

MARITIME REPORTER AND ENGINEERING NEWS



EUROPORT '83

M/V Miscaroo

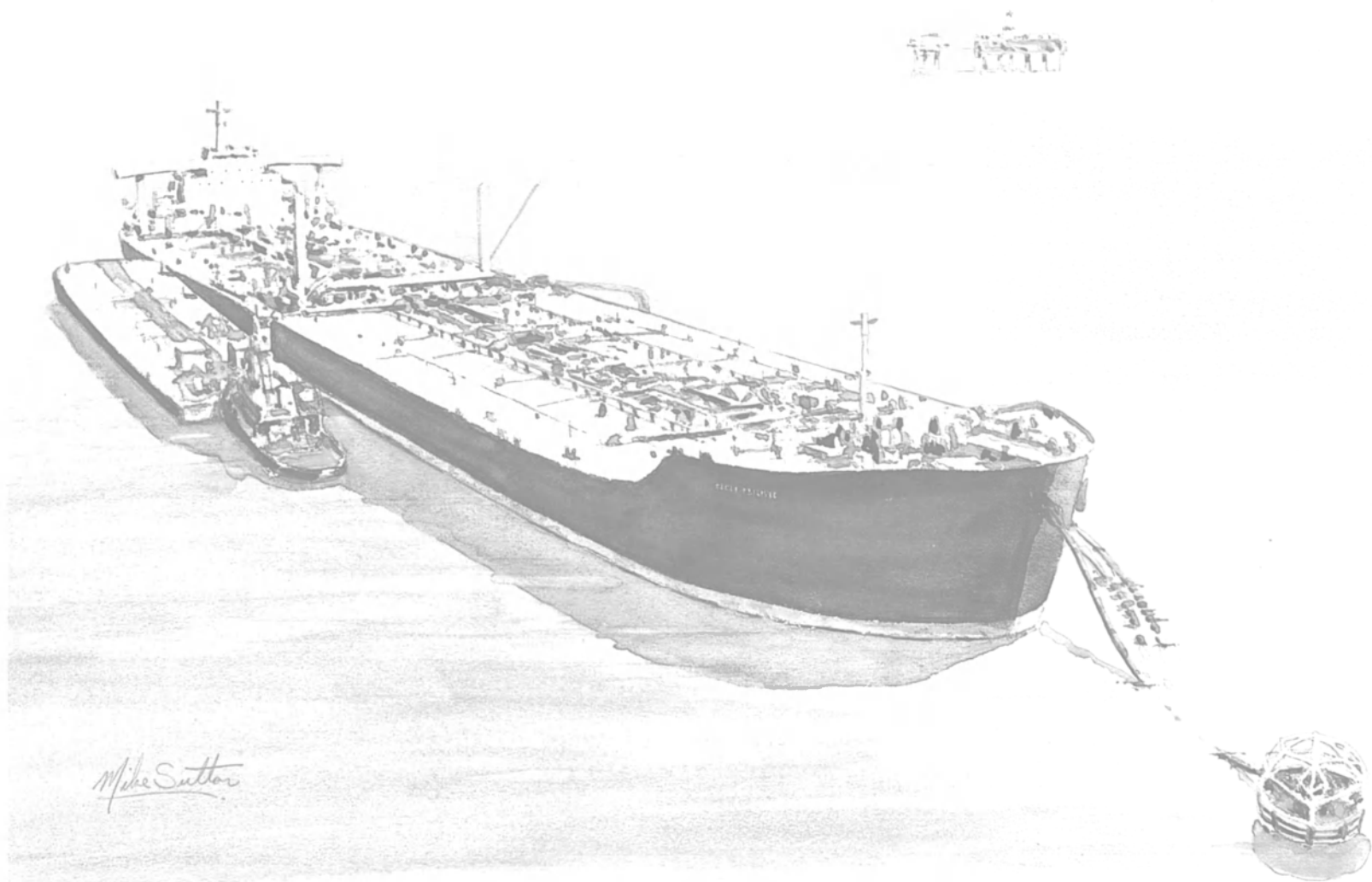
**Icebreaking Supply Vessel
M/V Miscaroo Delivered
By Vancouver Shipyards**

(SEE PAGE 4)

NAVY

(SEE PAGE 4)

OCTOBER 15, 1983



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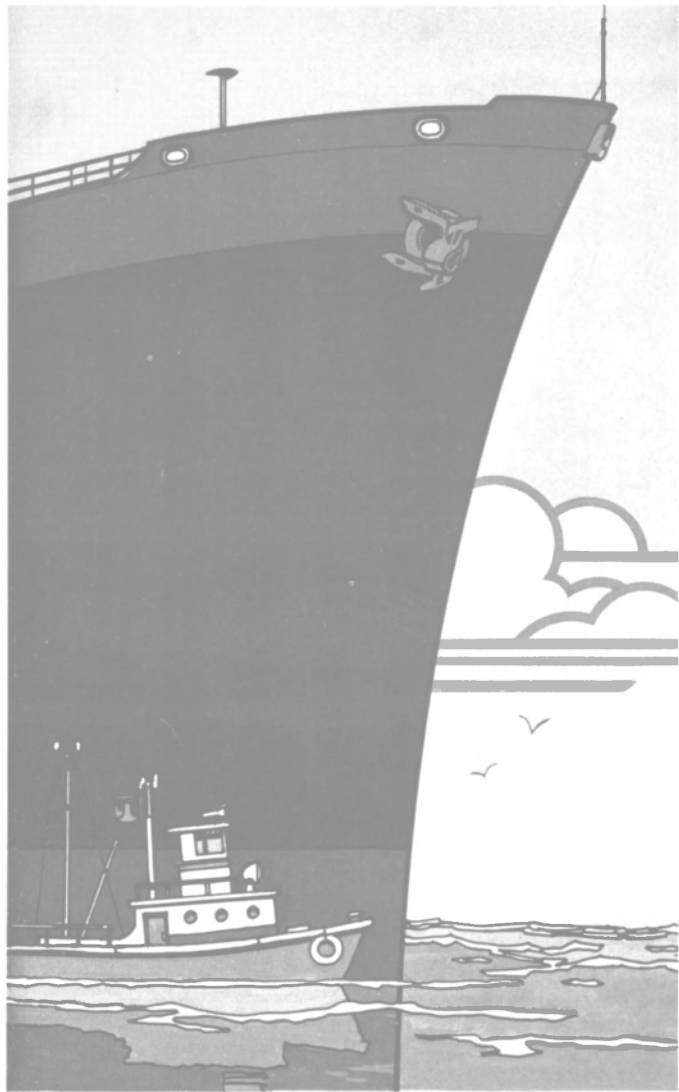


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ON THE COVER

**Miscaroo Delivered
by Vancouver Shipyards**

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Europort '83

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NATO Frigates

PAGE 26

Jeffboat Building Three Title XI Approved Cruise Vessels Worth \$28-Million

The Maritime Administration has approved in principle a joint application by Coastal Cruise Line, Inc., Republic Cruise Line, Inc. and Liberty Cruise Line, Inc., all of 120 S. Central Avenue, St. Louis, Mo., for a Title XI guarantee to aid in financing the construction of three passenger cruise vessels.

The vessels will be 207 feet long and have a beam of 37 feet and a full-load draft of 7 feet. Each will accommodate 100 passengers and require a crew of 23.

The vessels are expected to visit ports on the U.S. East Coast including Boston, Baltimore, Savannah and Miami during the spring, summer and fall and the U.S. Virgin Islands in the winter.

Jeffboat, Inc., Jeffersonville, Ind. is the builder of the vessels. Delivery dates are September 1983, December 1984, and July 1985. (See MR, 9/1/82.)

The Title XI guarantee covers \$21,360,000 or 75 percent of the estimated actual cost of the three vessels.

The MarAd Guarantee is designed to assist the companies in obtaining favorable commercial financing for the project.

GE Awarded \$87-Million Radar Contract Increase

General Electric Company, Syracuse, N.Y., is being awarded an \$87,664,348 modification to a previously awarded fixed-price-incentive contract for 10 AN/TPS-59 3D radar systems and special tools, test equipment and related data. The Naval Electronic Systems Command, Washington, D.C., is the contracting activity (N00039-80-C-0482).

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Centrico Forms New Mineral Oil Group Headed By Lohmeyer

Rising demand for Westfalia oil purifying centrifuges has spurred the formation of a "Mineral Oil Group" at Centrico, Inc., it was recently announced. According to Wend Wendenburg, executive vice-president of Centrico: "With oil prices high and slated to go higher, more and more users are controlling costs by burning heavy fuel oil. Westfalia oil purifying Separators are an important part of this trend, and our new Group will help us serve the market more efficiently." Centrico, Inc., Northvale, N.J., is the North American distributor of Westfalia Separators and related systems.

Westfalia Oil-Purifying Separators remove both water and solid particles from fuel and lubricating oil, allowing engines to burn heavier, less expensive grades of diesel fuel, as well as recycle lubricating oil. This results in savings in fuel and lube oil costs, reduced engine wear, reduced maintenance and less engine downtime.

Head of the new Group will be Klaus Lohmeyer, manager of marine and power systems for Centrico. Mr. Lohmeyer is a former seagoing chief engineer with experience in a wide tonnage range of merchant vessels. Before coming to Centrico he was employed

at Westfalia Separator AG for 15 years where he became a specialist in oil purification systems. He will be responsible for all sales and engineering activities in four fields: (1) marine applications, including small boats, offshore drilling, fisheries, etc.; (2) land-based power plants; (3) gas turbine fuel purification and washing systems; and (4) lubricants, coolants and hydraulic fluids, etc., used in the metalworking industries.

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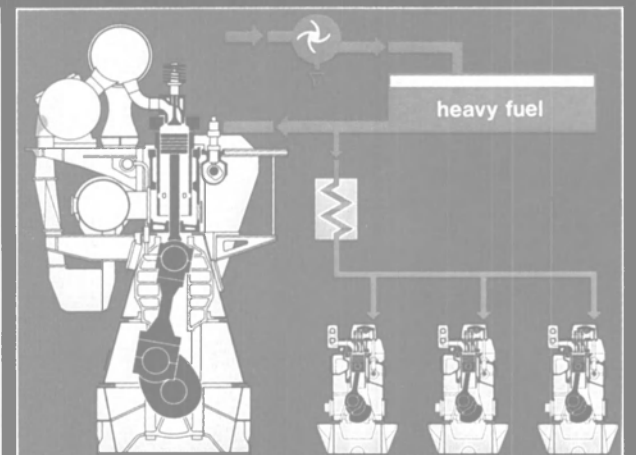
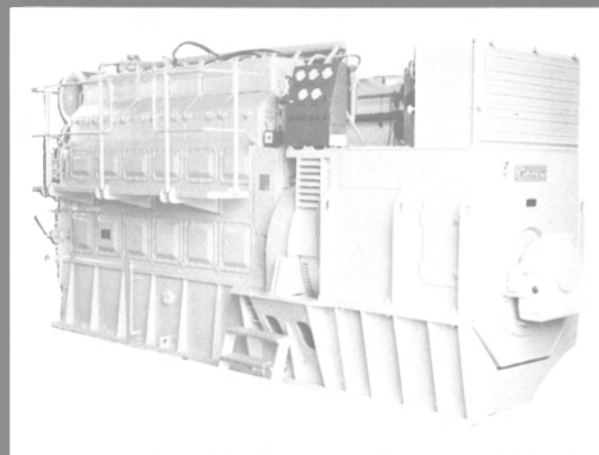
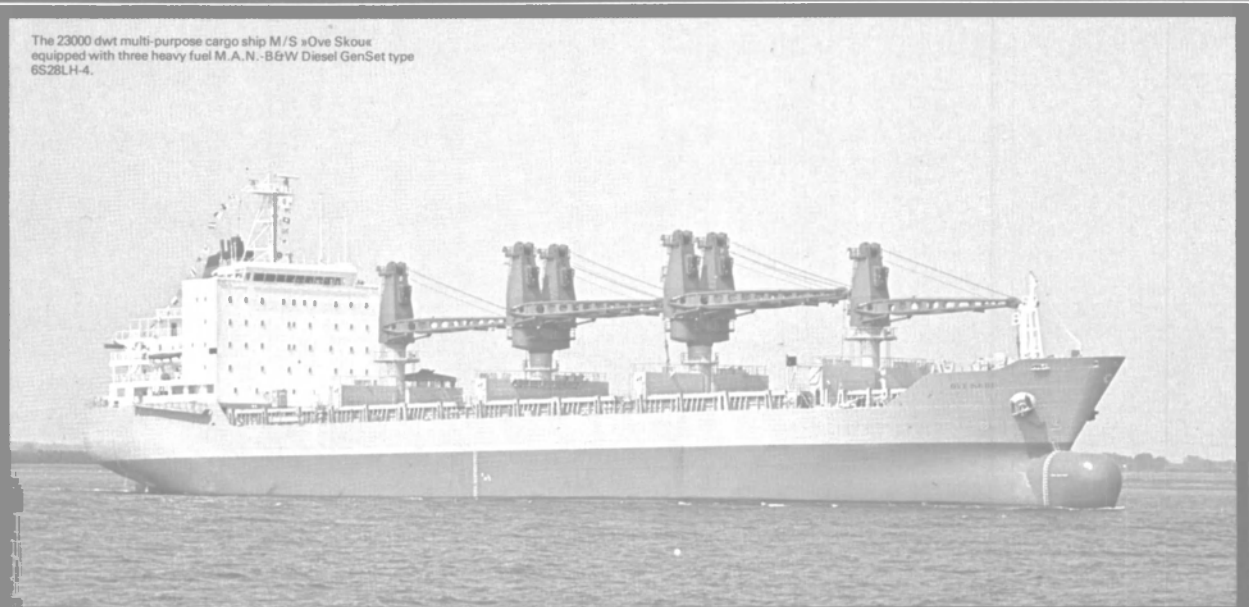
According to Mr. Wendenburg, oil purification equipment was initially purchased as add-on equipment, but they are increasingly being specified by designers and engine manufacturers as original equipment. In this way, maximum functional and design efficiencies are realized.

For full information and literature on Westfalia equipment,

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The world leader in H.F.O. operated Marine GenSets

The 23000 dwt multi-purpose cargo ship M/S »Ove Skov« equipped with three heavy fuel M.A.N.-B&W Diesel GenSet type 6S28LH-4.



H.F.O. marine GenSet

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The GenSets are manufactured worldwide by the M.A.N. B&W's licensee organization and sold through more than 20 M.A.N. B&W branch offices and more than 45 agents

Uni fuel concept

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- Marine GenSets and Main Engine operate on the same heavy fuel.
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- Marine GenSets designed to operate on fuels up to 7,000 Sec. R.1 and for »future« fuels.

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Krupp Atlas Offers Literature On Two New Products

Krupp Atlas-Elektronik recently introduced two new products to their line of navigational and hydrographic survey aids.

The Polarfix is a fully automated combined range/azimuth laser dynamic position fixing system incorporating automatic

tracking and data processing facilities. Suited for operation in ports and inland waterways, it is designed to overcome geometric siting and signal transmission difficulties associated with the operation of radio position fixing systems in these environments. System accuracy for short ranges is of the order of $\pm 0.2m$ per km of measured range.

Another new product, the Deso-

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A new high-precision color echo sounder, the Atlas 312 Echoscope,

is now being introduced to world fishing markets, the unit provides a combination of high definition images with a display of incoming echoes in 16 color gradations.

For information on Krupp Atlas line of products,

Write 90 on Reader Service Card

Berwanger Named Sales Manager For Tate Temco Inc.

Louis A. Berwanger Jr. has been appointed industrial sales manager for Tate Temco, Inc., Baltimore, Md. Mr. Berwanger comes to Tate Temco from Berwanger & Associates, an industrial sales firm in the Mid-Atlantic states, where he was vice president of sales and marketing. He is a graduate of the State University of New York, from which he holds a degree in business and marketing. Tate Temco is a leading manufacturer of pipeline strainers, hull drainage fittings, desiccant air dryers, manifold valves and specialty marine equipment. The company is a prime supplier to naval and commercial shipyards.

For free literature on the complete Tate Temco line,

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Masters Weather Center Offers New Forecasting Service Brochure

To take advantage of TeleSystems' expertise with maritime communications technology, the Masters' Weather Center is now part of COMSAT TeleSystems' maritime operations.

Operating around the clock, the Center offers a complete and fast forecasting, ship routing, tracking, and port scheduling service. Recommendations are based on global weather information obtained by satellite every 25 minutes. The Center offers ultramodern communications links, including TWX, telex, telecopiers, computer-to-computer, and toll-free phone linkage.

Ships owned by subscribers receive site-specific wind and wave weather forecasts and routing advisories. With the Masters' Weather Center services, ship operators, port operators, and offshore facilities can take advantage of favorable conditions to reduce fuel consumption, weather damage and voyage time.

The Center's personnel are experts in maritime operations management, meteorology, data processing, communications, and weather analysis and forecasting. They have the combined experience and the state-of-the-art technology to forecast weather accurately as well as analyze meteorological parameters from computerized models.

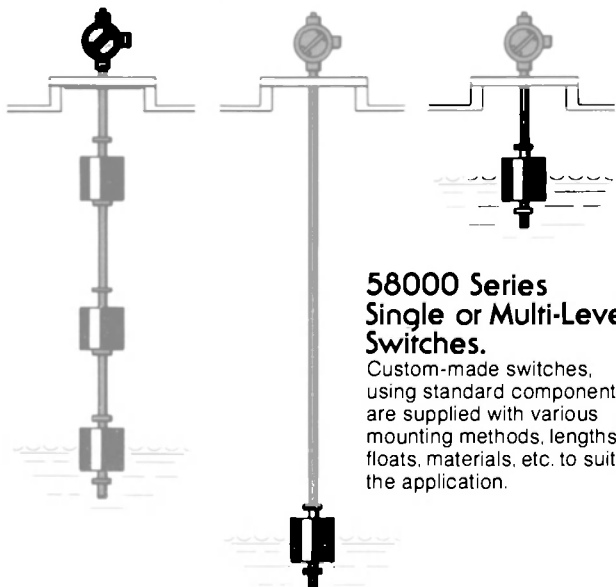
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Where high reliability is required for monitoring liquid levels and signaling alarms.

There's a GEMS switch to meet all types of marine liquid level applications...to monitor and control levels, signal alarms, and to provide oil/water interface. Ideal for use with diesel engine fuel tanks, lube oil reservoirs, ballast, bilge, or oil sump tanks or for other common shipboard uses.



58000 Series Single or Multi-Level Switches.

Custom-made switches, using standard components, are supplied with various mounting methods, lengths, floats, materials, etc. to suit the application.

LS-35565 (brass)/LS-56060 (stainless steel) Externally Mounted Models.



For use where access to inside of tanks is limited, such as on lube oil or fuel day tanks. Custom-length housings. Provide ease of maintenance and tank cleaning.

LS-270 Model with Protective Shielding for Turbulent In-Tank Conditions.



Small and compact, unit side-mounts in tank. Ideal for low level bilge or sump tanks, and oil/water interface.

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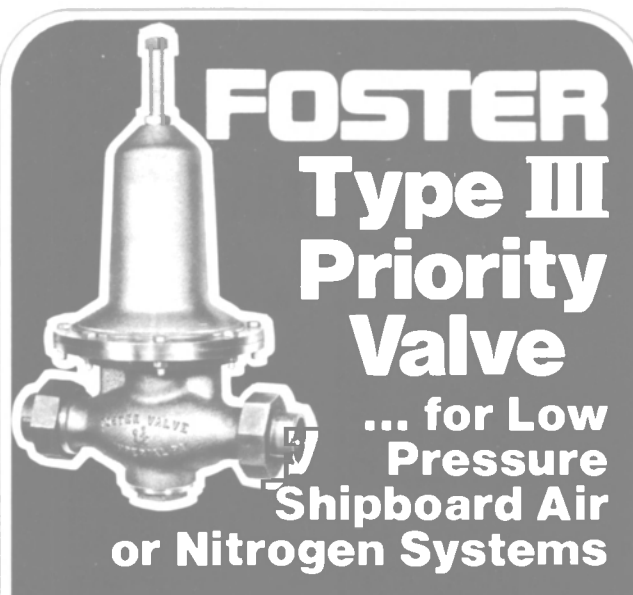
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FOSTER Type III Priority Valve

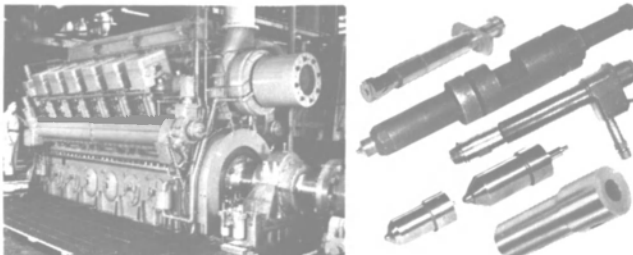
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Union Flonetics' Type III Priority Valves are designed to protect the supply pressure to essential shipboard services. Built to MIL-V-24384A, Type III, Class A, Design A. Available in bronze body sizes 1-1/4", 1-1/2", and 2" IPS. Write for additional information.

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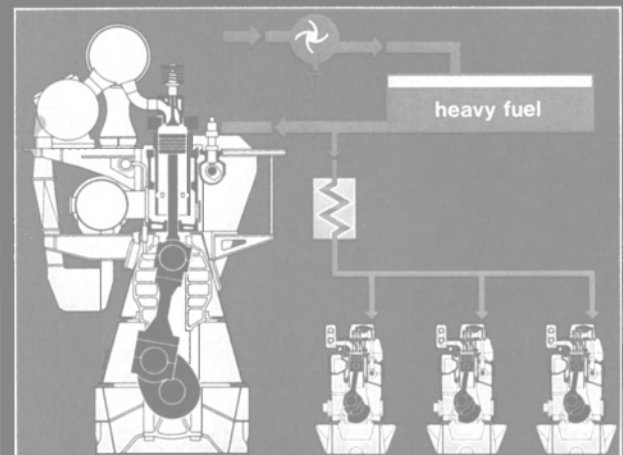
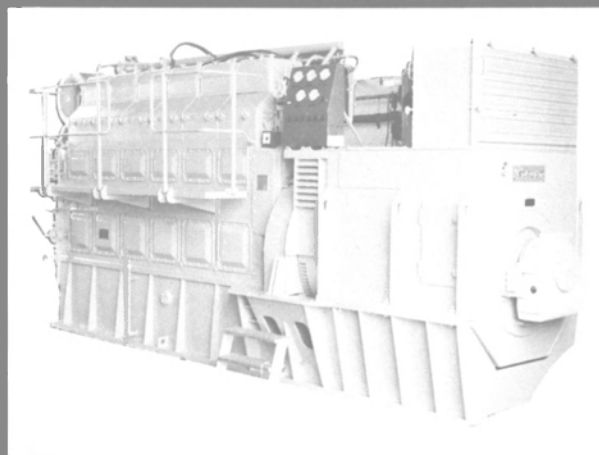
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- 85 years of experience in diesel engine design.
- 70 years of experience in marine GenSet design.
- 45 years of experience in GenSet operation on H.F.O.
- More than 5.0 mio accumulated service hours in marine GenSet on H.F.O.
- Most extensive know-how and continuing research and development in the marine diesel field.
- 500 kW — 4000 kW per unit at 720/750 RPM.

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The GenSets are manufactured worldwide by the M.A.N. B&W's licensee organization and sold through more than 20 M.A.N. B&W branch offices and more than 45 agents

Uni fuel concept

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- Marine GenSets and Main Engine operate on the same heavy fuel.
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- Simplified and cheaper bunkering.
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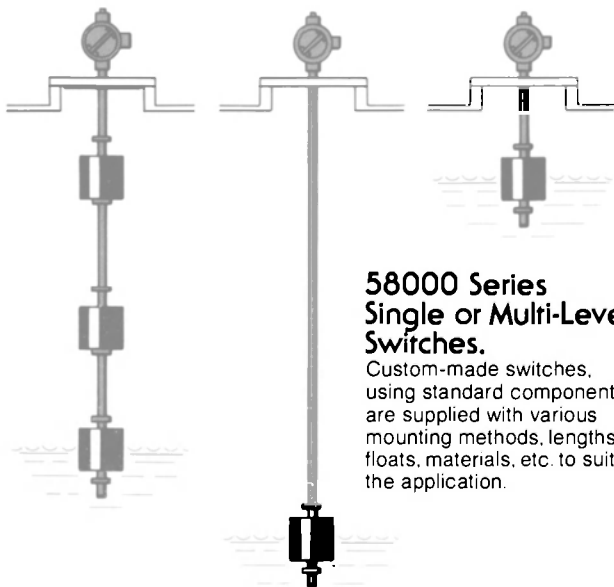
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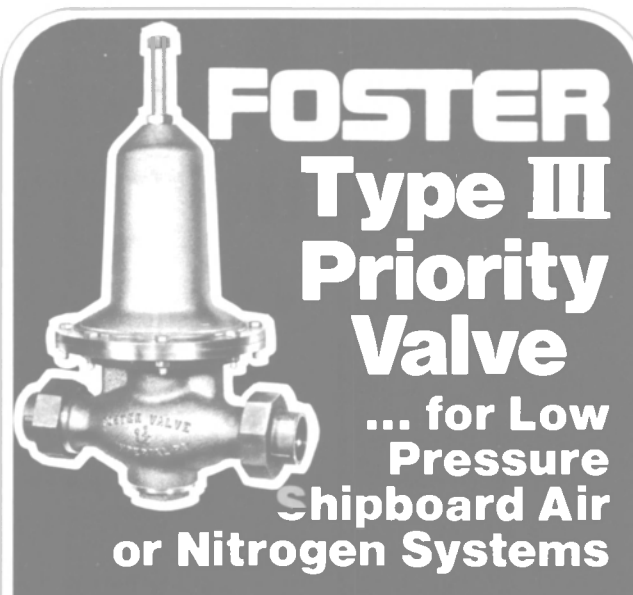
For application information, call toll-free (800) 321-6070. In Ohio call (800) 441-7733.

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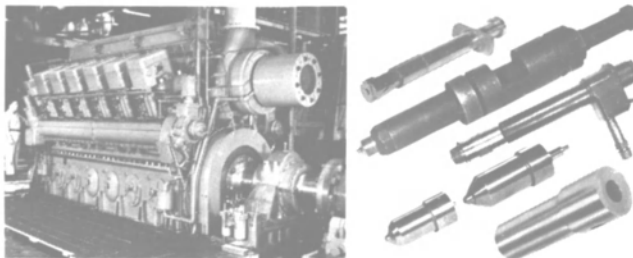
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Berwanger Named Sales Manager For Tate Temco Inc.

Louis A. Berwanger Jr. has been appointed industrial sales manager for Tate Temco, Inc., Baltimore, Md. Mr. Berwanger comes to Tate Temco from Berwanger & Associates, an industrial sales firm in the Mid-Atlantic states, where he was vice president of sales and marketing. He is a graduate of the State University of New York, from which he holds a degree in business and marketing. Tate Temco is a leading manufacturer of pipeline strainers, hull drainage fittings, desiccant air dryers, manifold valves and specialty marine equipment. The company is a prime supplier to naval and commercial shipyards.

For free literature on the complete Tate Temco line,

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Masters Weather Center Offers New Forecasting Service Brochure

To take advantage of TeleSystems' expertise with maritime communications technology, the Masters' Weather Center is now part of COMSAT TeleSystems' maritime operations.

Operating around the clock, the Center offers a complete and fast forecasting, ship routing, tracking, and port scheduling service. Recommendations are based on global weather information obtained by satellite every 25 minutes. The Center offers ultramodern communications links, including TWX, telex, telecopiers, computer-to-computer, and toll-free phone linkage.

Ships owned by subscribers receive site-specific wind and wave weather forecasts and routing advisories. With the Masters' Weather Center services, ship operators, port operators, and offshore facilities can take advantage of favorable conditions to reduce fuel consumption, weather damage and voyage time.

The Center's personnel are experts in maritime operations management, meteorology, data processing, communications, and weather analysis and forecasting. They have the combined experience and the state-of-the-art technology to forecast weather accurately as well as analyze meteorological parameters from computerized models.

For your free copy of the fact-filled weather service brochure "Perfectly Practical,"

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Maritime Reporter/Engineering News

Marinette Marine Names New VP Of Engineering



Joseph Mott

Marinette Marine, Marinette, Wisc., has announced the promotion of **Joseph D. Mott Jr.** to the position of vice president of engineering. Mr. Mott has been with the firm since 1976. His responsibilities include the administration of all engineering functions including the planned implementation of a computer-aided engineering system.

The Marinette Marine Engineering Design group has grown significantly in size and technical capabilities, which is evidenced by the in-house detail design work performed on such vessels as the April T. Beker and the Shell America.

