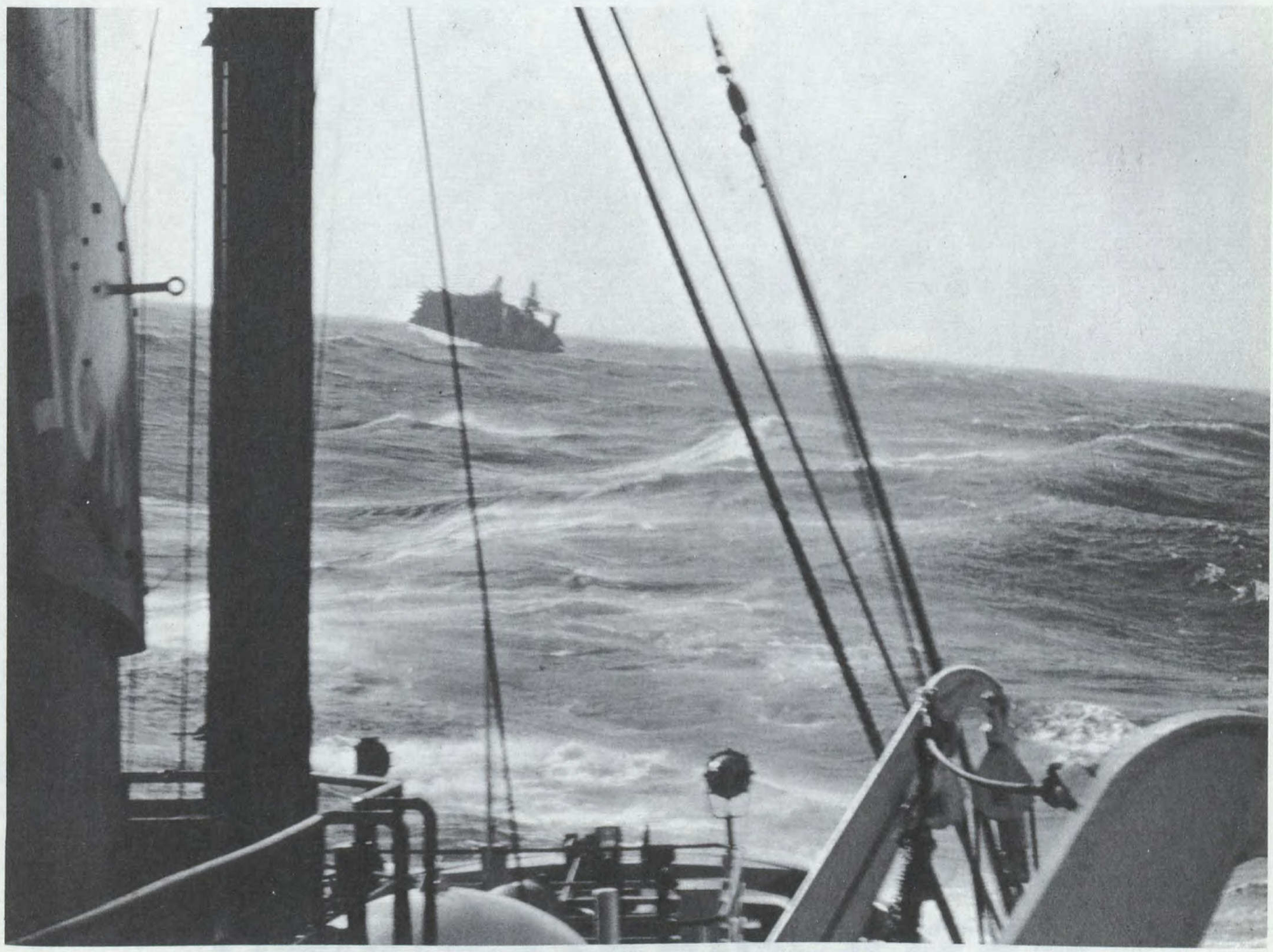
*Measurement and Testing:* sonic testing of timber piles, ship vibration, hull stresses, cable tension, ship and towed-body motions, wave buoys, shaft torque and horsepower, pumps and hydraulic mechanisms, precision alignment and deflection, water quality and pollution.

*Materials Science:* evaluation and application of materials, metallurgy of failures, corrosion and protective coatings, properties of ferro-cement.

*Analysis:* stress of structures, computer simulation of submerged cable dynamics, towing systems dynamics, motion compensator devices for marine handling systems.

*Innovative Design:* handling systems for submersibles, diving bells and towed bodies; constant-tension winches; cranes and drilling systems; submersible pumps for seawater and air/gas/liquid mixtures; propulsion drives; fish-sorting systems.

*Hydrodynamic Model Tests* (available mid 1975): in deep or shallow water, with captive or free models, floating or submerged, in seas at all angles. Tests will be for resistance, propulsion, stability, induced bending moments, steering and manoeuvring. Artificial ice will be used for ice-breaking tests. Long-chain polymer additives will be used for correction of scale effects.



*Rough weather towing dynamics are investigated by the Ocean Engineering Centre of B.C. Research.*

B.C. Research, 3650 Wesbrook Crescent • Vancouver, British Columbia V6S 2L2, Canada • Tel: (604) 224-4331
Telex: 04-507748 • Cable: RESEARCH BC

# OFFSHORE SERVICES ASSOCIATION LIMITED (OSA)

Eleven major Newfoundland companies have combined their resources and world-wide connections in the consortium known as Offshore Services Association Limited (OSA).

This consortium provides local service to the offshore oil industry through its own facilities and through joint-venture agreements with national and international corporations. OSA aims to be the service centre of the Atlantic coast, and is ready to help in every possible way in the development of oil in Newfoundland's offshore waters.

The member companies of Offshore Services Association Limited have the financial resources, staff, service facilities, equipment and other products to meet any of the existing demands of the offshore exploration program. They offer their services on a 24-hour basis for the benefit of oil rigs that need help in a hurry. Hundreds of skilled tradesmen and specially-trained service representatives are readily available.

Among the products and services available from OSA are: heavy equipment, machinery and machine shops; steel fabrication; electrical contracting and marine electronics; mechanical contracting; shipping; trucking; construction; engineering and technical services; insurance; marine engines; office equipment and supplies; food, ships' chandlery and general supplies; industrial hardware; and public warehousing.

Future plans of OSA include establishment of complete service base facilities for oil rigs and supply vessels.

**Offshore Services Association Limited**

P.O. Box 485, National Harbours Board Building • St. John's, Newfoundland, Canada • Tel: (709) 753-3682
Telex: 016-4550

# PEDERSON INDUSTRIES LIMITED

Pederson Industries Limited is engaged in the research, development, production and marketing of industrial products for ocean science applications.

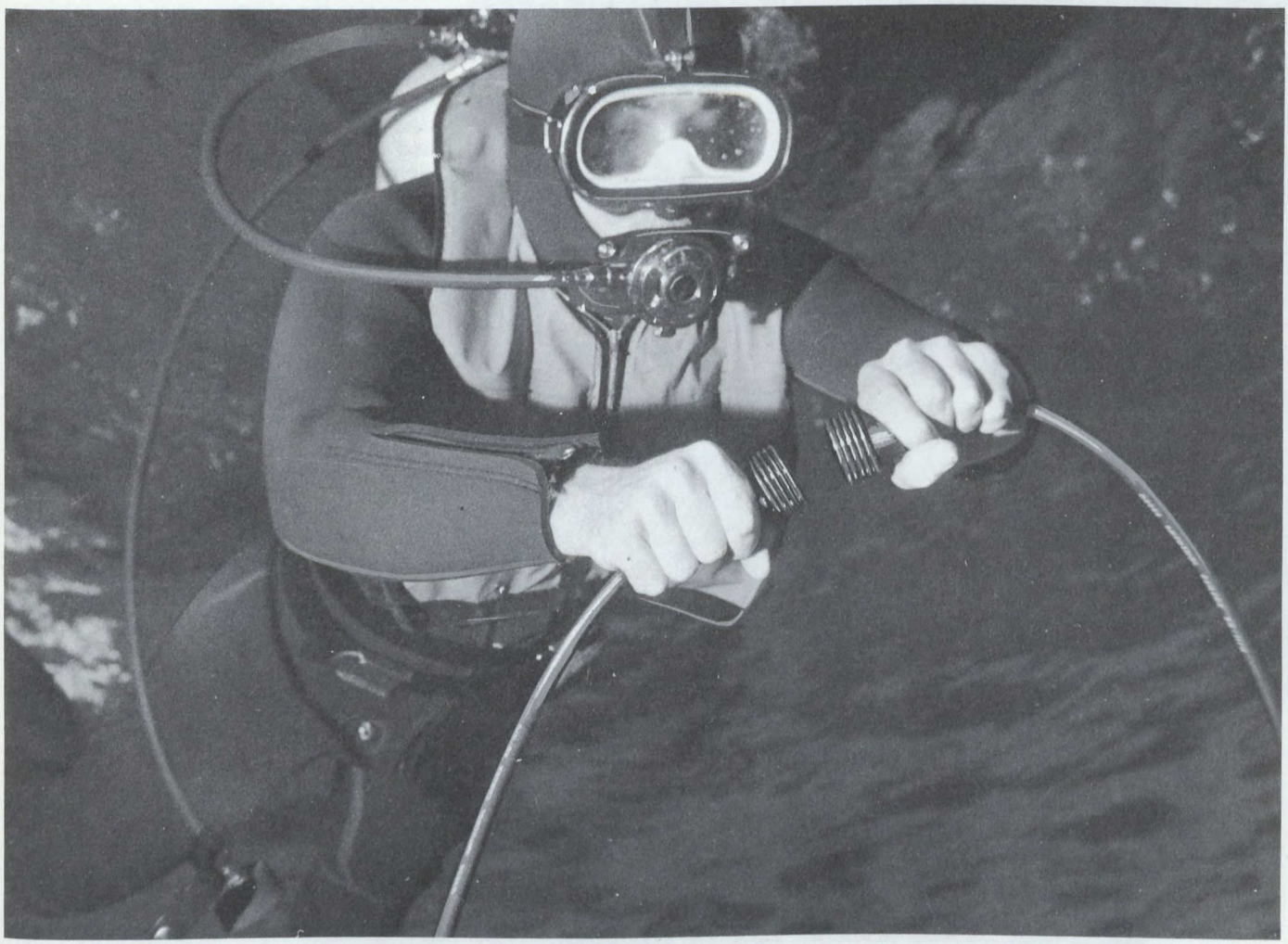
The firm is noted for its Pelcon Connector. Designed to function at maximum efficiency in underwater and salt-spray environments, the Pelcon Connector is used in underwater television, voice communications and monitoring of sonar systems.

The unique electrical and mechanical capabilities of the Pelcon Connector result from using electromagnetic induction as the means of transferring electrical energy and signals.

Other features of Pelcon Connectors are:

- Pressure-tested to 20,000 psi.
- Efficient handling of audio, ultrasonic, HF, VHF, UHF signals and fast rise-time digital pulses.
- Multi-channel and multiplexing capabilities.
- Impedance matching capability.
- Spark-proof, explosion-proof and shock-proof.
- No metal-to-metal contact.
- AC power connectors for total fail-safe underwater connections and applications.

Pederson Industries Limited exports to the United States, Britain, France, Norway, Sweden, The Netherlands, Germany, Italy and Turkey.



*Pressure-tested to 20,000 psi, Pelcon Connectors manufactured by Pederson Industries Limited are used for underwater television, voice communications and monitoring of sonar systems.*

1 Caesar Avenue • Ottawa, Ontario K2G 0A9, Canada • Tel: (613) 825-4646

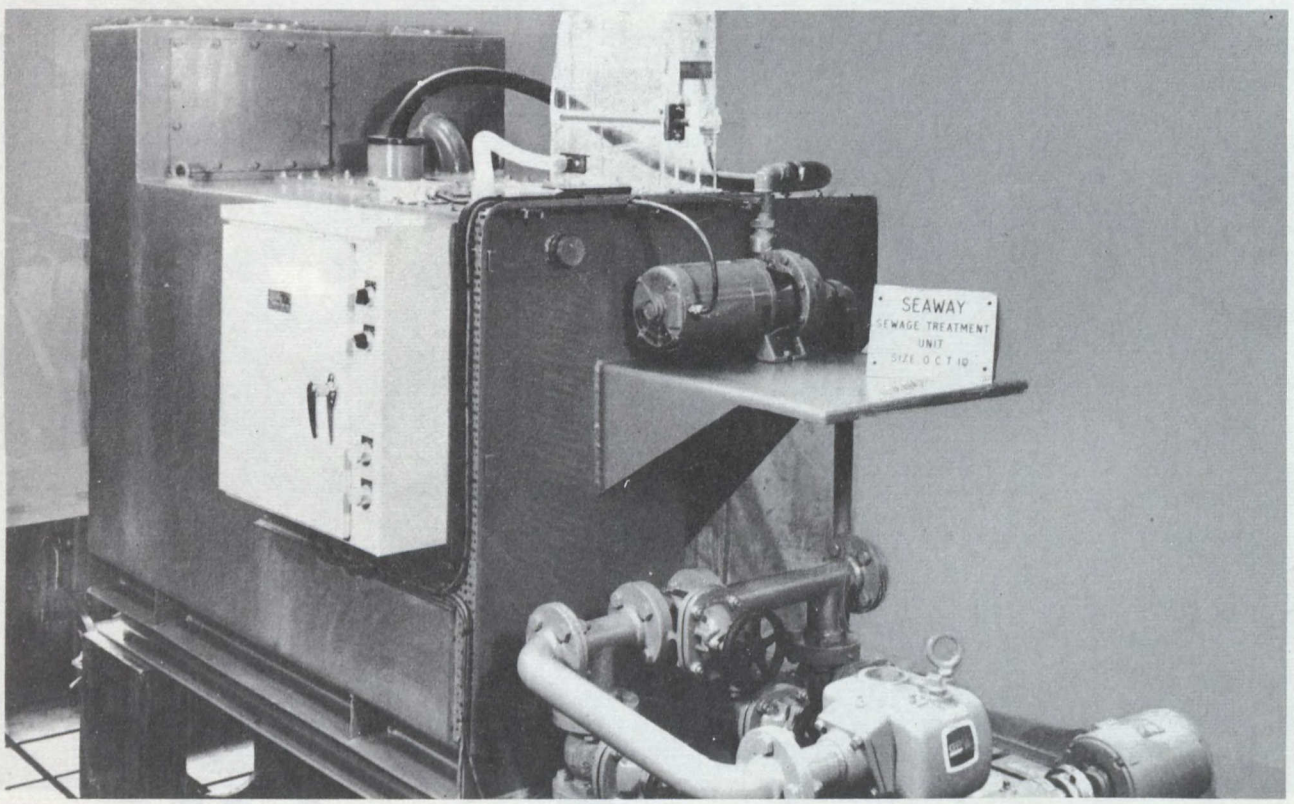
# POLLUTION CONTROL SYSTEMS (INTERNATIONAL) LIMITED

Pollution Control Systems (International) Limited has been manufacturing and marketing water pollution control equipment for 20 years.

To help combat the pollution of coastal waters, inland waterways and harbours, the firm offers its Seaway line of shipboard sewage and water treatment systems. Used successfully in more than 1,000 vessels throughout the world, the systems are trouble-free, require little maintenance and are readily adapted to space limitations.

The Seaway sewage unit passes sewage through four compartments for super-chlorination before pumping it out as harmless sterile liquid. The system operates automatically on a continuous cycle in which the pumps are the only moving parts.

Distribution and service are worldwide.




*Pollution Control Systems International produces its Seaway line of sewage treatment units for use on ships.*

27 Guardsman Road • Thornhill, Ontario L3T 2A1, Canada • Tel: (416) 889-9405 • Telex: 06-964593
Cable: SAFEWATERS

# R.B.H. CYBERNETICS (1970) LTD.

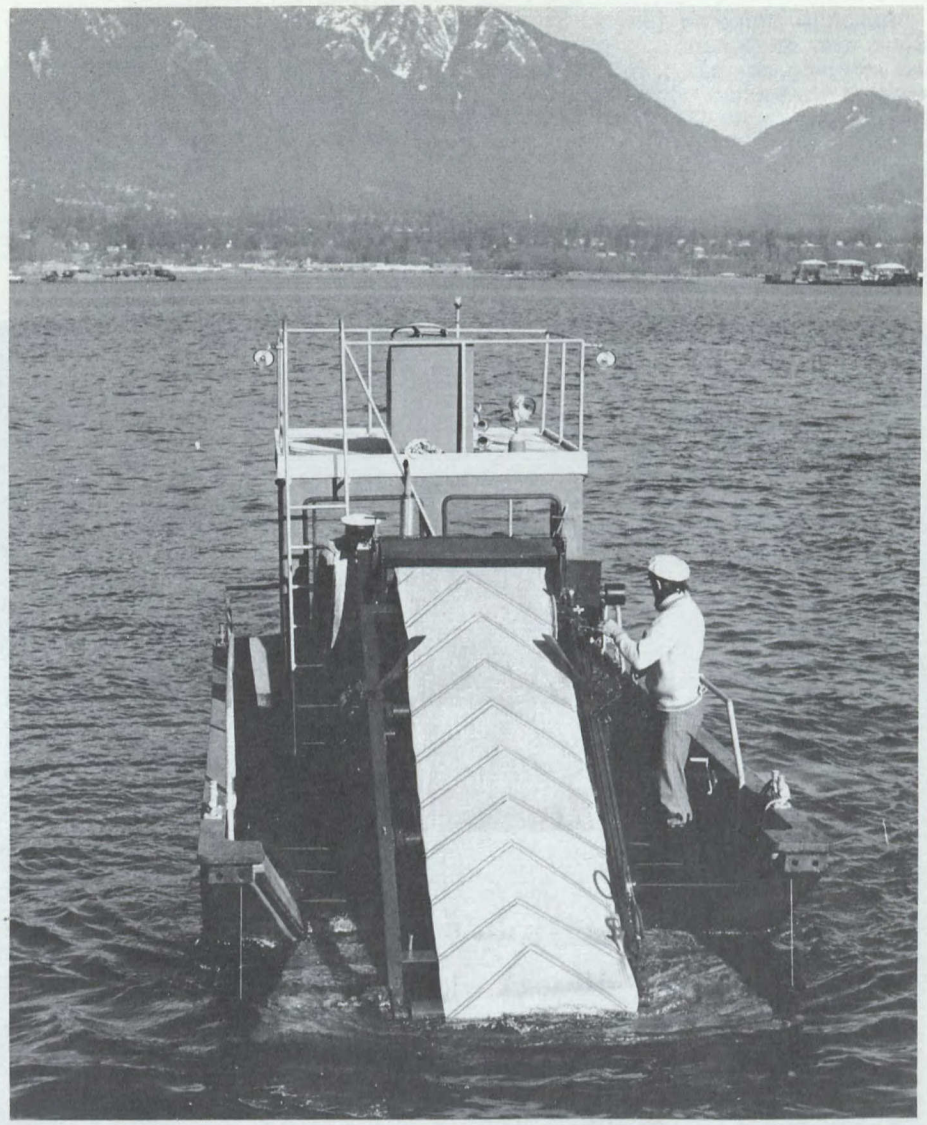
R.B.H. Cybernetics (1970) Ltd. is a leader in the fight against oil spills and has established representatives in many countries throughout the world. Its weapon is the Slicklicker, a highly efficient oil recovery machine that can pick up 40,000 Imperial gallons (180,000 to 225,000 litres) of oil per day from a water surface.

