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DECEMBER 1990 ISSUE

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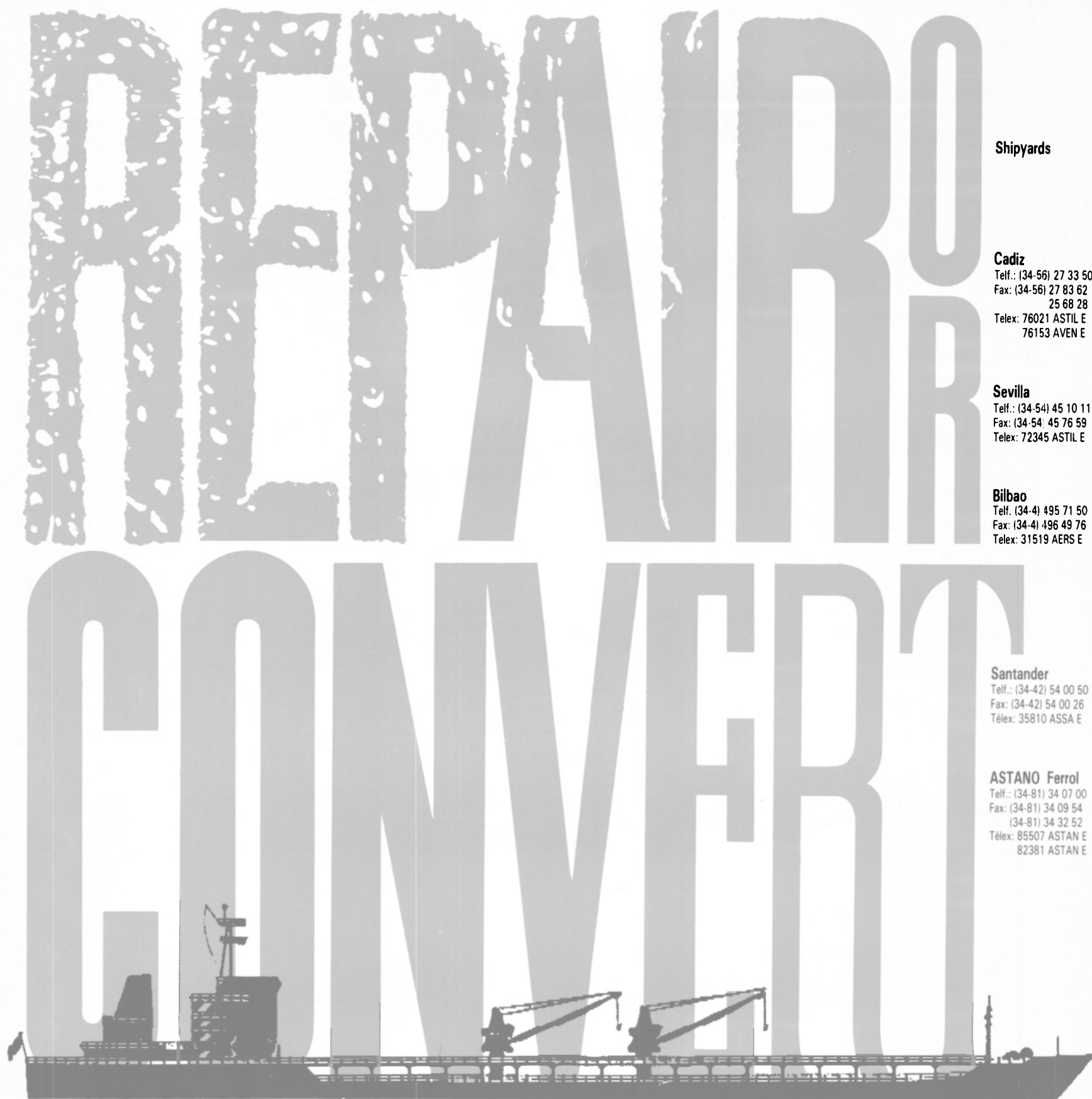