National Steel Receives \$13-Million Order To Overhaul The U.S.S. Cayuga

National Steel and Shipbuilding Company, San Diego, Calif., reported that a contract option for approximately \$13 million has been exercised by the U.S. Navy for the regular overhaul of the U.S.S. Cayuga (LST-1186)

A contract awarded by the Navy to NASSCO in October 1982 provided for the regular overhaul of the U.S.S. Tuscaloosa (LST-1187) with options for similar overhauls of four additional LSTs—Cayuga, Frederick, Peoria and Bristol County. Each option will be exercised separately; if all options are exercised, the total value of the contract will be approximately \$80 million.

Work on the Tuscaloosa commenced at NASSCO in June and is expected to conclude in early December. The Cayuga is scheduled to arrive at NASSCO on September 22 for an approximate eight-month overhaul period.

The Tuscaloosa, Cayuga, Frederick, Peoria and Bristol County were built by NASSCO during 1967-72 as part of a 17-ship contract fulfilled for the Navy by NASSCO.

NASSCO's current backlog is approximately \$670 million, which includes \$64 million of repair and overhaul work, including the Cayuga. In addition, NASSCO has Navy options for an additional \$265 million of work which is not included in the backlog.

NASSCO is a wholly owned subsidiary of Morrison-Knudsen Company, Inc.

TECO Transport Names Kaiser Executive V.P.

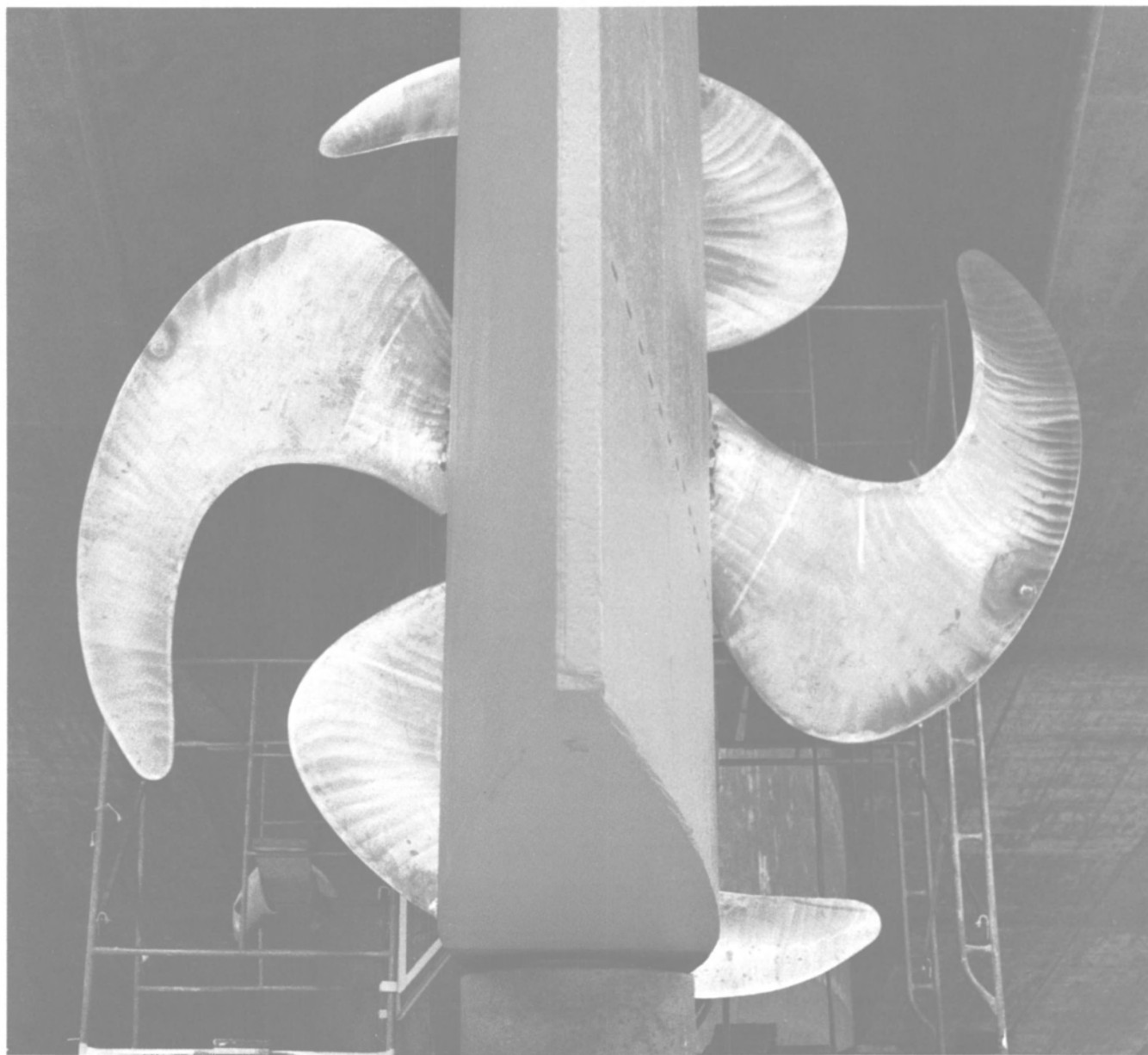
Alex Kaiser has been elected to the new position of executive vice president and chief operating officer of TECO Transport & Trade Corp., Tampa, Fla., an operating company of TECO Energy, Inc. For the past four years Mr. Kaiser has been vice president of Energy Supply for Tampa Electric Company, an affiliate operating com-

pany of TECO Transport & Trade.

TECO Transport & Trade is responsible for operations, construction and marketing for Electro-Coal Transfer, the largest bulk cargo transloading and storage facility on the lower Mississippi River, and for operations and marketing for Mid-South Towing, a Mississippi River barge company, and Gulfcoast Transit, an ocean barge company. These companies have been handling bulk commodities since 1959.

GE Issued \$19-Million Add-On Contract Award

General Electric Corporation, Military Electronic Systems Operations, Syracuse, N.Y., is receiving a \$19,050,116 modification to a previously issued fixed-price-incentive contract for stock repair parts associated with the ANTPS-59 solid state radar. The Marine Corps Logistics Base, Albany, Ga., is the contracting activity (N00039-80-C-0482).



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When American Steamship Company selected B-JCo highly skewed propeller blades for their MV CHARLES E. WILSON, they expected a solution to vibration problems. Measurements were recorded before and after the 1980 blade retrofit. Results have been documented: Reduced cavitation and reduced vibration—in ballast and full load conditions... in shallow and deep waters... at every power level. Greatly improved crew comfort—with low noise and vibration in ship's accommodations. Peak propulsive efficiency and superior maneuverability—because skewed propeller technology is uniquely suited to CP propellers.

Photograph courtesy of American Steamship Company

For over a decade, 75 US Navy warships have been demonstrating success at sea with B-JCo skewed CP propellers. We've applied that naval propeller manufacturing technology and experience to commercial ships. Highly skewed propellers can minimize vibration on large ships designed to maximize cargo capacity. They provide the low noise and vibration levels essential to research and fishing vessels.

Why accept a compromise solution when the B-JCo highly skewed CP propeller can work for your ship (retrofit or new construction), the way it worked for the WILSON? Contact our Marine Sales Department.

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PAI Exhibition Centre, Amsterdam

EUROPORT '83

Amsterdam, The Netherlands — November 8–12

Europort '83—the largest maritime exhibition in the world—will be held from Tuesday, November 8 to Saturday, November 12. The exhibition will be held for the 21st time, in Amsterdam, using all nine halls of the newly expanded RAI Exhibition Centre. A record number of shipping and shipbuilding executives as well as technical personnel from all over the world are expected to attend.

Until recently, Europort was staged annually. However, after Europort '81, it was decided to continue the event every other year. The increased capacity of the RAI complex and the transfer of

Europort's management to RAI Gebouw B.V., contributed to the decision to hold the exhibition every two years. (RAI Gebouw is not only responsible for the management of the exhibition and conference facilities, but also organizes most of the events staged at the RAI complex.)

Well over 430 exhibitors from 26 countries, together representing over 1,200 firms, have reserved stands at Europort '83. There will be six national stands—Denmark, East Germany, Finland, Japan, the United Kingdom and West Germany—among the participants.

The exhibits this year will cover

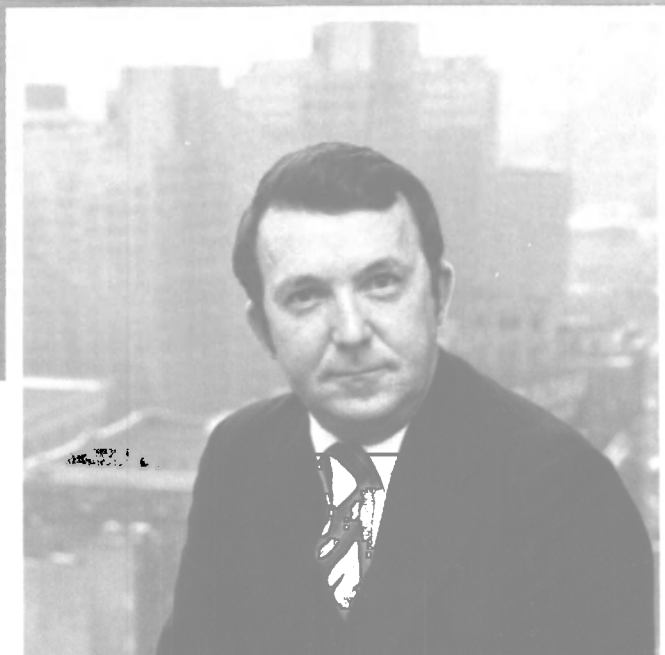
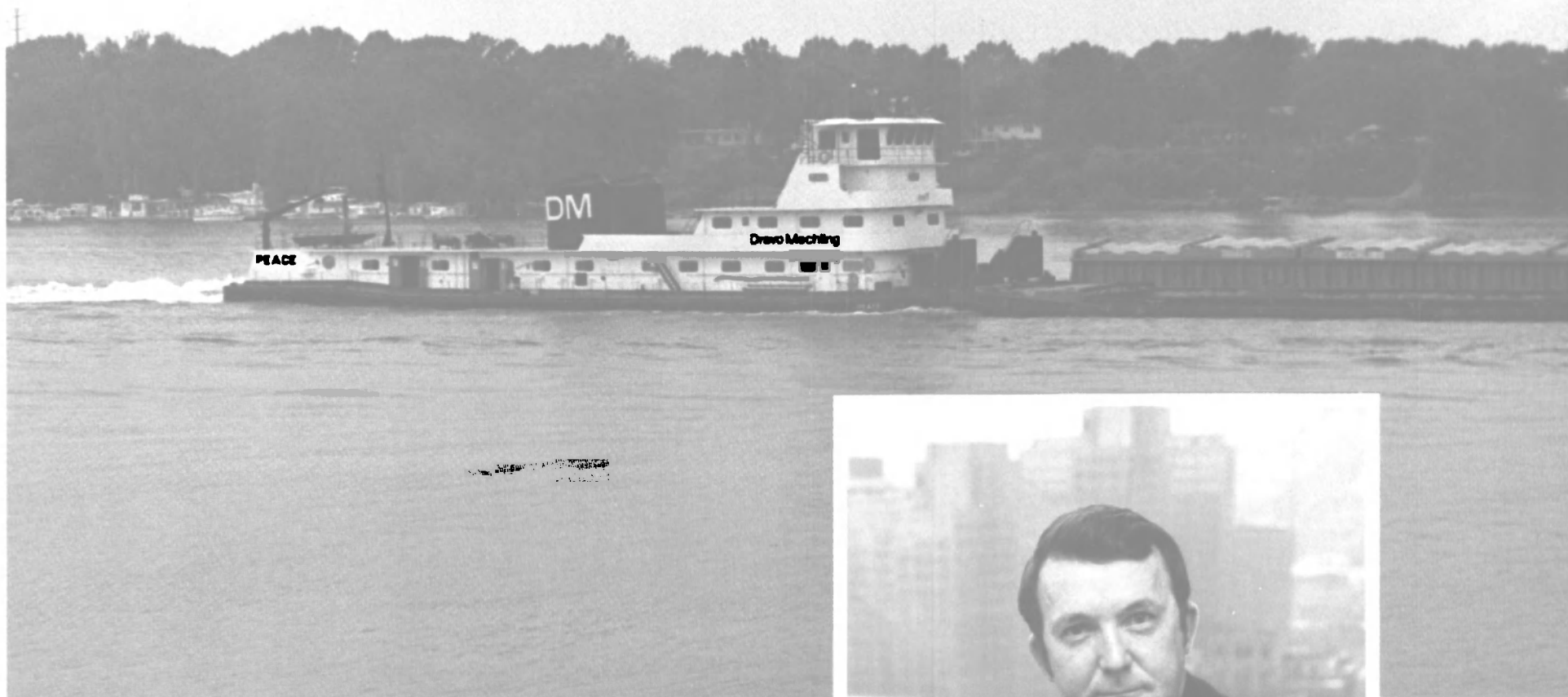
a wide range of products and services including: shipbuilding; fitting-out, repair and maintenance; cooling and refrigeration; containerization and storage tanks; harbor and port equipment; patrol craft, lifeboats and workboats; propulsion systems; auxiliary power supply; communication and navigation equipment and systems; calculation, measurement, regulation and steering systems; loading and unloading systems; advisors, designers and consultants. Other types of marine services, such as financing and insurance, decoration, oceanology, fishing, dredging, etc., will also be represented.

International Maritime Finance Conference

The main conference at Europort '83 will concentrate on International Maritime Finance. Speakers for the two-day congress will discuss the financial effects of international shipping policies, the problem of shipbuilding subsidies, the justification of finance for new tonnage (including cruise ships) and the financing of major machinery conversions.

Michael D. Revell will chair the first day's sessions, while Professor **Henry S. Marcus** is chairman for the second day's sessions.

(continued on page 11)



Engine operating efficiencies on the M/V Peace add up to \$180,000 annual savings.

"General Electric diesel engines on the repowered Motor Vessel Peace provide an impressive set of operating efficiency figures," emphasizes W. N. (Buck) Lay, Vice President of Operations at Dravo-Mechling.

"Through our motive power studies and engine application experience, we've projected that the GE engines will save more than 156,000 gallons of fuel annually. In addition, we expect to stretch the hours between overhaul from 16,000 to 24,000. Together, these benefits add up to approximately \$180,000 per year in savings."

Other important considerations in Dravo-Mechling's selection of GE engines were the reliability earned during more than 50 million hours of proven service, maintenance simplicity, and maximum standardization of parts.

General Electric diesel engines thus help achieve significant operating efficiency as the Peace pushes

strings of barges from Cairo, Illinois, at the junction of the Ohio and Mississippi Rivers, to the port of New Orleans.

Fuel efficiency and time between overhauls will vary from one application to another. To learn more about how GE diesel engines can help you, contact your GE representative or Manager, Diesel Power Products, Building 14-4, General Electric Company, 2901 East Lake Road, Erie, PA 16531 (814) 875-2319.

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That's when ARCO asked Daewoo to build them a Seawater Treating Plant, a first-of-a-kind facility that could maintain enough pressure in Arctic waters to keep oil production at 1.5 million barrels daily. It was Daewoo's S.J. Lee, project director, who made sure the massive structure was out of the Okpo Shipyard on time, even though many extra steps had to be taken to prepare the plant for 20 years of work in sub-zero marine conditions.



S.J. Lee is just one example of the exceptional dedication you'll find at Daewoo, and one of the reasons why we're becoming a favorite teammate of businesses around the world.

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Dredging Days

The International Inland Shipping Exhibition, known as Binenscheepvaart '83, has been organized for the third time and is an integral part of Europort '83. The so-called 'wet-work' contractors are grouped together in the

Delta Hall of the RAI complex to form a central theme—dredging.

A separate conference on Instrumentation and Control of Dredging Processes has been organized by the Central Dredging Association (CEDA).

The Dredging Days will comprise two sessions, the afternoon of Thursday, November 10 (1:30–5:45)

and the morning of Friday, November 11, 1983 (9:15–1:30).

Provisional Program

E.W. James of the International Association of Dredging Companies, will open the Dredging Days.

The following papers have been (continued on page 12)

(continued from page 8)

INTERNATIONAL MARITIME FINANCE PROGRAM

Tuesday, November 8

- 9:30—Official opening
- 10:15—Coffee break
- Chairman—**Michael D. Revell**, Administrative Vice President, Director of Shipping, Marine Midland Bank n.a.—London, United Kingdom.
- 10:30—Introduction to the conference by the chairman.
- 10:40—"An Overview of the Present Shipping and Shipbuilding Scene," **J.G. Davis**, Chairman, International Maritime Industries Forum.
- 11:25—"Bank Shipping Finance: a Spherical Approach," Prof. **Costas Grammenos**, Athens, Greece.
- 12:15—"The World Economy in Crisis," Prof. **Brian Griffiths**, Dean, the City University Business School—London, United Kingdom.
- 1:00—Luncheon
- 2:00—"Role of the Bank Committed to Investment in Shipping," **Charles Barrington**, Grindlays Bank p.l.c.—London, United Kingdom.
- 2:45—"The Financial Plight of Shipowners," **H. Rootliep** Member of the Board, Koninklijke Nedlloyd Groep N.V.—Rotterdam, the Netherlands.
- 3:30—Tea break
- 4:00—Panel discussion
- 5:00—Close
- 6:30—Reception at the Rijksmuseum

Wednesday, November 9

- Chairman—Prof. **Henry S. Marcus**, Associate Professor-Marine Systems, Massachusetts Institute of Technology—Cambridge, U.S.A.
- 9:30—Keynote speech, "International Maritime Policies and Their Effect on Finance," Prof. **Henry S. Marcus**.
- 10:15—"Dangers of Governmental Interventions and Subsidies for the World Shipbuilding Market," **W. Fante**, Managing Director, Verband der Deutschen Schiffbauindustrie e.V. Hamburg, Federal Republic of Germany.
- 11:00—Coffee break
- 11:15—"Economics of Large-Scale Machinery Conversions," Dr. **J.B. Parga**, President, Association de Ingenieros Navales de Espana—Madrid, Spain.
- 12:00—Luncheon
- 1:30—"The Case for Scrapping Now," **W.W.Y. Lee**, Chairman, Marine Navigation Company Ltd., London, United Kingdom, Member of Intertanko's Executive Committee.
- 2:15—"Finance for Port Development," **J.H. Betist**, Director of AMRO-Bank, Rotterdam, Head of Concern Relations, Amsterdam-Rotterdam Bank N.V., Rotterdam, the Netherlands.
- 3:00—"Ship Purchase—An Independent Tramship Owner's Point of View," **J.C. Lyras**, Director, Lyras Brothers Ltd.—London, United Kingdom.
- 3:45—Tea break
- 4:00—Final Summing-up, **Frank Chao**, President, Wah Kwong & Co. (Hong Kong) Ltd.—Hong Kong.
- 4:45—Close

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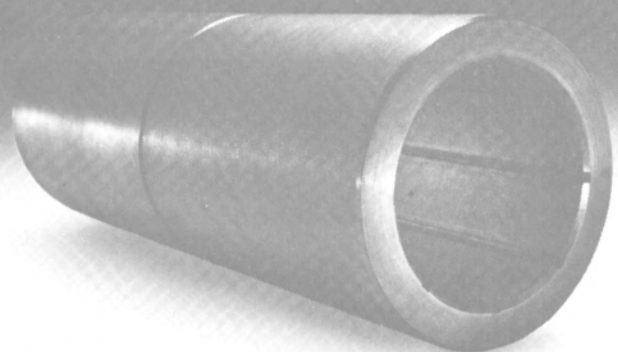
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(continued from page 11)
 selected by the international paper committee for presentation during the Dredging Days.

- "A Simulation Model for the Hydraulic Process of Cutter Suction Dredgers," Ir. **J.L.S. van Ostaeyen**, Dredging International B.V., Belgium.

- "A User-Friendly Automatic Control for Cutter Dredgers," **C. de Keizer**, Observator B.V., The Netherlands.

- "The Influence of Comprehensive Automation Systems on Cutter Suction Dredging Operations," **A.C. van Zutphen**, IHC Holland N.V., The Netherlands.

- "Automatic Laser Range/Azimuth Positioning System for Accurate Dredging Surveys and Dredging Control," **H.F. Wentzell**, Krupp Atlas Elektronik, Federal Republic of Germany.

- "Improving Dredging Performance by Using an Automated

Survey System," **J.S. van Velsen**, Intersite Systems, The Netherlands.

- "A System for the Remote Monitoring of Oceanographic Data to Support Dredging Operations," **S.J. Archer**, Offshore Environmental Systems Ltd., United Kingdom.

- "The Collection and Presentation of Hydraulic and Meteorological Information for a Project," **M. Ringelberg**, Rijkswaterstaat, Delta Division, The Netherlands.

- "Accuracy in Dredging Sand Waves in Access Channels," **F. Draisma, A.M. DeJonge**, Rijkswaterstaat, North Sea Division, The Netherlands.

- "Draghead Positioning of Trailing Suction Dredgers as a Means to Improve Efficiency," **G. Boedt**, Municipality of Rotterdam, Public Works, Harbour Department, The Netherlands; **D.G. Beulink**, IHC Holland N.V., The Netherlands.

- "Accuracy of Draghead Depth and Position Measurement," **G.F. Vermeij**, Observator B.V., The Netherlands.

- "Density Measurements by the use of Radiometric Principles," **G.W. Kappler**, Laboratory Prof. **Dr. Berthold**, Federal Republic of Germany.

- "Means of Measuring the Density of Solid-Liquid Mixtures," Prof. **Dr. W. Wiedenroth**, University of Paderborn, Federal Republic of Germany.

- "Instrumentation Packages to Customize Dredgers," **P.C. Lunsteroo**, IHC Holland N.V., The Netherlands.

- "The Role of Modern Instrumentation in the Measurement of Pipe Friction in Dredging," **N. van Dam**, Zanen Verstoep N.V., The Netherlands.

- "The Measurement of key Parameters in the Cutting and the Discharge Process on Board a Cutter Dredger," **D.K. Kremer**, Boskalis Westminster Baggeren B.V., The Netherlands; **J.A.H. Koenig**, Osiris-Cesco B.V., The Netherlands.

- "Automation as a Principal's Tool," **G. Ottervanger**, Rijkswaterstaat, North Sea Division, The Netherlands.

- "Instrumentation as a Tool for the Manager," **W.H.A. van Oostrum**, International Marine and Dredging Consultants, The Netherlands; **M. Engels**, Internationale Navigatie Apparaten B.V., The Netherlands.

Amsterdam will certainly become the center of attention for the international maritime industry during Europort '83. His Highness Prince **Bernhard** of the Netherlands is patron for the Europort '83. The industry's long-term support of the event and the new facilities offered at the RAI Exhibition Centre provide a perfect background for a highly successful exhibition and congress.

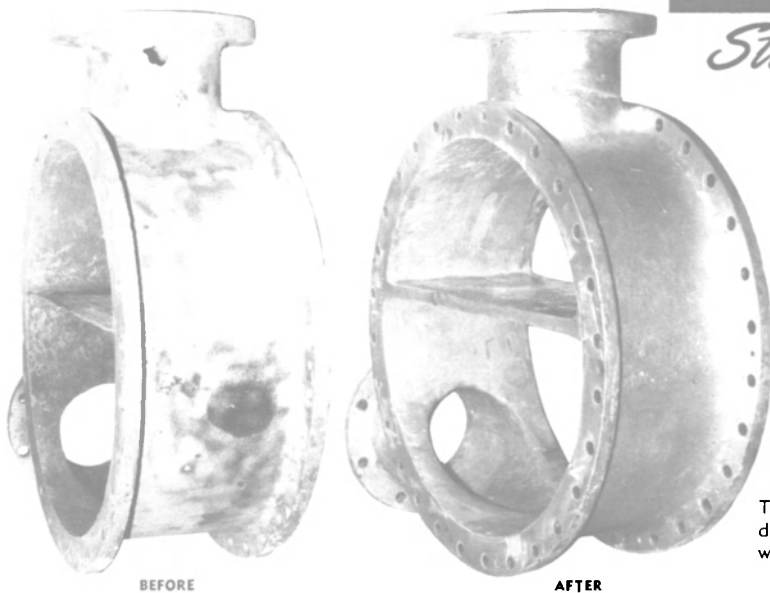
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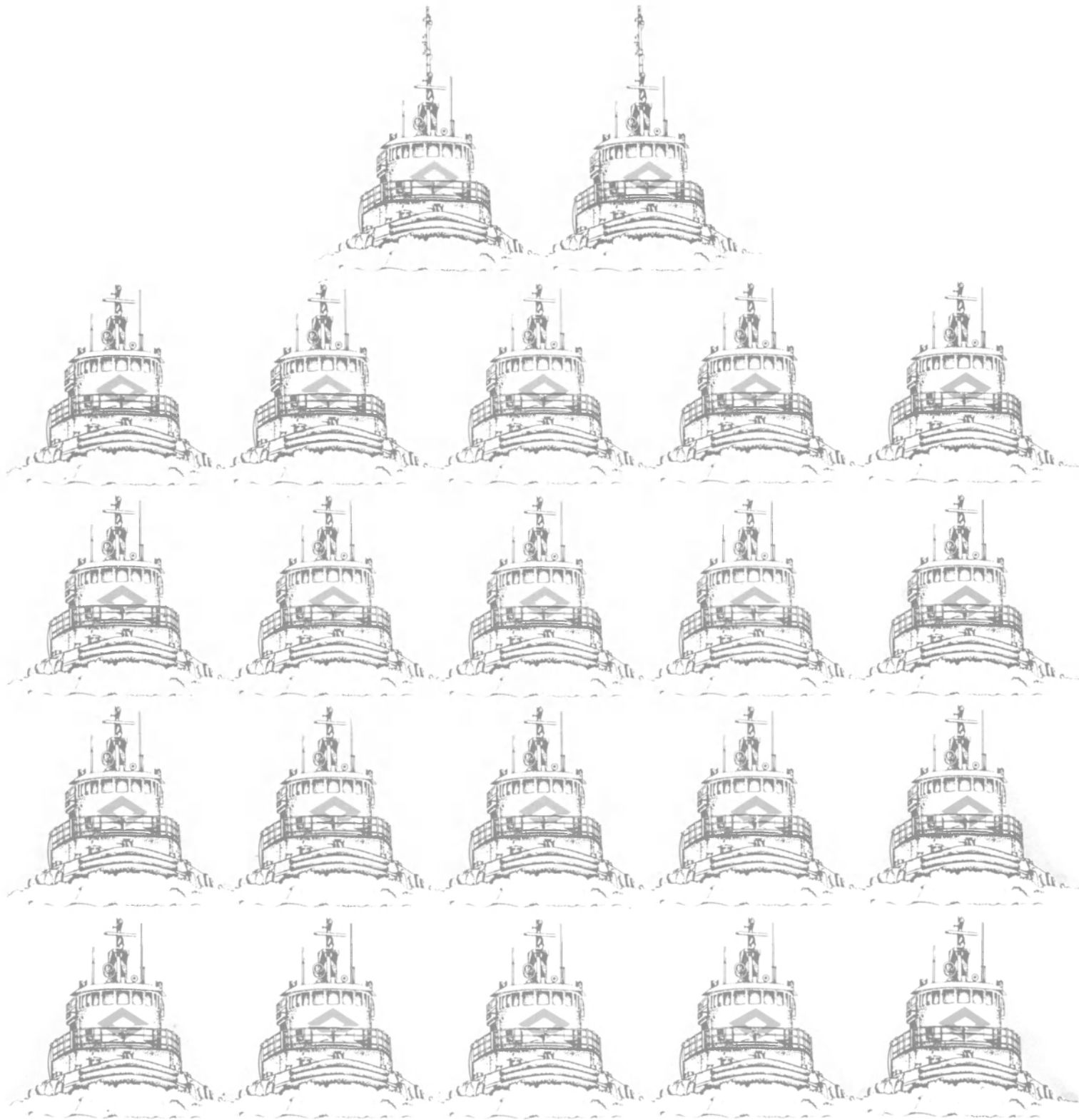
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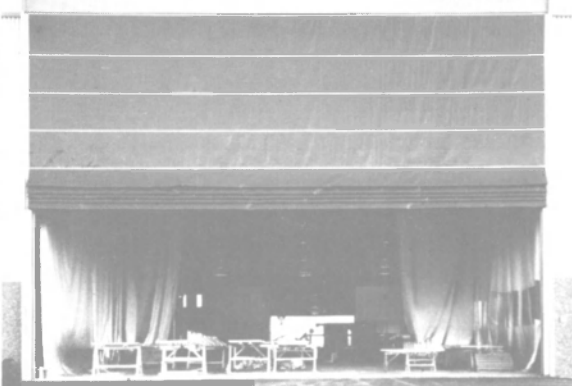


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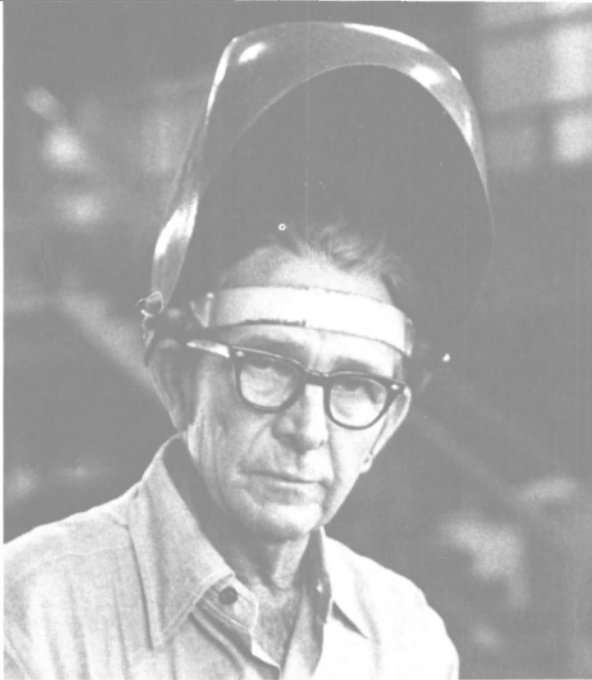
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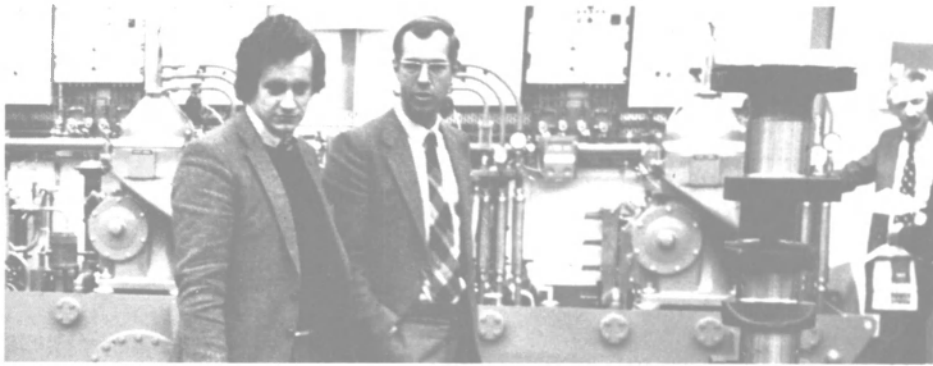
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Radm. Meyer Receives New Assignment

Rear Adm. Wayne E. Meyer, USN, the Navy's "Dean of Project Managers," was reassigned recently within the Naval Sea Systems Command as Deputy Commander for Weapons and Combat

Dempster M. Jackson, who retired from the U.S. Navy.