The Slicklicker has this advantage over other oil recovery systems: the end of the pick-up boom need not be held at the oil-water meeting point. Since belt and roller can extend into the water, the Slicklicker can be used under any wave conditions that its supporting vessel can tolerate.

During testing, the Slicklicker recovered 98 per cent crude in a medium ocean swell condition. This performance is a result of "preferential wetting" by which oil wets a treated belt but water does not. Thus an extremely clean separation is achieved.

R.B.H. Cybernetics also makes the Oleovator, an explosion-proof model of the Slicklicker. This is used in refineries to improve efficiency of A.P.I. Separators. It can also be used in any inplant situation where it is necessary to separate non-miscible liquid from water. The Oleovator is unique in that it picks up and breaks down emulsions to reduce the amount of de-emulsifier needed. Considerable savings occur in most instances.

Although Slicklickers can be mounted on any boat with a relatively low freeboard, Cybernetics recommends the Pelikan Cargo Landing Craft which has been designed to carry the Slicklicker and up to 4,000 gallons (18,184 litres). The Pelikan has a foam-case skin, in effect a double skin, and a shallow draft for inshore work. It is highly stable, and quickly reaches the scene of a spill. The Pelikan CLC is also available in aluminum.



*Mounted on a Sea Truck, one of R.B.H. Cybernetics' Slicklickers undergoes trials in waters off Vancouver, British Columbia.*

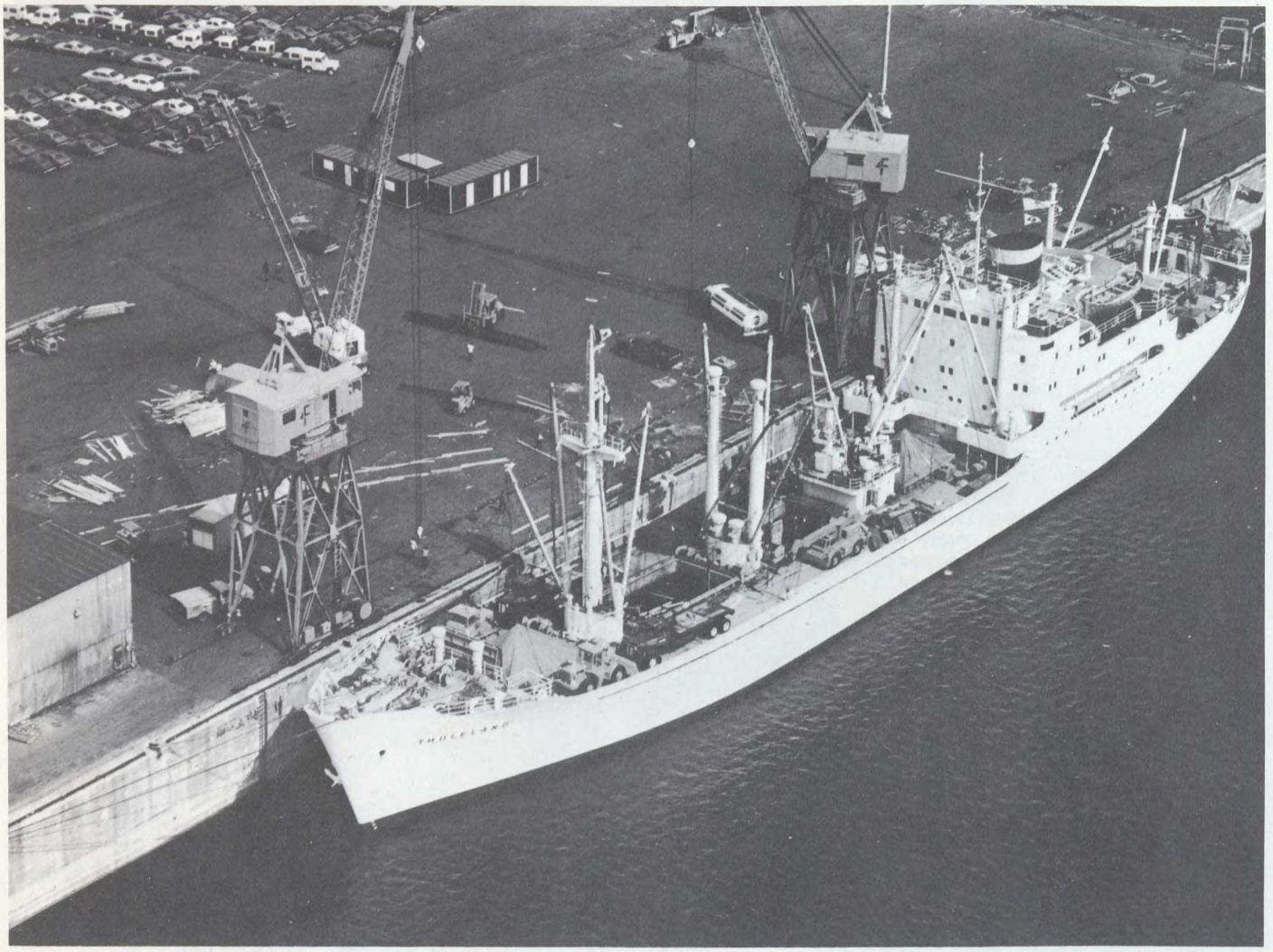
P.O. Box 4205, Postal Station A • Victoria, British Columbia, Canada • Tel: (604) 658-5713 • Cable: CYPAPCO

# RESOLUTE SHIPPING LIMITED

Resolute Shipping Limited is the arctic arm of Canada's largest deep sea shipping company, Federal Commerce & Navigation Company Limited. The company, with more than 20 years of arctic shipping experience, owns and operates specialized ice-class tankers and dry cargo vessels on a world-wide basis.

Every summer, from ports in Europe, the United States and Canada, its fleet of modern ships, barges, tugs and ancillary support equipment sails to arctic sites stretching from Spitsbergen to Eureka Sound and the Sverdrup Islands.

The search for oil, gas and minerals has changed the makeup of cargo in recent years. Resolute ships, formerly engaged largely in government-sponsored sea lifts to the north, are now increasingly employed by private industry. They transport oil rigs, mining equipment, housing and fuel for exploration in arctic regions. During the short and hectic arctic summer, the Resolute ships make as many as 15 voyages to northern sites, carrying cargo up to 50,000 tons (45,359 metric tons).



*Cargo bound for the high Arctic is loaded aboard M.S. "Thuleland", part of Resolute Shipping's service fleet, at Montreal.*

3800 Stock Exchange Tower, Victoria Square • Montreal, Quebec H4Z 1C4, Canada • Tel: (514) 878-1631
Telex: 01-2933 (FEDNAV) • Cable: RESOLUTESHIP

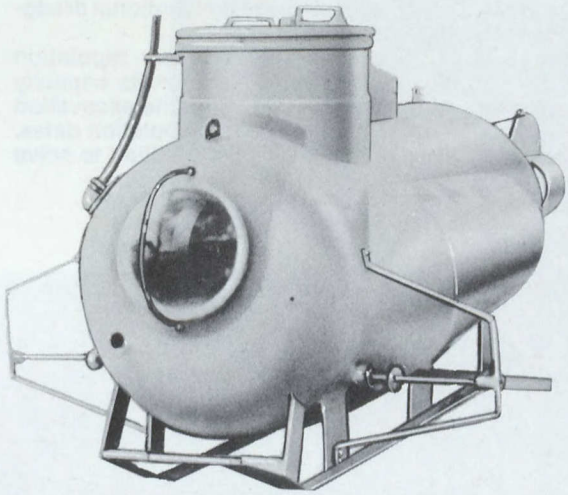
# ROBB ENGINEERING

Robb Engineering, established in 1848, has its roots in the history of Canadian building. Today it also serves the petroleum and oceanographic industries.

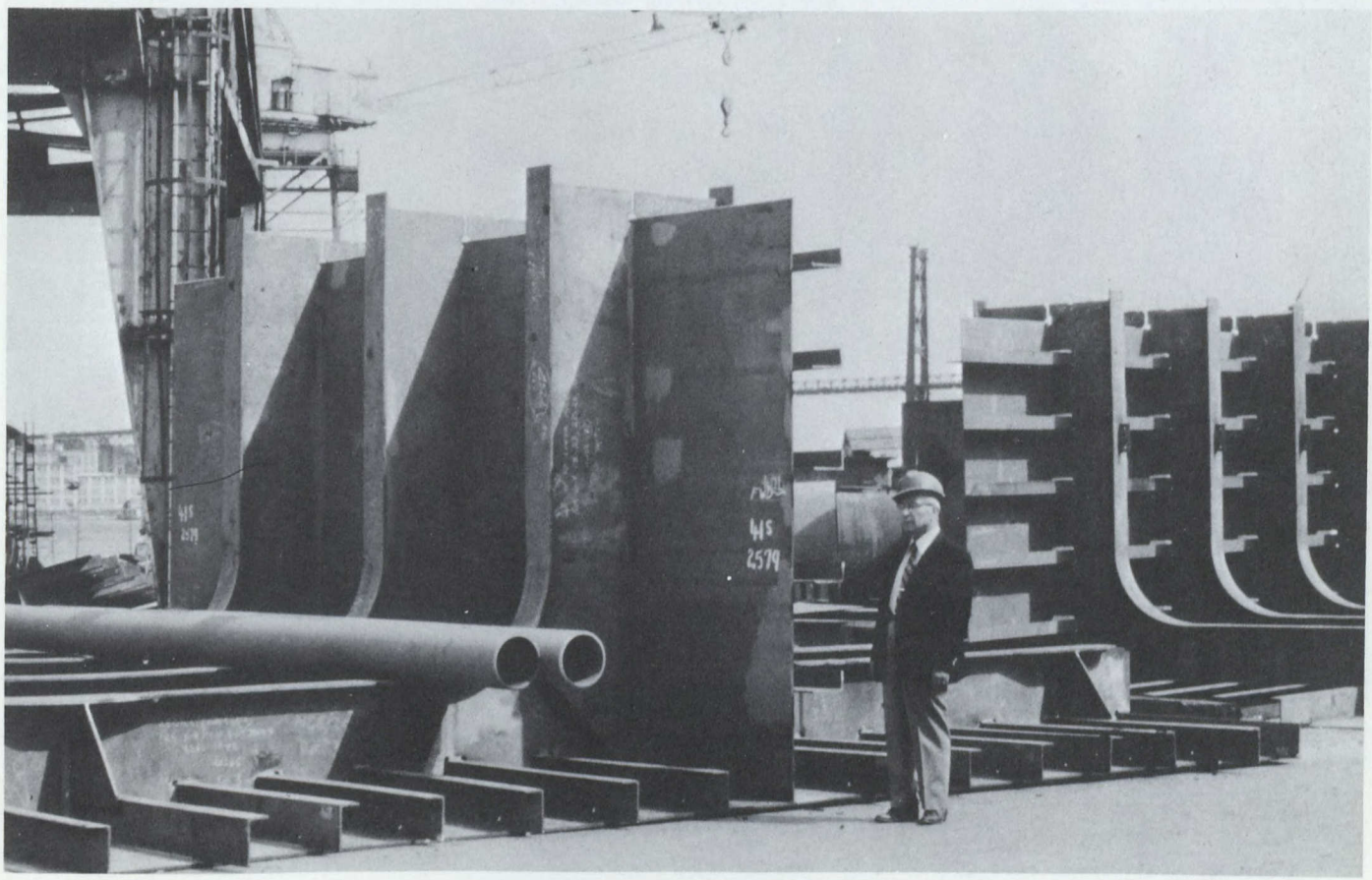
The company's Marine Division, as a subcontractor to local shipyards, fabricates structures ranging from mini-submarines and pontoon sections to substructures and deck houses for semi-submersible oil drilling rigs.

It also makes wave traps, gallow frames and associated equipment for fishing vessels.

Robb Engineering's Structural Division fabricates and erects stationary platforms for land-based drilling rigs. This work is all performed to customer design and specifications.



*Fabrication of mini-subs can be undertaken to customer specifications by the Marine Division of Robb Engineering.*



*Components for offshore drilling rigs are built by Robb Engineering's Marine Division.*

Division of Dominion Bridge Company, Limited • 51 LaPlanche Street, P.O. Box 490 • Amherst, Nova Scotia B4H 4A3 Canada • Tel: (902) 667-3801 • Telex: 019-33527

# SCEPTRE DREDGING LTD.

Effective and economical solutions to dredging problems are offered by Sceptre Dredging Ltd., an experienced company that accepts the challenge of dredging operations anywhere.

In the highly specialized field of dredging with portable equipment, the company has achieved international leadership. Portability of its equipment enables the company to transport and assemble units in remote areas not easily accessible to conventional dredging units.

Sceptre's world-wide reputation has been built, in part, on its capacity to solve problems of marine excavation and to meet exacting completion dates. Equipment is built or modified to solve specific problems.

The company's experienced personnel are ready to take on the most demanding projects. In the past, they have worked round-the-clock, seven days a week, in near tropical heat or Arctic cold and sometimes dredging as deep as 130 ft. (39.62 m) over highly irregular surfaces, to complete a job on time.

*The considerable amount of dredging required to construct the Robert Banks Superport near Vancouver, British Columbia, Canada, was carried out by Sceptre Dredging Ltd.*

1443 River Road • Richmond, British Columbia V6V 1L3, Canada • Tel: (604) 273-5521 • Telex: 04-507836

# SCOCEAN TECHNOLOGY LIMITED

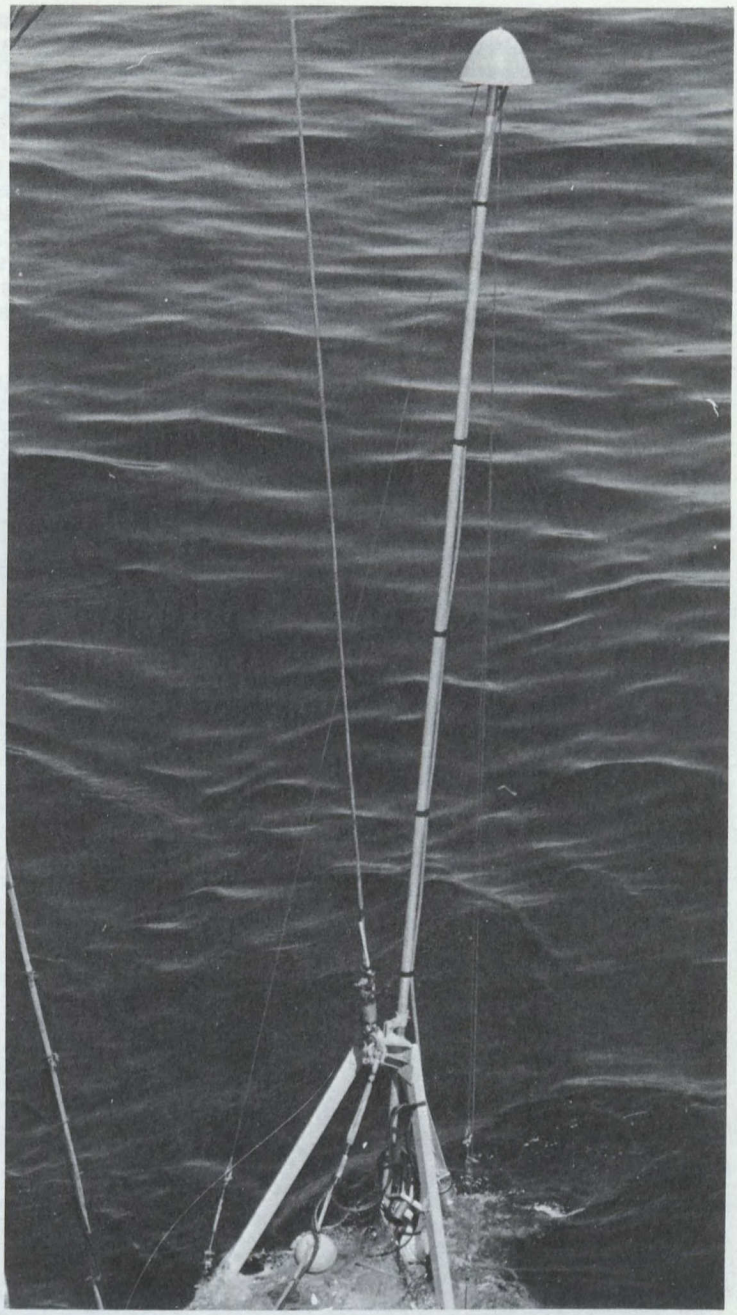
The shelf drill designed and developed by the Bedford Institute of Oceanography and manufactured under licence by Scocean Technology Limited is a reliable and extensively tested tool for underwater bedrock exploration.

The drill is manufactured in two sizes both of which use the same drive mechanism. They are controlled, monitored and powered from a surface ship or launch that does not have to be anchored at any time. This capability allows the drill to complete several holes in one day and cover large areas during the course of a survey.