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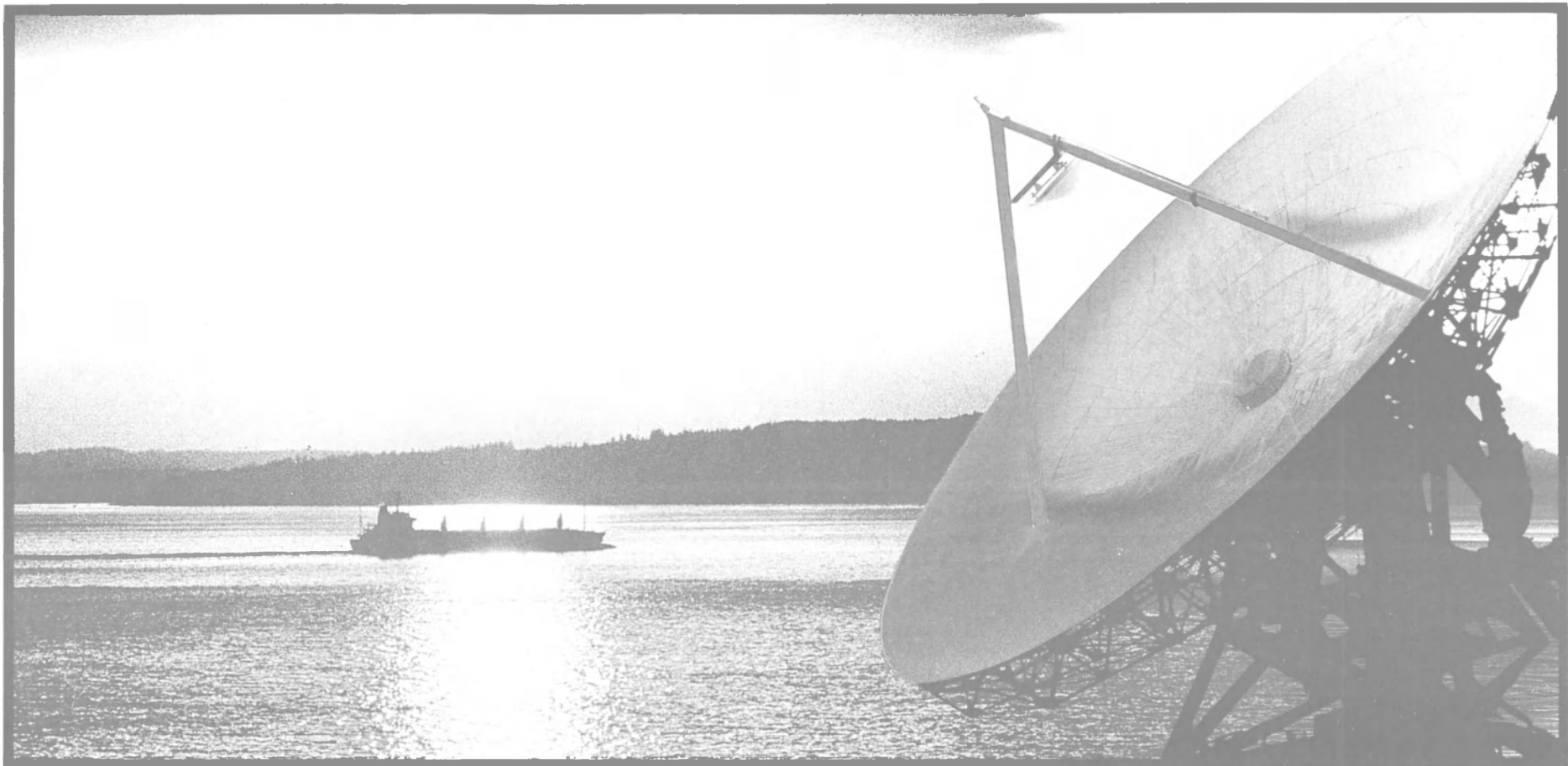
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ON THE COVER