Admiral Meyer previously served as project manager, AEGIS Shipbuilding. He held that position from the inception of the AEGIS project in 1970, to the readiness-for-war of the first AEGIS ship, USS Ticonderoga (CG 47), in 1983. Significantly, this guided missile cruiser was aban-

doned exactly on the schedule, and within the budget, established six years ago. Her transition from the Ingalls Shipbuilding yard, Pascagoula, Miss., to deployment was accomplished in the remarkably short time of nine months with highly successful performance at each milestone.



Admiral Meyer's completion of



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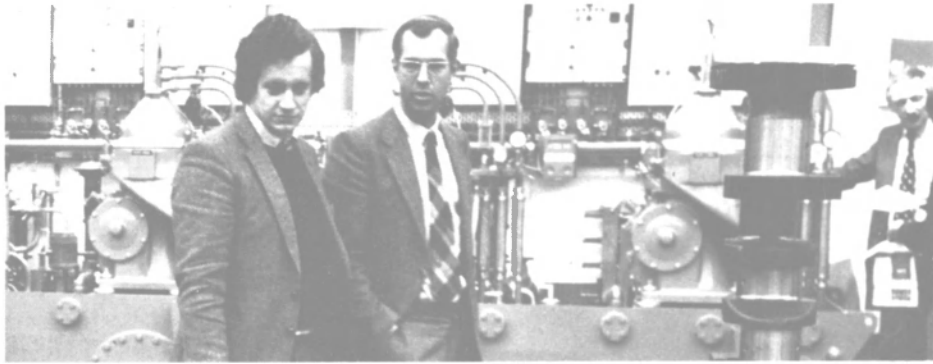


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Marine Coating Directory Is Offered By Farboil

Farboil Company, of Baltimore, Md., has published a new Directory of Farboil Marine Coatings Systems. It is available free upon request. The brochure provides paint characteristics for new construction and repair work as well

as paints for topside, weather deck, superstructure and cargo space, and antifouling paints for boottoppings and bottoms.

Farboil produces hundreds of conventional, high-performance epoxy, and chlorinated rubber paints designed to provide the best possible protection for ships in the harsh marine environment. All Farboil paints have passed strict

environmental tests and have been approved according to Federal specifications to meet the government Quality Product List.

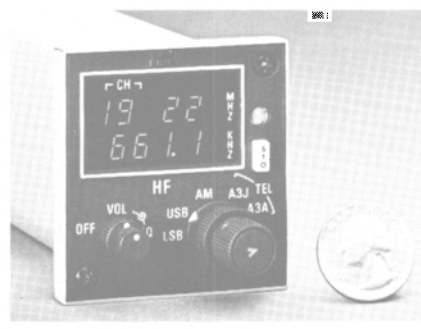
Farboil, a unit of Beatrice Chemical, a Division of Beatrice Foods, has offices worldwide.

For a copy of the Directory of Farboil Marine Coating Systems,

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IT TAKES A SMART RADIO TO MAKE HF/SSB COMMUNICATIONS EASY.



Operator Convenience

□ All 176 ITU Radiotelephone channel frequencies are stored permanently in non-volatile memory.

□ The memory also provides for storage of 99 user programmable simplex and semi-duplex channels. (This is standard with the KMC 95, not an option which costs extra as with some other radios.)

□ Keyboard entry provides easy access to 280,000 frequencies in the 2 to 30 MHz range.

Reliability

□ Extensive use of microcomputers means fewer parts—greater reliability.

□ Top quality electronic components used throughout the radio.

□ Zinc diecast chassis provides durability and keeps the component parts of the radio from interfering with one another electrically.

Installation Flexibility

□ Three optional remotes come in different sizes to suit any mounting requirement. The smallest remote has a front panel only 2-1/4 inches square.

□ Two fully automatic antenna coupler systems can combine with practically any size or type antenna you might prefer.

□ Private listening available with an optional telephone headset.

All the convenience and reliability adds up to one thing: an HF/SSB radio that is easier to use than you ever imagined possible, and a radio you can depend on when you need it most.

For more information on how the KMC 95 can make your life easier when it comes to long range communications, contact: Sales Manager, KMC 95 King Radio Corporation, 400 North Rogers Road, Olathe, Kansas 66062 • (913) 782-0400 • Telex WUD (0) 4-2299 Cable: KINGRAD

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Tomorrow's Electronics Today

Radm. Meyer Receives New Assignment

Rear Adm. **Wayne E. Meyer**, USN, the Navy's "Dean of Project Managers," was reassigned recently within the Naval Sea Systems Command as Deputy Commander for Weapons and Combat Systems. He relieved Rear Adm.

Dempster M. Jackson, who retired from the U.S. Navy.

Admiral **Meyer** previously served as project manager, AEGIS Shipbuilding. He held that position from the inception of the AEGIS project in 1970, to the readiness-for-war of the first AEGIS ship, USS Ticonderoga (CG 47), in 1983. Significantly, this guided-missile cruiser was christened, commissioned, and de-

ployed exactly on the schedule, and within the budget, established six years ago. Her transition from the Ingalls Shipbuilding yard, Pascagoula, Miss., to deployment was accomplished in the remarkably short time of nine months with highly successful performance at each milestone.

Admiral **Meyer's** completion of duty as project manager coincides



Wayne E. Meyer

with the entry of Ticonderoga into the Operating Forces' first deployment this fall as one of the world's most potent surface ships.

In his new position, Admiral **Meyer** is responsible for the development, engineering, procurement, testing, and in-service performance of weapons and combat systems for all Navy ships and submarines.

Rear Adm. **Donald (Pete) Roane** replaces Admiral **Meyer** as the AEGIS Shipbuilding Project Manager. He formerly served as Deputy Manager of that project and, most recently, was assigned as Commander, Naval Surface Group Western Pacific, before returning to the Naval Sea Systems Command in Arlington, Va.

New Catalog of Marine Equipment Available

The 1984 Marine Equipment Catalog will contain hundreds of marine product and equipment categories with thousands of illustrations, photos, drawings and specifications for products and equipment used in the construction, operation and repair of commercial vessels of all sizes—ocean inland, coastal offshore drilling and Navy.

The catalog is intended for use by vessel operators, shipbuilding, boatbuilding and repair companies, and naval architects and marine engineers to assist them in their specifying and purchasing requirements.

For details on how to obtain a copy of this catalog,

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B&W's Ultra-Long-Stroke Diesel Undergoing Test

M.A.N.-B&W Diesel, Copenhagen, Denmark, is offering its large engine ultra-long-stroke diesel to the marine industry. The new engine generates 12,480 hp using a 2-stroke system incorporating the uniflow scavenging concept. It features high power, low weight, low rpm and low fuel oil consumption.

B&W manufactures main engines for ships covering 2,300 to 56,000 horsepower. For information on B&W's line of modern diesel engines,

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"Prora Autotrack the leading integrated collision avoidance system"

PRORA marine radars and AUTOTRACK collision avoidance systems offer a wide range of facilities to meet all operational requirements for safe navigation in all weather conditions:

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- advanced microprocessor control and large scale integration
- logarithmic receiver, digital video processing
- AUTOTRACK dual channel tracking
- manually selected and recorded video maps

All these outstanding features are based on proven advanced technology design. High standard of auto-diagnostics, ease of maintenance and world wide service assistance ensure constant availability of PRORA and AUTOTRACK to the ship's officer.

Approved by major government authorities PRORA radars meet the latest applicable S.O.L.A.S. requirements. AUTOTRACK systems fulfil IMCO and U.S. COAST GUARD regulations for mandatory ARPA carriage.



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B&W Diesel Acquired By American M.A.N.

American M.A.N. Corporation, a wholly-owned subsidiary of Augsburg, West Germany, has acquired B&W Diesel Inc., New York, a wholly-owned subsidiary of B&W Diesel A/S, Copenhagen, Denmark.

The acquisition consolidates and strengthens the marketing, sales and service of M.A.N.—B&W Diesel in the United States. M.A.N.—B&W Diesel was formed in 1981, after Burmeister & Wain was acquired by M.A.N.

Claus Windelev, formerly president of B&W Diesel, Inc., has been appointed executive vice president of American M.A.N. Corporation and will be responsible for its Diesel Group.

M.A.N.—B&W produces medium and slow-speed diesel engines for marine propulsion, power generation and industrial applications in Augsburg, West Germany, and Copenhagen, Holeby and Frederikshavn, Denmark. The engines cover a wide power range from 500 to 56,160 bhp.

American M.A.N. Corporation has offices in New York, San Francisco, Houston and Miami. In addition to diesel engines, American M.A.N. Corporation markets large steam turbine generators, steel foundations, axial, centrifugal and screw compressors, materials handling equipment, specialized equipment for coal and oil gasification, chemical waste destruction, and waste heat boilers. Also, M.A.N. high-speed diesel engines from 50 to 700 hp and M.A.N.—SWF hoists are distributed through dealers and OEMs.

Emergency Medical Course Offered By Marine Safety

Preparing their crews on vessels or rigs to deal with emergency medical problems can significantly reduce medical care costs, lost-time injuries and legal problems.

In response to requests from a number of clients, MarineSafety International has arranged to have an emergency medical course presented at the MSI Training Center at LaGuardia Airport in New York City. The course, to be held December 6-8, is designed to meet the unique requirements of the marine environment.

It will be conducted in conjunction with Emergency and Safety Programs, Inc. (ESP) of Miami, Fla. Over the past eight years, ESP has conducted "Emergency Care At Sea" seminars for numerous marine and offshore firms including Sun, Exxon, ODECO, Mobil, SONAT, CNG, Global Marine Drilling, Jackson Marine, and the U.S. Customs Patrol.

Among the topics that will be covered are treatment for shock, wound management, burns, hypothermia, suspected heart attacks, chemical exposure accidents, head, neck, and back injuries, management of stroke victims and treatment for near drowning.

The program curriculum follows

the U.S. Department of Transportation developed "First Responder" course outline and is approved by the U.S. Coast Guard.

The course will be held at the MarineSafety training center, with some practice portions of the program carried out in MSL's engine room, cargo control room and ship's bridge simulators. Attendees will

stay at the nearby Sheraton Inn at LaGuardia Airport. The fee for the course is \$495 per person which covers training materials, lunches and local transportation.

For more information on the course, write or call **Tom Garrigan**, Marine Safety International, LaGuardia Airport, NY 11371. Telephone (212) 565-4125.

This automatic-declutching valve actuator has ABS approval for submergence to 133 feet.



Now. From the company with a 70-year tradition for technological quality and service: Westran. A fully-tested, non-

declutchable valve actuator

that meets MIL specs for vibration, shock, reliability and submergence

— approved by American Bureau of Shipping for 133 ft. salt water depth (62 psi). Features

include remote operation of hand-wheel, MIL-spec motors and controllers, ductile construction and the renowned quality control of Westran.

For information, write WESTRAN, VALVE COMPONENTS GROUP, 4025 Remembrance Road, N.W., Grand Rapids, MI 49504. Phone 616/791-0479 Telex 228-435.



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ON THE COVER

Icebreaking Supply Vessel M/V Miscaroo Delivered By Vancouver Shipyards

Vancouver Shipyards Co. Ltd. has delivered the M/V Miscaroo to its owner, BeauDril Ltd., a subsidiary of Gulf Canada Resources Inc. Vancouver Shipyards reports it is one of the most powerful supply vessels in the world and the first icebreaking supply vessel to be built in Canada to Canadian Coast Guard Arctic Class 4 regulations. The M/V Miscaroo is the second of two 14,900 BHP icebreaking/anchor-handling supply vessels built for operation in the Arctic by

BeauDril. Designed by Robert Allan Ltd. the M/V Miscaroo will be part of Gulf Canada Resources Inc. drilling operation in the Beaufort Sea, and is designed to operate in conditions of -50°C and will break level ice up to 1.2M thick at a continuous speed of three knots.

Propulsion machinery consists of a geared diesel-CPP combination. Four main Wartsila Vasa 8R32 diesels are rated 3,725 bhp each at 750 rpm. The engines in pairs drive Lips controllable pitch



The M/V Miscaroo can operate in 4 feet of ice at 3 knots

Call Out The Marines*

*Norris Bronze Body Butterfly Valves.

The Few . . . When it comes down to competition for Norris Marines*, you really have to search. Full lug or double rib span, elastomer or metal lined, with performance features other valves can't match. Norris Marines* are in a high performance class by themselves.

The Proud . . . Compute the economics of Norris Marines*. Their extended service life results in cost savings you can be proud of, they are easier to repair and are ideally suited to severe service.

The Norris Marines* . . . Norris R-Series bronze body butterfly valves meet or exceed: Mil-V-22133C (Navy); US Coast Guard-Marine Engineering Regulations, 46 CFR 56.20-15 (b) (1), category "A" Service; American Bureau of Shipping (ABS); Lloyds Register of Shipping and Det Norske Veritas (DNV). M-Series bronze body butterfly valves meet or exceed: Mil-V-16468; ABS 35.45.5, "Rules for Building and Classing Steel Vessels"; and Marine Engineering Regulations 46 CFR 56.50-60 (d) and are approved for root valve service.

Next time you need a butterfly valve, call out a Norris Marine*. Just dial toll free, 1-800-331-4468 and ask for George Little. Tell him you need a Norris Marine* and you'll really get some attention.

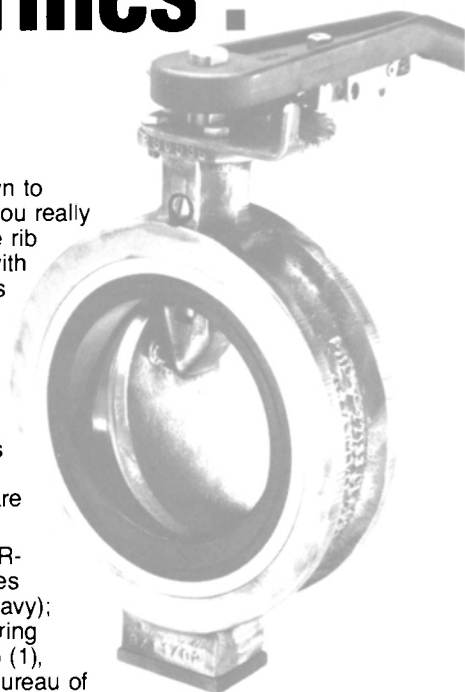
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propellers, each 3,750 mm diameter, through Lohmann & Stolterfoht twin input-single output reduction gearboxes.

The M/V Miscaroo incorporates several unique features to enhance performance in ice. Among these are a hull form incorporating a forefoot wedge designed to deflect ice from the path of the vessel, and large bossings over the propeller nozzles and rudders to protect them from ice.

Maneuverability is enhanced by electrically driven thrusters fore and aft. The forward thruster is a 1,200-hp Omnithruster and the aft thruster is an 800-hp KaMeWa controllable-pitch propeller thruster. The Omnithruster has been modified to incorporate an ice hull lubrication system, ejecting an air water mixture along the forward half length of the vessel.

Other major equipment onboard includes a Burrard Iron Works quadruple drum anchor-handling/towing winch of 150-ton line pull capacity, two Hydralift deck cranes and Gearmatic tugger winches. Miscaroo has been designed and equipped so that each of the 22 crew members has a private room. Amenities include large lounges, recreational spaces and a sauna. Detailed attention to vibration and noise isolation has resulted in noise levels less than 63 dB throughout the accommodation while under full power.

The 79.25m by 17.2m vessel has a molded depth of 9.7m, and a design draft of 7.5m. The vessel has a capacity of 1,250 tons of fuel oil; 1,100 tons of ballast water; 150 tons of potable water; max. deck cargo of 1,400 tons; and a deck cargo area of 450 m².

Navigation and communication equipment includes radar by Decca, gyrocompasses by Sperry, Wagner autopilot, Honeywell navigation echo sounder, Magnavox satellite/omega navigator, JMC automatic direction finder, Marconi SSB radios, Sperry doppler log, Alden Weatherfax and Simrad and Marconi watch receivers.

M/V MISCAROO Major Suppliers

Main Propulsion	Wartsila
Reduction Gears	Lohmann & Stolterfoht
Propellers	Lips
Bow Thruster	Omnithruster
Stern Thruster	KaMeWa
Ice Hull Lube System	Omnithruster
Crane	Hydralift
Anchor-handling/ Towing Winch	Burrard Iron
Tugger Winch	Gearmatic
Radar	Decca
SatNav	Magnavox
SSB	Marconi
Autopilot	Wagner
Fathometer	Honeywell
Gyrocompass	Sperry
ADF	JMC
Doppler Log	Sperry
Watch Receivers	Simrad & Marconi
Weatherfax	Alden

James Hurley Named To Vice President Post By Fairbanks Morse

M.D. Maddox, president of Fairbanks Morse Engine Division of Colt Industries in Beloit, Wisc., announced the appointment of James F. Hurley to vice president of contract administration. Mr. Hurley will be responsible for all facets of contract administra-

tion, including assistance in the development of contract proposals and follow-on activities with appropriate departments.

Mr. Hurley is transferring to the Fairbanks Morse engine division from the Garlock Mechanical Packing Division of Colt Industries. Prior to joining Garlock, he served as a member of the New York State legislature for three terms.

Apelco Relocates To Tampa, Names Vourloumis New Marketing Manager



John Vourloumis

Stanley Clark, president of Raytheon Marine Company and Apelco Marine Electronics, has announced the relocation of Apelco's headquarters for sales, service and distribution from Manchester, N.H., to Tampa, Fla. At the same time, Mr. Clark announced John Vourloumis, formerly national sales manager of Cybernet Marine Division, has been appointed marketing manager of Apelco Marine Electronics. Mr. Vourloumis has responsibility for sales of the complete Apelco line of marine electronics, worldwide.

"We think we have the right person to take an aggressive new market position for Apelco," said Mr. Clark. "With Raytheon's engineering resources, and John's record of success in the industry, we look forward to expanding Apelco's product line, and providing wide distribution and improved service."

In addition to products such as recording echosounders, flashing depth sounders, radiotelephones, and loud hailer, Apelco products include the new ALC-900 Loran-C Navigator, and Clipper 54AS and 90AS VHF-FM Marine Radiotelephones, introduced this year. Among products to be introduced this winter are a new EPIRB, and an ADF with EPIRB "homing" capabilities, and other fish-finding and communication equipment.

For a free catalog of Apelco products,

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Title XI Requested For \$4-Million Reconstruction Of The Tanker Neches

The Maritime Administration has received an application from Falcon Tankers, Inc., a subsidiary of Falcon Carriers, Inc., Houston, Texas, for a Title XI guarantee to aid in financing the reconstruction of the tanker USNS Neches.

The work on the 37,000-dead-weight-ton, diesel-powered vessel will include the upgrading of its cargo system and stripping pumps and valves. The engine and fuel system also will be improved to allow use of heavy fuel oil and to make changes that conform to the Port and Tanker Safety Act.

The vessel operates in the foreign trade of the United States.

If approved, the Title XI guar-

antee would cover \$3,112,000, or 75 percent of the estimated actual cost of \$4,150,000.

Hydraulics Shiplift Commissioned At Hyundai

A shiplift system designed and constructed by Hydraulics Hydraulic Systems, Goleta, Calif., was recently commissioned at the Hyundai Heavy Industries Mari-

time Engineering Department's facility at Ulsan, Korea.

The system's platform is approximately 66 by 400 feet and has a capacity of 4,100 metric tons. Its maximum load density is 43 metric tons per meter. Hydraulics has provided a multi-speed system which will permit faster platform movement when under lower load conditions, and have incorporated field-proven chain jacks for lifting

and lowering the platform, according to John Johnson, director, shipyard systems, Hydraulics.

The new shiplift was designed to operate in conjunction with the existing Hydraulics ship transfer system already installed at the Hyundai yard. Capabilities now exist for ship movement in any direction at yard level and for both side-loading or end-loading on and off the platform.

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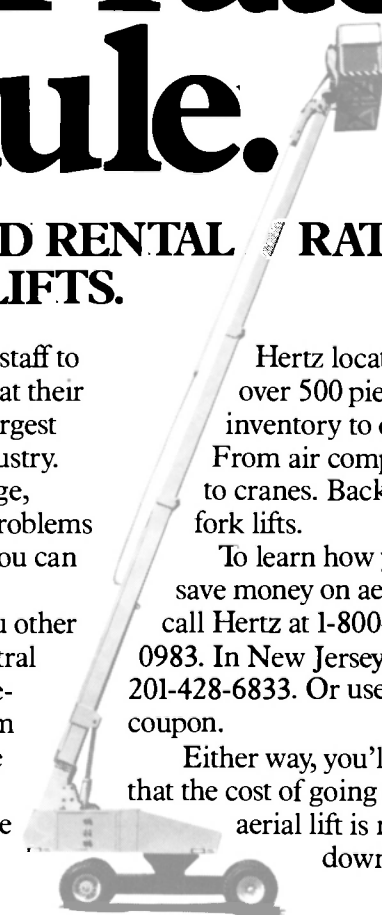
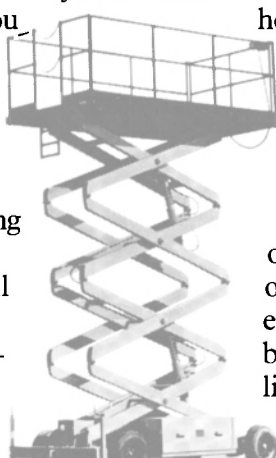
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**High-Speed Supermaran Ferry
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The 280 passenger catamaran ferry Marine Hawk showing its high speed capability.

The Mitsui Supermaran CP30 type Marine Hawk was recently delivered at the Tamano Works of Mitsui Engineering & Shipbuilding Co., Ltd., Tokyo, Japan, to her joint owners, The Maritime Credit Corporation and Nankai Ferry Co., Ltd. She is a catamaran type high-speed passenger vessel built of light alloy, and is now engaged in domestic regular passenger service.

The Mitsui Supermaran, having a unique catamaran hull form completely different from conventional catamarans, is a very economical seaworthy passenger boat, with excellent high-speed performance.

All seats are on the upper deck to give passengers an extensive view through large windows and one meter between each row of seats for ample leg room. It is fully air conditioned and comparatively free from noise and vibration, allowing the passengers an enjoyable and comfortable ride.

Design and construction of the Mitsui Su-

permaran CP30 type was based on MES's experience in high-speed vessel design including Hovercraft and semi-submerged catamarans.

**Fuel Consumption Measurement
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—Free Literature Available

A British engineering company, Plint and Partners Limited, England have made extensive trials of a high precision fuel consumption measurement system. The product has the backing of the Department of Industry who placed pre-production orders for the system.

The marine gauge has been designed to be insensitive to ships' motion. The gauge weighs the fuel consumed by the engine over measured times. It therefore does not need corrections for changes in temperature and viscosity of the metered fluid.

The development program, prior to installation onboard ship, included long periods of operation on 3,000 second residual oil at operation temperatures of up to 135°C.

The Plint system has the ability to make an accurate measurement of fuel consumption automatically every four minutes (or a longer time increment depending on requirements). The results show how power requirements are affected by differing factors such as weather conditions, water depth, loading and trim, hull and propeller condition, fuel properties, engine condition and the state of the transmission. A detailed explanation of the system, along with flow diagrams, curves and charts is available in a booklet entitled "Marine Fuel Consumption Measurement System." For your free copy,

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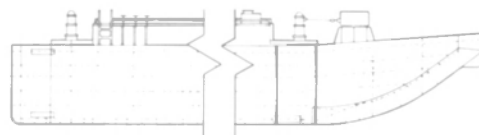
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The Bremen

NATO FRIGATES

Current Situation And Future Design Trends

by Dr. Ugo Mazza, General Secretary,
Ente Promozione Industria Navale (EPIN)

Transatlantic reinforcement and resupply would be a critical factor in the conventional defense of Central Europe. Even considering major improvements now planned in airlift and pre-positioning of materiel, the bulk of equipment and resupply would have to come by sea. In addition, the economic survival of European members of the North Atlantic Treaty Orga-

nization (NATO) depends on trade and raw materials from overseas; more than 90 percent of the imports of these countries moves by sea.

The Warsaw Pact countries are not dependent on sea transport of imports or exports, and it is impossible to interpret the massive buildup of the Soviet Navy as other than offensive in strategic

concept. For this purpose, the U.S.S.R. has amassed a fleet of more than 400 modern submarines, four aircraft carriers and a battle cruiser, with more of these types to follow. The Soviet Navy also has 40 or more cruisers and a large number of destroyers, frigates and smaller ships. The naval air arm numbers more than 1,500 aircraft.

A recent NATO document synthesizes the strategic scenario for North Atlantic naval defense, which could also be applied to the Mediterranean flank of the alliance. The main wartime task of the growing Soviet fleet is seen as
(continued on page 30)



Their seductive melodies could mean disaster for entire crews. Their alluring voices could entice sailors to cast themselves into the sea. Or steer a course of destruction into rocky shores.

They were the Sirens. Daughters of the river god. Witches of the shallow waters. With the head of a beautiful woman, and the wings of a bird.

According to Greek mythology, these sea nymphs terrorized sailors until confronted by Odysseus and his crew of Argonauts. Odysseus filled his men's ears with wax, and had himself bound to the ship's mast to resist their sensuous music and song.

So overcome with grief at this rejection, the Sirens threw themselves into the sea. As they hit the water, they were changed into stone, eventually washing up on the shores of Italy where Naples stands today.

Of course, accounts of these deadly beauties were believed to be the result of sunstroke, or the doldrums that drove even the most sea-worthy of men insane.

But no matter how nightmarish or frightening the tales, they did not deter other explorers in their quest to cross and conquer unknown seas.

This story is one of a series, "Myths of the Sea," compliments of Gulf Oil Trading Company, a leading supplier of quality Veritas marine lubricants and fuels.