The small size of the drills and their low center of gravity allow operations in adverse weather conditions on typical shelf terrain.

The larger drill has been employed on five cruises in the Bedford Institute continental shelf program and during these operations completed 99 drillings in 23 working days. Core recovery amounted to 249 ft. (76.5 m) in 1,380 ft. (410 m) of hole drilled.

The complete shelf drill system includes the underwater drilling mechanism and frame, handling lines, on-deck motor controller, ground-fault protection for safety of personnel and indication of flushing pressure, motor current, drill bit extension and drill tilt.



*Two buoyant lines, one for load and the other for power and instrument signals, accompany Scocean Technology's drill to the continental shelf bottom.*

| *Specifications* | *Model 7001* | *Model 8001* |
|---|---|---|
| Drill barrel length | 6.1 m | up to 6.1 m |
| Core diameter | 2.5 cm | 2.0 cm |
| Weight | 1,000 kg | 159 kg |
| Basic power | 5 hp, 440 v | 1½ hp, 220-440 V |

P.O. Box 2034, 3 Ernest Avenue • Dartmouth, Nova Scotia B3A 2H3, Canada • Tel: (902) 434-9565 • Cable: SCOCEAN

# SEASPAN INTERNATIONAL LTD.

Seaspan spans more than oceans; it spans more than a century of marine transportation experience, including everything from high seas salvage to less complicated coastal towing operation.

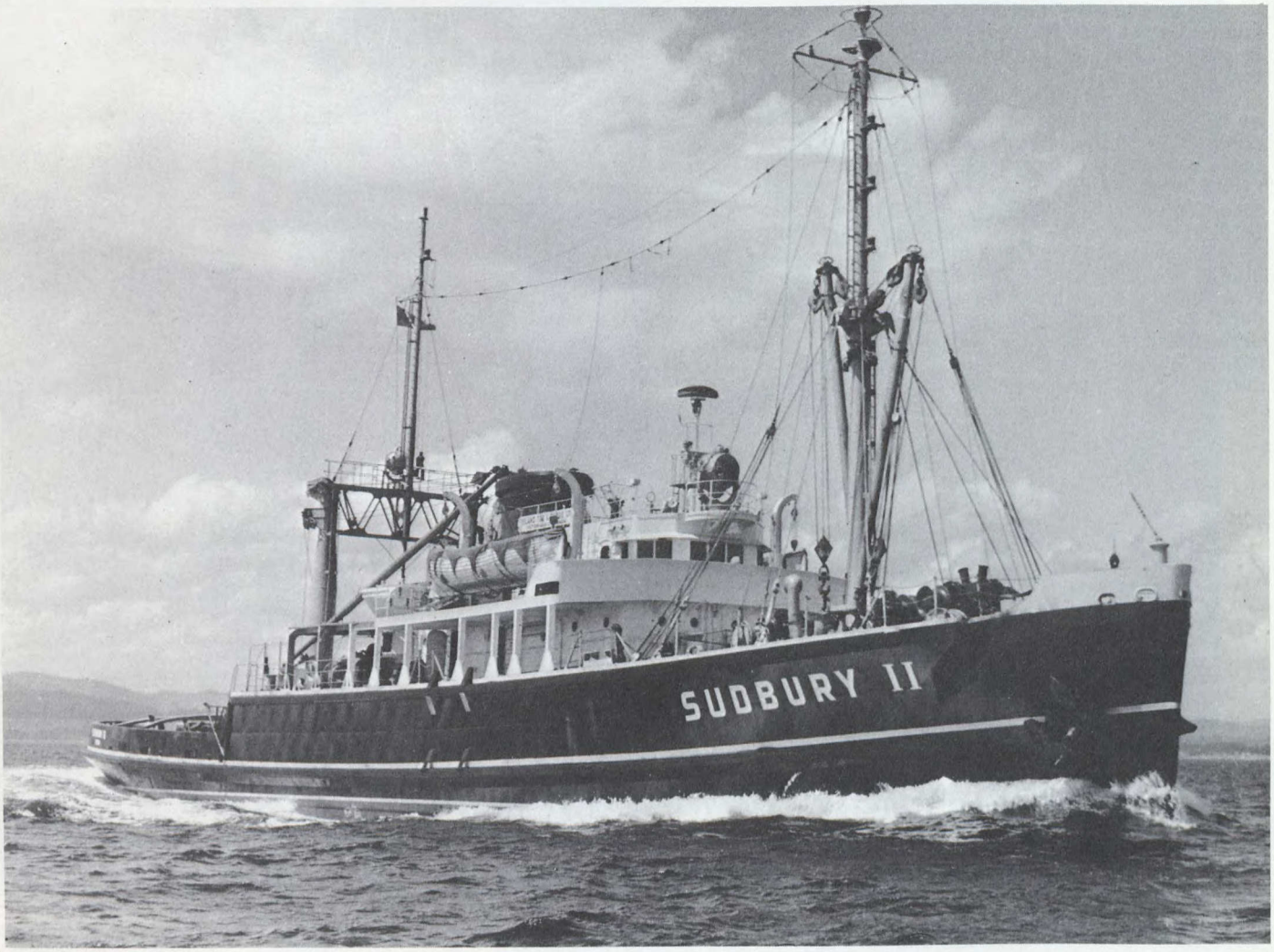
Seaspan International Ltd. is as old as the towing industry in Canada's Pacific northwest — and as new as the latest innovation in water transportation.

Seaspan is an integrated coastal and deep sea transportation company. It operates a fleet of more than 40 tugs of from 300 to 5,750 hp and 223 towed barges from 500 to 20,000 deadweight tons as well as self-propelled rail car barges.

Seaspan is also a member of Arctic Transportation Ltd., a consortium formed to move materials and equipment for the oil industry from any world port to the United States or Canadian Arctic.

The company's staff, numbering more than 1,000, are competent, experienced and well aware of the importance of developing new innovations to meet any need.

A subsidiary, Seaspan Development Co. Ltd. (SEADEVCO), provides consulting services in tug and barge transportation to industry. These services range from feasibility studies to development of complete transportation systems on a turnkey basis.




*"Sudbury II", one of Seaspan International's 40 tugs, heads for a rendezvous with an ocean vessel off the British Columbia coast.*

10 Pemberton Avenue • North Vancouver, British Columbia V7P 2R1, Canada • Tel: (604) 988-3111 • Telex: 04-352532
Cable: SEASPAN

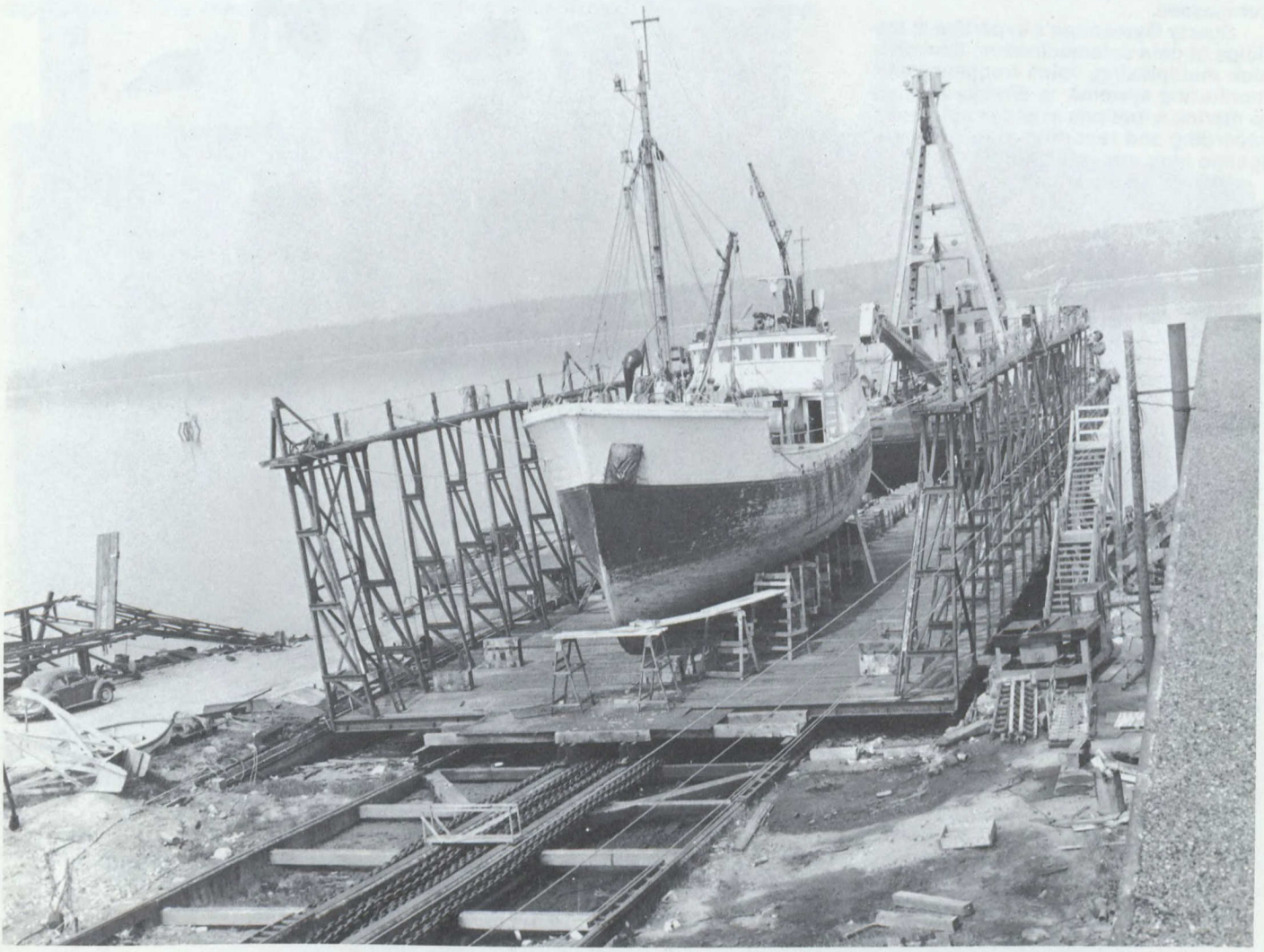
# SHELBURNE INDUSTRIES LIMITED

Shelburne Industries Limited puts Canadian maritime expertise into repairing and refitting ships. It offers year-round service, being in an ice-free harbour, with water depths exceeding 30 ft. (9.1 m).

This Nova Scotia company, besides repairs and refits, offers outfitting wharfs with power, water, telephone, heating and air services; tug services; and 25-ton mobile crane services. Its marine railway is capable of docking vessels up to 3,000 long tons (3,040 metric tons).

The dry dock will accommodate a variety of vessels up to 360 ft. (110 m) in length, 50 ft. (15.25 m) in breadth, 17 ft. (5.2 m) draft forward and 20 ft. (6.1 m) draft aft.

Shelburne provides administration in tendering, planning and production control.



*This vessel is being refitted in the dry dock of Shelburne Industries Limited.*

P.O. Box 940 • Shelburne, Nova Scotia B0T 1W0, Canada • Tel: (902) 875-3131 • Telex: 019-21898

# SPERRY GYROSCOPE OTTAWA DIVISION

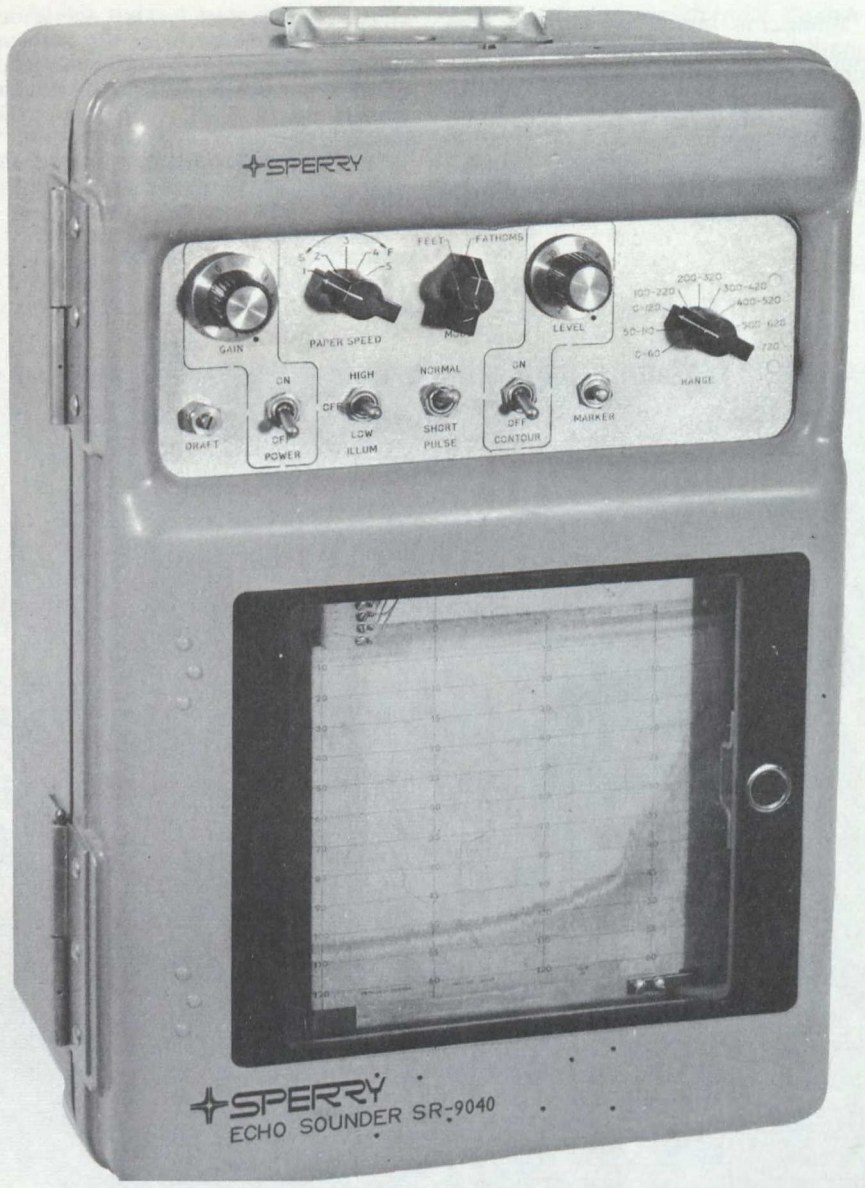
Sperry Gyroscope Ottawa Division designs, manufactures and services a wide range of products for the marine, aerospace and communications industries. For the marine industry, the company designs and makes echo sounders, event data loggers and visibility detection equipment (as an aid to navigation). It also performs complete overhauls of sophisticated marine compasses.

Sperry Gyroscope's expertise in the fields of data communication, time division multiplexing, voice frequency and monitoring systems, is directly applied to marine situations in which automatic recording and reporting of remote navigation aids are required.

The company's staff of 300 in Ottawa is supported by the Sperry Marine Systems Division Canada, a sales and service organization with offices in major ports. Sperry Marine has representatives throughout the world to service Sperry products.

One of Sperry's most popular pieces of equipment is the SR-9040 Echo Sounder widely used by surveyors and oil exploration companies in Canada and the United States. It is a portable, solid-state device designed especially to meet the requirements of the professional surveyor.

Each recorder features 18 selectable depth ranges to a maximum depth of 2,160 m (7,087 ft.). Minimum depth limit is 0.6 m (2 ft.). Stylus speed is set to ensure that all depth readings are within 0.2 per cent of true depth, at a design underwater sound velocity of 1,463 m (4,800 ft.) per second. Plug-in crystals are available for lower or higher sound velocities.




*Sperry Gyroscope Ottawa Division makes this portable echo sounder (SR-9040) for hydrographers. Its dimensions are 19 x 14 x 10 in. (48.26 x 35.56 x 25.40 cm).*

P.O. Box 390, 3 Hamilton Avenue • Ottawa, Ontario K1N 8P6, Canada • Tel: (613) 728-4681 • Telex: 013-3637
TWX: 610-562-1972

# SPILSBURY & TINDALL LTD.

From mountain exploration to offshore drilling, from Arctic to tropical climates, Spilsbury & Tindall (S & T) radio equipment is in service.

It is especially suited for use in areas where permanent equipment has not yet been installed and where trained personnel are lacking. And it is used in South America, Africa, Asia and extensively throughout Canada. Recent expeditions in the Himalayas and the Arctic have called on S & T for radio-telephones. Some prime users are oil and mining companies, exploration parties, forestry services, airlines and air-charter services.

S & T radio-telephones are rugged, lightweight, easy to install and operate. They require negligible maintenance.

Two S & T products are particularly suitable for installation on offshore drilling rigs: the SBH-125 SSB Transceiver, and the LWX-100 LF radio beacon transmitter. These are in service with oil companies around the world, including locations in Asia, the Middle East and South America. The company designs and manufactures a wide range of HF/SSB radio-telephones and specialized tuneable whip antennas. They are frequently used on support helicopters in offshore operations.