Clockwise, from right of logo: Reconstructed chemical tanker Seabulk America (story on page 6); containership Taihe, built by Kvaerner Govan (story on page 20); and the destroyer USS Moosbrugger and frigate USS Samuel B. Roberts in the Mediterranean as part of the Kennedy battle group supporting "Operation Desert Shield." Photo, G. Stuckert

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INSIDE

Maritime 2000—a series of articles examining the latest developments in the shipbuilding and repair market and how they impact the future of the industry. **16**

Outstanding Oceangoing Ships of 1990 **20**

Naval Technology & Shipbuilding **25**

Jeffboat To Build 7,200-HP Towboat For ACBL

American Commercial Barge Line Co. (ACBL) will construct a 7,200-horsepower towboat at Jeffboat, Inc., an ACBL subsidiary and builder of inland waterway vessels. It is the first towboat built by ACBL since 1981.

The twin-screw vessel will have a length of 175 feet and beam of 50 feet. She will be built at a cost of \$5 million. Construction is expected to begin in the second half of 1991.

The towboat will feature engines designed to burn a cheaper, heavier fuel blend to cut everyday operating costs.

For free literature detailing the boat and barge building facilities of Jeffboat,

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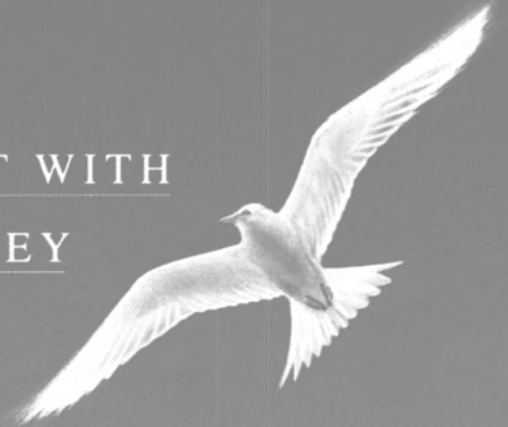
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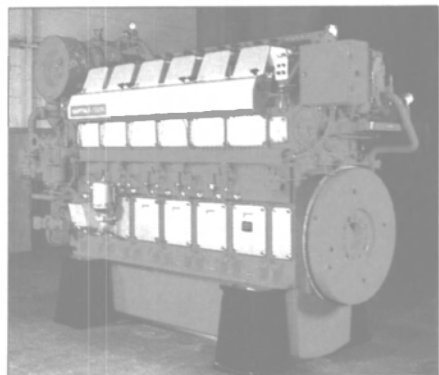


PROPULSION UPDATE

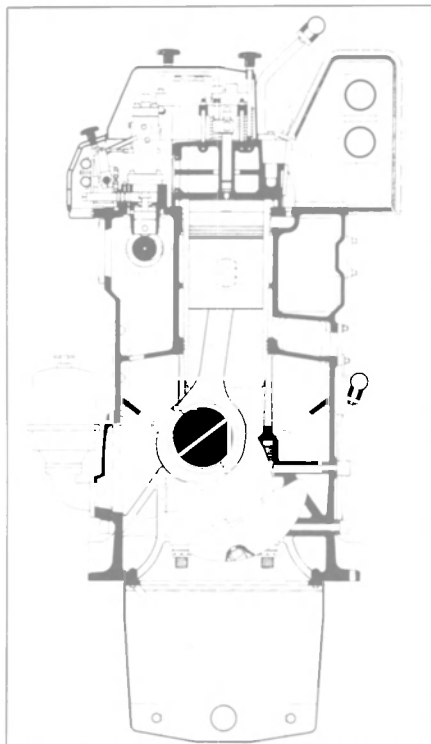
Wartsila Diesel Introduces In-Line Version Of Nohab 25 Engine

Responding to market demand, Wartsila Diesel has introduced a six-cylinder in-line version of their Wartsila Nohab 25 engine. Besides general marine applications, the engine's weight-power ratio of 7.0 kg/kw makes it a contender for military and traction purposes. Also envisaged are high-pressure gas installations.