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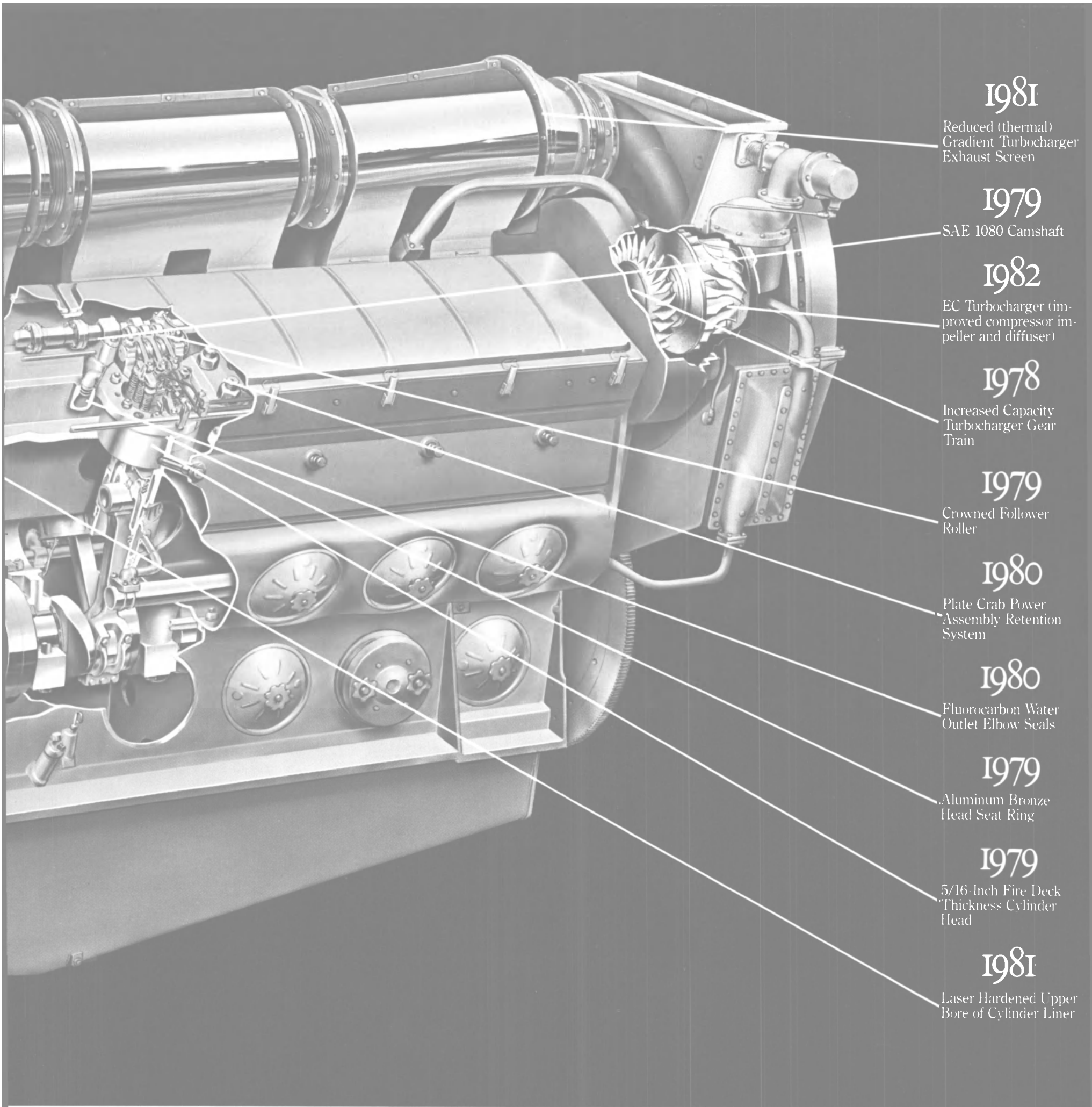
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1978

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NATO Frigates



the interdiction of NATO supply lines. For this reason, since the early 1970s, antisubmarine and antiship capability has been improved greatly in NATO navies. In particular, a new generation of multi-purpose surface vessels has been developed, such as frigates and corvettes, capable of fulfilling a complete range of missions in

deep and coastal waters. Before the current widespread interest in these types of ships, frigates and corvettes had been conceived as second-rate escort units, with primary ASW mission and secondary anti-aircraft, self-defense capabilities.

The new frigate/corvette designs incorporate advanced performance

and up-to-date weapons systems and electronics—a major technical and operations evolution that is making these ships the backbone of modern, well-balanced navies. In Europe, considerable interest has grown toward making the latest generation of corvettes and frigates the solution to several operating and economic problems.

This type of ship will be discussed in the following review.

In general terms, without taking into account particular operational requirements, a modern frigate could be defined as a warship whose main tasks require the capability to carry out multiple missions in an environment of multiple threats—surface, subsurface and air. These missions could well include:

- long-range convoy escort;
- engagement of surface naval vessels and interdiction of enemy merchant traffic;
- hunter-killer operations against submarines;
- shore bombardment and support in large-scale landings or commando operations.

Displacement increased from about 1,500 tons to the range of 2,500-4,500 tons due to the multiple tasks and the seriousness of the threats—mainly submarine and missile. For these reasons, on the technical side the frigate concept has evolved greatly since the 1960s. Among the advances were the introduction of the gas turbine for main propulsion, and advanced weapons systems and electronics including surface-to-surface and surface-to-air missiles, anti-missile systems, electronic warfare systems, command and control, etc. At least one shipboard helicopter is a standard feature in most designs.

Considering these trends, in 1968 NATO established the Project Group II to study the 70s standard frigate as a common basis for the requirements of all navies in the alliance. But when the design was proposed, insurmountable difficulties prevented a common solution. Different national requirements and pressures from national industries did not permit a single, unique design, and this ambitious program resulted only in a simple list of technical indications about weapons systems, electronics, propulsion plants, etc.

There are now eight different interpretations of the Type 70 frigate on duty or building for NATO navies, all very different in performance, operating capability and equipment.

Belgium opted for a national design, the E 71, tailored to the country's needs and characterized by fixed operational areas and fixed and rather well-known threats. Displacing 2,300 tons, four Wielingen Class frigates have been built by two Belgian shipyards, Beolwerf and Cockerill-Ougree, and commissioned in 1978. These compact units are armed with four Exocet surface-to-surface missile launchers, an 8-cell Sea Sparrow surface-to-air missile launcher, a Creusot Loire 100-mm gun, a 6-barreled Creusot-Bofors antisub-

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marine rocket launcher, and two torpedo tubes.

Conceived mainly for escort missions, the E 71 frigates are not equipped with helicopters or an anti-missile weapon system, but after the Falklands war the Belgian Navy began selection of a suitable type to install in the Wielingen Class.

Main electronics are provided by the Dutch firm HSA, and include the fully integrated and automated command and control system HSA SEWACO 4; the sonar is a U.S.-built Westinghouse SQS 505 A.

The Wielingen propulsion plant is based on a Rolls Royce Olympus TM 38 28,000-bhp gas turbine and two Cockerill CO.240 diesel engines in combined diesel or gas (CODOG) arrangement. Maximum speed is 29 knots and range is 4,500 miles at 18 knots.

In 1978 Canada approved a Patrol Frigate Program for six units to be built in national shipyards. After a long selection process, the contract was awarded recently to a consortium of St. John Shipbuilding and Sperry. Basic requirements are for a ship of 4,000 tons displacement armed with Harpoon surface-to-surface missile launchers, a point air defense missile system in vertical launchers (probably Sea Sparrow), a medium gun (Bofors or OTO Melara), an anti-missile weapon system, two Sea King large helicopters in a hangar, and ASW torpedo tubes. The propulsion plant will be based on gas turbines (probably GE LM 2500) in CODOG configuration.

Denmark placed an order in 1975 with the Aalborg Waerft yard for three light frigates of 1,300 tons displacement designed by the British Y-ARD firm. Designed for operations in the Baltic theater, the Niels Juel Class ships are all in service and present a well-balanced weapons array, including eight Harpoon surface-to-surface missile launchers, an 8-cell Sea Sparrow surface-to-air missile launcher, a 76-mm OTO Malara compact gun, and four antisubmarine torpedo tubes. A General Dynamics RAM missile/anti-missile system will be fitted to complete the weapons package.

Main propulsion for the Danish ships is provided by a General Electric LM 2500 18,400-bhp gas turbine and two MTU diesel engines in CODOG arrangement; maximum speed is 30 knots. Radars and sonars are from Plessey; fire control systems and combat information center are from Philips (Sweden). No helicopter facilities are provided.

France did not participate in NATO's Project Group II but the French Marine Nationale developed for its own operating needs a type of light escort ship, and in 1972 began a program for 18 units characterized by simplicity, economy and ease of operation. Known

as the A 69 or D Estienne d'Orves Class, these 1,300-ton light frigates were designed by Direction Techniques des Constructions Navales and built by the Lorient Naval Dockyard using prefabricated modules extensively.

Primarily intended for coastal ASW operations, the French ships are fitted with rather light armament—two or four Exocet surface-to-surface missile launchers, a

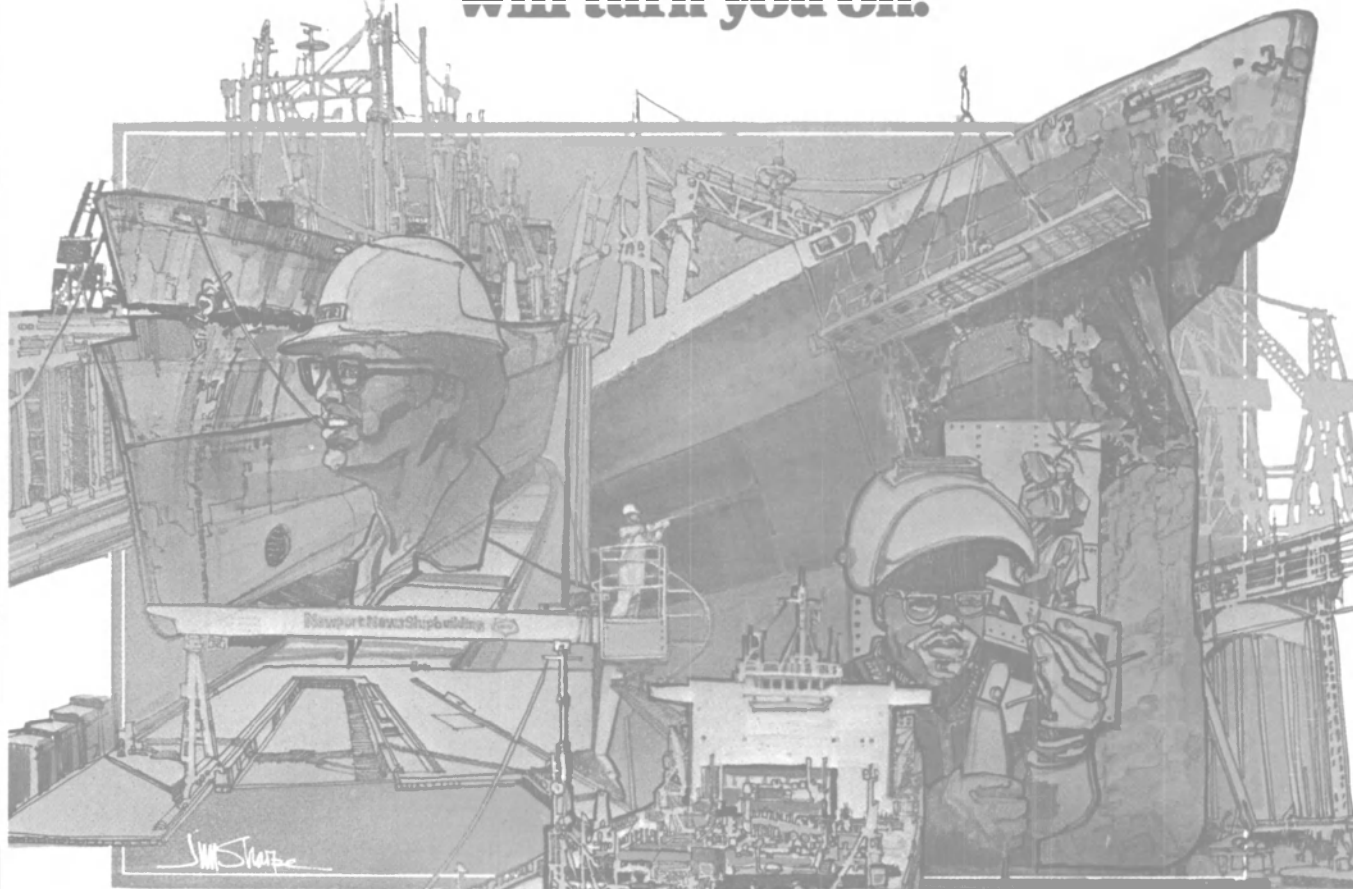
100-mm Creusot Loire gun, an antisubmarine rocket launcher, and four torpedo tubes. Electronics are from Thomson CSF and CSEE. Propulsion is provided by two S.E.M.T.-Pielstick 12,000-bhp diesel engines driving two shafts; maximum speed is 24 knots.

Federal Republic of Germany requirements influenced greatly the decisions of NATO's Project Group II for a new type of frigate.

Bundesmarine required particular characteristics of seaworthiness, endurance, multi-role capabilities, and combat effectiveness. Similar in appearance to the Dutch Kortenaer Class, the F 122 or Bremen Class frigates have been designed by Bremer Vulkan. Six ships were ordered at four yards; the first three are already in service and

(continued from page 32)

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NATO Frigates



(continued from page 30)
the remaining three will be completed in 1984.

The Bremen frigates have a displacement of 3,500 tons and are conceived to fulfill a wide range of missions in the North Atlantic theater. Armament includes eight Harpoon surface-to-surface missile launchers, an 8-cell Sea Sparrow

surface-to-air missile launcher, two General Dynamics RAM anti-missile systems, two multiple air defense Stinger missile launchers, a 76-mm OTO Melara compact gun, a Breda 105-mm rocket launcher, and four ASW torpedo tubes. Radars and fire control systems are from the Dutch firm HSA, and sonar from Krupp Atlas.

The propulsion system includes two General Electric LM 2500 gas turbine totaling 51,600 bhp and two MTU diesel engines in CODOG arrangement. Maximum speed is 30 knots; range is 4,000 miles at 18 knots. On board are carried two Westland Lynx anti-submarine helicopters with AQS 18 sonar; these are capable of

being armed with guided antiship missiles.

The acceptance of these new frigates represents an important step in the modernization of the West German Navy; it is intended that these vessels will form the backbone of the Bundesmarine. The principal role of the Bundesmarine, within the NATO sphere of operations and together with other allied navies, is to provide escorts, antisubmarine and anti-aircraft defense to insure that shipping routes in the North Sea and the Baltic approaches are kept open for allied reinforcements during times of tension or war.

The principal role of the Bremen Class frigates will be to escort to Northern Europe the convoys that have crossed the Atlantic, and to provide all-around defense against air, surface and subsurface attacks. Secondary roles include the prevention of Warsaw Pact amphibious operations in the North Sea area or the exit of ships from the Baltic to join with other Soviet naval forces in the Atlantic.

Great Britain's participation in NATO's Group studies was limited, preferring an independent program with different technical and operational requirements. Primarily designed for antisubmarine missions and to operate with large task forces or as convoy escort, Britain's Type 22 frigates have good characteristics of seaworthiness and endurance. Named Broadsword, the class includes 13 ships divided into three batches—all built or to be constructed by Yarrow (Shipbuilders) Ltd. in Scotland. Each batch shows marked differences, even in displacement—4,000, 4,500 and 4,700 tons.

The eight ships of the first two batches are armed only for missiles—four Exocet surface-to-surface missile launchers, two Sea Wolf surface-to-air six-barreled missile launchers, and six antisubmarine torpedo tubes. When they first appeared these units were considered by many observers to be under-armed, and gave place to discussions of their high costs, sophistication and diversity from the configuration of the other NATO country frigates.

During the Falkland war the Broadsword frigate fought bravely, and her Sea Wolf missiles provided the best defense against Argentinian air attacks, particularly at close range and low-level conditions. However, this vessel showed some limitations in the lack of guns to use against enemy fast attack craft or to support amphibious operations. For this reason, the five units of the third batch ordered by the Royal Navy after the South Atlantic conflict will show some additions in the

(continued on page 34)

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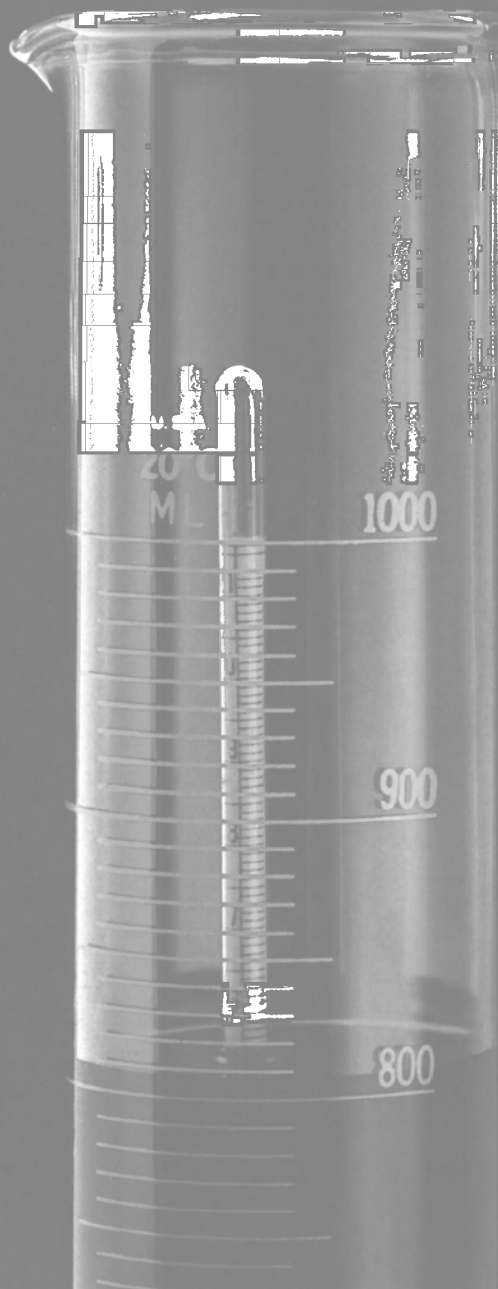
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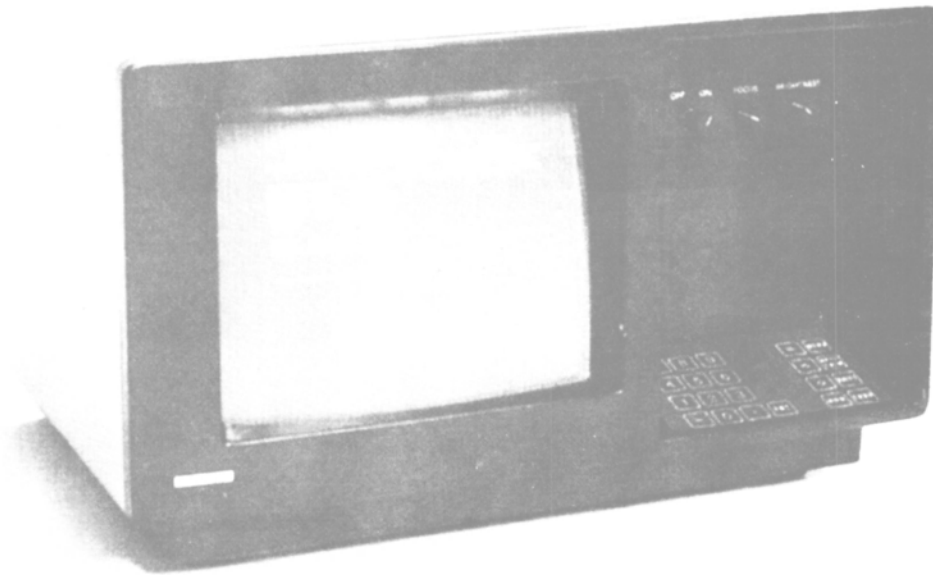
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- tells how to burn bunker fuel in the most economical manner.

Examples of calculations

OPTIMUM TRIM		SPEED = KNOTS			
		BASIC	OPTIMUM	ACTUAL	
DRAFT AFT (M)					
DRAFT FWD (M)					
DRAFT MEAN (M)					
TRIM (M)					
FUEL SAVING (T/D)					
CARGO					
	%	VOL	M ³ /T	WEIGHT	
HOLD NO. 1	0	0	0	0	
HOLD NO. 2	20	1360	0.4300	3163	
HOLD NO. 3	20	1356	0.4300	3153	
HOLD NO. 4	70	4844	0.4300	11265	
HOLD NO. 5	0	0	0	0	
TOTAL				17581	

1. Cargo

Each hold can be loaded either in percent, volume or weight. In the case of percent and volume a stowing factor has to be added.

OPTIMUM TRIM		SPEED = KNOTS			
		BASIC	OPTIMUM	ACTUAL	
DRAFT AFT (M)		9.72			
DRAFT FWD (M)		7.22			
DRAFT MEAN (M)		8.47			
TRIM (M)		2.5			
FUEL SAVING (T/D)					
CARGO					
	%	VOL	M ³ /T	WEIGHT	
HOLD NO. 1	0	0	0	0	
HOLD NO. 2	20	1360	0.4300	3163	
HOLD NO. 3	20	1356	0.4300	3153	
HOLD NO. 4	70	4844	0.4300	11265	
HOLD NO. 5	0	0	0	0	
TOTAL				17581	

2. Draft and trim calculation

The instrument calculates forward, aft mean draft and trim.

OPTIMUM TRIM		SPEED = 15 KNOTS			
		BASIC	OPTIMUM	ACTUAL	
DRAFT AFT (M)		9.72	7.32		
DRAFT FWD (M)		7.22	9.62		
DRAFT MEAN (M)		8.47	8.47		
TRIM (M)		2.5	-2.3		
FUEL SAVING (T/D)			4.97		
CARGO					
	%	VOL	M ³ /T	WEIGHT	
HOLD NO. 1	0	0	0	0	
HOLD NO. 2	20	1360	0.4300	3163	
HOLD NO. 3	20	1356	0.4300	3153	
HOLD NO. 4	70	4844	0.4300	11265	
HOLD NO. 5	0	0	0	0	
TOTAL				17581	

3. Optimum trim calculation

An estimated average speed of the vessel is used as an input. The instrument calculates the OPTIMUM trim for BASIC mean draft and presents the optimum fuel saving in tons per day when the ship is retrimmed to its optimum.

OPTIMUM TRIM		SPEED = 5 KNOTS			
		BASIC	OPTIMUM	ACTUAL	
DRAFT AFT (M)		9.72	7.32	8.48	
DRAFT FWD (M)		7.22	9.62	8.45	
DRAFT MEAN (M)		8.47	8.47	8.46	
TRIM (M)		2.5	-2.3	0.03	
FUEL SAVING (T/D)			4.97	2.99	
CARGO					
	%	VOL	M ³ /T	WEIGHT	
HOLD NO. 1	0	0	0	0	
HOLD NO. 2	29	2005	0.4300	4663	
HOLD NO. 3	20	1356	0.4300	3153	
HOLD NO. 4	61	4199	0.4300	9765	
HOLD NO. 5	0	0	0	0	
TOTAL					

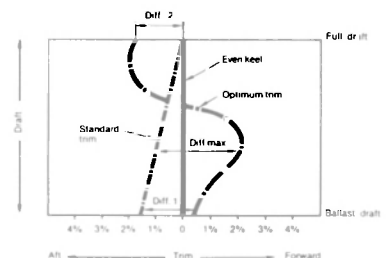
4. Load shifting

The operator can shift cargo from one hold to another and immediately read off the difference in fuel saving by so doing. 1500 tons shifted from 4 to 2

OPTIMUM TRIM		SPEED = 15 KNOTS			
		BASIC	OPTIMUM	ACTUAL	
DRAFT AFT (M)		9.72	7.32	8.05	
DRAFT FWD (M)		7.22	9.62	9.18	
DRAFT MEAN (M)		8.47	8.47	8.61	
TRIM (M)		2.5	-2.3	-1.13	
FUEL SAVING (T/D)			4.97	3.92	
BALLAST					
	%	VOL	SP GR	WEIGHT	
TANK 1.1 FP	100	505	1000	505	
TANK 1.2 + 1.3	0	0	0	0	
TANK 1.4 + 1.5	0	0	0	0	
TANK 1.6 + 1.7	0	0	0	0	
TANK 1.8 + 1.9	0	0	0	0	
TANK 1.10 + 1.11	0	0	0	0	
TANK 1.12 AP	0	0	0	0	

5. Ballast

Every factor that affects the trim is taken into consideration. In this example the forepeak is filled to 100% with water. A fuel saving ensued of one ton per day.



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NATO Frigates

(continued from page 32)

armament, with a 4.5-in. gun forward and two 30-mm twin-mounts; even the Sea Wolf system will be modified to improve its anti-missile capabilities. All the Type 22 frigates are capable of carrying

two Sea Lynx helicopters armed for antisubmarine or antiship operations.

The electronics of this class are among the most sophisticated, particularly command, control and information systems, which can coordinate important air-naval operations. Sensors are from Marconi, Kelvin-Hughes and Plessey.

The propulsion plant is a COGOG (combined gas or gas) installation with two Rolls Royce Olympus gas turbines with a total of 56,000 bhp and two Rolls Royce Tyne gas turbines of 8,500 bhp total providing a maximum speed of 30 knots and a cruising speed of 18 knots with an endurance of 4,500 miles.

Italy, with an important role in

the Mediterranean theater, planned her new frigates according to the NATO Project Group concept but with specific technical and operating requirements to meet the increasing presence of the Soviet fleet and other potentially hostile navies. The principal mission of the Italian Navy is, together with the U.S. Navy's Sixth Fleet, to provide defense to the convoys from Gibraltar to friendly ports and to prevent operations by enemy naval forces. A high-intensity threat level characterizes the Mediterranean situation, and the Italian Navy developed an advanced multi-role frigate class with powerful and well-balanced armament but a limited displacement.

Five of the eight 3,000-ton Maestrale Class frigates are already in service. Together with four Lupo Class 2,500-ton frigates, they represent the modern nucleus of the Marina Militare Italiana. The Maestrale vessels were constructed by the C.N.R. shipyard in Riva Trigoso, with extensive utilization of prefabricated modular elements.

The design employs, as much as possible, propulsion system, equipment, weapons systems and undoubtedly the experience achieved with the 18 Lupo Class frigates that were built, 14 of which were exported to Peru, Venezuela and Iraq. The Maestrale Class has been duly adapted to the specific tasks required, particularly all the precautions suggested by up-to-date technology and rules aimed at reducing noise levels in order to optimize antisubmarine characteristics.

The armament includes four OTOMAT surface-to-surface missile launchers, an 8-cell Aspide (Selinia) surface-to-air missile launcher, a 127-mm OTO Melara gun, two DARDO systems with two twin 40-mm BREDA turrets, two SCLAR 105-mm rocket and flare launchers, and two triple torpedo tubes.

To carry out antisubmarine operations, considered the unit's main task, each Maestrale is equipped with two AB 212 helicopters, and Raytheon variable-depth sonar aft. Other sensors and electronics include Selenia radars, Elmag fire control system, Elettronica ECM/ECCM, Elmer telecommunications, etc. A Selenia IPN 10 provides an advanced and integrated command and control systems.

The propulsion plant is a CODOG configuration employing two Fiat/General Electric LM 2500 gas turbines with 50,000 total bhp and two GMT diesel engines with 11,000 total bhp. Controls of main engines and electric power plant are fully automated. Maximum speed is 33 knots; cruising speed is 21 knots with a range of 6,000 miles.

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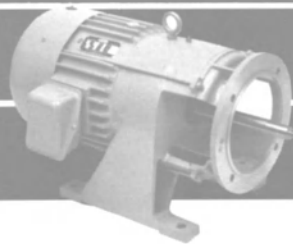
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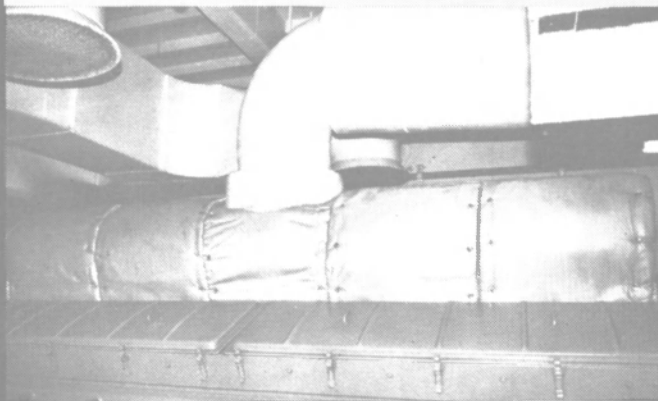
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of the NATO Project Group, Netherlands found that its requirements were very similar to those of the German Navy. Thus in June 1973 a Netherlands/German Group was established, and a year later defined their main weapons configuration, which in essence is identical to the NATO frigate concepts. This binational design provided great advantages through standardization of various ship systems and also allowed training and maintenance to be standardized, with resultant cost savings. The German version has several differences but the cooperative effort produced a joint procurement program leading to further cost savings.

The Netherlands Kortenaer Class includes 10 standard units, now all in service, and two anti-aircraft frigates now under construction at RSV shipyard. With full-load displacement of 3,700 tons, these ships have good characteristics of sea-keeping and endurance, and are designed to provide complete defense against air, surface and undersea threats.