*This solid-state radio beacon transmitter (LWX-100) from Spilsbury & Tindall Ltd. is specially suitable for use on offshore drilling rigs.*

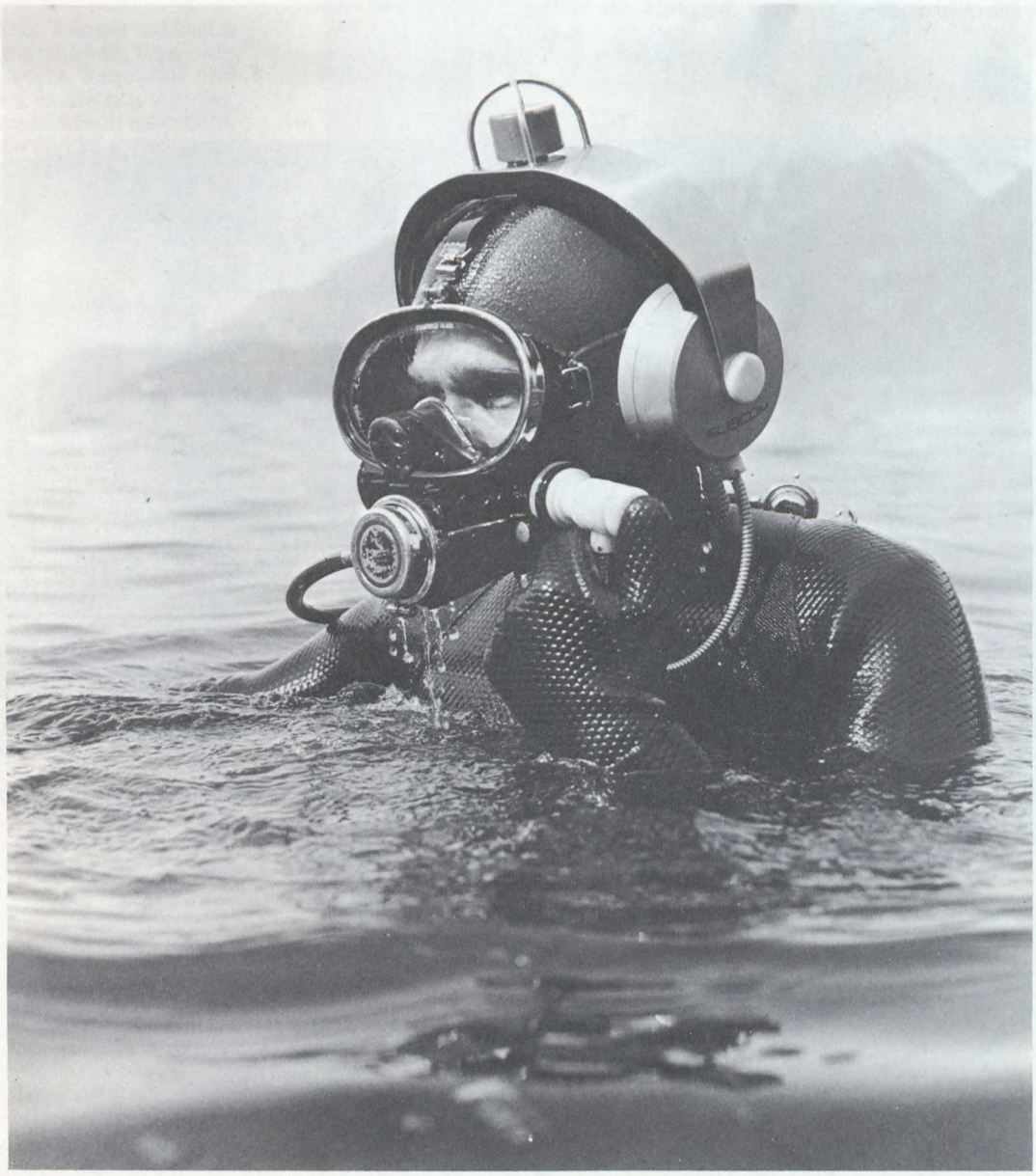
120 East Cordova Street • Vancouver, British Columbia V6A 1L1, Canada • Tel: (604) 684-4131 • Telex: 04-55482
Cable: SPILTIN

# SUBCOM SYSTEMS LTD.

Keeping the diver in complete communication with the world above is the specialty of Subcom Systems. The company's wireless, two-way voice communications systems for free-swimming divers are in use throughout the world in commercial, scientific and military operations.

Subcom manufactures wireless communication systems for diving bells and for use in submersibles, under conditions ranging from the North Sea and the Arctic to the Caribbean. It also has the capability to produce custom designs.

Subcom's line of hard wire communications includes wired diver phones, re-compression chamber systems and custom microphone and earphone assemblies for a variety of applications. A wide range of acoustic pinger beacons, hydrophones and acoustic pinger locating systems are also produced by Subcom.



*This diver's communication unit, Subcom's 130D, is rugged and reliable. The headset weighs only half a pound (.227 kg) in water, yet it contains all electronic components. It can operate to a depth of 300 ft. (91.44 m), with a communicating range of more than 500 ft. (152 m). Its companion unit, 130S, provides two-way voice communication with the surface.*

153 Riverside Drive • North Vancouver, British Columbia V7H 1T6, Canada • Tel: (604) 929-1258

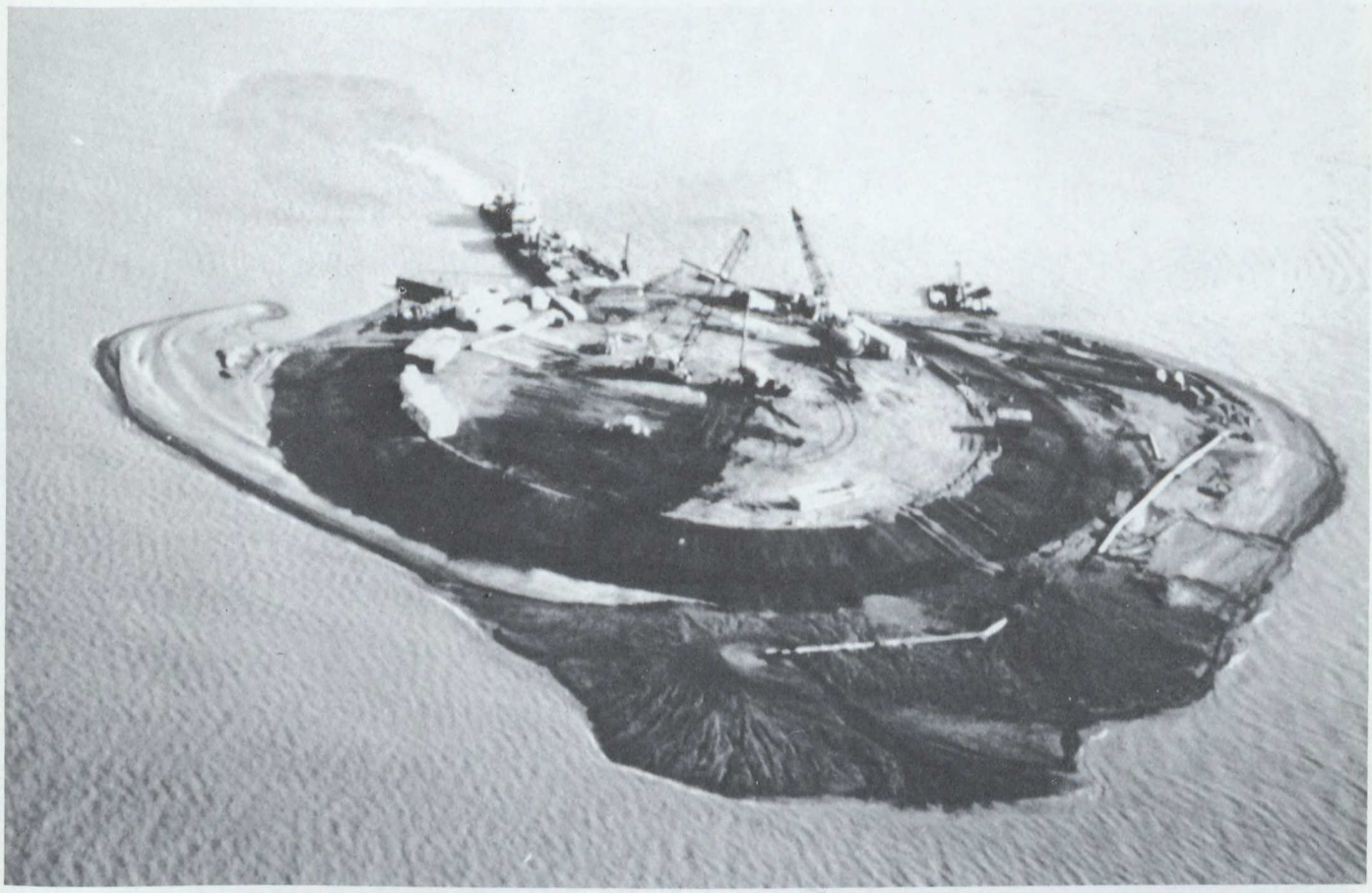
# SWAN WOOSTER ENGINEERING CO. LTD.

A pioneer in Arctic engineering, Swan Wooster Engineering Co. Ltd. is prepared to tackle unusual and difficult engineering assignments anywhere in the world — whether it be on an artificial drilling island in the Arctic Ocean or an oil-service dock built to withstand the storms and ice of Alaska's Cook Inlet.

This consulting engineering firm has been active in Canada for 50 years, has a subsidiary operation in the United States and has been responsible for numerous projects in other areas of the world. It specializes in the design of deep sea ports and bulk commodity port terminals.

Swan Wooster Engineering undertakes the full range of coastal engineering investigations required for siting new offshore and protected deep water terminals. It prepares feasibility studies and carries out detailed design, procurement and construction-management services.

The company's engineering-oriented economists ensure that proposed solutions bear a direct relationship to the function and expected life of the proposed structures, to provide the optimum solution to each specific problem.



*Swan Wooster Engineering assisted in the planning, detail design, and logistic problems of this pioneer operation, the first offshore drilling island in the Arctic Ocean.*

1525 Robson Street • Vancouver, British Columbia V6G 1C5, Canada • Tel: (604) 684-2351 • Telex: 04-51275
Cable: SWANCO

# TALBOT, JACKSON & ASSOCIATES LTD.

Specialization takes on a new dimension with Talbot, Jackson & Associates. These marine engineers and economic consultants begin the design of a vessel with a computer-aided economic analysis of various modes of marine transport to determine which would be the most effective for the client's needs.

Company consultants, drawing on the best of modern technology, have won recognition in all their fields, from naval architecture and marine engineering to vessel condition and draft surveys, marine transportation and operation prognoses, financing, rigging, cranage, cargo handling, and marine computer services.

Innovation is standard practice with this firm. Examples include flush, weather deck hatches for ocean service; slingless loading platforms on coastal vessels; heavy-fuel installation systems for diesel engines on coastal vessels; the largest Canadian pusher tug/barge system, and the largest self-loading/side-dumping log ship in Canada.

The company will also undertake supervision of construction of new vessels and will represent the owner when ships need overhaul, maintenance or repair.

*Power and efficiency are combined with a pleasing appearance in the "Carrier Princess", which recently went into service as a trailer/rail car ferry between Vancouver and Schwartz Bay, British Columbia. Designed by Talbot, Jackson & Associates, the ship has an overall length of 380 ft. (116 m) and can transport 50 trailers or 30 rail cars.*

208 Pemberton Avenue • North Vancouver, British Columbia V7P 2R5, Canada • Tel: (604) 985-7481 • Telex: 043-52613
Cable: TALNAVARK

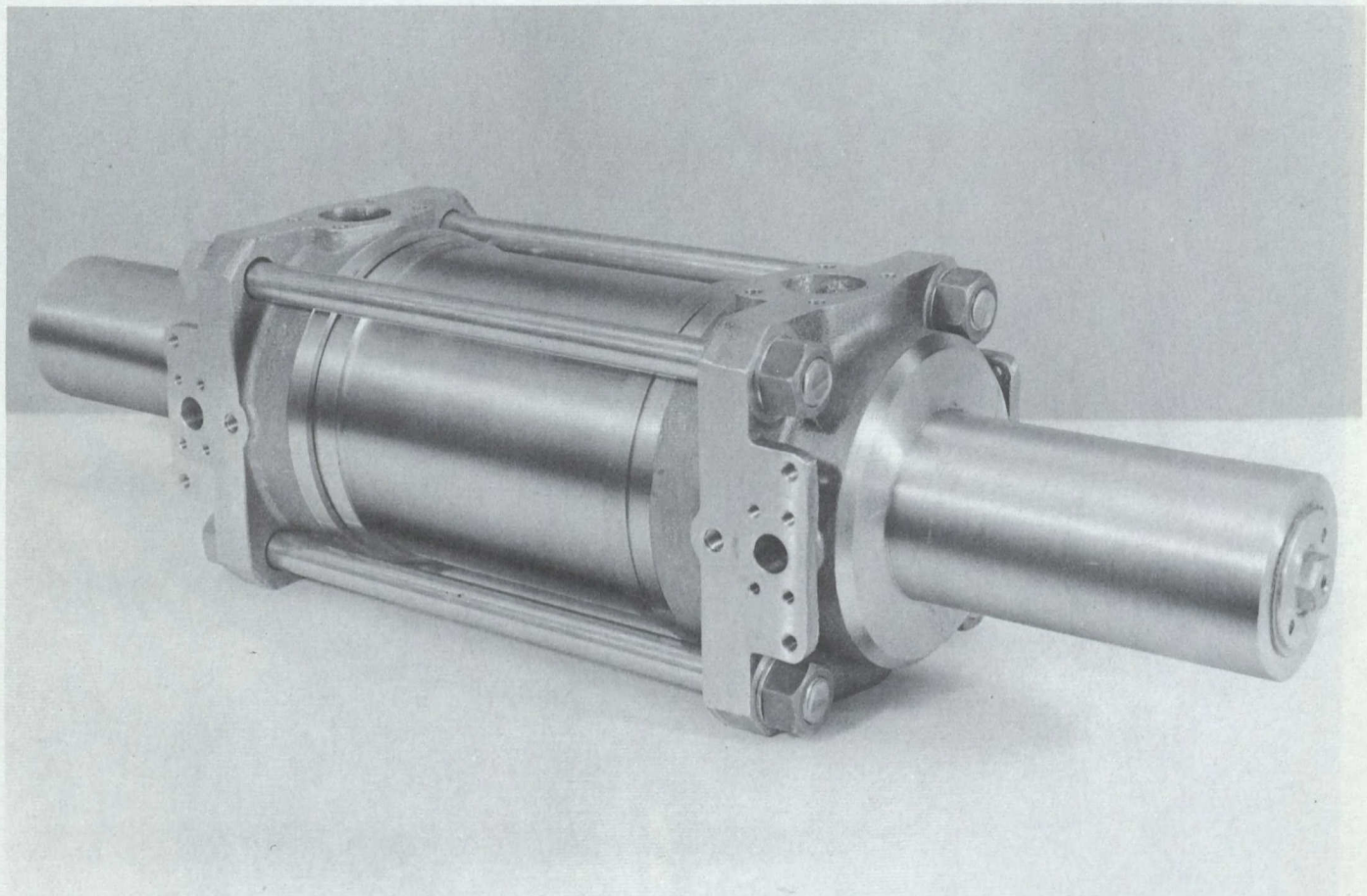
# TECHWEST ENTERPRISES LTD.

Techwest Enterprises offers a complete source of procurement for a wide variety of special research, development and manufacturing projects. It is a subsidiary of the British Columbia Research Council, operating independently of the parent organization with its own manufacturing licences and facilities.

As a complement to the research and design activities of B.C. Research, Techwest provides a contract coordination, production and marketing capability. The classification "commercially confidential" is applied to all its projects, whether handled alone or in association with B.C. Research. Where specified by the customer and the nature of the project, "secret" classification is enforced.

Techwest is prepared to consider any contractual engineering or scientific requirement, large or small, rapidly and thoroughly. The company will respond to bid, proposal or straight procurement requirements where it believes it can make a useful contribution.

Disciplines and interdisciplinary groups can be assembled in engineering physics, applied biology, applied chemistry and management services.



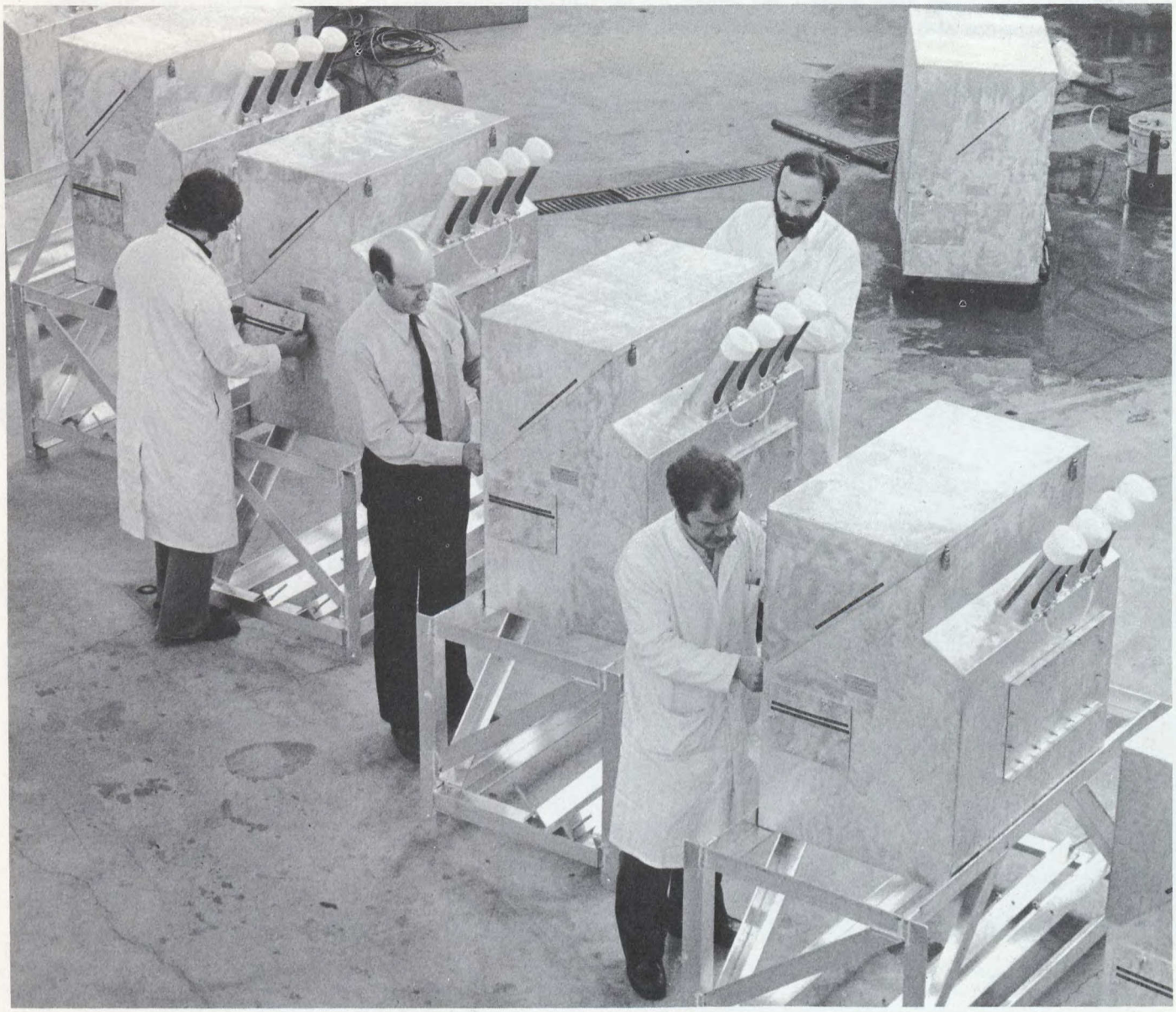
*Hydraulic-powered submersible pump (60 hp) is just one of many Techwest Enterprises' products of special interest to the ocean industry.*

3650 Wesbrook Crescent • Vancouver, British Columbia, V6S 2L2, Canada • Tel: (604) 224-4331 • Telex: 04-507748
Cable: RESEARCH BC

# TECHWEST ENTERPRISES LTD.

Techwest Enterprises, in addition to its services, makes available products of particular interest to the ocean industry. These include:

- motion-compensating cranes for handling submersibles and towed bodies in severe sea conditions;
- submersible pumps with hydraulic drives, used for pumping large volumes of sea water or gases to high pressure. They also can be used to expel stale air or explosive gases from underwater vehicles and habitats, eliminating umbilical gas hoses;
- herring sorter for separating fish according to sex;
- salmon colour meters;
- photologging and data-acquisition systems;
- electroluminescent lamps.