The Wartsila Nohab 6R25, as the new engine is designated, is a logical complement to the 8-, 12- and 16-cylinder V-engines in the 25 Series, which were introduced on the market in 1986-87. While it is a development of the same basic concept, the newcomer embodies many original ideas and is a very modern design offering competitive per-



Wartsila Nohab 6R25 engine.



Cross section of the Wartsila Nohab 6R25.

formance and extended power margins.

Standardized built-on equipment has been used throughout. All connections are prefabricated and, in general, provision has been made for simple installation.

Deliveries of the Nohab 6R25 engines began this past autumn, with the first two engines being installed for propulsion in an Italian cruise yacht, where comfort criteria are particularly stringent.

Besides an advanced resilient mounting system to reduce structure-borne noise and vibration, a

special combined exhaust washing/silencer system has been developed to counter both noise and particulate emissions.

For more information and free literature on the in-line version of the Wartsila Nohab 25 engine,

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The Seabulk America is the newest chemical carrier in the U.S. coastwise trade.

Hvide Takes Delivery Of Reconstructed Chemical Tanker

Florida-based U.S.-flag carrier Hvide Shipping, Inc., recently took delivery of the newly reconstructed 46,300-dwt U.S.-flag chemical tanker M/V Seabulk America.

"The double-bottomed Seabulk America is the newest, most sophisticated chemical carrier in the U.S.

coastwise trade. We are very proud to have this state-of-the-art vessel join the Seabulk fleet," said **J. Erik Hvide**, president and chief operating officer of Hvide Shipping Inc.

The Seabulk America is the result of rebuilding the wrecked tanker M/V Fuji, utilizing the forebody of the former barge 4102. Norfolk Shipbuilding & Drydock Company (NORSHIPCO), Norfolk, Va., performed the joining of the two vessels and below the waterline work, including the installation of the hi-lift Willi Becker rudder and Kort nozzle/propeller. North Florida Shipyards, Jacksonville, Fla., performed extensive modifications, reflagging, maintenance and repair work on both the Fuji and the forebody.

"We are extremely pleased with the Seabulk America and her performance capabilities. The Seabulk America's 24 cargo segregations will make her very marketable and a great asset to the U.S. fleet and our company," said Mr. Hvide.

The unique capabilities of the vessel were demonstrated when she delivered 22,000 tons of phosphoric acid to New Orleans, La., on her maiden voyage. Her six stainless steel center tanks totaling 22,000 cubic meters have the capability of carrying acid and other corrosive cargo with specific gravity of up to 2.1. An additional 161,000 barrels of capacity are available in her 22 inorganic zinc-coated wing tanks. She is one of the few chemical tankers in the world which meets the 1990 MARPOL regulations.

The Seabulk America has an overall length of 685 feet, maximum molded beam of 99 feet, and design draft of 36 feet.

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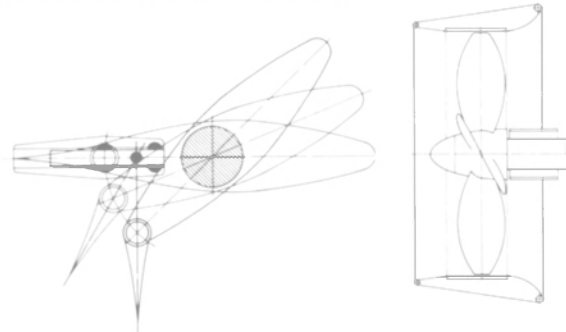
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The vessel features a unique combination of a slow-speed Mitsubishi-Sulzer 7RND68 main diesel engine, rated at 11,550 bhp at 150 rpm, fully automated engine room (ACCU), state-of-the-art navigation, communication and cargo monitoring equipment, hydraulic cargo system, inert gas and nitrogen generating system.