Armament of the standard frigates includes eight Harpoon surface-to-surface missile launchers, an 8-cell Sea Sparrow surface-to-air missile launcher, a 76-mm OTO Melara gun, a 40-mm Bofors gun, and two twin antisubmarine torpedo tubes. The 40-mm gun will be replaced with a HSA Goalkeeper 30-mm 4-barrel anti-missile system. For antisubmarine operations, the Kortenaer ships are provided with two Lynx helicopters.

The two anti-aircraft frigates have a different armament configuration, without the 76-mm gun and the helicopter pad and hangar but with a Standard MR A/A long-range missile launcher. These ships are also provided with command and control facilities for a task group commander and his staff.

Sensors and other electronic equipment are from HSA, including a SEWACO III Command, control and information system, and a RAMSES ECM system. Propulsion plant is a COGOG configuration with two Rolls Royce Olympus 50,000 total bhp gas turbines and two Rolls Royce Tyne 8,000 total bhp gas turbines.

Maximum speed of the Kortenaer frigates is 30 knots and the range is 4,700 miles cruising at 16 knots. Two ships of this class were bought by the Greek Navy in 1980. Portugal also selected this type, one to be delivered by the RSV yard and the other two to be built under licence but economic conditions have stopped this program.

Turkey, after a long evaluation and selection, recently signed a contract with the German yard Blohm + Voss for four frigates of the MEKO 200 type; two will be built in the Federal Republic and the other two under licence in Turkey, probably at Goluck Navy Yard. This is a completely new de-

sign based on the "containerization" system MEKO for rapid interchangeability of weapons or electronics systems without extensive conversion work.

Technical details are not yet available, but the MEKO frigates will displace 2,400 tons at full load and will have a multi-purpose weapons system with eight Harpoon surface-to-surface missile

launchers, an 8-cell Aspide surface-to-air missile launcher, a 127-mm FMC Mk 45 gun, two or three Contraves Seaguard anti-missile systems, and two triple torpedo tubes. A fixed hangar will accommodate an Agusta Bell 212 anti-submarine helicopter.

Propulsion of the MEKO will be all-diesel, with four MTU engines totaling 26,000 bhp on two shafts;

maximum speed is 27 knots.

The only NATO naval force without latest generation frigates is the Royal Norwegian Navy, which operates five Oslo Class ships built in the mid-60s at the Naval Dockyard in Horton, and later refitted with Penguin surface-to-surface missile launchers

(continued on page 36)



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NATO Frigates



(continued from page 35)

and a Sea Sparrow surface-to-air missile launcher.

The U.S. Navy, with its own particular technical needs and operational requirements, participated only marginally in the NATO Project Group studies. In fact, the U.S. decision was for a "low mix" unit, a ship as inexpensive as possible but capable of operating as

an escort on the Atlantic supply route or to be effectively integrated into a large task group. The capability to operate alone was only partially considered. The main problem was the economic one; in emergency situations or in wartime, large numbers would be needed and as many as possible should be built.

In the early 1970s, the U.S. Navy planned the construction of a class of 59 frigates—the FFG-7 program. They were follow-on ships to the large numbers of ocean escorts (DE and later FF) built in the 1950s, but with emphasis on anti-missile and antiship defenses. These would complement other units that emphasized antisub

marine capabilities, such as the Knox Class fitted with SQS 26 large sonar and ASROC. The new frigates have a viable antisubmarine role, employing a medium sonar and two helicopters plus the Mk 32 torpedo tubes and weapons system for close-in defense.

The lead ship, named Oliver Hazard Perry, was authorized in the Fiscal Year 1973 new construction program; the last, with the Navy number FFG-60 and as yet unnamed, was authorized in the FY 83 program. To permit series building with its attendant large-scale economies, construction of all 59 ships of the Perry Class was allocated to two companies—Bath Iron Works at Bath, Maine, and Todd Shipyards Corporation's yards at San Pedro, California, and Seattle, Washington. To date, 38 of these frigates have been commissioned and the program is to be completed in 1987.

The Perry Class ships are slightly longer but lighter than the earlier Knox Class, with a full-load displacement of 3,600 tons. They have been designed to fulfill basic requirements of seaworthiness, long range and comfortable crew accommodations. Fin stabilizers will be fitted at a later date; space and weight considerations are in the design.

Armament includes a single-arm Mk 13 missile launcher capable of firing both Standard MR surface-to-air missiles and Harpoon surface-to-surface missiles. A mixed missile magazine provides for 40 Harpoon/Standard Missiles.

The Perry Class features a medium- to long-range defense missile system, whereas the other NATO frigates have the short- to medium-range point defense Sea Sparrow or Aspide 8-cell launcher. At the same time, the Perry's only launcher has to fire the Harpoon antiship missiles (instead of the six to eight independent launchers on the European frigates) and this fact is considered a severe limitation in the event of damage.

The principal gun on the Perry is a single 76-mm OTO Melara with a firing rate of 90 rounds per minute. One 20-mm Phalanx Mk 16 CIWS (Close In Weapons System) is to be fitted atop the hangar as a last-ditch anti-missile defense. Two side-by-side hangars can accommodate two Kaman SH2F LAMPS-2 helicopters capable of antisubmarine and antiship operations, or after 1985, the new Sikorsky SH60 LAMPS-3 helicopters.

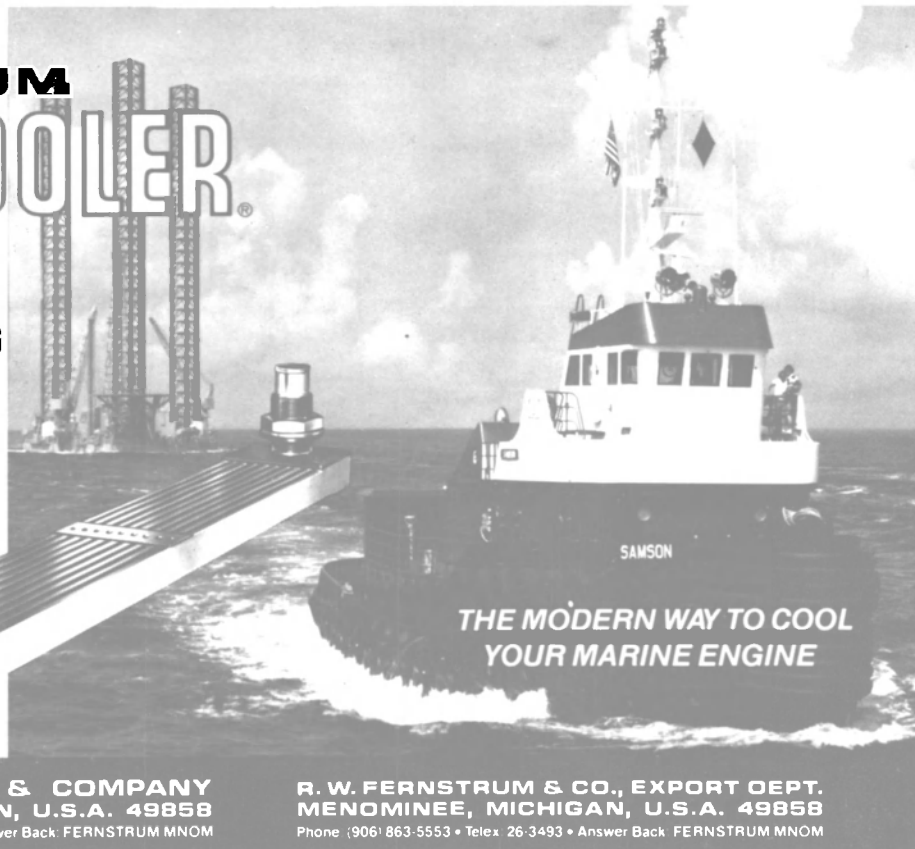
The Mk 92 fire control system is installed atop the bridge and has a dome-shaped antenna. Other sensors include a Raytheon SPS 49 long-range radar, a Westinghouse SPS 55 search and naviga-

(continued on page 38)

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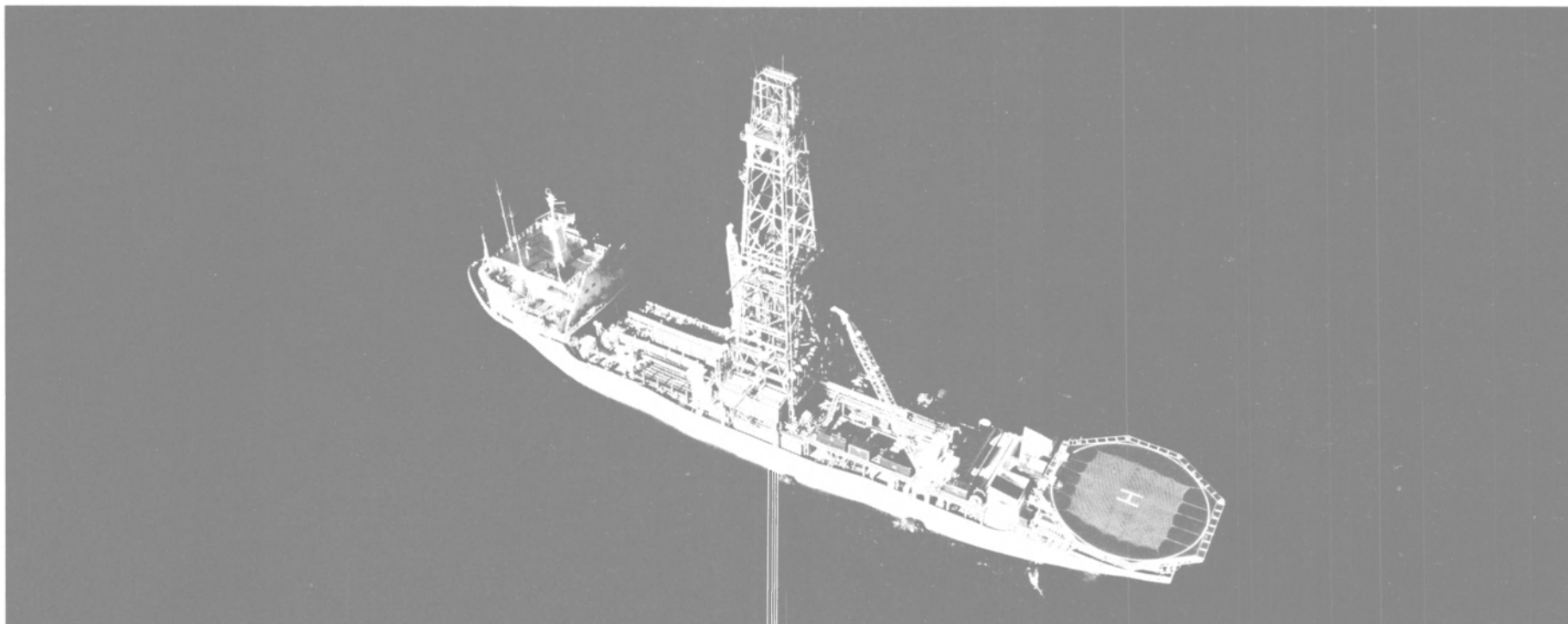
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NATO Frigates

(continued from page 36)

tion radar, and a Lockheed STIR (modified SPG 60) illuminator radar for controlling the M13 missile launcher and the 76-mm gun. The European frigates, following the system redundancy principle, generally have a radar for each weapons system.

The propulsion plant is a COGAG installation with two General Electric LM 2500 40,000 total shp driving a single shaft.

The Perry Class is fitted with two retractable propeller pods aft of the sonar dome to improve berthing maneuvering and to provide take-home power in the event of damage to the main engines or to the propeller shaft. Each pod has a 325-hp motor to provide

a speed of 10 knots. Maximum speed is 29 knots and range is 4,500 miles at 20 knots.

Four frigates of the Perry Class were ordered by the Royal Australian Navy. Three of them, known as the Adelaide Class, are now in service; six additional "simplified" ships are planned for construction under licence in Australia at Williamstown to replace the River Class.

Three ships of the Perry Class are building under licence in Spain by Bazan de Construcciones Navales Militares at Ferrol for completion in 1985-87; two more have been approved for probable completion in 1988. The Spanish version will be faster and will include some modifications to the weapons systems, with the Harpoon surface-to surface missile launchers mounted on the upper deck and a 20-mm multi-barrel Meroka system in place of the Phalanx CIWS.

To sum up, this wide range of design differences has been the disappointing outcome of the NATO Project Group II study that envisioned a common type of frigate for the 1970s. Of the 14 navies analyzed, there were 11 different ship types with wide variations in the weapons systems, electronics, propulsion plants, etc. On the other side there are the Warsaw Pact fleets where ships, armament, electronics and propulsion plants are all of Russian origin with a very high level of standardization.

In late 1980 a new NATO Group was established to study "Frigate Replacement 90." This program is aimed at having new ships entering service towards the mid-1990s. These vessels are not intended to replace the present generation frigates described above, which at that time will be between 10 and 15 years old, but rather to fill other replacement needs such as the German Homburg and Lutjens Classes, the Dutch Von Speijk Class, the British Leander Class, the U.S. Knox Class, and others.

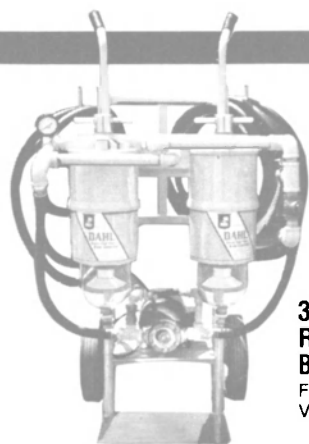
Seven countries—Canada, France, Germany, Italy, Netherlands, United Kingdom and United States—have agreed to participate in the project, which envisions a NATO antisubmarine frigate with a conventional hull. Of course, it remains to be seen if different national requirements will allow for a common design, or at least a common list of guidelines.

Such an ambitious project has met with skepticism in most NATO countries. However, in December 1982 the first prefeasibility study demonstrated clearly that tremendous savings could be achieved if nations build the same type of warship—something on the order of \$5.6 billion for 100 frigates over a 10-year period, about 21 percent of the total cost. Moreover, there should be further savings during the expected 25-year life span of these ships of some 12 percent in the cost of operating and maintaining them.

In making this study the designers were free to select equipment meeting the stated capability requirements from the full range of systems available in NATO countries, including items that are not yet in production. The study was conducted with parametric analyses to demonstrate the relative effectiveness and impact on ship size, configuration and cost for each of the system concepts and alternative ship designs.

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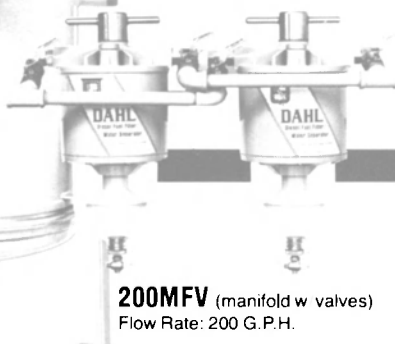
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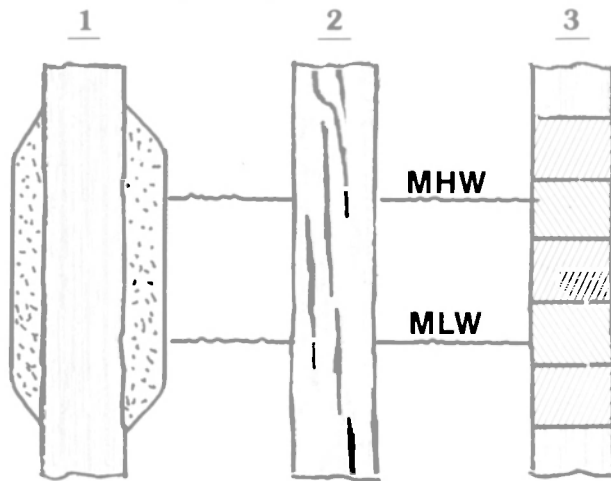
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The study also evaluated what industrial organization would be needed to move the project through the subsequent phases of feasibility study, project definition and production. Representatives from the interested countries participated enthusiastically in the study; more than 90 companies provided some 150 technicians who met frequently.

After completion of the prefeasibility study, each government made a national evaluation of the results before joining with their allies in the Project Group to arrive at a NATO decision. At a meeting in April 1983, all seven participating countries, plus Belgium and Spain, gave the green light for a continuation of the project, towards the final target to produce a lead ship in 1992.

But what will be the shape of the frigate of the future? Despite the many theoretical advantages, it is very unlikely that unconventional hull designs such as catamarans, hydrofoils or surface effect ships (SES) will be seriously considered for frigate type vessels

before the end of the century. In that case, the most promising concept appears to be the SES.

Frigates of the next two generations will consequently be of the displacement type. This does not mean that their architecture will not evolve; two main trends are toward reducing the ship's radar and IR signature and toward an increasing use of modular construction elements. When combined, these factors are likely to result in vessels with smaller, lower and more simplified superstructures than the frigates now in service.

Other important changes could result from innovations in electronic and armament technology. Development of conformal radars with flat antennae would allow designers to dispense with the presently necessary forests of masts and to realize far simpler and lower superstructures. Also, the next generation frigates will have vertical launch systems for the surface-to-air missiles of short to medium range such as the Sea Sparrow, Aspide, Sea Wolf, etc. These same concepts could be ap-

plied to the future antiship missiles, with many advantages for the systems' reliability. The main gun will maintain its role, and introduction of guided ammunition will improve its capabilities.

Greater emphasis will be placed on anti-missile defense with development of conventional or missile systems to face the threat of the second generation supersonic sea-skimmer antiship missiles. Growing in importance will be the helicopters—in the future completely indispensable for the ship's defense—not only for antisubmarine hunter-killer operations but for antiship missions, particularly against fast attack craft.

In the propulsion sector, developments are foreseeable in gas turbines; all the possibilities of the CODOG, COGOG and COGAG combinations are still to be explored. However, the foremost requirement for the future frigate is the reduction of underwater noise for better ASW operations.

Other changes will involve automation systems to reduce manning and insure a constant control

of main engines, power generation plants, electrical equipment, etc. Some navies are testing optical fibers for data distribution; such connections between information services or command centers and users everywhere in the ship would provide better performance than traditional cable networks, and savings in volume and weight.

In the electronics sector, a wider employment of laser and optical technologies is foreseeable. Other improvements will impact command, control, communications and information systems, which will represent the "brain" of the future frigates.

The lessons learned in the Falkland/Malvinas war have prompted all navies to give added consideration to the factors that affect the survivability of ships in combat situations. These include damage control systems; redundancy and independence of anti-fire stations and emergency power supplies; fireproof cables and internal communication networks; and the materials used for construction and outfit of the ships.



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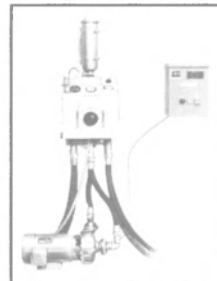


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**Moss Point Marine Delivers
'Nicor Power' To Nicor Marine**



The Nicor Power built by Moss Point Marine is powered by EMD engines totaling 6,000 hp.

Moss Point Marine Inc. of Escatawpa, Miss., has delivered the 6,000-hp, 214-foot Nicor Power to Nicor Marine Inc., of New Orleans.

With her extraordinary horsepower and supply vessel capacities above and below decks,

the 214 by 44 by 16 fits a new description of workboat. "This is certainly no regular off-the-shelf vessel built for regional use," pointed out a Moss Point Marine official. "She's custom designed, engineered and constructed for worldwide adaptability and performance."

The Nicor Power has a propulsion system that starts with a set of EMD 16-645-E-7B main engines. Electric power is supplied by two Delco 150-kw 12V71 generators and auxiliary Detroit Diesel 12V71-N engines. For added maneuverability, a Harbor Master 550 bow thruster supplied by Murray & Tregurtha is included in the vessel's propulsion list. Engine controls were furnished by Wabco, while Continental Electric supplied the genset control panel. Kort nozzles, Coolidge stainless-steel five-blade (102 x 110) props and Reintjes reduction gears complete the propulsion package.

With all this power and size, the Nicor Power has a capacities list to match. Above deck, with a certified bollard pull strength of 80 tons, she features a Smatco hydraulic tugger winch powered by a Detroit Diesel 12V71 engine. Even with this equipment, her clear deck space measures 120 by 36. Other top deck equipment includes a powerful HBL double wildcat anchor windlass.

Below decks, the Nicor Power contains unusually large bulk mud, liquid mud, water and fuel storage capacities: 239,000 gallons of drill water; 21,000 gallons of potable water; 130,000 gallons of fuel; 1,300 barrels liquid mud; and 6,000 cubic feet bulk mud storage capacity.

Miscellaneous equipment on the vessel includes a Kahlenberg horn; Carlisle & Finch searchlights; Perko running and navigation lights; 12-man Switlik life rafts and an Avon inflatable rescue boat. Fuel, fire and bilge pumps were all supplied by Aurora.

Among her electronics list are a set of Furuno 1011 radars; Stephens SEA 106-1 SSB and Sailor RT-144 VHF radiotelephones; Sperry autopilot; TI 9000 Loran; Decca 801 SatNav; a pair of Simrad Skipper 603 depth sounders; EMI Ken Cognivich monitors and alarms and Epiliso Sperry MV37-D compass.

Crew quarters contain a total of 24 berths, complete galley with separate walk-in freezer and refrigerator and comfortable dining/recreation areas.

The Nicor Power is both USCG and ABS (Ice Class C) certified.

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A New Omni-Sonar Is Introduced By SIMRAD —Literature Available

SIMRAD Marine, Seattle, Wash., has introduced a low costing multibeam SIMRAD SA100 Omni-Sonar.

Unique transducer design, electronic circuitry and manufacturing methods are used to produce this multibeam omnidirectional color sonar designed for ocean fishing. The SA100 has an automatic or manual tilt down to 53 degrees and can search 360 degrees around the vessel to a range of up to 2,500 meters. Using a frequency of 57 kHz, it achieves a quick and effective search pattern.

Combining horizontal and vertical search with color coding of echo strength eases the task of choosing the most profitable fish schools. With high-resolution, non-fading sonar overview and continual readout of tilt, range, depth and bearing of the chosen target, the risks of a lost catch are minimal.

For full information on the new SA100,

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T.A.S.T. Will Represent Atlantic Sandblasting In Northeast Area

Atlantic Sandblasting & Coatings, Inc. has named **Alfred E. Stanford**, president of the T.A.S.T. Corporation, as its exclusive sales representative on Northeast coast of the United States.

Atlantic Sandblasting & Coatings acts as a subcontractor for shipyards and prime contractor for shipowners. The company provides complete turnkey blasting and coating to the marine industry, specializing in internal and external coatings.

T.A.S.T. Transportation and Storation Corporation, provides representation in the United States for international shipyards and repair facilities.

For further information and free literature on Atlantic Sandblasting & Coatings service,

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Marathon Oilfield Service Offers Color Brochure On Rigs And Resources

A new eight-page, full-color brochure now available discusses the drilling capabilities and equipment fleets of the three drilling contractors and the well servicing/workover company which make up Marathon Oilfield Service Companies, headquartered in Houston, Texas.

The new brochure covers the geographical area of operation for each company, introduces headquarters/management personnel as well as the presidents of the four operating companies and gives the histories of each company.

The brochure also discusses the combined experience, equipment and personnel available through the high degree of flexibility and mobility which make it possible for Marathon Oilfield Service Companies to undertake drilling programs of just about any scope in virtually any part of the U.S.

Marathon Oilfield Service Companies include Butler-Johnson, Inc., based in Shreveport, La., which serves the Arkansas, Louisiana, Texas area; Willis Drilling Company, operating in South Texas from headquarters in Edinburg, Texas; Cubby Drilling Inc., of Midvale, Ohio, and Western Oil Well Service Company which provides well servicing and workover in Montana, North Dakota, Wyoming, Idaho and Utah.

The brochure includes rig fleet equipment lists for each of the four companies.

Marathon Oilfield Service Companies are part of Marathon Manufacturing Company, the leading manufacturer of mobile offshore jackup drilling rigs, materials-handling equipment, fabricated metal products and other energy and natural resources related products. Marathon Manufacturing Company is a wholly-owned subsidiary of The Penn Corporation.

For a free copy of "Rigs and Resources,"

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Bath Iron Appoints Four New Directors

Maine's Bath Iron Works Corp. has announced the appointment of four new directors as part of its program to continue strengthening its advanced technology program and to prepare for upcoming shipbuilding projects.



James Vander Schaaf

Jerry L. Steiner

James R. Vander Schaaf has been promoted to program manager for the shipyard's Advanced Shipbuilding Technology Program and its Computer Aided Design and Computer Aided Manufacturing (CAD/CAM) Department. **Jerry L. Steiner** was promoted to director of the Navy AEGIS Cruiser Program. BIW has been designated by the Navy, along with Ingalls Shipbuilding of Mississippi, to construct the new Navy cruisers. Mr. Steiner will also be responsible for the development of BIW's proposal to participate in the Navy's



John Berger



George Baldwin

DDG 51 program, a new destroyer envisioned for the future.

John H. Berger was promoted to director of quality assurance and **George Baldwin** was named BIW's director of advertising.

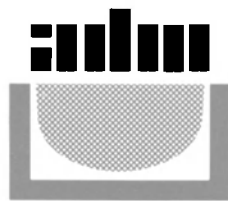
The appointment of Mr. Baldwin and the

promotions of the three others were announced by **James M. Blenkhorn**, senior vice president of business and technical development, and **Steven G. Buttner**, vice president of program management.

Mr. Berger, who holds degrees from the University of Wisconsin, Pepperdine and New Hampshire College, has been at BIW since April of 1982. Mr. Baldwin is a graduate of St. Lawrence University.

He was director of advertising at Uniroyal, Inc., and most recently, an advertising executive at Grey Advertising before coming to BIW.

Mr. Steiner, a graduate of Webb Institute of Naval Architecture, has been at BIW since 1976. Mr. Vander Schaaf, a graduate of the University of Michigan and Johns Hopkins University, began his career at the Maine shipyard in July of 1981.



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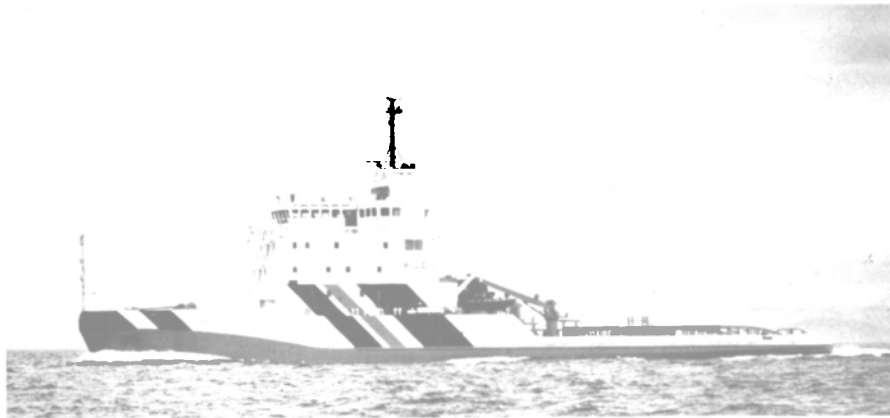
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Burrard Yarrows Delivers Icebreaker/Utility Vessels To Gulf Canada Resources

Burrard Yarrows Corporation, Canada's largest West Coast shipyard, has delivered two sister-ship icebreakers to Gulf Canada Resources Inc. of Calgary.

The vessels, named Kalvik and Terry Fox, are reported to be the most powerful of their type in the world. They are 88 meters in length, 17.5 meters in the beam, have a draft of 8 meters, a deadweight tonnage of 2,200, carry a crew of 18 and are designed for optimum performance in both open and ice-canopied waters.

Particular attention has been given to the form of the forward part of the vessels to prevent ice flowing under the hull and ingesting into the propellers. In addition, the bow design has been developed to maximize both level ice and ridge penetration performance. Particular attention has been given to directional stability in the ice ramming mode.

These Arctic Class 4 icebreaking

anchor-handling, tug/supply vessels will be used in Gulf's drilling operation in the Beaufort Sea. The basic design requirements included the ability to operate continuously in 1.22 m of level ice, although this performance is expected to be exceeded in actual operations.

A sophisticated towing and anchor-handling system is incorporated in the design with equipment arranged undercover for protection from Arctic weather. The towing system includes an 80-ton pull towing winch and a friction brake capable of up to 390 tons holding power. Anchor handling will be carried out with a double drum waterfall type winch, each drum capable of 200 tons pull.

The hull is of double chine form and incorporates a semi-spoon bow, forward ice plow, and raked transom stern. To simplify construction, the hull is of fully developa-

ble form. This is particularly advantageous as the shell plating and hull support structure are of EH36 modified special quality steel.

Each vessel uses twin screws driven by twin TM510 Stork-Werkspoor diesels delivering a total of 23,200 bhp and driving through Lohmann & Stolterfoht single reduction gearboxes to open controllable-pitch propellers. A 1,000-kw generator is clutched off each gearbox and, in the icebreaking mode, drives an air bubbler system. Ship's service electrical power is provided by two 750 kw a.c. generators. A 200-kw emergency generator is also installed.