*Techwest Enterprises staff examine a shipment of herring sex sorters destined for the B.C. roe herring industry.*

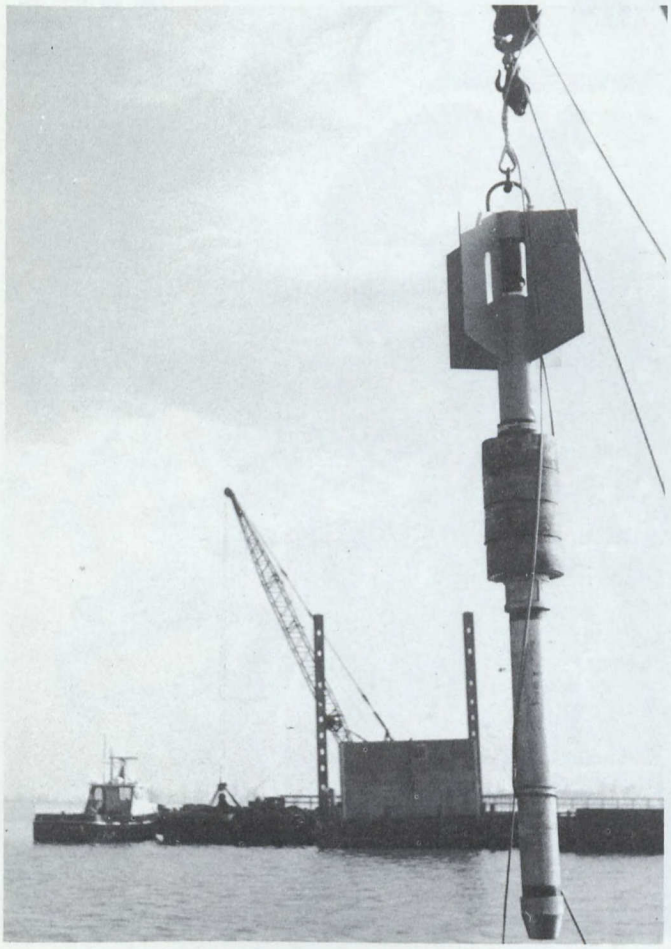
3650 Wesbrook Crescent • Vancouver, British Columbia, V6S 2L2, Canada • Tel: (604) 224-4331 • Telex: 04-507748
Cable: RESEARCH BC

# TERMAREX LIMITED

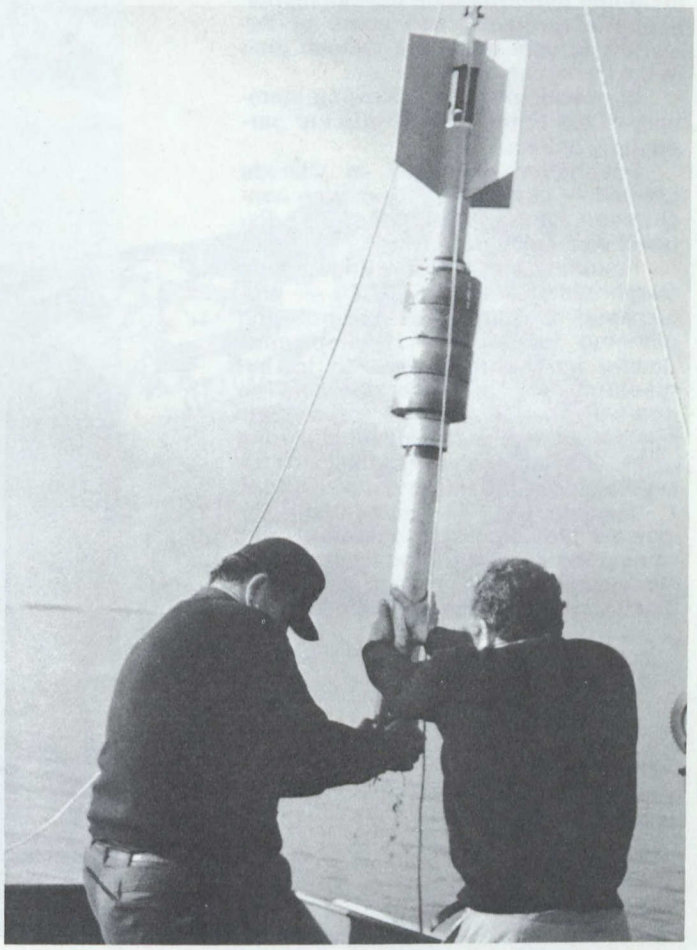
Complete service packages are provided for offshore site investigations by Termarex Limited, a production-oriented organization that specializes in the application of geophysics for the civil engineer and for aggregate exploration.

Sub-bottom, bottom and water behaviour data are indispensable to the engineer and Termarex's integrated services provide the required information in the most useful format. All the latest techniques — continuous seismic profiling, high and low-frequency sounding, sidescan sonar, bottom coring and sampling — are available to give engineers the data they need to ascertain foundation conditions essential for drilling locations, for pipe-line route studies and for harbour and bridge investigation sites.

These capabilities are combined with Termarex's water quality studies and used to monitor and control the environmental impact of such marine activities as dredging, dumping and major construction.



*A Termarex gravity corer is poised, ready to collect bottom cores during marine construction.*



*Coming to grips with the business end of a Termarex gravity corer.*

255 Yorkland Boulevard • Willowdale, Ontario M2J 1S3, Canada • Tel: (416) 491-5352 • Cable: GEOMAREX

# THE FOUNDATION GROUP OF COMPANIES

The Foundation Group covers practically all phases of engineering and construction, from economic and feasibility studies to construction including total project execution and project management.

Since 1910, the Group has served industry and government in construction, engineering, planning and research for a wide diversity of projects, including hydro-electric developments, industrial projects, and some of the world's largest and most difficult jobs in the Canadian north.

In oceanology, the following members of the Foundation Group are particularly active:

Foundation Company of Canada Limited — contractors for marine construction, salvage and underwater disposal and industrial diving.

Foundation of Canada Engineering Corporation Limited (FENCO) — professional consultants in research and planning for harbour developments, coastal works, Arctic research, ice engineering and pollution control. The company has developed a complete system of ice tests for engineering uses, and for analyzing effects of ice on structures, vessels and environment.

Geocon Ltd. — geotechnical engineers providing field operations and consulting services in soil mechanics, geological studies, marine site investigations, and ocean geotechnics.

*The burial of the ore-carrier "Tritonica" 60 ft. (18.28 m) below low water in the St. Lawrence River shipping channel is one of many salvage and underwater disposal operations carried out by the Foundation Group of Companies.*

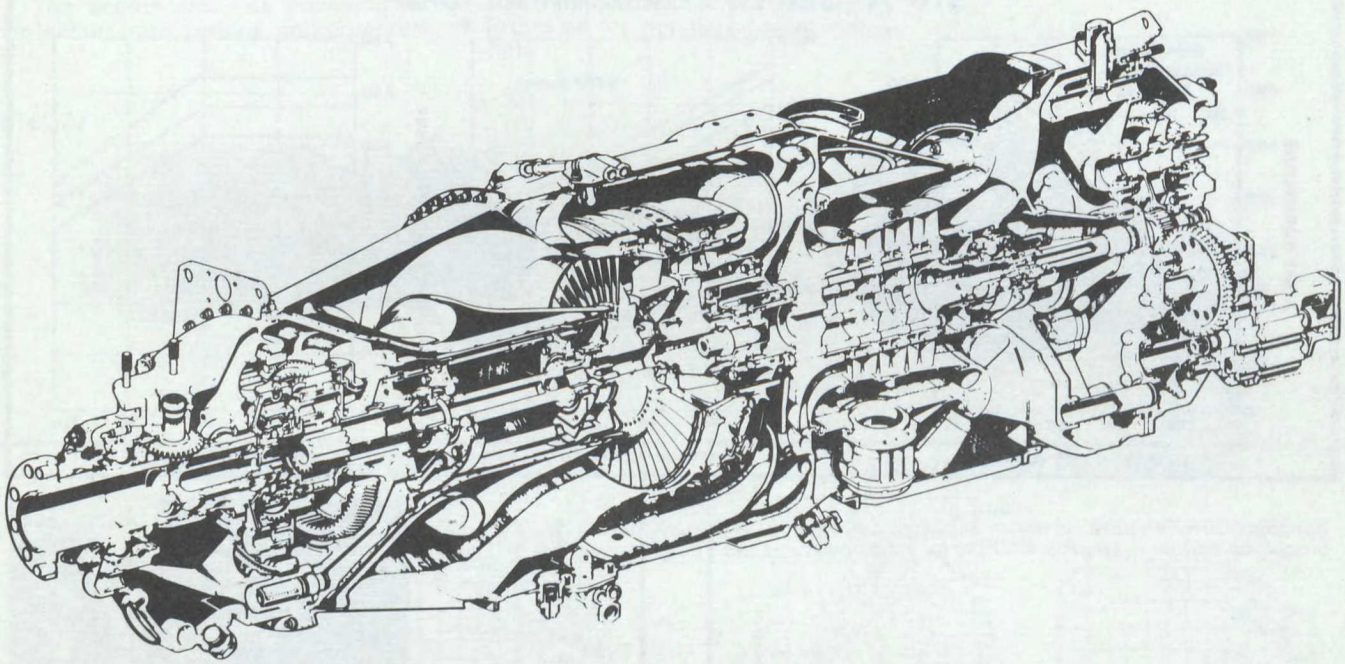
1 Yonge Street • Toronto, Ontario M5E 1E7, Canada • Tel: (416) 361-4722 • Telex: 02-2814 • Cable: FOUNDANENG

# UNITED AIRCRAFT OF CANADA LIMITED

United Aircraft of Canada Limited (UACL) designs and manufactures families of small gas turbine engines for use in aviation, marine, vehicular and industrial applications. The company is a subsidiary of United Aircraft Corporation and, as such, its products are fully supported by a world-wide network of trained service representatives.

The Industrial and Marine Division of UACL was established to meet the demands for gas turbine power in fields other than the aerospace industry. The Division assumes full systems responsibility in the design and supply of complete industrial and marine systems incorporating UACL engines as well as large gas turbines manufactured by Pratt & Whitney Aircraft.

The ST6 family of engines is derived from the world-famous PT6 aero-engine series. These engines, leaders in their power class, have been approved by the FAA to run up to 8,600 hours between overhauls. To date, more than 6,000 have been delivered and have accumulated more than 12 million hours in operation.



*The ST6 gas turbine is a lightweight, simple-cycle, free turbine engine with a unique arrangement of components and main shafts making it both short and compact.*

P.O. Box 10 • Longueuil, Quebec, Canada • Tel: (514) 677-9411 • Telex: 05-267509 • Cable: UNITEDAIR

# UNITED AIRCRAFT OF CANADA LIMITED

The ST6-70 series of gas turbines from United Aircraft will burn aviation turbine fuels, gasoline and diesel fuels without changes or adjustments. (Data on use of gaseous fuels is supplied on request.) The oil tank capacity is enough for more than 50 hours of operation and the engine starts in temperatures as low as –50°F (–10°C) assuming full load in under one minute.

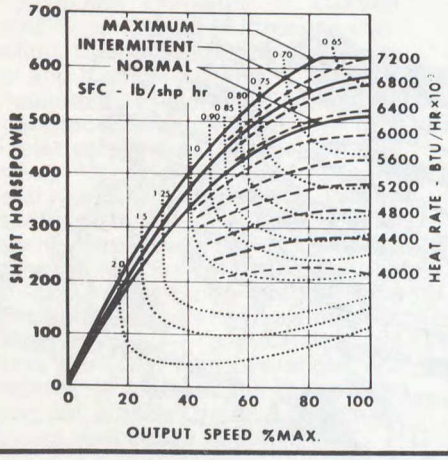
Starting in extremely low temperatures is helped by an air assist system. This system supplies pressurized air to the fuel manifold to improve atomization when starting with cold viscous fuels.

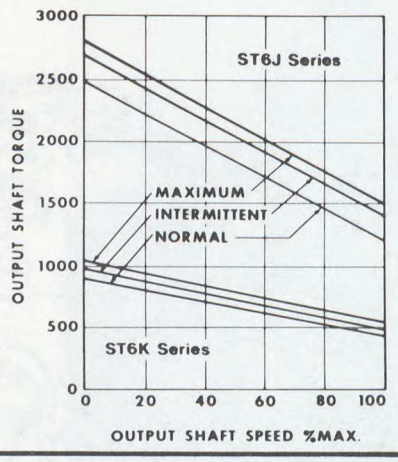
A compressor wash system, specially developed to remove airborne contaminants such as salt particles, dust and film deposits, has also been incorporated into the engine. The wash fluid is stored in a tank and the wash is accomplished with the engine running at low power.

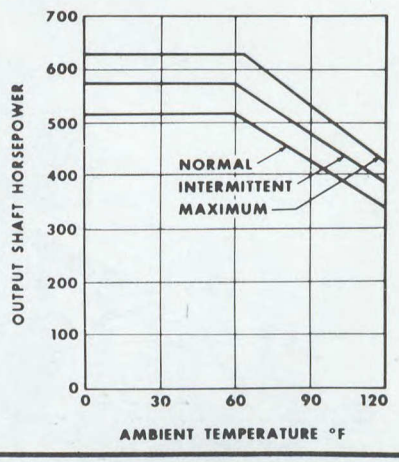
To start and operate the engine, an electrical power supply of 24 to 28 volts DC is required. The current drain is less than three amperes during continuous running.

Models ST6-60 and ST6-70 have met U.S. Navy Spec. MIL E 17341 (B) Ships and to date are the only gas turbines in the power class so qualified. Lloyd's Register Certificates can be supplied where required.

## ST6-70 SERIES PERFORMANCE DATA




*Canadian DDH "Iroquois" is one of four ships powered by UACL's all-gas turbine propulsion system — two P & WA FT4s for main power and two FT 12s for cruising.*

P.O. Box 10 • Longueuil, Quebec, Canada • Tel: (514) 677-9411 • Telex: 05-267509 • Cable: UNITEDAIR

# UNITED AIRCRAFT OF CANADA LIMITED

Three other UACL gas turbine engines — the ST6L-77, ST6T-75 and ST6L-80 — are winning world acclaim.

*ST6-77*

The gas turbines in this series are similar in appearance to the ST6-70 series but provide up to 30 per cent more power.

The ST6L-77 is a free turbine, direct-drive output shaft engine suitable for integration with high-speed auxiliary power units. Maximum output is 33,000 rpm. Other versions can be provided with reduction gearing to the 6,000 and 2,000 rpm range.

The engine also has provision for containing burst turbine and compressor discs and it incorporates intake air screen, compressor wash spray ring and heat insulating blankets on exhaust and generator case.

*ST6T-75*

This is a Twin-Pac™ version of the ST6 with a twinning reduction gear providing 6,600 rpm output. Engine aerodynamic components are similar to the ST6-70 series. Compressor turbine nozzle vanes are cooled, thus permitting the higher temperature required for increased power level without affecting the engine's life.

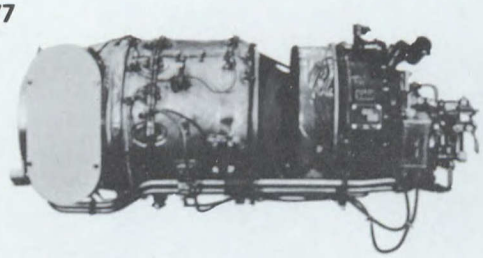
Other features include:

- Dual manifold system for cool starts
- Provision for remote oil level indication
- Suppressed high-frequency compressor noise
- Interchangeable gas generators

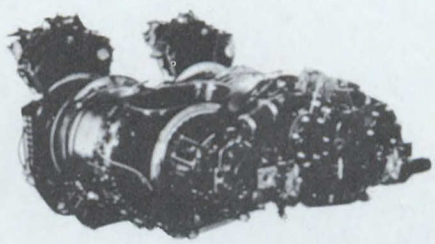
*ST6L-80*

Similar in size and appearance to the ST6-77, these engines provide 25 per cent more power with a lower SFC. Incorporated is a new, higher pressure ratio compressor with increased mass flow and a new, two-stage free turbine. The ST6L-80 is a direct-drive engine with a 30,000 rpm output speed. Other versions are available with 2,000 rpm and 1,200 rpm output integral gearboxes.