The vessel will join three other tankers, the Seabulk Magnachem, OMI Dynachem and OMI Hudson, that are long-term chartered to Ocean Specialty Tankers Corporation (OSTC), a Houston, Texas-based joint venture between OMI Corporation and Hvide. OSTC markets the tankers in the domestic chemical and clean petroleum trades.

For free literature detailing the conversion services of North Florida Shipyards or NORSHIPCO,

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Willi Becker Rudder Installed On Converted 'M/V Seabulk America'

Willi Becker Ingenieurbüro GmbH of Germany supplied a high-performance hi-lift flap rudder for the recently reconstructed 46,300-dwt chemical tanker M/V Seabulk America.

Working with consultants on the project, Willi Becker Ingenieurbüro worked on a proposal for a high-performance flap rudder, after it was found that the vessel's existing rudder would be unsuitable following her conversion. Willi Becker supplied the largest SA-type Becker rudder, with rudder blades with an area of 36 square meters.

According to Willi Becker, the rudder performed extremely well during sea trials to both the satisfaction of the company and the owner, Hvide Shipping, Inc., Ft. Lauderdale, Fla.

More than 4,000 vessels have been equipped with Willi Becker-designed rudders. These vessels represent various types and sizes, from small- and medium-sized fishing boats, cargo liners, supply and Navy vessels to large passenger ships, car carriers and 150,000-dwt tankers.

Most recently, Willi Becker Ingenieurbüro has developed a free hanging rudder designs with areas of 55 meters square for a 150,000-dwt tanker under construction.

For free literature detailing Willi Becker flap type rudders,

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Norway Export Award Goes To Peter Lombard

Peter P. Lombard, president of American United Marine Corporation, has been honored for his outstanding contribution to trade relations with Norway and the United States and has been awarded a special export diploma by the Export Council of Norway.

The award, first given in Copenhagen in 1966, is presented infrequently to recognize special individual efforts that contribute to the development of the export markets of Norwegian companies. Mr. Lombard is the first person from the U.S. to receive this diploma since 1985. It is the result, in part, of his success in achieving significant targeted improvements in the U.S. market positions of his principals.

Mr. Lombard's firm is the sales

representative in the U.S. for four leading Norwegian producers of marine equipment. These are Skarpenord International A/S, producers of complete valve control, cargo management, EDS, and cargo monitoring systems; Permea Maritime Protection A/S, producers of inert gas systems; Seatron A/S, producers of fuel management systems; and Flebu A/S, producers of inert gas fans.

Norwegian companies supplying

equipment to the shipping industry are recognized worldwide for the quality and technical sophistication of their specialized products and systems.

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Major EC Yards Outline 'Eurotanker' Development

Five of the largest European shipbuilders recently met in Madrid to join forces and develop a new tanker

design for the 21st century.

The group, which included Spain's Astilleros Espanoles S.A., Germany's Bremer Vulkan and Howaldtswerke-Deutsche Werft, Italy's Fincantieri Cantieri Navali Italiani, and France's Chantiers de l'At-

lantique, agreed to begin work. A formal framework agreement is expected to be signed later this month.

The VLCC design will be environmentally conscious with a strong emphasis on preventing pollution at

sea. The working title for the program is "E-3 Tanker" (European, Ecological and Economical Tanker).

Some of the main features of the tanker will be a 2-million-barrel capacity, special collision-avoidance systems, and a double-hull internal structure.

The group, which will divide the research and development work, has agreed to meet on a regular basis, with the aim of completing the state-of-the-art VLCC by the end of 1991.