In addition to the large centerline rudder, steering is assisted by a 500-hp stern thruster. The air bubbler system also functions as a bow thruster. A special coating, Inerta 160, covers the hull up to the main deck, protecting the hull and reducing friction.

The name, Kalvik, means wolverine in Inuit.

The Terry Fox was named for a young man who, after losing a leg to cancer, attempted to run 5,000 miles across Canada to raise money for cancer research. He completed 3,000 miles. At the time of his death, over \$22-million had been pledged in his name.

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NKK To Build Mobile Drilling Island For Beaufort Sea Project

Global Marine Development Inc., Newport Beach, Calif., has contracted to NKK and Mitsui & Co. the construction of a unique mobile drilling island to work in the frozen Beaufort Sea.

The island, called a Concrete Island Drilling System is to be operated by the Global Marine subsidiary for oil and gas exploration in northern Alaska's Harrison Bay.

The concrete island will be a major improvement over traditional gravel-based drilling platforms in that it is not subject to environmental destruction and can be relocated to other drilling locations, said **Toshiaki Yamamoto**,

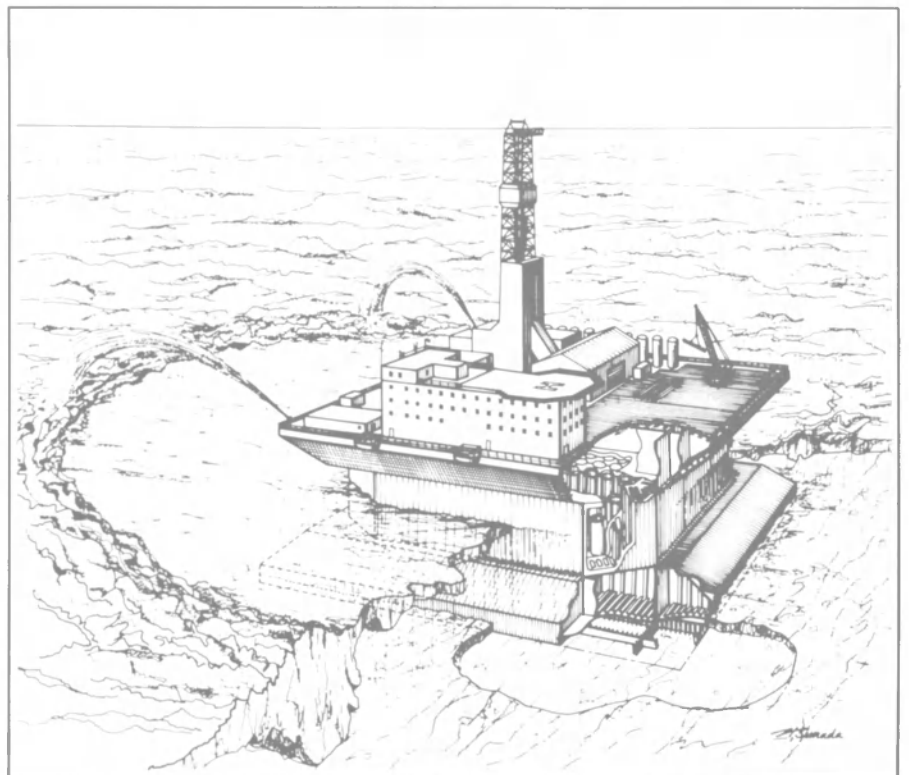
executive vice president of NKK America, Inc., Los Angeles. The unique island will be built in three sections: a steel mud base to sit on the sea bed, a concrete structure to rest on the base, and upper steel deck barges to install drilling equipment and living modules.

It is scheduled for completion in the spring of 1984 and will be towed to Point Barrow, Alaska, to join the August sealift to Beaufort Sea during a two-week period when Point Barrow is not frozen.

The island will measure about 295 feet across its square deck and stand about 95 feet high, and will combine new steel and cement



The Terry Fox prepares for Arctic service.



This "concrete island drilling system," planned for installation in northern Alaska's Harrison Bay, will be operated by Global Marine Development Inc.

technologies, including a new NKK steel for low-temperature use (below -50 °C), latest welding techniques and high-strength, light-weight concrete construction technology to resist ice pressures.

Mr. Yamamoto said the new mobile drilling island will be re-floatable to move to new locations, and when compared with gravel islands, features low construction cost, low operational cost and safer operation.

Tenneco In Joint Venture To Operate Its Own Service Boats In Gulf

Tenneco Inc., Houston, Texas, recently announced that two of its subsidiaries and a Norwegian company are forming a joint venture, Argosy Offshore Ltd., to own and operate oil field service boats in the Gulf of Mexico.

Tenneco Oil Exploration and Production and Philadelphia Life Insurance Company, both Tenneco Inc. subsidiaries, and Wilhelm Wilhemsen of Oslo, Norway, have agreed to a plan under which about 20 vessels will be used to support Tenneco Oil's extensive exploration and production activities in the Gulf, Tenneco said.

About half the vessels, Tenneco said, are relatively new and have been in limited service in the Gulf. The others are either under construction in the United States or are covered under construction options.

Argosy Offshore will be headquartered in Lafayette, La. Operations will be headed by general manager Fred Lentjes, formerly with Tenneco Oil. Boats will operate out of Intracoastal City, La., and Sabine Pass, Texas. Crews will be U.S. citizens, Tenneco said.

Tenneco said it anticipates the operation will meet the requirements of about 35 per cent of its current service boat needs. The remainder of its boat services will continue to be contracted from other operators.

"Tenneco Oil's decision to own and operate its own boats follows studies that indicate it is economically feasible to do so," explained Phil Oxley, president of Tenneco Oil Exploration and Production.

The operation, Tenneco said, could provide about 150 jobs within the first year if all construction options are exercised. Startup is anticipated during the last quarter of this year.

New Filter Housing Aids Design Flexibility —Literature Available

Increased performance and greater design flexibility are the hallmarks of the new SH Series High Pressure Filters from Stauff

Corporation, Waldwick, N.J., a United States manufacturer of hydraulic components and accessories. The new SH Series design is rated for 6,000 psi continuous service and has a rated fatigue pressure of 5,500 psi. Available in sizes from 14 to 160 gpm, Stauff SH Series Filters offer ease of installation with in line, L type and

manifold mounting.

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ings of 435 and 3,000 psid. Stauff filters and Betapure elements are compatible with all hydraulic fluids; petroleum base, phosphates esters, HWBF, water glycols and inert emulsions. For free literature describing the new stauff HS series,

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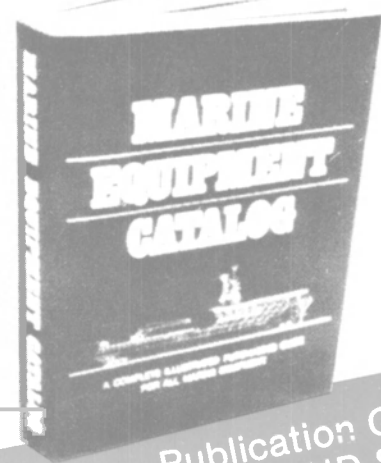
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432	341
389	322
Deck Machinery/Cranes/Cargo Handling	Rope/Chains/Mooring Systems
405	502
296	233
288	220
247	159
231	115
Controls/Monitoring/Steering	Oily Water Separators
398	367
271	335
260	309
246	242
233	225
Propellers/Thrusters	Valves/Fittings/Bearings (Shaft Couplings)
362	300
353	278
285	232
257	224
250	223

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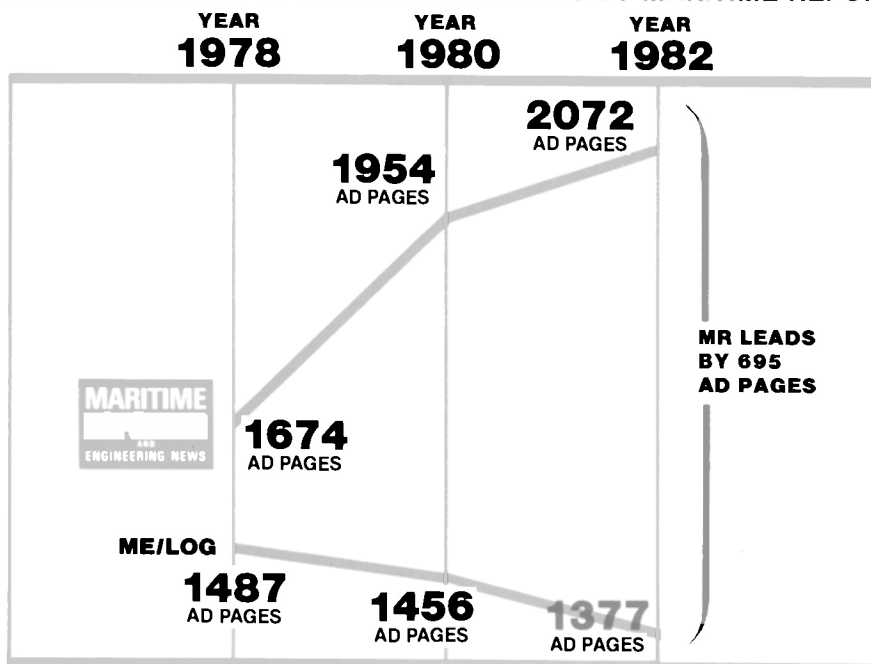
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Produce detailed manufacturing drawings and supervise the lifting and handling of 10 to 600 Ton components. Five years experience in manufacturing or structural engineering. B.S. in M.E. or C.E. required.

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Built: 1980
Principal Dimensions: 166' x 38' x 13'
Gross Tonnage: 233 Net Tonnage: 158
Approximate Capacities:
Fuel 43,322 gals.
Water 14,800 gals.
Liquid Mud 1,850 bbls.
Bulk Mud 3,000 cu. ft.
Ballast Water 2,937 bbls.
Crew Quarters 15

ABS Load Line or Class: Maltese Cross A-1 Circle E
Supply Vessel, AMS

Engines: Twin GM 16-V-149's

Gears: Twin Disc MG-540

Auxiliary Machinery:

- Schottel Bow Thruster powered by a GM 8-V-71
- 75 KW Delco Generator powered by 2 GM 6-71's

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42,000 Fuel, 16,000 Mile Range, Excellent Condition

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American 9310 Crawler Crane — Factory New, Immediately Available — 225 Ton fully equipped all independent lift crane — For Sale or Lease.

American 9310 Crawler — 225 Ton capacity, S/N GS-18834 (New Aug. 1976) fully equipped, 3 drums, all independent, excellent low hour machine. Located New Orleans.

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Tug Boats — (2) 5600 HP Ocean Going Tugs (new in 1975) Alcoa diesel engines — Excellent Condition.

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Could handle ships Under 400' L. O. A.

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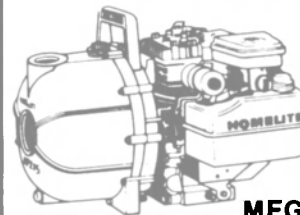
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A.B.S.
Classed Maltese Cross A-1
International Load Line

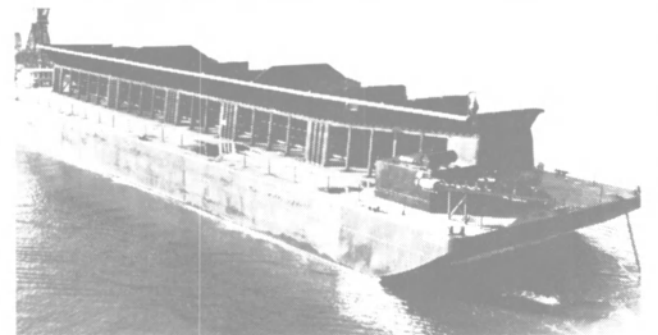
U.S.C.G.
Oceans
Certificate of Registry
Gross Tons — 8914
Panama Canal Tonnage
Certificate

Length	400' 0"
Beam	99' 6"
Depth	25' 0"
Deadrise	27"
Draft Light	3' 11"
Draft Loaded	19' 4"
Transverse Bulkheads	5 O.T.
Length Bulkheads	3 O.T.
No. Tanks	20
Rolled Bilge	48" R.
Mich. Bow	60' length
Sq. Raked Stern	80' length

DECK CARGO
Open Deck Area 37,886 S.F.
Deck Load 1,500 P.S.F.
D.W.T. 15,800 L.T.

AS OIL BARGE
Oil Cargo 148,500 BBL's
21,000 L.T.
Cargo Piping 14" Mains
10" Suctions

Self Unloading Aggregate Barge



ZAG-501

Length (O.A.)	248' - 0"
Beam	63' - 0"
Depth	16' - 0"
Displacement Light	1010 S.T.
Draft Light (F.W.)	2' - 7 1/2"
Draft Loaded (F.W.)	11' - 8"
DWT	4000 S.T.
Diesel Electric Set	100 KV
Hopper Volume	2667 cu. yd

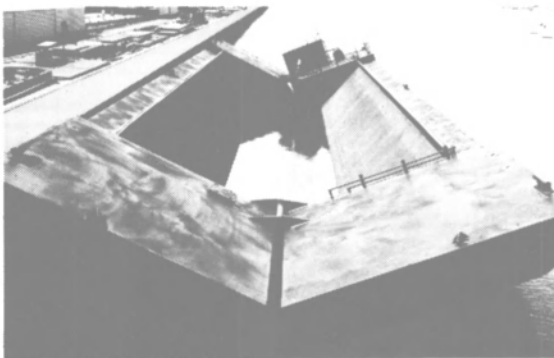
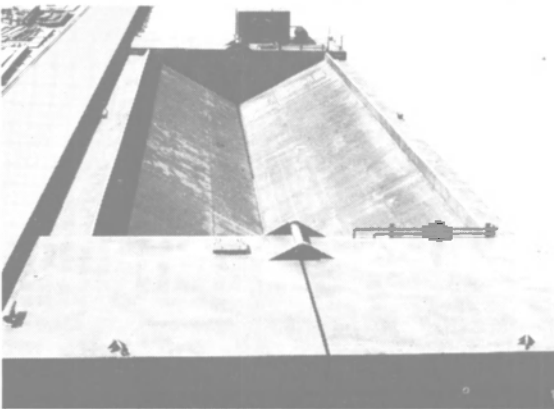
Hopper Unloading Gates: 27-36" x 36" Horiz. sliding gates w/individual hydr. controls.

Main Unloading Conveyor: 48" wide belt, 30 H.P. elect. motor, 250 ft./min. Max. disch. rate — 667 cu. yd./hr.

Transfer Conveyor: 42" wide belt, 10 H.P. elect. motor, 350 ft./min. off loading location — Stbd. side fwd. at 9 ft. above deck.

Hull Plating: Deck, side shell & bott. 9/16"

Split Type Self Dumping Scows



Built 1979. For sale, long or short term charters

SPECIFICATIONS

ABS loadlined for USCG-approved offport dumping

Length (MLD)	180' - 0"
Beam (MLD)	50' - 0"
Depth of Mid-Body (MLD)	14' - 0"
Hopper Length (MLD)	128' - 0"
Level Hopper Volume	1421 cu. yd.
DWT @ d = 10.22 ft.	1615 L.T.
Rake Lengths F & A	26' - 0"
Twin Skegs	
Stern & Fwd. Rake Decks Stepped up	2' - 0"
Engine GM 671	
Hydraulic Pumps (2) 12 GPM & 75 GPM	
Time To Open (Fully Closed to Fully Open)	6 Min. 5 Sec.
Time To Close	4 Min. 34 Sec.
Hopper Angle Fully Open	53.78°
Fuel Tank Capacity	445 Gal.
Hydraulic Cylinders (2 Fwd. & 2 Aft)	18" Diam. 120" Stroke

Plating	
Side	9/16"
Bottom	5/8"
Hopper	5/8"

Combination Deck Cargo & Tank Barge

**Fully-Classed
Ocean Service**



230' x 60' x 15' Comb. Deck Cargo & Grade 'D' Tank Barge

Length O.A.	230' - 0"
Beam	60' - 0"
Depth	15' - 6"
Deadrise	6"
Number of Tanks	10
Total Tank Volume @ 95%	24,000 BBL
Cargo Pumps	Two Twin Screw, Deleval IMO GTS-268-066-CBEM
Rating	1500 GPM, 1150 RPM, 100 PSIG Disch. Press., 5000 SSU
Location	Below Deck Pumproom in Fwd. Rake
Diesel Engines	Two Detroit Model 8V-71, 230 HP @ 1800 RPM
Location	Above Deck in Fwd. Deckhouse
Fuel Capacity	1400 Gal.
Fill & Disch. Connections	8" ANSI 150# FLG P/S
Heating Coils	2" Sch. 80 Pipe For Shore Steam
Hull Plating	Deck 1/2", Side Shell 5/8", Bott. 3/8", Shear Strake 1/2"
Deck Cargo Dwt. at Loadline	3900 S.T.

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DRYDOCK: Lifting capacity, 4,500 L.T.

Could handle ships Under 400' L. O. A.

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ABS. A1 Maitese Cross, 150' x 50' x 13'. Wiley steam whirley 120 foot boom, 75 tons at 40 feet. Fuel & water tanks in hull. Two 250 American 3 drum hoists. 6 point mooring system. Available for inspection, Houma, LA.

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1975 - 2,800 DWT SINGLE DECK
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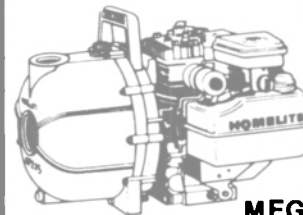
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One Year Warranty

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YOUR TOTAL COST \$189.00

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International Load Line

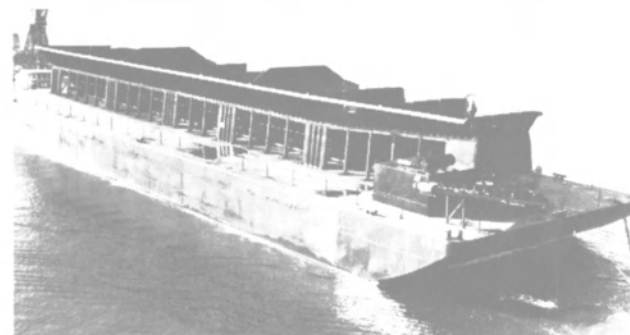
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Panama Canal Tonnage
Certificate

Length	400' 0"
Beam	99' 6"
Depth	25' 0"
Deadrise	27"
Draft Light	3' 11"
Draft Loaded	19' 4"
Transverse Bulkheads	5 O.T.
Length Bulkheads	3 O.T.
No. Tanks	20
Rolled Bilge	48" R.
Mich. Bow	60' length
Sq. Raked Stern	80' length

DECK CARGO
Open Deck Area 37,886 S.F.
Deck Load 1,500 P.S.F.
D.W.T. 15,800 L.T.

AS OIL BARGE
Oil Cargo 148,500 BBL's
21,000 L.T.
Cargo Piping 14" Mains
10" Suctions

Self Unloading Aggregate Barge



ZAG-501

Length (O.A.)	248' - 0"
Beam	63' - 0"
Depth	16' - 0"
Displacement Light	1010 S.T.
Draft Light (F.W.)	2' - 7 1/2"
Draft Loaded (F.W.)	11' - 8"
DWT	4000 S.T.
Diesel Electric Set	100 KV
Hopper Volume	2667 cu. yd

Hopper Unloading Gates: 27-36" x 36" Horiz. sliding gates w/individual hydr. controls.

Main Unloading Conveyor: 48" wide belt, 30 H.P. elect. motor, 250 ft./min. Max. disch. rate — 667 cu. yd./hr.

Transfer Conveyor: 42" wide belt, 10 H.P. elect. motor, 350 ft./min. off loading location — Stbd. side fwd. at 9 ft. above deck.

Hull Plating: Deck, side shell & bott. 9/16"

Split Type Self Dumping Scows

Built 1979. For sale, long or short term charters

SPECIFICATIONS

ABS loadlined for USCG-approved offport dumping

Length (MLD)	180' - 0"
Beam (MLD)	50' - 0"
Depth of Mid-Body (MLD)	14' - 0"
Hopper Length (MLD)	128' - 0"
Level Hopper Volume	1421 cu. yd.
DWT @ d = 10.22 ft.	1615 L.T.
Rake Lengths F. & A.	26' - 0"
Twin Skegs	
Stern & Fwd. Rake Decks Stepped up	2' - 0"
Engine	GM 671
Hydraulic Pumps (2)	12 GPM & 75 GPM
Time To Open (Fully Closed to Fully Open)	6 Min. 5 Sec.
Time To Close	4 Min. 34 Sec.
Hopper Angle Fully Open	53.78°
Fuel Tank Capacity	445 Gal.
Hydraulic Cylinders (2 Fwd. & 2 Aft)	18" Diam. 120" Stroke

Plating	
Side	9/16"
Bottom	5/8"
Hopper	5/8"

Combination Deck Cargo & Tank Barge

Fully-Classed
Ocean Service



230' x 60' x 15' Comb. Deck Cargo & Grade 'D' Tank Barge

Length O.A.	230' - 0"
Beam	60' - 0"
Depth	15' - 6"
Deadrise	6"
Number of Tanks	10
Total Tank Volume @ 95%	24,000 BBL
Cargo Pumps	Two Twin Screw, Devalval IMO GTS-268-066-CBEM
Rating	1500 GPM, 1150 RPM, 100 PSIG Disch. Press., 5000 SSU
Location	Below Deck Pumproom in Fwd. Rake
Diesel Engines	Two Detroit Model 8V-71, 230 HP @ 1800 RPM
Location	Above Deck in Fwd. Deckhouse
Fuel Capacity	1400 Gal.
Fill & Disch. Connections	8" ANSI 150# FLG P/S
Heating Coils	2" Sch 80 Pipe For Shore Steam
Hull Plating	Deck 1/2", Side Shell 3/8", Bott. 3/8", Shear Strake 1/2"
Deck Cargo Dwt. at Loadline	3900 S.T.

For additional information or to make an appointment to inspect, call or write:
Tom Sherwood, Andy Canulette, Jr.



ZIDELL EXPLORATIONS, INC.

3121 S.W. Moody Ave., Portland, Oregon 97201
Phone: 503 228-8691 • Telex 36-0503 • Cable "Zidell"
Toll free: 1 800 547-9259

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CARGO PUMPS (2)

Surplus New Unused
(Mfg. 1979)

3050 GPM @345' Head, Single Stage
1760 RPM Size 8x10, 21B Mfg. by Bingham

Driven by

450 HP GE Electric Motor 3/60/2300

or

450 HP Elliott Steam Turbine 100 lbs.
Fraction of original cost

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Large inventory of surplus chain and fittings

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9 x 12 American Hoist & Derrick Winches, reconditioned equal to new

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Agents for The Crosby Group

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Newly Manufactured For Us

IN STOCK
FOR
IMMEDIATE DELIVERY



SIZES	
26"x48"	26"x66"
26"x60"	30"x60"

STEEL DOGS

6-Dog right and left hand hinged doors with frames. Constructed of 1/4" steel plate and meet Coast Guard regulations for above deck as well as below deck use. All dogs are bronze bushed. Also available with 8" bronze portlights.

A.B.S. CERTIFICATES AVAILABLE
Hose Tested at 5 P.S.I.

at 1.5 to 3 meters from door. Doors are built according to approved drawings and technical requirements of A.B.S.



NEW 7" RADIUS PANAMA CHOCKS

(MEET PANAMA REGULATIONS)
14" x 10" CLEAR OPENING

With extended legs for welding to deck. 14" wide on base — length 28" — height 27 1/4". IMMEDIATE DELIVERY FROM STOCK.

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Marine Warehouse

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(301) 752-1077

TWX: 710-234-1637

Twin City Shipyard Delivers Split Hull Barges To Panama



Split hull hopper barge built by Twin City Shipyard can be activated by radio control.

Two split hull hopper barges were recently delivered to the Panama Canal Commission by Twin City Shipyard, Inc., St. Paul, Minn.

The two ruggedly constructed dump barges were specially designed by Twin City Shipyard for the Panama Canal Commission to handle extremely large and dense blasted rock up to 10 feet in diameter having a loaded specific gravity of 2.26.

Special features include hopper sheathing over the steel plate sloping sides of 3-inch white oak planking and 1-inch steel reinforced rubber. Double course hopper seals are of special rubber moldings developed by TCS engineers. TCS utilized its patented hull locking device along with TCS's improved hull actuating system. The critical alignment of the two hull halves was maintained by a carefully controlled welding sequence during construction. Two machinery rooms are provided below deck, one housing a diesel generator set and switch gear and the other containing the hydraulic power unit for the two opening and closing rams. Each machinery space has an independent fixed CO2 fire extinguishing system. Two bilge pumps are piped into recessed hydrants for deck washdown. The opening and closing of the hull can be totally controlled at a deck mounted console or from a hand held radio controlled station from a distance of up to 1/4 mile. Slow-speed and high-speed hull opening and closing functions are provided. The dump barges are designed and built to ABS classification and U.S.C.G. certification for full ocean service.

Wartsila AB Delivers LPG/Ammonia Tanker To Maraven In Venezuela



Paramacay is powered by a Wartsila Sulzer engine.

Oy Wartsila AB Turku Shipyards, Finland, has delivered the gas tanker Paramacay to Maraven S.A. of Venezuela. The vessel and its accommodations were designed for tropical conditions.

It is equipped with four tanks with a total volume of 14,000 cubic meters. Pressure and temperature may be regulated to accommodate different gases and differing port handling facilities. Special cold resistant steel is used for the free-standing pressurized vessels which rest on hardwood supports. Four fire extinguishing systems are utilized: water; water spray; carbon dioxide; and powder. It meets the latest IMO safety and environmental protection requirements.

Main particulars are: length 146 meters; beam 22 meters; depth 14 meters; draft 8 meters; cargo capacity 14,000 m³/11,570 tdw; main engine, Wartsila Sulzer 6RLB 56, speed of 16.25 knots. The vessel is designed for a crew of 38 people and is classed Lloyd's Register of Shipping+100 A-1 Liquid Gas Carrier.

Raymond International Ships Two Offshore Decks



Two offshore platform decks fabricated by a unit of Raymond International Inc. are prepared for a long sea voyage to the Middle East. The decks were assembled in Houma, La. They are scheduled for installation in the Gulf of Suez later this year by Raymond Offshore Constructors' crane ship Sirius III. Raymond Offshore Constructors is a wholly owned subsidiary of Raymond International Inc., a worldwide engineering and construction company headquartered in Houston.

Daewoo Employs Unique Floating Drydock And Ship Transfer System



This floating drydock at Daewoo's Okpo yard employs a Hydranautics Hydraulic Systems innovative ship transfer system.

A new floating drydock and innovative transfer system were commissioned recently in the Daewoo shipyard at Okpo, South Korea.

The drydock, designed by U.K.-based A.P. Appledore, features four fixed towers which serve as wing walls, differing from the traditional concept with full-length wing walls.

The transfer system supplied by Hydranautics Hydraulic Systems, Goleta, Calif., also represents a new generation in shipyard design and operation by providing virtually unlimited flexibility, according to **John Johnson**, Hydranautics Director of Shipyard Systems.

Capable of moving ships or ship sections up to 6,000 metric tons, the Hydranautics system will be used to transfer ships or ship sections on or off the floating drydock. In the yard, vessels can be moved by the hydraulic system on fixed or portable beams.

Additional versatility has been provided by the Daewoo yard since the Hydranautics hydraulic system can accommodate movement of offshore structures and jack-ups as well as ships.

For complete literature on Hydranautics ship transfer systems,

Write 11 on Reader Service Card

BUYERS DIRECTORY

This directory section is an editorial feature published in every issue for the convenience of the readers of MARITIME REPORTER/Engineering News. A quick-reference readers' guide, it includes the names and addresses of the world's leading manufacturers and suppliers of all types of marine machinery, equipment, supplies and services. A listing is provided, at no cost for one year in all 24 issues, only to companies with continuing advertising programs in this publication, whether an advertisement appears in every issue or not. Because it is an editorial service, unpaid and not part of the advertisers contract, MR/EN assumes no responsibility for errors. If you are interested in having your company listed in this Buyers Directory Section, contact John C. O'Malley at (212) 689-3266.