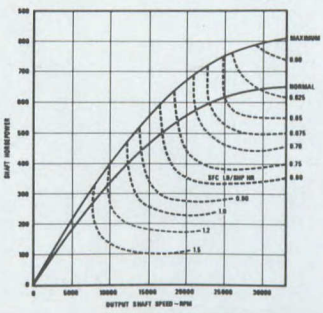
**ST6L-77**



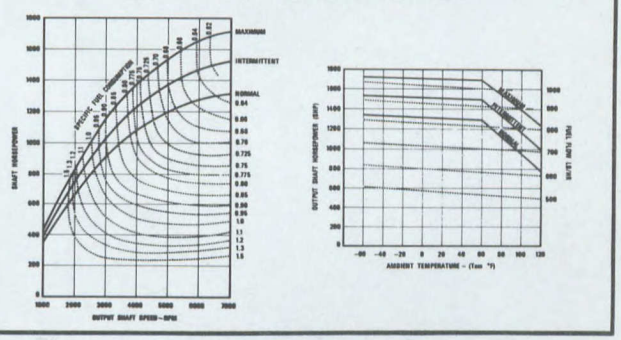
**ST6T-75**



**ST6L-77 ENGINE PERFORMANCE**



**ST6T-75 ENGINE PERFORMANCE**



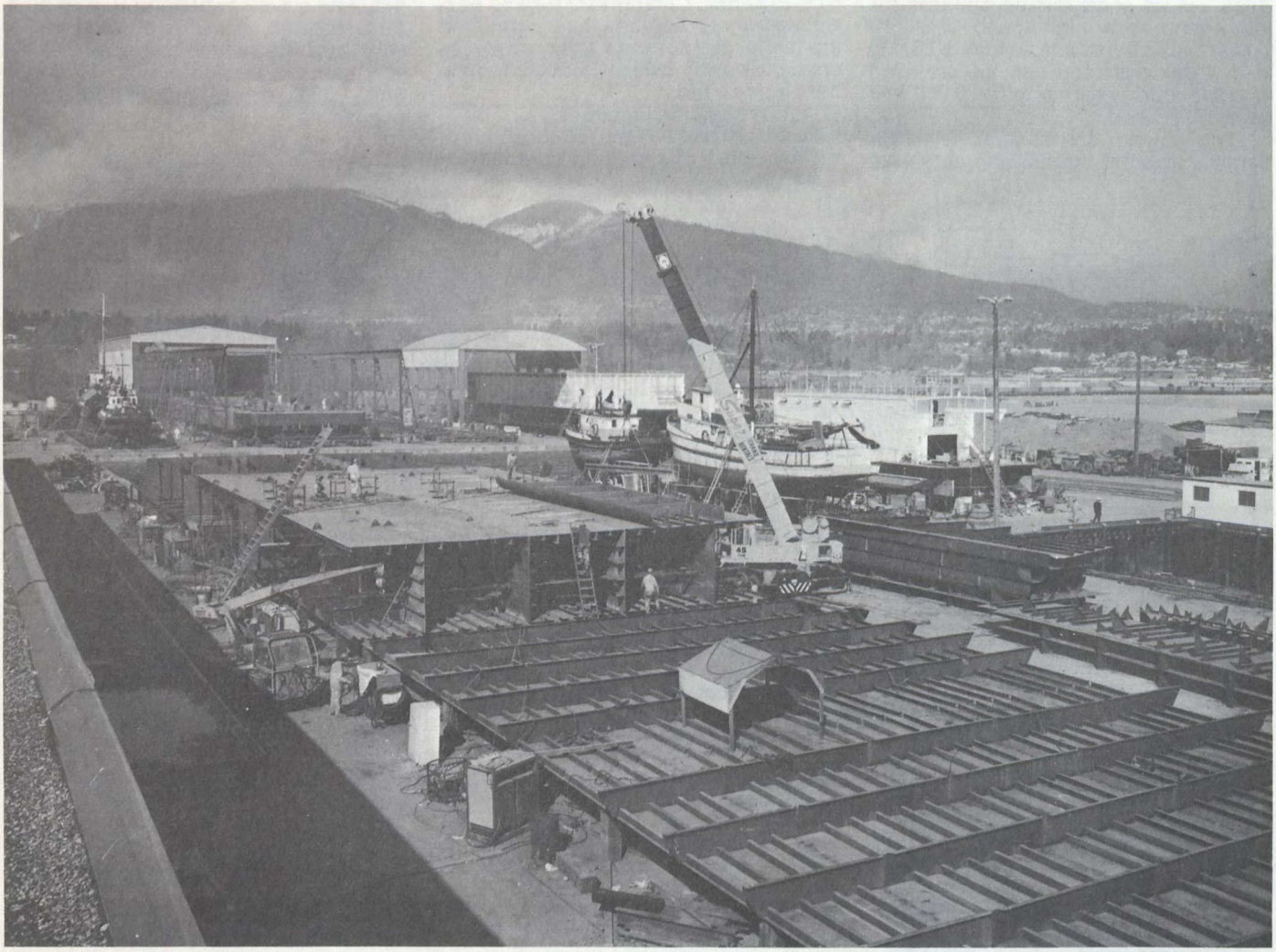
P.O. Box 10 • Longueuil, Quebec, Canada • Tel: (514) 677-9411 • Telex: 05-267509 • Cable: UNITEDAIR

# VANCOUVER SHIPYARDS CO. LTD.

Vancouver Shipyards Co. Ltd., a subsidiary of Seaspan International Ltd., is a large up-to-date shipbuilding and repair yard at the port of Vancouver. It constructs all types and classes of offshore supply vessels, tugs, vehicle and passenger ferries, and shallow draft tunnel vessels.

To facilitate repair work, Vancouver Shipyards uses a "syncrolift" marine elevator. This raises vessels from the water in minutes regardless of tide level. It can handle vessels up to 275 ft. (83.8 m) in length, 68 ft. (20.7 m) beam and 1,500 long tons (1,524 metric tons) displacement.

Once raised, vessels are moved by a rail system to various working centres. Because a vessel is moved to the worker, time is saved and greater productivity achieved.



*Vancouver Shipyards Co. Ltd. built seven oil barges in less than six months for Northern Transportation Ltd. to be used on the McKenzie River.*

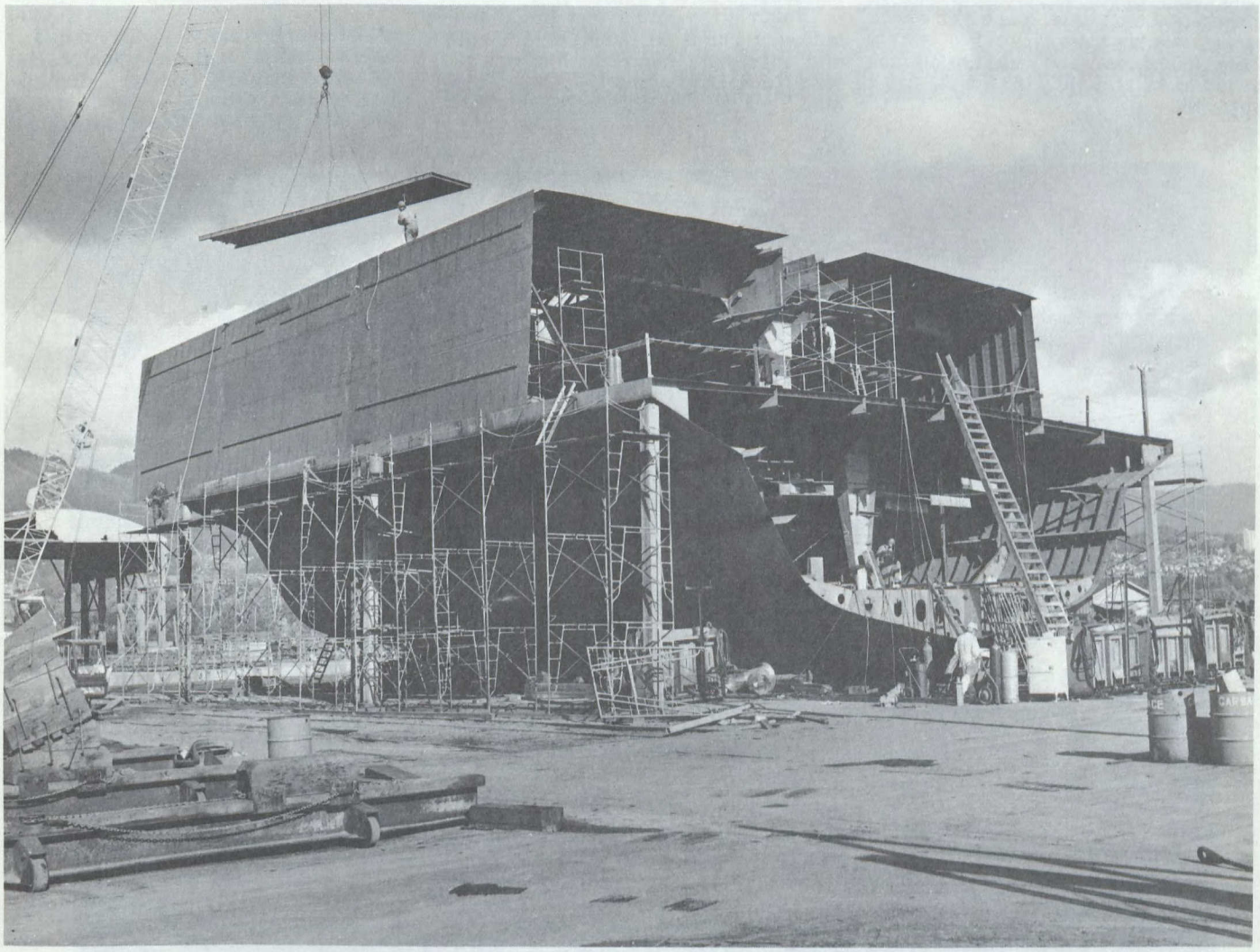
50 Pemberton Avenue • North Vancouver, British Columbia, Canada • Tel: (604) 988-6361 • Telex: 04-352532
Cable: SEASPAN

# VANCOUVER SHIPYARDS CO. LTD.

Vancouver Shipyards' building facilities are capable of handling several construction projects simultaneously while continuing to perform normal repair and conversion work.

The company has enlarged its plant in North Vancouver and is now prepared to construct offshore drilling rigs.

Vancouver Shipyards and Seaspan International provide technical consultation services to industries needing expert advice on development of new water transportation equipment and methods or the improvement of inefficient transportation equipment.



*Workers construct the 84 ft. (25.6 m) mid-section for the ferry M. V. "Queen of Vancouver" at Vancouver Shipyards Co. Ltd.*

50 Pemberton Avenue • North Vancouver, British Columbia, Canada • Tel: (604) 988-6361 • Telex: 04-352532
Cable: SEASPAN

# VELAN ENGINEERING LTD.

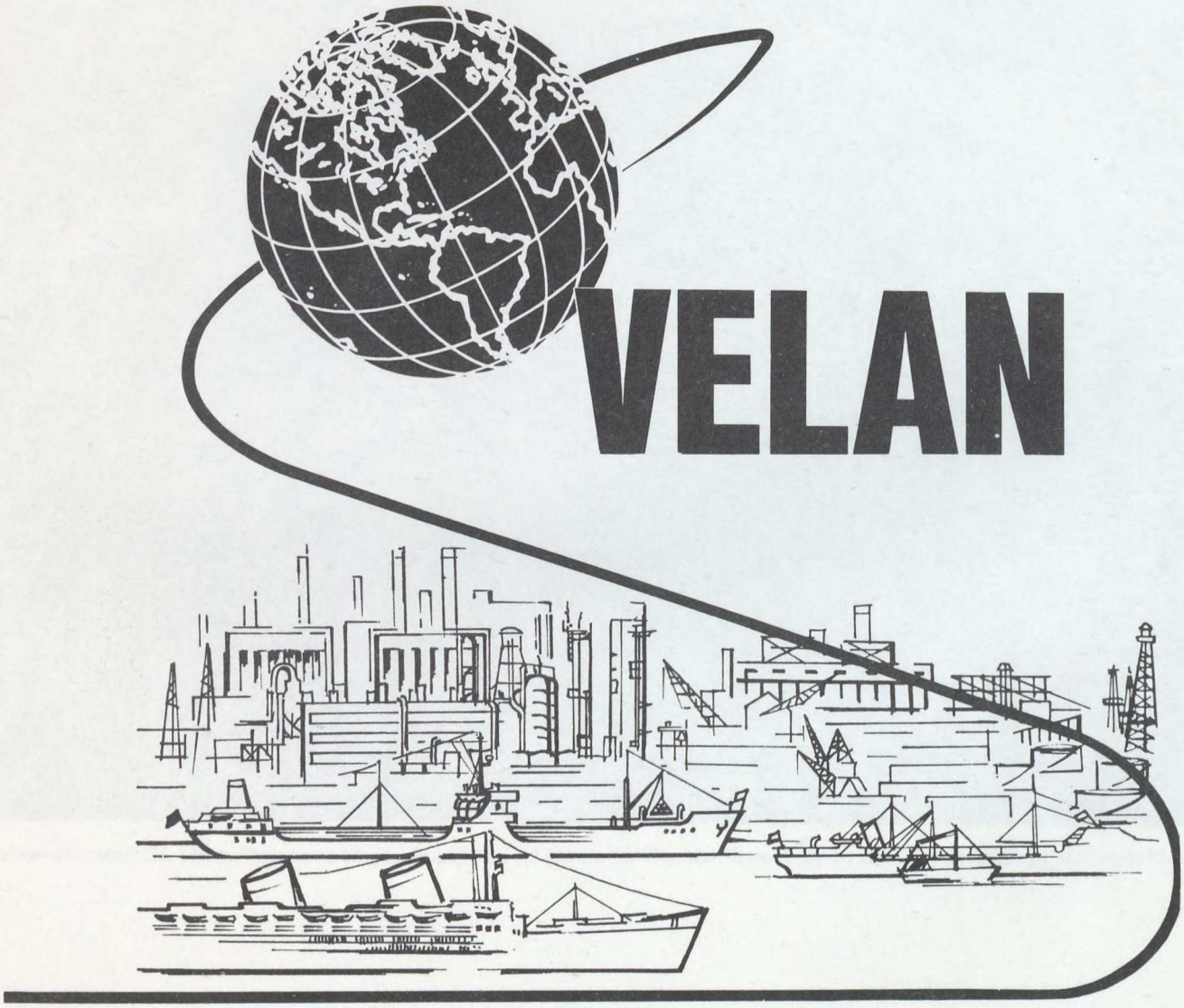
Velan Engineering Ltd. is one of the world's largest manufacturers of valves and steam traps for such industries as oil refining, petrochemical, thermal and nuclear power, cryogenics, marine and chemicals.

It also offers a complete line of forged and cast gate, globe and check valves, in sizes from ½ in. (12.7 mm) to 24 in. (609.6 mm) and pressure classes of 150 to 4,500 # ANSI (68.2 kg to 316.4 kgf/cm²).

In the face of today's energy crisis, Velan's steam traps have special value since they are designed specifically with conservation in mind. The company's bimetallic and thermodynamic steam traps have a range of from 0 to 2,500 psi (0 to 176 kgf/cm²).

Velan Engineering has two manufacturing plants in Montreal, Canada, and subsidiary plants in Plattsburgh, New York, U.S.A. and Leicester, England.

A nuclear valve assembly plant is now being set up in Paris. In addition to its plants, Velan is serviced by a worldwide network of agents and distributors with offices in Britain, Norway, Germany and France, and representatives on five continents.




2125 Ward Avenue • Montreal, Quebec H4M 1T6, Canada • Tel: (514) 748-7743 • Telex: 01-20172 • TWX: 610-421-3673

# VICTORIA MACHINERY DEPOT CO. LTD.

Victoria Machinery Depot Co. Ltd. (VMD) has built the world's largest semi-submersible oil drilling rig. It has also constructed 10-foot (3.04 m) undersea wellhead cellars and service capsules of high-tensile, quench and tempered steel that have been tested recently at an operating depth of 1,400 ft. (426.72 m).

Other VMD products and capabilities include components for undersea manned submersibles, pressure hulls, and a wide range of process equipment for the petrochemical industry. For gas-processing plants, Victoria Machinery supplies such units as high-pressure sulfinol contactors, separators, absorbers, condensers and reaction boilers.

The company has fabricated all the manned submersible equipment to date — capsules, wellhead cellars, modules and, recently, a manifold centre — for Lockheed Petroleum Services Ltd. of New Westminster, B. C.

Similarly, it has built the spherical hull components for the renowned Pisces and Aquarius mini-subs of International Hydrodynamics Company Ltd. of North Vancouver, B.C.

VMD specializes in high-pressure critical service fabrication including heavy-wall pressure vessels.

Up-to-date, non-destructive and metallurgical testing equipment is used by an experienced and skilled staff to ensure that VMD customers receive the highest quality in material and workmanship. The inspection requirements of all codes and specifications are met in plant by VMD personnel.