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Mechanical Resources, Inc., 191 Cambridge Ave., Jersey City, NJ 07307
Nance Industries, P.O. Box 1547, Beaumont, TX 77704-1547
Unitemp Inc., 3590 Kennedy Rd., So. Plainfield, NJ 07080
York Division, Borg-Warner Corp., P.O. Box 1592, York, PA 17405

ANCHORS AND CHAIN

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American United Marine Corp., 5 Broadway, Rte. 1, Saugus, MA 01906
Engelhard Industries Division, 2655 U.S. Route 22, Union, NJ 07083
Kaiser Chemical, Div., of Kaiser Aluminum & Chemical Corp., 300 Lakeside Dr., Rm. 1128 KB, Oakland, CA 94643

BASKET STRAINERS

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Riley-Beard, P.O. Box 31115, Shreveport, LA 71130

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Lucian Q. Moffitt, Inc., P.O. Box 1415, Akron, Ohio 44309

Thomson-Gordon Limited, 3225 Mainway, Burlington, Ontario, Canada L7M 1A6

Waukesha Bearings Corp., P.O. Box 798, Waukesha, Wisc. 53186

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Apache Equipment, Inc., 10690 Shadow Wood Dr., Suite 112, Houston, TX 77043

Butterworth Inc. (USA), 3721 Lapas Dr., P.O. Box 18312, Houston, TX 77223-9989

Butterworth Systems (UK), 123 Beddington Lane, Croydon CR9 4NX, England

CLEMCO, P.O. Box 7680, San Francisco, CA 94120

Complete Abrasive Blasting Systems, 18250 68th Avenue South, Kent, WA 98031

E.I. DuPont de Nemours & Co., Inc., Starblast Division, Room X39186, Wilmington, DE 19898

Rockwell International, Power Tool Division, 400 N. Lexington Ave., Pittsburgh, PA 15208

Schmidt Mfg. Inc., P.O. Box 37, Fresno, TX 77545

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Combustion Engineering, Inc., Windsor, Connecticut 06095

Foster Wheeler Boiler Corp., 110 S. Orange Ave., Livingston, NJ 07039

Howe-Baker Engineers, Inc. (Econoflex Burners), Combustion Systems Div., P.O. Box 956, Tyler, TX 75710

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Hughes Bros., Inc., 17 Battery Pl., New York, N.Y. 10004

National Propeller Exchange, P.O. Box 1444, Grafton, VA 23692

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Gulf Oil Trading Co., 1290 Ave. of the Americas, N.Y., N.Y. 10019

National Marine Service Inc. (Transport Div.), 1750 Brentwood Blvd., St. Louis, MO 63144

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National Control Systems, Inc., 827 Hanley Industrial Court, St. Louis, MO 63144

Norcontrol, 135 Fort Lee Rd., Leonia, NJ 07605

Norske Telekom A/S, Drammensveien 126, Oslo 2, Norway

Tracor Marcon, Inc., 13433 N.E. 20th St., Bellevue, WA 98005

Transamerica Delaval, Inc., Gems Sensors Division, Cowles Road, Plainville, CT 06062

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Appleton Marine, P.O. Box 2339, Appleton, WI 54913

ASEA Stal-Laval Inc., 525 Executive Blvd., Elmsford, NY 10523

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Chester Hoist Division, Monogram Industries, P.O. Box 229, Lisbon, OH 44432

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Markey Machinery Co., Inc., 79 S. Horton St., Seattle, Wash. 98134

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General Thermodynamics Corporation, 210 South Meadow Road, P.O. Box 1105, Plymouth, Massachusetts 02360

Haynes Corporation, P.O. Box 179, Jackson, MI 49204

Van der Horst Corp. of America, 314 Penn Ave., Olean, NY 14760

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NewMar, P.O. Box 1306, Newport Beach, CA 92663

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Fire-Brite, Hoftert Manufacturing Company, Inc., 1700 East Church Street, Jacksonville, FL 32201

EQUIPMENT—Marine

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Argo Marine, 140 Franklin St., New York, NY 10013

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Thomas Coudon Associates, 6655 Amberton Dr., Baltimore, MD 21227

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 Tracor Hydraulics, Inc., 7210 Pindell School Rd., Laurel, MD 20707
 Uhlig & Associates, Inc., 8295 SW 188th St., Miami, FL 33181
 VeVeY Engineering Works Ltd. U.S. Rep: Carl G. Brimmekamp & Co., Inc.,
 102 Hamilton Ave., Stamford, CT 06902
 Thomas B. Wilson, Associates, 1258 North Avalon Blvd., Wilmington, CA
 90744
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 American Hydromath Co., Buckwheat Bridge Rd., Germantown, N.Y. 12526
 Anschutz & Co. GmbH, Postfach 6040, D-2300 Kiel 14, West Germany
 Atkinson Dynamics, Section 6, 10 West Orange Ave., South San Francisco,
 CA 94080
 Cybernet International, Inc., 7 Powder Horn Dr., Warren, NJ 07060
 DEBEG Marine, Inc., 10 Manor Parkway, Salem, NH 03079
 Electric Tachometer Corp., 68th & Upland Street, Philadelphia, PA 19142
 A/S Elektrisk Bureau, P.O. Box 98, N-1360 Nesbru, Norway
 Electro-Nav Inc., 840 Bond Street, Elizabeth, NJ 07201
 EPSCO Marine, 550 Wholesalers Parkway, Harahan, LA 70123
 Fleet Marine, 1820 N.E. 146th Street, North Miami, FL 33181
 Furuno U.S.A., 271 Harbor Way, S. San Francisco, CA 94080
 Harris Communications (RF Communications), 1680 University Avenue,
 Rochester, NY 14610
 Hose McCann Telephone Company, Inc., 9 Smith Street, Englewood, NJ
 07631
 ITT Mackay Marine, 2912 Wake Forest Road, Raleigh, N.C. 27611
 Japan Radio Co., Ltd., Akasaka Twin Tower (Main), 17-22 Akasaka 2-
 chome, Minato-ku, Tokyo 107, Japan
 King Radio Corporation, 400 North Rodgers Rd., Olathe, KS 66062
 Kongsberg North America Inc., 135 Fort Lee Road, Leonia, NJ 07605
 Kongsberg Vapenfabrikk, Norcontrol Division, P.O. Box 145, Horten 3191,
 Norway
 Krupp Atlas-Elektronik, 1453 Pinewood St., Rahway, NJ 07065
 Lorain Electronics Corp., 2307 Leavitt Rd., Lorain, OH 44052
 Magnavox Navigation Systems, 2829 Maricopa Street, Torrance, CA 90503
 Nav-Com, Inc., 9 Brandywine Drive, Deer Park, NY 11729
 Navidyne Corp., 11824 Fishing Point Drive, Newport News, VA 23606
 Radar-Decca Marine, Inc., 4200 23rd Avenue West, Seattle, WA 98199
 Radar Devices, Inc., 2955 Merced Street, San Leandro, CA 94577
 Radio-Holland USA, Inc., 6033 South Loop East, Houston, TX 77033
 Raytheon Marine Co., 676 Island Pond Road, Manchester, N.H. 03103
 Raytheon Ocean Systems Company, Westminster Park, Risho Avenue, East
 Providence, RI 02914
 Raytheon Service Co., 103 Roester Rd., Glen Burnie, MD 21061
 Rivertronics, P.O. Box 247, Godfrey, IL 62035
 Robertson Auto Pilot, 135 Fort Lee Road, Leonia, NJ 07605
 Selesmar S.p.A., Casella Postale 9, 50020 Montagnana Val Di Pesa,
 Firenze, Italy
 Servo Corporation of America, 111 New South Road, Hicksville, NY 11802
 Simrad, Inc., 2215 NW Market St., Seattle, WA 98107
 Sperry Corporation, Great Neck, NY 11020
 Standard Communications, P.O. Box 92151, Los Angeles, CA 90009
 Texas Instruments, Inc., P.O. Box 405, 3438, Lewisville, TX 75067

OILS—Marine—Additives

Gulf Oil Company—U.S. (Domestic Oils), 909 Fannin Street, Houston, TX
 77001
 Gulf Oil, New York District Sales Office (Domestic), 433 Hackensack Ave-
 nue, Hackensack, NJ 07601
 Gulf Oil Trading Co., 1290 Ave. of Americas, New York, N.Y. 10019
 Mobil Oil Corp., 150 East 42 Street, New York, NY 10017
 Shell Oil Co., 1 Shell Plaza, Houston, Texas 77002
 Texaco, Inc. (International Marine), 135 East 42nd St., N.Y., N.Y. 10017

OIL/WATER SEPARATORS

Biospherics Incorporated, 5001 Forbes Blvd., Lanham, MD 20801
 Butterworth Inc. (USA), 3721 Laps Road, P.O. Box 18312, Houston, TX
 77223-9989
 Butterworth Systems (UK), 123 Bedington Lane, Croydon CR9 4NX,
 England
 Centrico, Inc. (Westfalia Separators), 100 Fairway Court, Northvale, NJ
 07647
 Dahl Manufacturing, Inc., 2521 Railroad Ave., Ceres, CA 95307
 From Industrial, P.O. Box 33210, Tulsa, OK 74135
 National Fluid Separators, Inc., 1239 Hanley Industrial Court, St. Louis, MO
 63144
 Phoenix Oil Refiner Co., Inc., 330 Hill Ave., Nashville, TN 37210

PAINTS—COATINGS—CORROSION CONTROL

American Abrasive Metals, 460 Coit Street, Irvington, NJ 07111
 Ameron, 4700 Ramona Blvd., Monterey Park, CA 91754
 Bareco, 6910 East 14th St., Tulsa, OK 74112
 Bywater Coatings, 1610 Engineers Road, Belle Chasse, LA 70037
 CLEMCO, P.O. Box 7680, San Francisco, CA 94120
 "CONSOL" manufactured by Contact Paint & Chemical Co. Inc., 200 S.
 Frontkintown Rd., Baltimore, MD 21223
 Devoe Marine Coatings Co., P.O. Box 7600, Louisville, KY 40207
 E.I. Dupont de Nemours & Co., Inc., Nemours Bldg. Rm. N-2504-2,
 Wilmington, DE 19898
 Esgard, Box 2698, Lafayette, LA 70502
 Eureka Chemical Company, 234 Lawrence Avenue, So. San Francisco, CA
 94080
 Farboil, 8200 Fischer Road, Baltimore, MD 21222
 Grow Group, Inc., 200 Park Ave., New York, NY 10017
 Hempel Marine Paints, Inc., 65 Broadway, New York, NY 10006; P.O. Box
 41, So. Houston, TX 77587; P.O. Box 10265, New Orleans, LA 70181
 International Paint Company, Inc., 2270 Morris Avenue, Union, NJ 07083
 Jolon-Baltimore Copper Paint Co., 840 Key Highway, Baltimore, MD 21230
 Magnus Maritec International Inc., 150 Roosevelt Pl., P.O. Box 150, Palis-
 ades Park, NJ 07650
 Mobil Chemical Co., Maintenance & Marine Coatings Dept., P.O. Box 250
 Edison, N.J. 08817
 Palmer Products Inc., P.O. Box 8, Worcester, PA 19490
 Products Research & Chemical Corp., 5454 San Fernando Rd., Glendale,
 CA 91203
 Solwico Glassflake, Inc., 5 Marine View Plaza, Hoboken, NJ 07030
 Seaguard, 4030 Seaguard Ave., Portsmouth, VA 23705
 Selby, Battersby & Company, 5220 Whiby Avenue, Philadelphia, PA 19143
 Sermetel, Inc., 4401 Sermetel Dr., Moss Point, MS 39563
 Teledyne Metal Finishers, 1725 East 27th St., Cleveland, OH 44114

PETROLEUM SUPPLIES

Shell Oil Co., 1 Shell Plaza, Houston, Texas 77002

PIER REPAIRS

Acquatic Marine Systems, Inc., P.O. Box 326, Williamsville, NY 14221
PIPE-HOSE—Cargo Transfer, Clamps, Couplings, Coatings
 Camlock Flange Sales Corp., 449 Sheridan Blvd., Inwood, L.I., N.Y. 11696
 Hydro-Craft, Inc., 1821 Rochester Industrial Dr., Rochester, MI 48063
 Knights' Piping Inc., 5309 Industrial Road, Pascagoula, MS 39567
 Kubota Ltd., 2-47, Shikit Suhigashi 1-Chome, Naniwa-Ku, Osaka 556-91,
 Japan
 Metropolitan Plumbing Supply Corp., 5000 Second St., Long Island City, NY
 11101
 Penca Division/Hudson Engineering Co., P.O. Box 68, Bayonne, NJ 07002
 Selkirk Metalbestos, Box 19000, Greensboro, NC 27419
 Stauff Corporation, 21-31 Industrial Park, Waldwick, NJ 07463
PLAQUES—BRONZE—ALUMINUM
 Duramax Metals, Inc., 2401 Wesley Street, Portsmouth, VA 23707
PLASTICS—Marine Applications
 Hubeva Marine Plastics, Inc., 390 Hamilton Ave., Bklyn, N.Y. 11231
**PROPULSION EQUIPMENT—Bowthrusters, Diesel Engines, Gears,
 Propellers, Shafts, Turbines**
 American Lohmann Corp., 1415 Chestnut Ave., Hillside, NJ 07205
 Armac Steel/Advanced Materials Div., 703 Curtis St., Middletown, OH
 45043
 Avondale Shipyards, Inc., P.O. Box 52080, New Orleans, La. 70150
 Bird Johnson Company, 110 Norfolk St., Walpole, Mass. 02081
 Burmeister & Wain Alpha Diesel AS, DK-1400 Copenhagen K, Denmark
 Caterpillar Engine Division, 100 N.E. Adams, Peoria, IL 61629
 Colt Industries Inc. (Fairbanks Morse Engine Div.), 701 Lawton Avenue,
 Beloit, WI 53511
 Columbian Bronze Corporation, 216 No. Main Street, Freeport, NY 11520
 Combustion Engineering, Inc., Windsor, Connecticut 06095
 Deutz Corp., 7585 Ponce de Leon Circle, Atlanta, GA 30340
 Diesel Marine International, Ltd., c/o NORSHIPCO, P.O. Box 2100, Nor-
 folk, VA 23501
 Elliott Company, 1809 Sheridan Ave., Springfield, OH 45505
 Escher Wyss GmbH, (Member Sulzer Group), Ravensburg, Germany
 General Electric Co., Diesel Power Products, 2901 E. Lake Rd., Erie, PA
 16531
 General Motors, Electro-Motive Division, LaGrange, IL 60525
 George Engine Company, Inc., Lafayette, LA
 Gullen Marine Co., Inc., 160 Van Brunt St., Brooklyn, NY 11231
 Harbormaster, 36 Hancock St., Quincy, MA 02171
 Krupp Mak Diesels, Inc., 4329-33 Di Paolo Center, Glenview, IL 60025
 M.A.N.-B&W Diesel, 2, Ostervej, DK-4960 Høleby, Denmark
 MTU of North America, One E. Putnam Ave., Greenwich, CT 06830; 10450
 Corporate Dr., Sugarland, TX 77478; 2945 Railroad Ave., Morgan City,
 LA 70203; 180 Nickerson St., Seattle, WA 98109; 1730 Lynn St., Arlington,
 VA 22209
 MWM-Murphy Diesel, 12 Greenway Plaza, Suite 1100, Houston, TX 77046
 Mapeco Products, Inc., 20 Vesey St., New York, NY 10007
 Maritime Industries, Ltd., 6307 Laurel St., Burnaby, B.C. Canada V5B 3B3
 Michigan Wheel, 1501 Buchanan Ave., S.W., Grand Rapids, MI 49507
 National Marine Service Louisiana, Inc., 222 Bayou Rd., Belle Chasse, LA
 70037
 Omnitruster Inc., 9515 Sorensen Ave., Santa Fe Springs, CA 90670
 Penske GM Power, Inc., 600 Parsippany Road, Parsippany, NJ 07054
 SACM (Societe Alsacienne De Constructions Mechaniques De Mulhouse) 1,
 Rue De La Fonderie, Boite Postale 1210, 68054 Mulhouse Cedex, France
 Karl Senner, Inc., P.O. Box 10055, New Orleans, LA 70181
 Skinner Engine Company, P.O. Box 1149, Erie, PA 16512
 Sulzer Brothers, Dept. Diesel Engines, CH-8401 Winterthur, Switzerland
 Transamerica DeLaval Inc., Engine & Compressor Div., 550 85th Ave.,
 Oakland, CA 94621
 Transamerica DeLaval, Inc., Turbine & Compressor Div., P.O. Box 8788,
 Trenton, N.J. 08650
 Turbine Specialties, Inc., P.O. Box 207, West State Street Road, Salina, KS
 67401
 Turbine Specialties/Gulf Coast, Inc., 1900 Industrial Blvd., Harvey, LA
 70058
 Voith Schneider America, 159 Great Neck Rd., Ste 200, Great Neck, NY
 11021
 WABCO Fluid Power, an American-Standard Company, 1953 Mercer Rd.,
 Lexington, KY 40505
 Wartsila Power Inc., 5132 Taravella Rd., P.O. Box 868, Marrero, LA 70072
 Waukesha Engine Division, Waukesha, WI 53187
 Welco Industries, Inc., 9027 Shell Rd., Cincinnati, OH 45236
 ZF of North America, Inc., 3225 Commercial Avenue, Northbrook, IL 60062
 ZF of North America, Inc. (Motive Power Corporation, P.O. Box 365,
 Mineola, NY 11501)

PUMPS—Repairs—Drives

FMC Corporation, Pump Division, 326 S. Dean Street, Englewood, NJ
 07631
 Industrial Products & Engineering Co., Inc., 1 Sawyer Dr., Coventry, RI
 02816
 Jim's Pump Repair, 48-55 36th St., Long Island City, NY 11101
 Megator Corporation, 562 Alpha Drive, Pittsburgh, PA 15238
 Naniwa Pump, c/o Maritime Equipment Inc., P.O. Box 537, Flemington, NJ
 08822
 Penca Division/Hudson Engineering Co., P.O. Box 68, Bayonne, NJ 07002
 Sims Pump Valve Co., Inc., 1314 Park Ave., Hoboken, NJ 07030
 Transamerica DeLaval, IMO Pump Division, P.O. Box 447, Monroe, NC
 28110
 Vita Motivator Company, 200 West 20th St., New York, NY 10011
 Warren Pumps Division, Bridges Avenue, Warren, MA 01083
 Wilden Pump & Engineering Co., 22060 Van Buren St., P.O. Box 845, Col-
 on, CA 92324
REFRIGERATION—Refrigerant Valves
 Bailey Refrigeration Co., Inc., 74 Sullivan St., Brooklyn, N.Y. 11231
 Part Refrigeration Div., 157 Perry St., New York, NY 10014
ROLLING SYSTEMS
 Hilman, Inc., 2604 Atlantic Ave., Wall (Belmar), NJ 07719
ROPE—Manila—Nylon—Hawes—Fibers
 American Mfg. Co., Inc., Willow Avenue, Honesdale, Pa. 18431
 Atlantic Cordage Corp., 60 Grant Avenue, Carteret, NJ 07008
 DuPont Co., KEVLAR Aramid Fiber, Room G-15465, Wilmington, DE 19898
 Samson Ocean Systems, Inc., 99 High Street, Boston, Mass. 02110
 Tubbs Cordage Company, P.O. Box 709, Orange, CA 92666
 Wall Industries, Inc., P.O. Box 560, Elkin, NC 28621
RUDDER ANGLE INDICATORS—STEERING
 Electric Tachometer Corp., 68th & Upland St., Philadelphia, Pa. 19142
 Hy-Drive America Corp., 3629 Vernon Blvd., Long Island City, NY 11106
 Marine Drive Systems, 519 Raritan Center, Edison, NJ 08817
 Robertson, 135 Fort Lee Rd., Leonia, NJ 07605
 Schattel of America, Inc., 8375 N.W. 56 St., Miami, FL 33166
SAFETY EQUIPMENT
 Datrex, 3795 N.W. 25th Street, Miami, FL 33142
 Elkhart Brass Manufacturing Co., Inc., P.O. Box 1127, Elkhart, IN 46515
 Wormald Fire Systems, One Stanton St., Marinette, WI 54143
SANITATION DEVICES—Pollution Control
 Effluent Technology Corporation, P.O. Box 2094, Tacoma, WA 98401
 Envirovac Inc., 1260 Turret Dr., Rockford, IL 61111
 Marine Moisture Control Co., Inc., 449 Sheridan Blvd., Inwood, L.I., N.Y.
 11696
 Marland Environmental Systems, Inc., N. Main Street, Walworth, WI 53184
 National Sanitation Foundation, P.O. Box 1468, Ann Arbor, MI 48105
SCAFFOLDING EQUIPMENT—Work Platforms
 McCausey Lumber Co., 7751 Lyndon, Detroit, MI 48238
 Patent Scaffolding Co., One Bridge Plaza, Fort Lee, NJ 07024
 Swiss Fabricating Inc., Camp Horne Rd., Emsworth, Pittsburgh, PA 15237
 Trus-Joist Corp., P.O. Box 60 Boise, ID 83704
 Waco Ladder & Scaffolding Co., Inc., 4315 41 St., P.O. Box 126, Brent-
 wood, MD 20722
SHAFT SEALS, REVOLUTION INDICATOR EQUIPMENT
 Bird-Johnson Co., 100 Norfolk St., Walpole, MA 02081
 Crane Packing Company, 435 Regina Dr., Clarksburg, MD 20734
 EG&G Sealair, Engineered Products Div., Marine Products Group, Warwick,
 RI 02888

Electric Tachometer Corp., 68th & Upland St., Philadelphia, Pa. 19142
 Henschel Corp., 14 Cedar St., Amesbury, Mass. 01913
 Penca Division/Hudson Engineering Co., P.O. Box 68, Bayonne, NJ 07002
SHIPBREAKING—Salvage
 The Boston Metals Co., 313 E. Baltimore St., Baltimore, Md. 21202
 Fred Devine Diving & Salvage, Inc., 6211 N. Ensign, Swan Island, Portland,
 OR 97217
 Zidell Explorations, Inc., 3121 S.W. Moody St., Portland, Ore. 97201

SHIPBUILDING EQUIPMENT

Pearlson Engineering Co., P.O. Box 8, Kendall Branch, Miami, FL 33156
 Total Transportation System Inc., 813 Forest Dr., Newport News, VA 23206
 Total Transportation Systems (International) A/S, Bjornegarden, P.O. Box
 28, N5201, Oslo, Norway
SHIPBUILDING STEEL
 Armco Steel Corp., 703 Curtis St., Middletown, Ohio 45042
 Bethlehem Steel Corp., One State Street Plaza, N.Y. 10004
 Welded Beam Company, P.O. Box 280, Perry OH 44081

SHIPBUILDING—Repairs, Maintenance, Drydocking

Alabama Maritime Corp., P.O. Box 3026, Mobile, AL 36652
 Amsterdam Drydock Company, Post Box 3006, 1003 AA, Amsterdam,
 Holland
 Asmar Shipyards Co., Astilleros y Maestranzas de la Armada, Prat 856, Piso
 14, Casilla 150-V, Valparaiso, Chile, S.A.
 Astilleros Balboa, S.A., c/o Jackson Marine Corp., 17 Battery Place, New
 York, NY 10004
 Ateliers et Chantiers de Bretagne—ACB, 44040 Nantes Cedex, France
 Atlantic Dry Dock, P.O. Box 276, Ft. George Island, Jacksonville, FL 32226
 Atlantic Marine Inc., P.O. Box 138, Ft. George Island, Jacksonville, FL
 32226
 Avondale Shipyards, Inc., P.O. Box 52080, New Orleans, La. 70150
 Bath Iron Works Corp., 700 Washington St., Bath, ME 04530
 Bay Shipbuilding Corp., 605 North 3rd Ave., Sturgeon Bay, WI 54235
 BFC Marine Services, Inc., 25 Fifth St., Brooklyn, NY 11231
 Bender Shipbuilding & Repair Co., Inc., P.O. Box 42, Mobile, AL 36601
 Bethlehem Steel Corp., Bethlehem, PA 18016
 Blohm & Voss Company, 55 Morris Avenue, Springfield, NJ 07081
 Burmeister & Wain Skibsvoerft A/S, P.O. Box 2122, Refshaleoen-1015 Co-
 penhagen K-Denmark
 Burrard Yarrows Corporation, P.O. Box 86099, North Vancouver, B.C.,
 Canada
 Burton Shipyard, Inc., P.O. Box 3636, Port Arthur, TX 77640
 Caneco Shipyard, Rua Carlos Seidl, 714, Caju, 20.931, Rio de Janeiro, RJ,
 Brazil
 Cantieri Navali Riuniti, Via Cipro, 11, 16100 Genova, Italy
 Carrington Slipways Pty. Ltd., Old Punt Road, Tomago, N.S.W., Australia
 2322
 China Shipbuilding Corp., 3 Chung Kang Rd., Hsia Kong, Kaohsiung, Tai-
 wan, Republic of China
 Conrad Industries, P.O. Box 790, Morgan City, La. 70380
 Curacao Drydock Company Inc., 26 Broadway, Suite 741, New York, NY
 10004
 Daewoo International (America) Corp., 437 Madison Ave., New York, NY
 10022
 Daewoo Shipbuilding & Heavy Machinery Ltd., Ayangri, Changsung-PO,
 Koje-Kun, Kyungnam, Korea
 Dorby Ltd., Military Road, 1 Industrial Sites, West Bank, 5201 East London,
 Republic of South Africa
 Dravo Marine Equipment Company, Neville Island, Pittsburgh, PA 15225
 Eastern Marine, Inc., P.O. Box 1009, Panama City, FL 32401
 FMC Corp., Marine & Rail Equipment Div., 4700 N.W. Front Ave., Portland,
 Oregon 97208
 Far East Livingston Shipbuilding Ltd., 31 Shipyard Rd., Jurong Town, Singa-
 pore 2262
 Genstar Marine, 10 Pemberton Ave., No. Vancouver, B.C., Canada V7P
 2R1
 Gladding-Hearn Shipbuilding Corp., 1 Riverside Ave., Somerset, MA 02725
 HBC Barge, Inc., Grant Building, Pittsburgh, PA 15219
 Halter Marine, Inc., P.O. Box 29266, New Orleans, LA 70189
 Hong Kong United Dockyards Ltd., P.O. Box 534, Kowloon Central Post
 Office, Kowloon, Hong Kong
 Hyundai Mipo Dockyard Ltd., 456 Cheonha-Dong, Ulsan, Korea
 I.N.M.A. S.p.A., 19100 La Spezia, v. le S. Bartolomeo 362, Italy
 Jakobson Shipyard Inc., P.O. Box 329, Oyster Bay, NY 11771
 Joffboat, Inc., Jeffersonville, Ind. 47130
 Keppel Shipyard Limited, 325 Telok Blangah Road, P.O. Box 2169, Singa-
 pore 0409

Koch Ellis Barge & Ship Service, P.O. Box 187, Westwego, LA 70094
 Leevac Corporation, P.O. Box 2607, Morgan City, LA 70381
 Lockheed Shipbuilding and Construction Co., 2929 16th Avenue, S.W., Se-
 attle, Wash. 98134
 McDermott, Incorporated, 1010 Common Street, New Orleans, LA 77227
 John Manly Shipyards, 2050 East Kent Ave., Vancouver, B.C. V5P 2T2,
 Canada
 Marathon LeTourneau Offshore Co., 1700 Marathon Bldg., 600 Jefferson,
 Houston, TX 77002
 Marystown Shipyard Limited, P.O. Box 262, Marystown, Newfoundland,
 Canada AOE 2MO
 Misener Industries, Inc., 5353 Tyson Avenue, P.O. Box 13625, Tampa, Fla.
 33681
 Mitsubishi Heavy Industries, Ltd., 5-1, Marunochi 2-chome, Chiyoda-ku, To-
 kyō, 100 Japan
 Monark Boat Co., P.O. Box 210, Monticello, Ark. 71655
 Moran Shipping Agencies, 10 Jefferson Blvd., Warwick, RI 02888
 Moss Point Marine Inc., P.O. Box 1310, Escatawpa, MS 39552
 Nashville Bridge Company, P.O. Box 239, Nashville, TN 37202
 National Marine Service (Shipyard Division), P.O. Box 38, Hartford, IL
 62048
 National Steel & Shipbuilding Corp., San Diego, Calif. 92112
 Newport News Shipbuilding & Dry Dock Co., 4101 Washington Ave., New-
 port News, Va. 23607
 North Florida Shipyards, P.O. Box 3863, Jacksonville, FL 32206
 O.A.R.N. (Officine Allestimento-Riparazioni Navi), P.O. Box 1395, Genoa,
 Italy 16100
 Overseas Shipyards, Inc., 21 West St., New York, NY 10006
 Patti Industries Inc., South B St., Pensacola, FL 32573
 Progressive Shipbuilders & Fabricators, Inc., P.O. Box 9130, Houma, LA
 70361
 Promet (PTE) Ltd., 27 Pandam Rd., Jurong Industrial Estate, Singapore 22
 Promet Marine Services Corp., 242 Allens Ave., Providence, RI 02906
 Puerto Rico Drydock & Marine Terminals, Inc., P.O. Box 2209, San Juan,
 Puerto Rico 00903
 Rauma-Repola, 26100 Rauma 10, Finland
 Samsung Shipbuilding & Heavy Industries Co., Ltd., Samsung Main Bldg.
 250, 2Ka, Taepyeong-ro, Chung-ku, Seoul, Korea
 Savannah Shipyard Co., P.O. Box 787, Savannah, GA 31402
 Schiess Defries, Postfach 111146, Schiess-Str. 61, D-4000 Dusseldorf 11,
 West Germany
 Service Machine Group, Inc., P.O. Box 2664, Morgan City, LA 70381
 Southbay Boat Inc., P.O. Box 13308, San Diego, CA 92113
 Southwest Marine, Inc., P.O. Box 13308, San Diego, CA 92113
 Swiftships Inc., P.O. Box 1908, Morgan City, LA 70380
 Thomas Marine, 37 Bronsford St., Patchogue, NY 11772
 Todd Shipyards Corp., 1 State St. Plaza, New York, N.Y. 10004
 Tracor Marine, P.O. Box 13107, Port Everglades, Fla. 33316
 Union Dry Dock & Repair Co., Foot of Pershing Road, Weehawken, N.J.
 07087
 Valmet Oy, Helsinki Shipyard, Laivanrakentajantie 2, P.O. Box 910 SF-
 00101 Helsinki 10, Finland
 Veralmes Estaleiros Reunidos Do Brasil S.A., Rua Buenos Aires, 68, Rio de
 Janeiro—RJ—Brazil
 Waterman Supply Co., 2815 E. Anaheim St., P.O. Box 596, Wilmington, CA
 90748
 West Coast Salvage And Contracting, 2150 East Kent Avenue, Vancouver,
 B.C. V5P 2T2
 Zidell Explorations, Inc., 3121 S.W. Moody Street, Portland, OR 97201

BUYERS DIRECTORY

(continued)

SHIPPING—PACKING

Pilotage Consultants, Inc., P.O. Box 2046, New Hyde Park, NY 11040

SILENCERS

Burgess-Manning Silencing Equipment Division, 8108 Carpenter Frwy., Dallas, TX 75247

Riley-Beard, P.O. Box 31115, Shreveport, LA 71130

SMOKE INDICATORS

Robert H. Wager Co., Inc., Passaic Avenue, Chatham, N.J. 07928

STUFFING BOXES

Johnson Rubber Co., Duramax Marine Div., 16025 Johnson St., Middlefield, OH 44062

Smith-Meeker Engineering Co., 157 Chambers Street, New York, NY 10007

SURVEYORS AND CONSULTANTS

Francis B. Crocco, Inc., P.O. Box 1411, San Juan, Puerto Rico 00903

Hull & Cargo Surveyors, Inc., 99 John St., New York, NY 10038

Frank Jeffrey & Assoc., 5201 Westbank Exp., Suite 206, Marrero, LA 70073

M.A. Stream Associates, Inc., 400 Second Ave. W., Seattle, WA 98119

TANK CLEANING

Butterworth Inc. (USA), 3721 Lapas Dr., P.O. Box 18312, Houston, TX 77223-9989

Butterworth Systems (UK), 123 Beddington Lane, Croydon CR9 4NX, England

Penco Division/Hudson Engineering Co., P.O. Box 68, Bayonne, NJ 07002

TANK LEVELING INDICATORS

ARMTEC Industries, Inc., Manchester, NJ 03103

Kockumation AB, Box 1044, S-212 10 Malmö, Sweden

Norcontrol, 135 Fort Lee Rd., Leonia, NJ 07605

Salwico Inc., 5 Marine View Plaza, Hoboken, NJ 07030

Transamerica Delaval, Inc., Gems Sensors Division, Cowles Road, Plainville, CT 06062

TOWING—Barges, Vessel Chartering, Lighterage, Salvage, etc.

Atlantic Towing Ltd., 300 Union Pl., St. John, N.B., Canada E2L 1B6

Bay-Houston Towing Co., 805 World Trade Bldg., Houston, Texas 77002

Bulkfleet Marine Corporation, 1800 West Loop So., Houston TX 77027

Curtis Bay Towing Co., Mercantile Bldg., Baltimore, Md. 21202

Henry Gillen's Sons Lighterage, 21 West Main St., Oyster Bay, N.Y. 11771

James Hughes, Inc., 17 Battery Pl., New York, N.Y. 10004

International Transport Contractors Holland B.V., 5 Kenaupark, P.O. Box 21, Haarlem, Holland

McAllister Bros., Inc., 17 Battery Pl., New York, N.Y. 10004

McDonough Marine Service, P.O. Box 26206, New Orleans, La.

Midland Affiliated Co., 580 Walnut St., Cincinnati, OH 45201

Maron Towing & Transportation Co., Inc., One World Trade Center, Suite 5335, New York, N.Y. 10048

National Marine Service, Transport Div., 1750 Brentwood Blvd., St. Louis, MO 63144

Suderman & Young Co., Inc., 918 World Trade Bldg., Houston, Texas 77002

Turecama Coastal & Harbor Towing Corp., One Edgewater St., Clifton, Staten Island, N.Y. 10305

VALVES AND FITTINGS

Clow Corporation, 1211 West 22nd St., Oak Brook, IL 60521

The Crosby Group, Inc., P.O. Box 3128, Tulsa, OK 74101

Dover Corporation, Norris Division, P.O. Box 1739, Tulsa, OK 74101

Hayward Marine Products, 900 Fairmount Avenue, Elizabeth, NJ 07207

Jamesbury Corp., 640 Lincoln Street, Worcester, MA 01605

Marine Moisture Control Co., 449 Sheridan Blvd., Inwood, N.Y. 11696

Metropolitan Plumbing Supply Corp., 50-09 Second Street, Long Island City, NY 11101

Newmans Inc., 9 Joanna Court, East Brunswick, NJ 08816

Pittsburgh Brass Manufacturing, Sandy Hill Rd., R.D. 6 Box 387-A, Irwin, PA 15642

Stacey Fetterolf Corp., P.O. Box 103, Skippack, PA 19474

Stockham Valves & Fittings, Box 10326, Birmingham, AL 35202

Tate Temco, Inc., 1941 Lansdowne Road, Baltimore, MD 21227

Union Flonetics, P.O. Box 459, Clinton, PA 15026

Robert H. Wager Co., Inc., Passaic Avenue, Chatham, N.J. 07928

Waukesha Bearings Corp., 405 Commerce St., P.O. Box 798, Waukesha, WI 53186

Westran Corporation, Valve Components Group, 4025 Rememberance Rd., N.W., Grand Rapids, MI 49504

William E. Williams Valve Corporation, 38-52 Review Avenue, Long Island City, NY 11101

Winel, Inc., 34655 Mills Road, North Ridgeville, OH 44039

Zidell Explorations, Inc., (Valve Division), 3121 S.W. Moody Avenue, Portland, OR 97201

VIBRATION ANALYSIS

DLI Engineering Corp., 253 Winslow Way West, Bainbridge Island, WA 98110

WATER PURIFIERS

Aqua Chem Inc., P.O. Box 421, Milwaukee, WI 53201

AquaGlobal, 50/60 Inip Dr., Inwood, NY 11696

Bull & Roberts, Inc., 785 Central Ave., Murray Hill, NJ 07974

Drew Chemical Corporation, One Drew Chemical Plaza, Boonton, NJ 07005

Everpure, Inc., 660 N. Blackhawk Dr., Westmont, IL 60559

Riley-Beard, P.O. Box 31115, Shreveport, LA 71130

WELDING

CRC Automatic Welding, P.O. Box 3227, Houston, TX 77253-3227

Metallizing Co. of America, Inc., 321 So. Hamilton, Sullivan, IL 61951

Oerlikan Welding Industries, Inc., P.O. Box 40964, Houston, TX 77240

WINCHES AND FAIRLEADERS

Braden Winch Co., 800 East Dallas, Broken Arrow, OK 74012

CONMACO, Inc., 820 Kansas Ave., P.O. Box 5097, Kansas City, KS 66119

Markey Machinery Co., 79 South Horton St., Seattle, Washington 98134

McElroy Machine & Mfg. Co., Inc., P.O. Box 4454, W. Biloxi, MS 39531

Reel-O-Matic Systems, Inc., 418 Hellam Street, Wrightsville, PA 17368

Smith Berger Marine Inc., 516 So. Chicago St., Seattle, WA 98108

Stanspec Corp., 13600 Deise Ave., Cleveland OH 44110

Superior-Lidgerwood-Mundy Corp., 1101 John Avenue, Superior, WI 54880

Timberland Equipment Ltd., Box 490, Woodstock, Ont. Canada N4S 7Z2

WINDOWS

Kearfott Marine Products, A Singer Co., 550 South Fulton Avenue, Mt. Vernon, N.Y. 10550

WIRE AND CABLE

Anaconda Ericsson Inc., Continental Wire and Cable, P.O. Box 1863, York, PA 17405

Anixter Bros., Inc., 4711 Golf Road, One Concourse Plaza, Skokie, Illinois 60076

Delco Wire & Cable, Inc., 257 Rittenhouse Circle, Keystone Industrial Park, Bristol, PA 19007

Seacoast Electric Supply Corp., 225 Passaic St., Passaic, NJ 07055

Seacoast Electric Supply Corp., 1505 Oliver St., Houston, TX 77007

Tri-Mark, Inc., 8585 Industry Park Drive, Piqua, OH 45356

WIRE ROPE—Slings

Bethlehem Steel Corp., Bethlehem, PA 18016

A.L. Don Company, Foot of Dock Street, Matawan, NJ 07747

I & I Sling Company, 2626 Market Street, Dept. D, Aston, PA 19014

ZINC

Smith & McCroken, 153 Franklin St., New York, N.Y. 10013

General Dynamics Building Cargo Transfer Platform Barge With National Jacking System



National Supply racks for General Dynamics jackup barge.

An offshore jacking system built by National Supply Company, Houston, will give "legs" to a cargo handling barge designed for shipping major marine components between New England shipyards.

The jacking system will enable General Dynamics' Electric Boat Division to load and unload components at dock level, then raise the legs and tow the barge between its shipyards in Groton and 50 miles up the coast at Quonset Point, R.I.

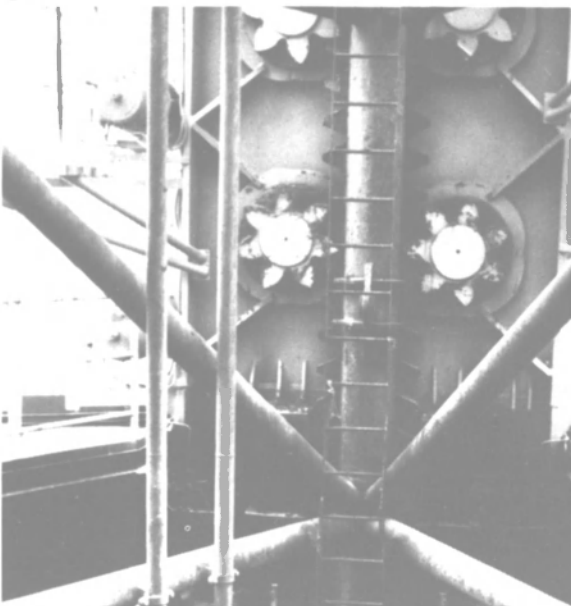
Also described as a "cargo elevating platform," the barge will be 195-foot long and 78-foot wide with a capacity of about 1,200 tons. The barge is expected to make about 25 trips a year between the two shipyards with components weighing up to 600 tons.

National's jacking system was developed for the offshore oil industry. Drilling or production platforms fitted with the jacking system could be towed to an offshore oil field. Then the legs would be jacked into place to create a stable platform in varying water depths. The legs could then be easily retracted whenever the platforms needed to be towed to a new location.

Bruce Dawson, sales engineer for National's Drilling Equipment Division, Houston, said the rack-and-pinion jacking system consists of three independent jacking units and legs. Each cylindrical leg, fitted with a sawtooth rack, is 72 feet in length, with an outside diameter of six feet.

"The system is electrically controlled and can be powered from shore-supplied power sources," added Mr. Dawson. "The electrical system provides smooth and continuous movement for the precise adjustment of the platform to the docks in a minimum amount of time."

The barge loading and jacking system idea grew out of a brainstorming session at Gen-



Barge legs are raised and lowered by rack and pinion jacking system.

eral Dynamics. Cranes used in recent years had been limited to 300 tons and the Electric Boat Division sometimes wanted to transport far larger components.

The jacking units were manufactured at National Supply Company's plant in Torrance, Calif., and the legs and racks were made in Houston. The equipment was then shipped to Quincy, Mass., where the barge is being constructed by General Dynamics' Quincy Shipbuilding Division.

National said the barge jacking system should find an easier service life than those used on many offshore installations.

"We're really looking at an ideal situation here because loading and unloading will be done in protected areas on concrete pylons and under good weather conditions," he said. By comparison, some offshore jacking system legs used on drilling rigs are longer than a football field and are expected to withstand severe pounding from ocean waves and high winds.

Mr. Dawson said jacking systems can be used for other non-oilfield purposes—such as portable drydocks, bridge erection and pile driving.

For free literature on National Supply's offshore jacking system,

Write 94 on Reader Service Card

380-Foot Drillship To Be Auctioned In Singapore

The drillship Petromar North Sea, will be auctioned on November 1, in Singapore Harbor, it was announced by Max Rouse & Sons, Inc., Los Angeles auctioneers handling the sale.

Owned by Petromarine Drilling Co., the 380-foot vessel was built by Bethlehem Steel and converted to a drillship by Todd Shipyards. It underwent a \$10-million refurbishing and overhaul in 1981.

Replacement value of the Petromar North Sea is estimated at between \$55-million and \$65-million.

The ship has air conditioned quarters for 100 men, a hospital ward, and it carries enclosed capsule-type life boats. It is fully outfitted, and has a large inventory of supplementary equipment valued in excess of \$1 million.

Drilling machinery includes National 1625 drawworks and 12P160 mud pumps. The rig is equipped with heave compensator and riser tensioners. The electrical system produces 420 kw with 4 CAT 399 generators.

The mailing address of Rouse & Sons, Inc. is Box 5250, Beverly Hills, Calif. 90210. Phone: (213) 655-9300. Representative in Singapore is Richard Schindele, who may be reached at 251-8183.



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**Free Literature Available
On New Diesel Engine
Corrosion Inhibitor**

Bull and Roberts of Murray Hill, N.J., is offering free literature describing their new Diesel Engine Corrosion Inhibitor, BR 700, which is rapidly gaining attention of engineers throughout the marine and workboat industries. This non-toxic, low level nitrite formulation will not only protect the cooling system against rust, corrosion, and deposit formation, but due to the action of special dispersants, will slowly remove existing deposits while the engine is in operation. Special bubble breaker eliminates foaming and reduces cavitation potential. BR 700 is compatible with all antifreeze solutions.

Bull and Roberts is also offering complete laboratory analysis of engine jacket cooling water as a service in conjunction with BR 700 treatment. For full details and literature,

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**M & M Electric Awarded
\$4.5-Million Navy Contract**

M&M Electric Company Incorporated, Hanahan, S.C., is being awarded a \$4,548,000 fixed-price contract for construction of a mooring platform at Naval Station, Charleston, S.C. The Naval Facilities Engineering Command, Alexandria, Va., is the contracting activity (N62467-81-C-0290).

**Hyundai Heavy Industries
Wins \$25-Million Contract
To Build 80,000-Dwt Tanker**

Hyundai Heavy Industries Co., Ltd., Seoul, Korea, has won a contract to build an 80,000-dwt crude oil tanker. The US \$25-million contract has been signed by C.L. Lee, chairman of HHI, and T.Y. Chao, chairman of Wah Kwong, in Hong Kong. The medium sized oil tanker is to be constructed by HHI at its Ulsan shipyard for delivery in October 1985.

The new ship will be 243.8 meters long, 42 meters wide and 19.2 meters deep.

This is the owner's first order placed with a Korean yard. Wah Kwong is Hong Kong's third largest shipowner.

**\$4.5-Million Shipping
Contract Let To Lavino**

Lavino Shipping Company, Philadelphia, Pa., is receiving a \$4,500,000 fixed-price contract for container and breakbulk ocean transportation service between Norfolk, Virginia, and Bermuda. The Military Sealift Command, Washington, D.C., is the contracting activity (N00033-84-C-8505).

October 15, 1983

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October 12

- **SNAME ANNUAL MEETING**
(Society of Naval Architects and Marine Engineers)
plus
- **Second Annual SNAME INTERNATIONAL MARITIME EXPOSITION**

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NOVEMBER 15

Advertising Closing Date
October 26

- **NAVAL MACHINERY AND ELECTRONICS**

Special NAVY Report

A full review article examining in depth the latest developments in naval electronics, machinery and equipment as reported by leading manufacturers and suppliers to the navies of the world.

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A portfolio reviewing the most prominent workboats, towboats, tugs, and offshore support vessels constructed during 1983. Each one selected because of its outstanding design, performance or service characteristics.

- **SPECIAL WORKBOAT INDUSTRY ISSUE**

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- **REDUCING FUEL COSTS An Equipment & Systems Review**

A review of equipment and systems offered by leading manufacturers to reduce fuel consumption and cut fuel costs for all vessel owners — inland, offshore, ocean — diesel and steam.

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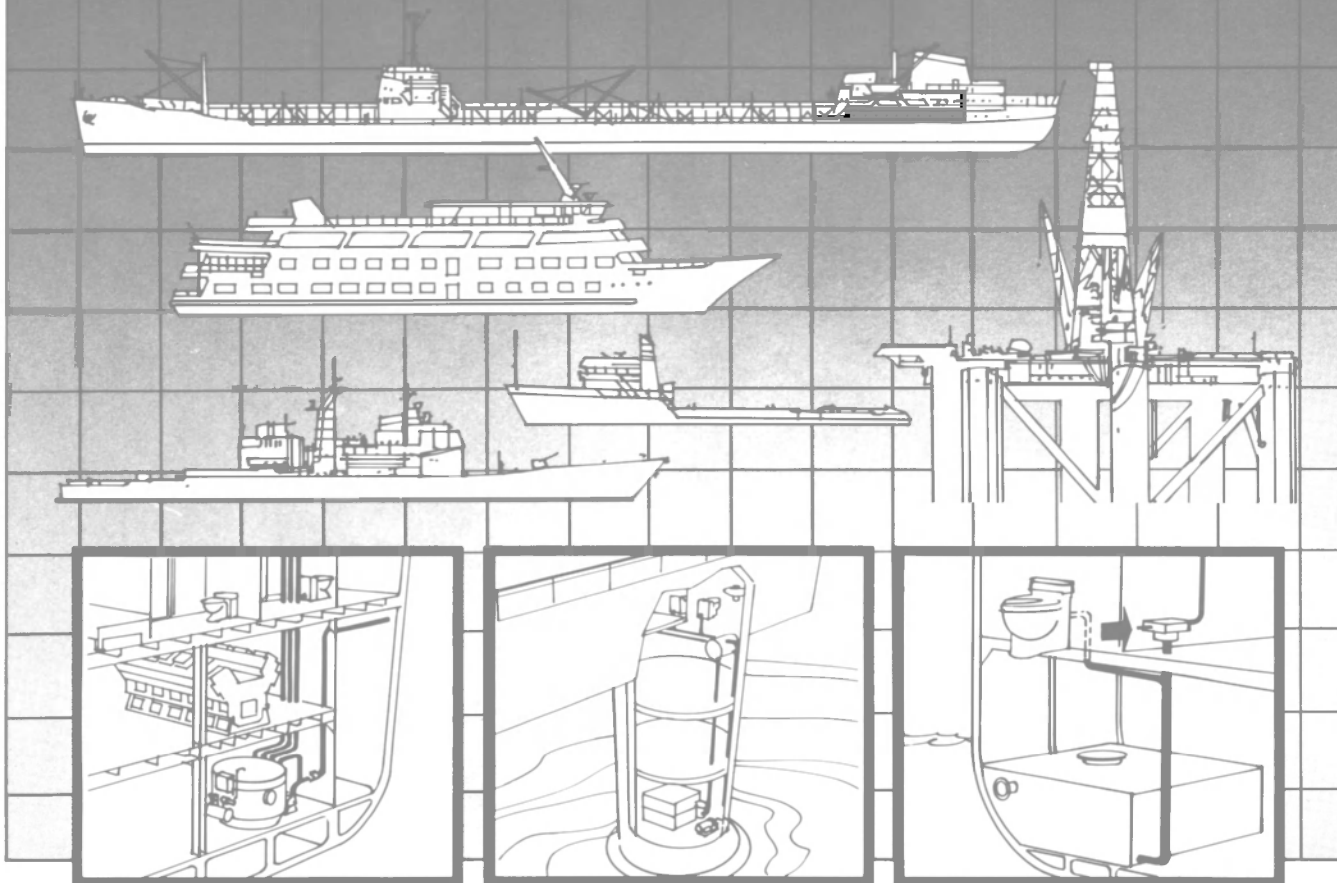
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From big to little ships... and everything in between.

ENVIROVAC has a vacuum toilet collection system to suit your specific needs.



Holding system

The vacuum collection system shown above is primarily used for the holding of sewage while transiting restricted waters with ultimate discharge at sea or to a shore side connection. This system can also be interfaced with a TYPE II wastewater treatment system or an atmospheric holding tank.

Column tank system

Where elevation and vessel design permits, the column tank system allows direct connection of the vacuum system to a treatment plant or atmospheric holding tank without the need for sewage pumps and controls.

Mini column tank system

For smaller installations and where height is limited, the mini column system allows direct connection of the vacuum system to a treatment plant or atmospheric holding tank.

Advantages of vacuum...tough to beat

Three pint flush offers 90% reduction in sewage volume and holding weight.

Small diameter piping (2") results in lower material and labor costs.

No slope piping allows wide flexibility in piping design and upward flushing capability.

The ENVIROVAC record

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the U.S. Marine industry (Navy, Coast Guard, Corps of Engineers and Commercial). Our toilets and systems are operating in, or on order, for over 155 ships in the U.S.A. and over 1,000 systems are in use worldwide.

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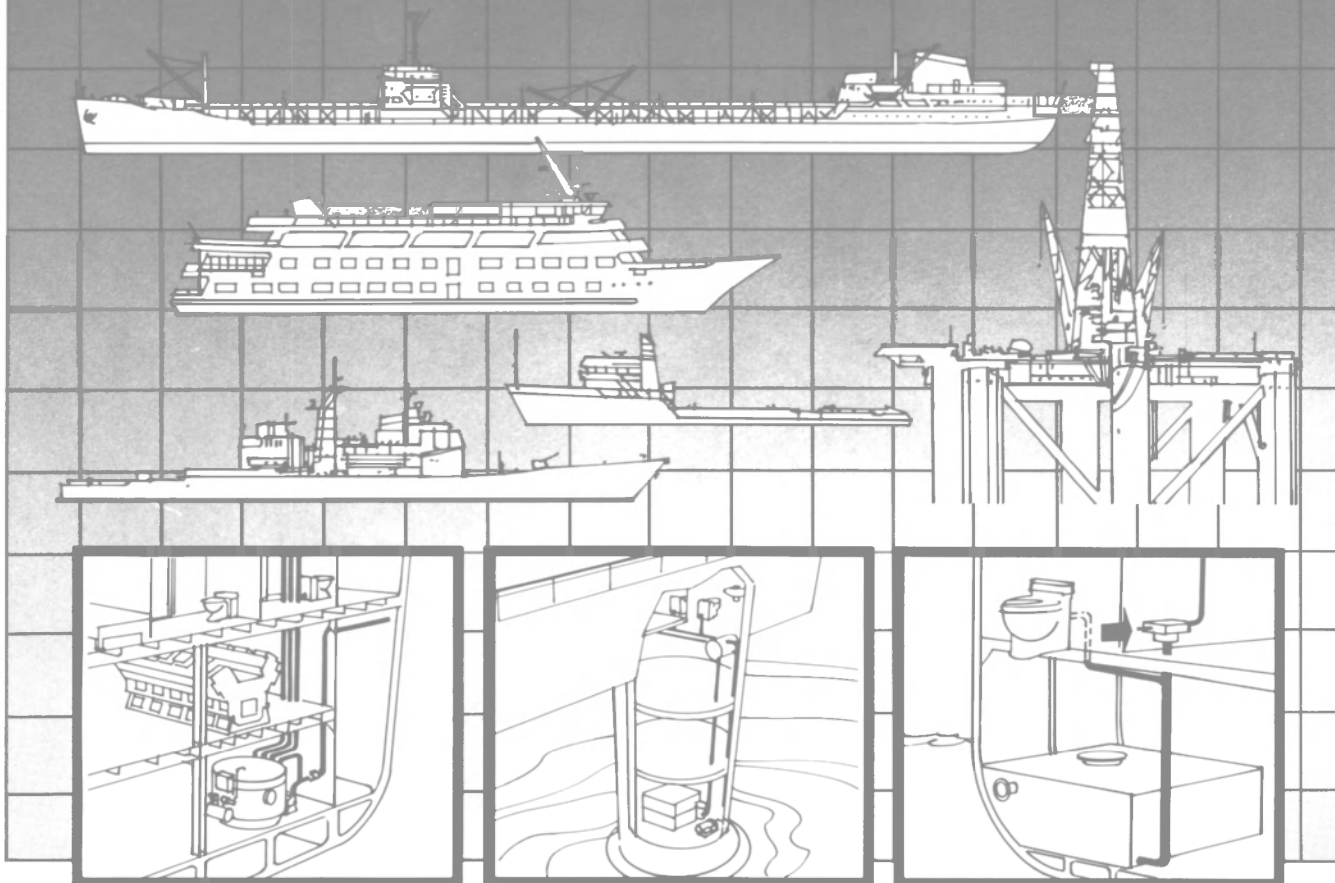
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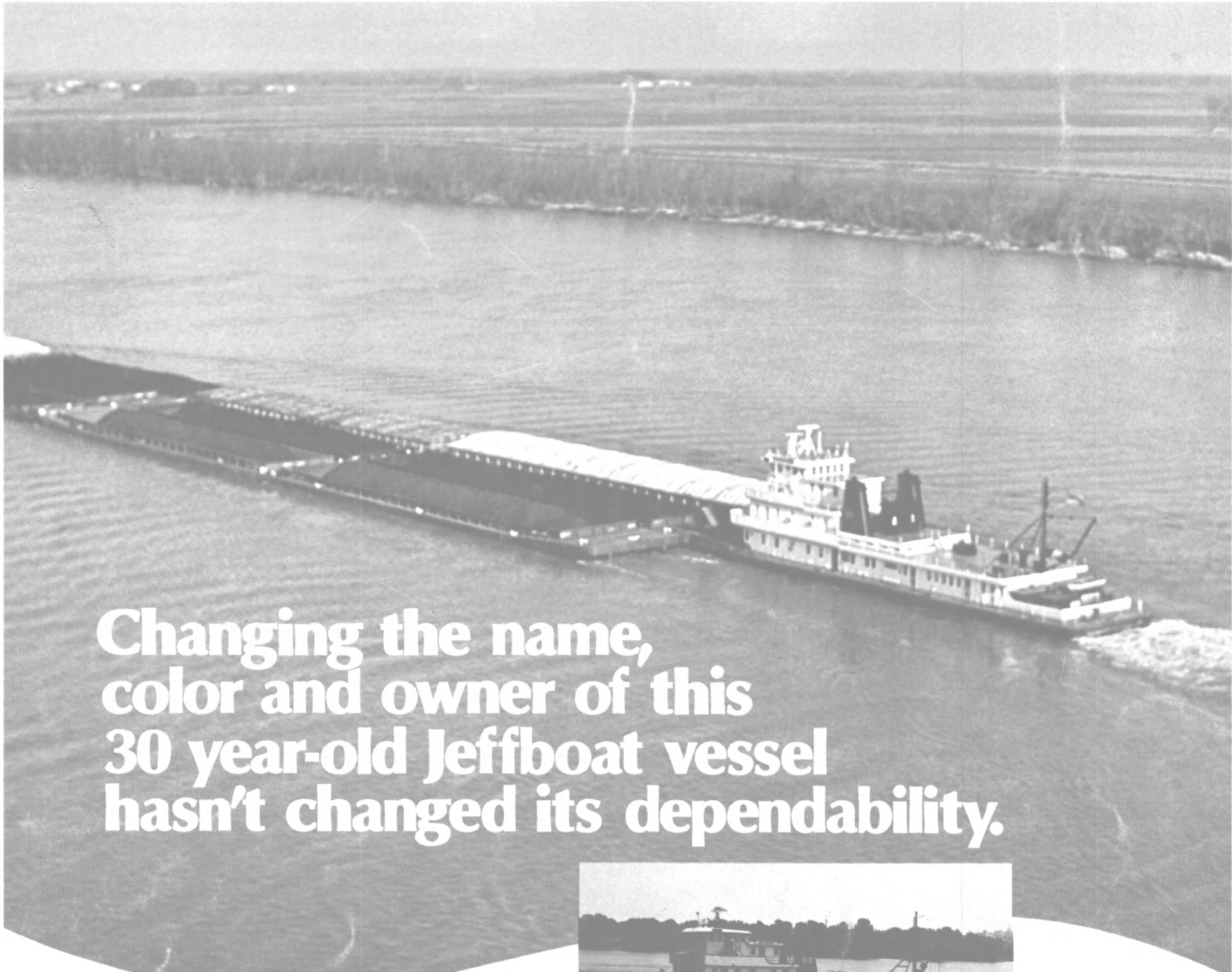
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