*Victoria Machinery Depot Co. Ltd. recently produced this manifold centre for Lockheed Petroleum Services Ltd. VMD is actively engaged in fabricating critical components for the offshore industry.*

P.O. Box 670, 343 Bay Street • Victoria, British Columbia V8W 2P3, Canada • Tel: (604) 382-2141 • Cable: DEPOT

# WAGNER ENGINEERING LTD.

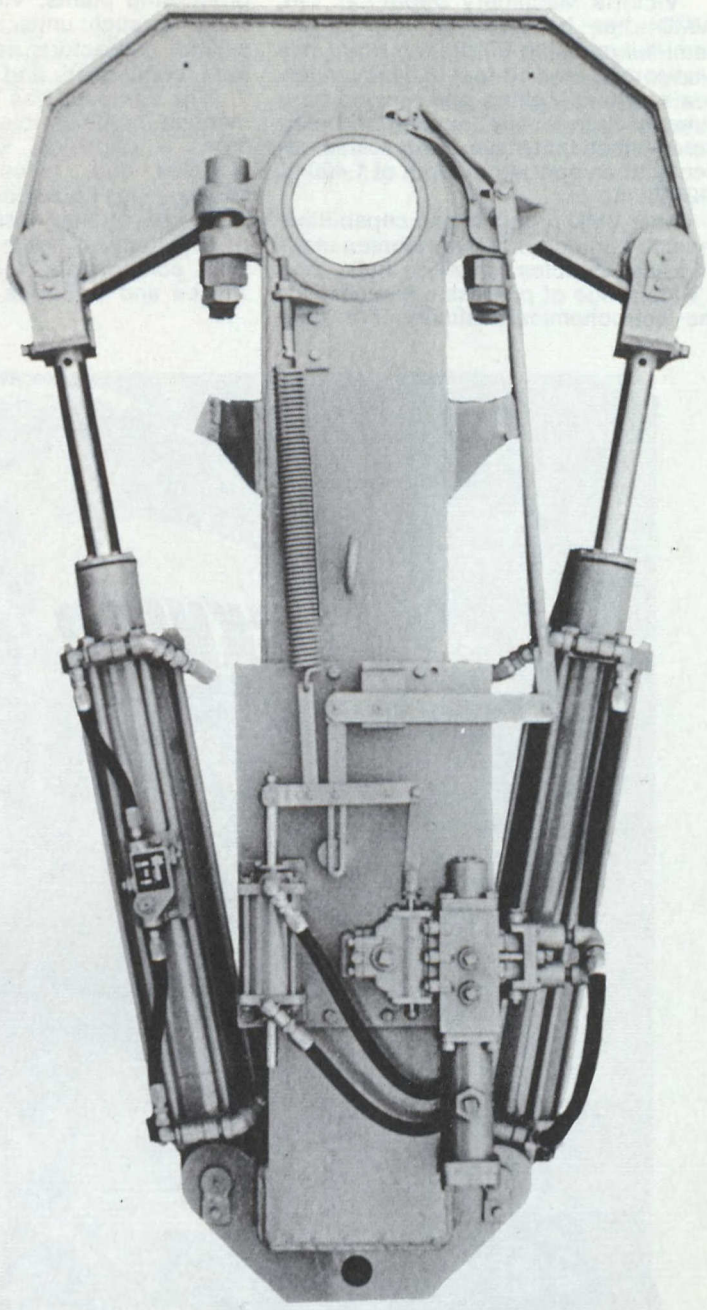
Up-to-date design and extremely high reliability are built into the hydraulic steering systems available from Wagner Engineering Ltd. In business for more than 30 years, the company's newest designs surpass traditional steering systems by providing simpler operation, fewer components and reduced weight. Wagner has established agents in many countries around the world.

Wagner steering systems feature a patented control-valve system that gives full follow-up, electro-hydraulic steering with motion storage, automatic slack compensation and smooth acceleration and deceleration.

High-accuracy rudder positioning without shock is now possible and accurate and reliable control over distances more than 500 ft. (150 m) is achieved by a hydraulic telemotor system that has automatic changeover to emergency manual steering.

Among other features of Wagner's system are rudder actuators that provide balanced torques of up to 2 million lb. ft. (360 ton metre).

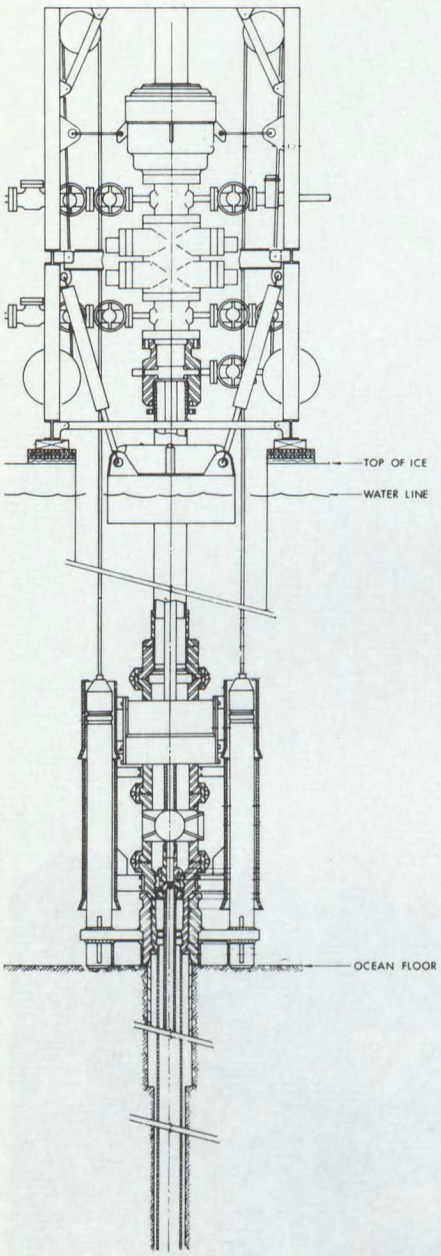
The company also produces manual hydraulic systems as small as 350 lb. ft. (50 kgm).



*Wagner Engineering designed this hydraulic steering system to minimize space and weight. The unitized assembly greatly reduces installation costs. The telemotor control is pre-assembled, and the patented valving gives more accurate and reliable performance than traditional methods.*

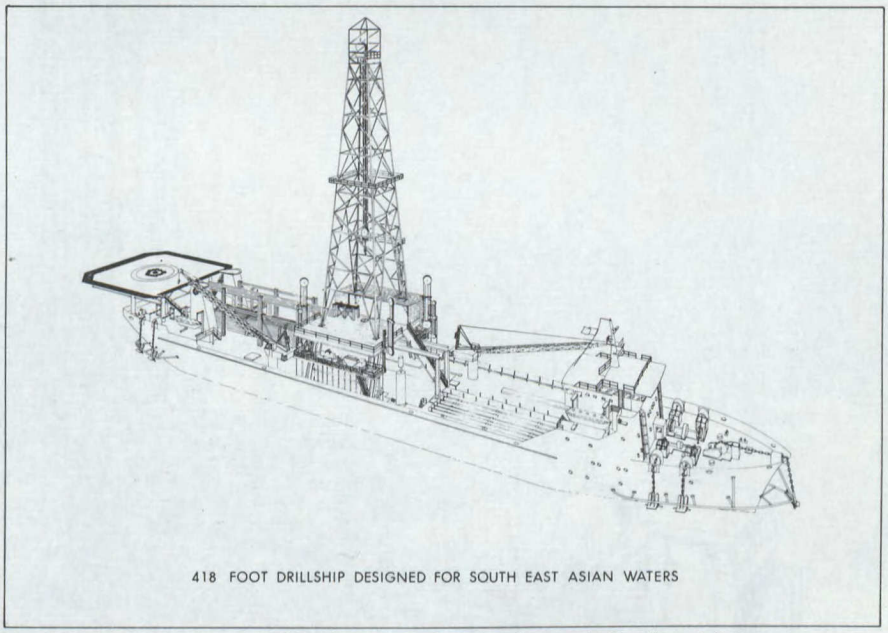
1742 West Second Avenue • Vancouver, British Columbia V6J 1H6, Canada • Tel: (604) 736-0451 • Telex: 04-508833
Cable: WAGENG

# WESTBURNE ENGINEERING




*Subsea drilling systems are custom-designed by Westburne Engineering.*

*Fully equipped engineering and design facilities are available in the Calgary office of Westburne Engineering.*




*This drillship was designed by Westburne Engineering for use in Southeast Asian waters.*

Westburne Engineering offers consulting engineering services for offshore and Arctic petroleum exploration and development.

The company specializes in arriving at innovative solutions to new problems in offshore and frontier areas. Its world-wide consulting services range from conceptual design and feasibility studies, to complete design, installation and start-up of oil field systems for frontier areas.

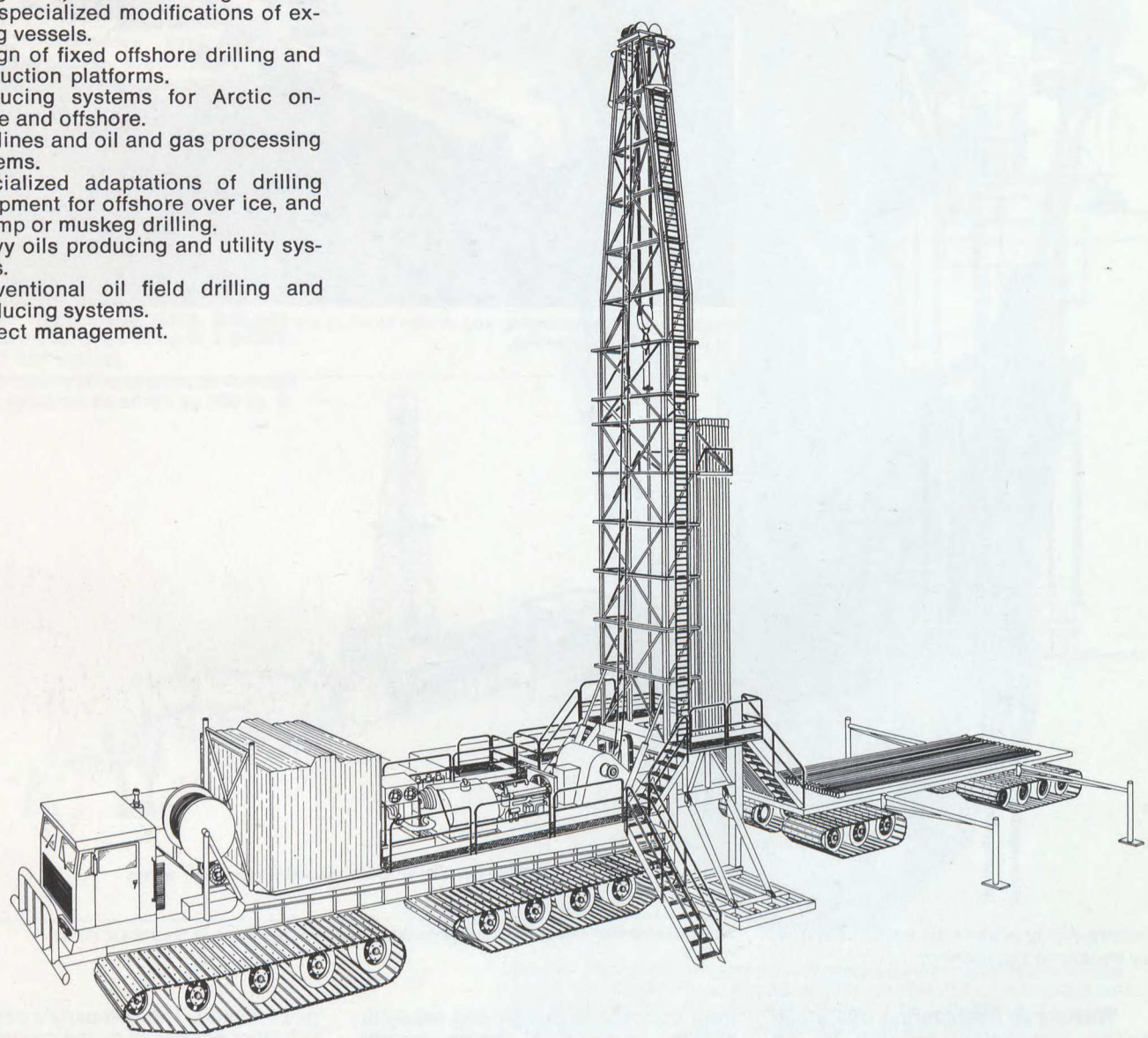
Westburne Engineering has a growing and highly skilled staff having more than 60 years of combined engineering and design experience in the oil and gas industry. The company's capability is further enhanced by the co-ordinated teamwork, technical assistance and financial capability of affiliated companies engaged in contract drilling and in oil field supplies.

300-535 Seventh Avenue Southwest • Calgary, Alberta T2P 0Y4, Canada • Tel: (403) 266-8931 • Telex: 038-25629

# WESTBURNE ENGINEERING

A complete range of consulting and engineering services is provided for the petroleum and gas industry by Westburne Engineering. Recent work and areas of specialization by this Calgary-based company include:

- Cost and feasibility studies in remote and offshore frontier areas.
- Design of offshore drilling vessels and specialized modifications of existing vessels.
- Design of fixed offshore drilling and production platforms.
- Producing systems for Arctic onshore and offshore.
- Pipelines and oil and gas processing systems.
- Specialized adaptations of drilling equipment for offshore over ice, and swamp or muskeg drilling.
- Heavy oils producing and utility systems.
- Conventional oil field drilling and producing systems.
- Project management.



*A self-propelled drilling rig created by Westburne Engineering, for work in swamp and muskeg conditions.*

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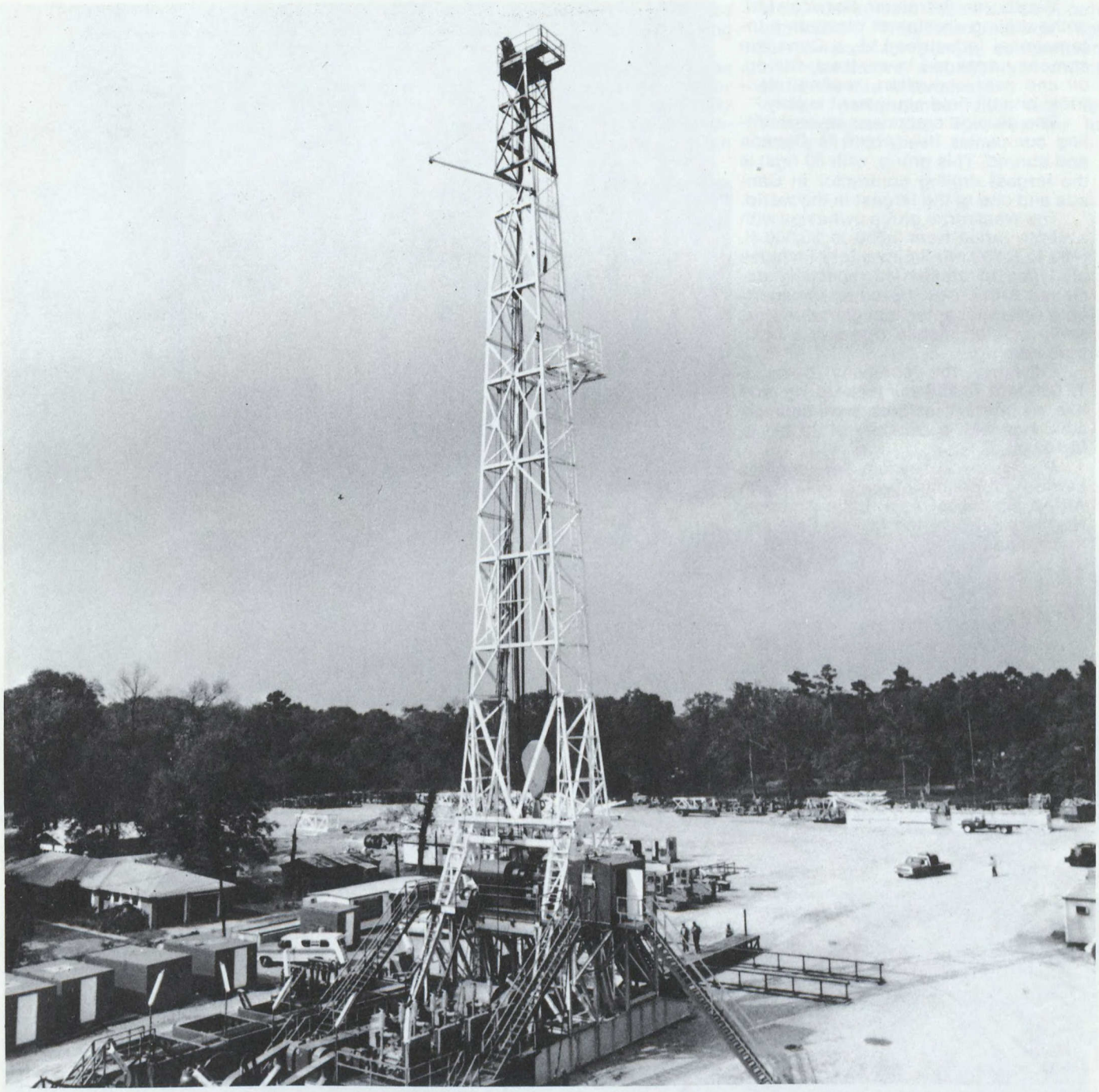
# WESTBURNE ENGINEERING



*This helicoper transportable drilling rig was designed for Westburne International Drilling Ltd. for work in Brazil. Its capacity is 14,750 tt. (4,500 m).*

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# WESTBURNE PETROLEUM SERVICES LTD.

Westburne Petroleum Services Ltd. is the drilling division of Westburne International Industries Ltd., a Canadian company engaged in contract drilling, oil and gas production, heating, electrical and oil field equipment supply.

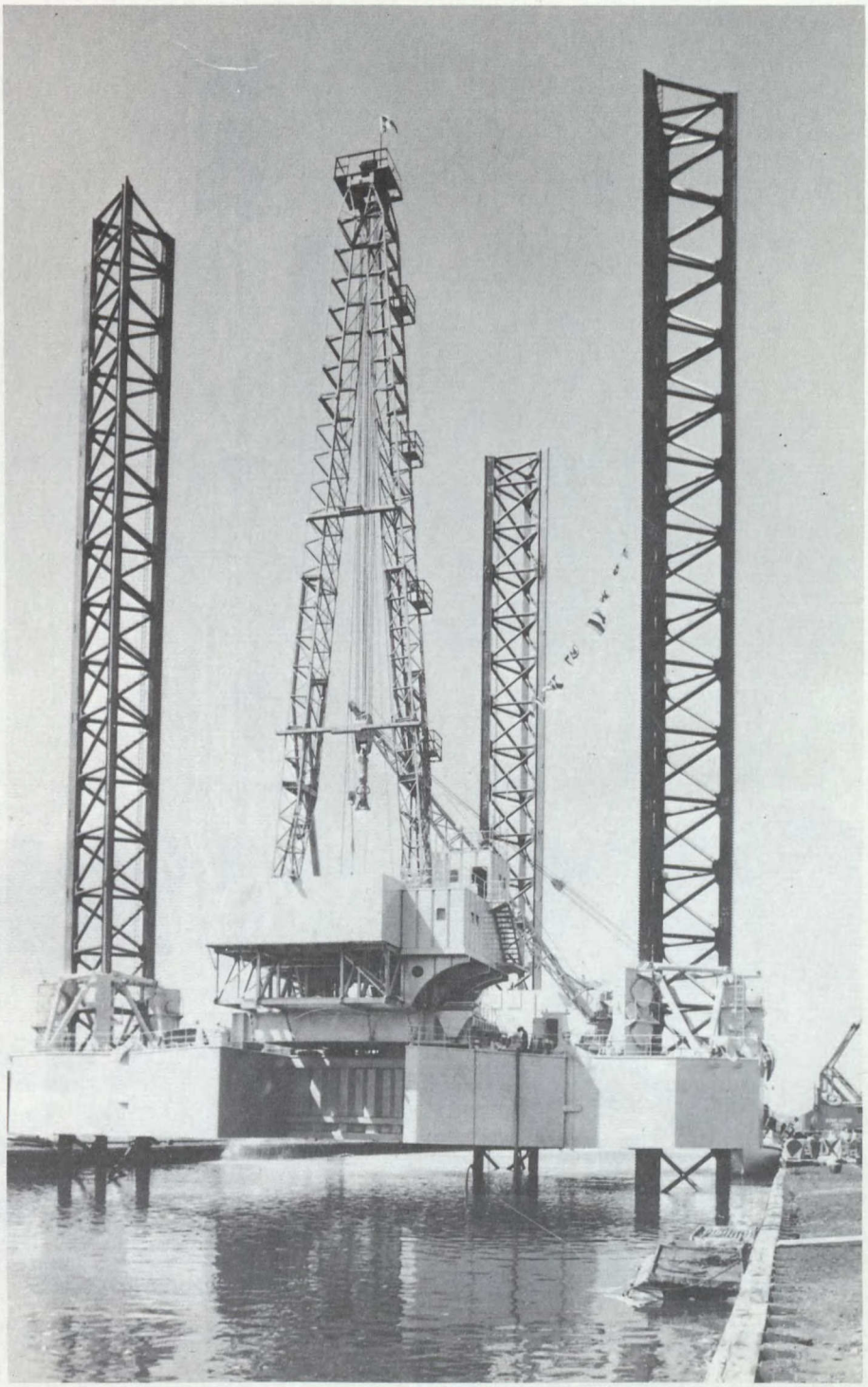
The division comprises several drilling companies itself, both in Canada and abroad. This group, with 80 rigs, is the largest drilling contractor in Canada and one of the largest in the world.

The Westburne group owns rigs with a depth range from 1,500 to 20,000 ft. (460 to 6,100 m). Its inventory includes all types of equipment, specially designed Arctic rigs, Hercules transportable rigs, helicopter transportable rigs, self-propelled mobile rigs and a light, core hole rig.

Offshore, the company owns a 12,000-foot (3,658 m) jack-up rig and has an interest in three semi-submersible rigs with a capacity of 20,000 ft. (6,100 m).

Westburne Petroleum Services has carried out drilling operations in North Africa, Southeast Asia, Latin America, Northern Europe, the Middle East and in Canada.

*Westburne Petroleum Services Ltd. specifically designed this slant hole drilling rig for offshore petroleum exploration.*



*This is one of Westburne Petroleum Services Ltd.'s self-contained jack-up drilling platforms.*

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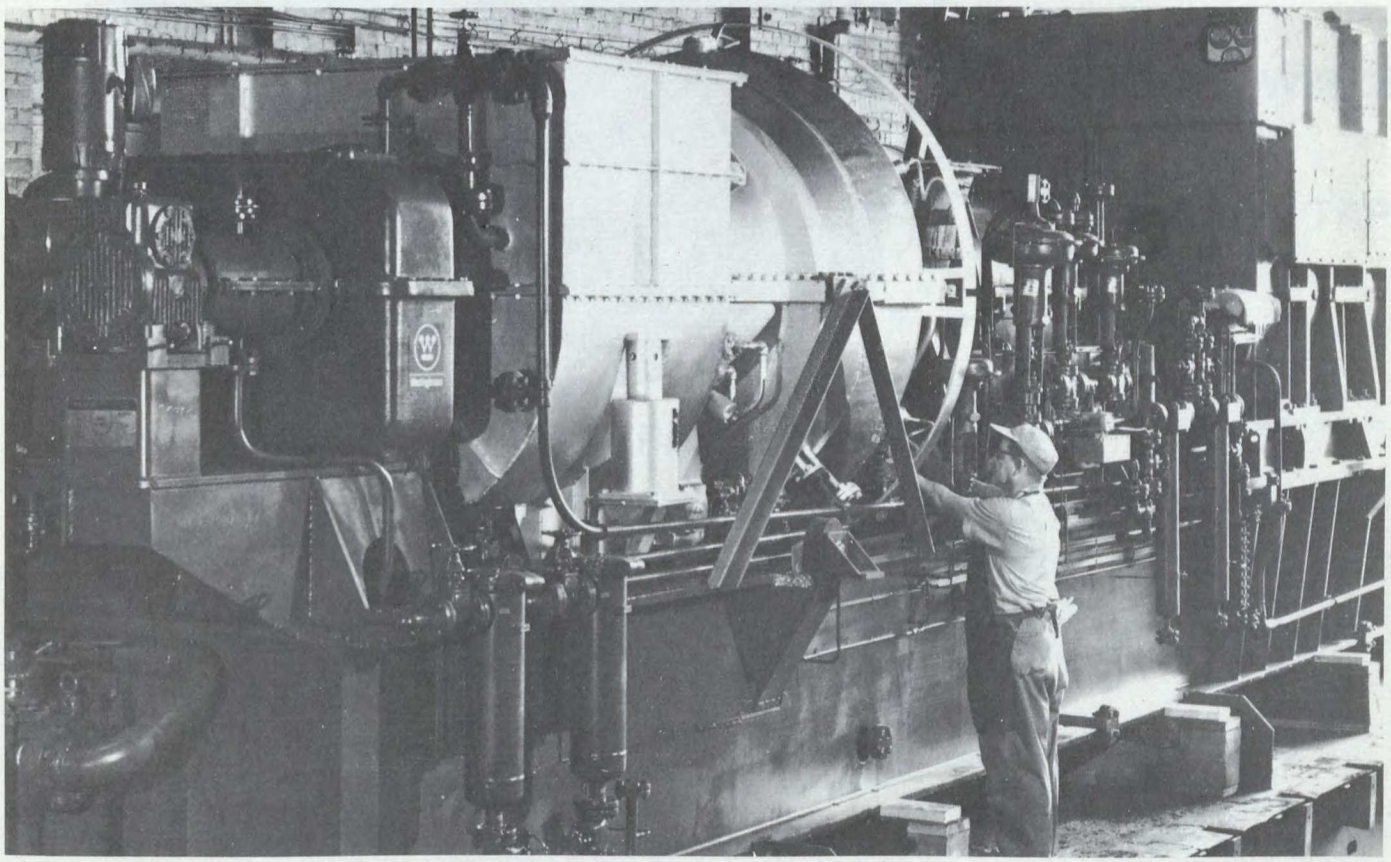
# WESTINGHOUSE CANADA LIMITED

Westinghouse gas turbines were the first to be designed and built for an icebreaker. Produced by Westinghouse Canada Limited, these engines perform along with a conventional diesel-electric propulsion system. The world's first icebreaker powered by gas turbines, the CCGS "Norman McLeod Rogers", is equipped with twin Westinghouse gas turbines providing 8,800 driving horsepower.

The ability of Westinghouse gas turbines to burn a wide variety of oil or gaseous fuels, and their high reliability combined with impressive power density per square foot of engine-room area, make them ideal for shipboard application. They also provide high performance for pumps, compressors and generators on offshore drilling platforms and at terminals.

For performance data, ask for Westinghouse Gas Turbines for Industry BH 7316.

*The world's first gas turbine icebreaker, the "Norman McLeod Rogers", is powered by twin Westinghouse engines.*



*A Westinghouse Model W41G power plant undergoes tests before shipboard installation.*

286 Sanford Avenue North • Hamilton, Ontario, Canada • Tel: (416) 528-8811 • Telex: WESTINGHSE HAM 021-655
Cable: WESTCAN HAMILTONONTARIO (CANADA)

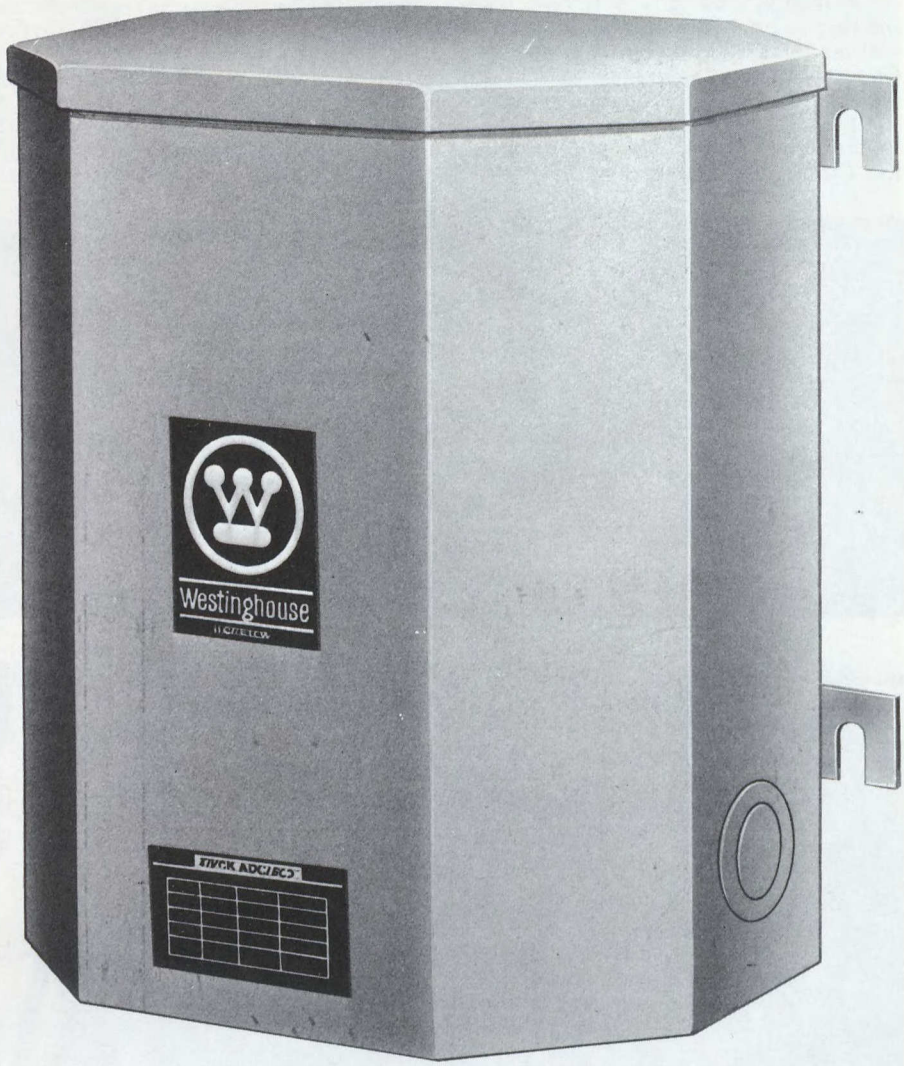
# WESTINGHOUSE CANADA LIMITED

Westinghouse Canada Limited designs dry-type transformers specifically for shipboard use, bulkhead or deck mounting with standard knockouts. These units meet the rigid requirements of IEEE-45 and Lloyd's Register.

All units are epoxy filled and feature drip-proof construction of the smallest, lightest, most quiet design available.

They are also the safest. They cannot explode, no tonic gas can be released and fire hazards are negligible. The "potted" construction provides the ultimate protection against effects of dust, moisture and corrosive vapour.

These transformers are available in single phase, 2 through 50 KVA.




*Dry-type transformers for marine and shipboard use are made by Westinghouse Canada Limited.*

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Cable: WESTCAN HAMILTONONTARIO (CANADA)

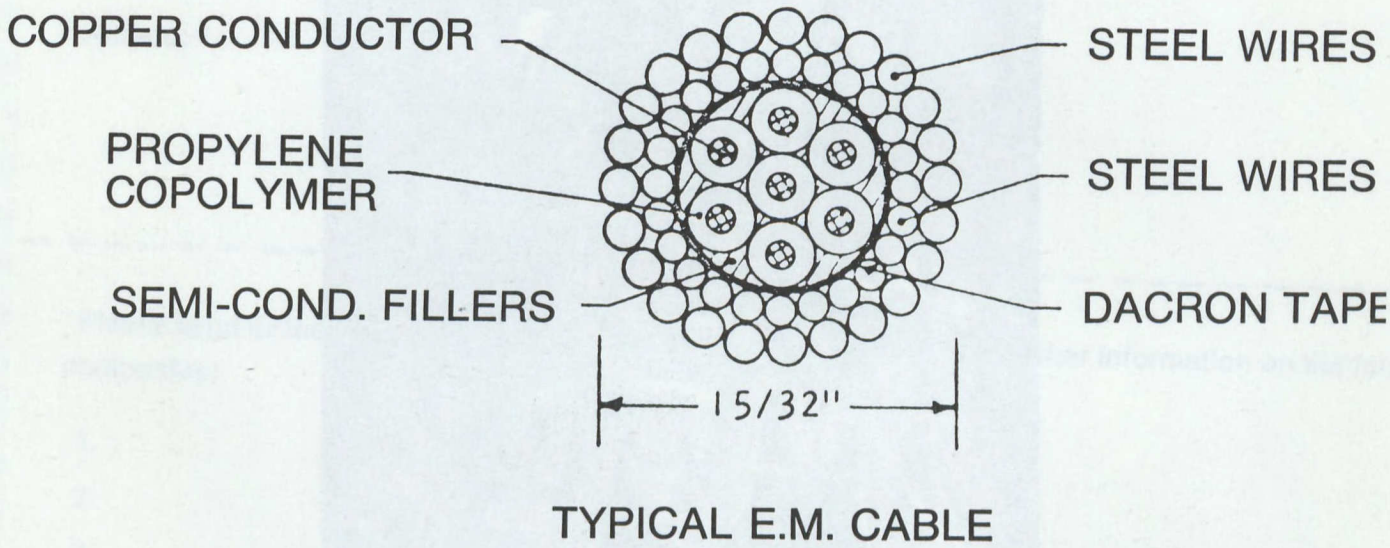
# WIRE ROPE INDUSTRIES LTD.

Wire Rope Industries Ltd., a long-established manufacturer of steel wire rope in Canada, is now producing electro-mechanical cables for oceanographic work and underground studies of oilfields.

Other products manufactured and supplied by the company include every type of steel wire rope, wire rope slings and flat web nylon slings.

The company recently moved into the largest wire rope plant facility in Canada — at Pointe Claire, Quebec, near Montreal — and has already supplied electro-mechanical cables to oil exploration companies working in Western Canada oil fields.

With the technical backing of a world-wide organization, Wire Rope Industries is prepared to serve petroleum and oceanographic companies anywhere.




TYPICAL E.M. CABLE

*Cross-section shows construction of a typical electro-mechanical cable from Wire Rope Industries Ltd.*

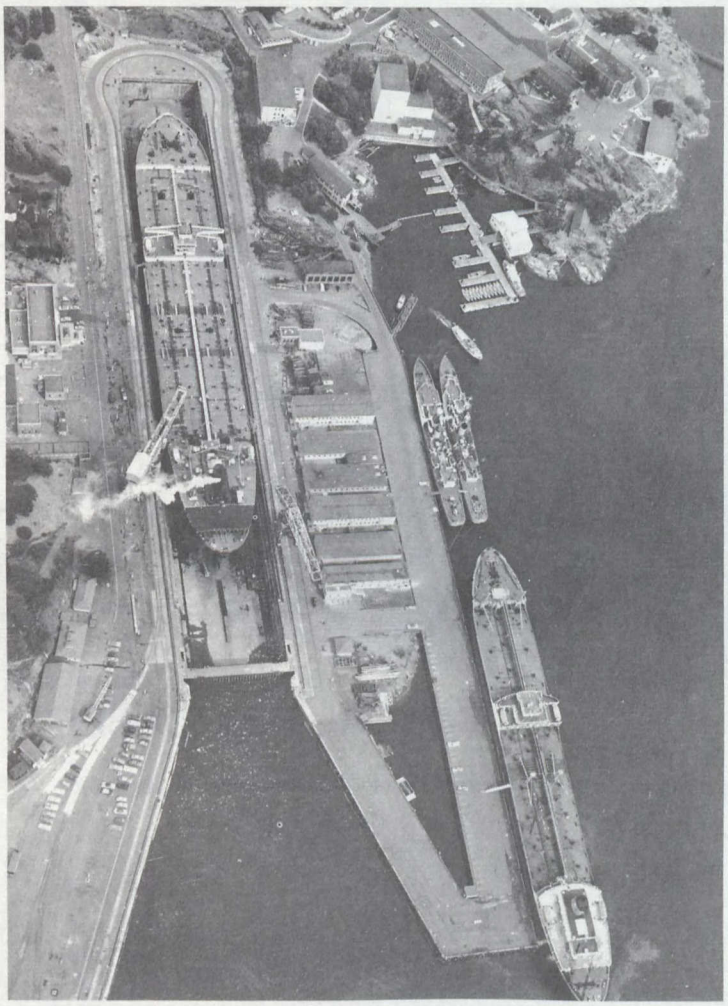
5501 Trans Canada Highway • Pointe Claire, Quebec H9R 1B7, Canada • Tel: (514) 697-9711 • Telex: 05-821693

# YARROWS LIMITED

The Burrard-Yarrows Group owns several floating drydocks, a marine railway and operates in the large graving dock at Esquimalt Harbour, immediately adjacent to the Yarrows premises. This dock is 1,173 ft. (357.62 m) long and 126 ft. (38.40 m) wide.

These docking facilities, backed by the complete shipyard shop capability of both its shipyards, enable the Group to perform almost any type of ship repair or major conversion.

In any single year, repair work is performed on about 400 ships flying the flags of many nations.



*A super-tanker is refitted in a Burrard-Yarrows drydock while a smaller tanker waits its turn.*

P.O. Box 1030 • Victoria, British Columbia V8W 2S9, Canada • Tel: (604) 385-4421 • Telex: 044-8165
Cable: YARROWS Victoria

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For further information about Canada's offshore petroleum and oceanology capability please contact:

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or the nearest Canadian Trade Office.

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