Lindenau's Latest LNG Carrier Developments Detailed In New Paper

A Paper on liquefied gas carriers, developed, designed and built by Lindenau GmbH, Schiffswerft & Maschinenfabrik, Germany, has recently been made available by the Lindenau yard.

The literature lists such main particulars as dimensions, deadweight, speed, tonnage, machinery, etc., for each vessel, along with mechanical drawings. Included is a description of the M/T Rio Gas, which received the "Outstanding Ocean Going Award" from Maritime Reporter/Engineering News.

The Lindenau shipyard can deliver gas carriers of all types in the size between 1,600 cbm to 18,000 cbm with advanced technology.

For further information and free literature from Lindenau,

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MSI/CAORF Offers Safety Course In Tug/Barge Handling

MarineSafety International is offering a tug-barge simulator training course at the Computer Aided Operations Research Facility (CAORF), which is located on the grounds of the U.S. Merchant Marine Academy at Kings Point, N.Y. The course is aimed at increasing the margin of safety in handling barges during transit, in traffic, or while docking at or departing terminals.

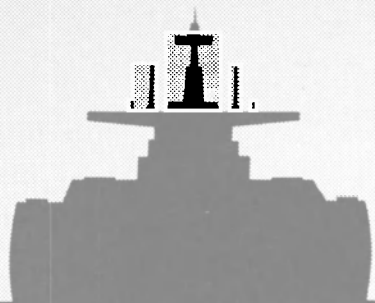
The three-day tug-barge handling course is limited to three or four officers at a time. It covers maneuvering and docking oil-carrying barges under a variety of operational and environmental conditions. The hydrodynamic responses of a typical 2,200-hp harbor tug in the notch or on the hip of a 54,000-barrel barge are duplicated in the CAORF simulator.

Among the companies that have sent their captains and mates to the MarineSafety course are Moran Towing, Spentonbush-Red Star, Foss Maritime, Exxon, Chevron, Gulf-Canada, Maritrans and Morania. Some of the companies send six to eight officers and combine the tug-barge handling with seamanship and first aid over a five-day course.

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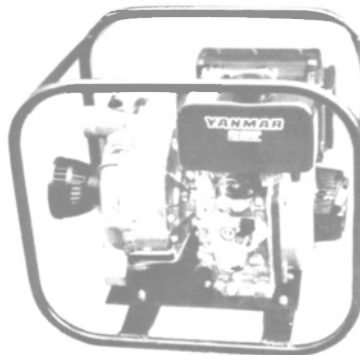
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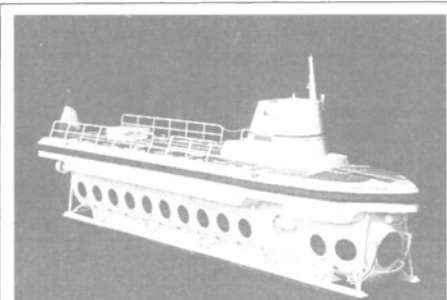


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TOUR SUB 'CORAL RANGER'—Intersub-France recently unveiled the design of a new generation submersible catering specifically to the tourist market. The tour submarine's size has been optimized to carry 46 passengers and crew of two on sightseeing expeditions beneath the sea to a maximum depth of 250 feet. The 100-ton, 66-foot-long all-electric Coral Ranger, which features large viewports along both sides and extra large viewports front and back, is designed to be equipped with USCG-approved safety features throughout.

Fourth \$50-Million Seismic Survey Vessel Ordered By Houston Firm

Western Atlas International of Houston, Texas, has ordered a fourth seismic survey vessel from Norway-based Ulstein shipbuilding group. The order is reported to be worth NOK300 million (about \$50 million). The vessel, which will be delivered in spring 1992, employs the same UT 747 design as the three earlier units being built by Ulstein for Western Atlas.

China Shipbuilding Delivers First Of Four Containerships To MISC

China Shipbuilding Corporation's Keelung shipyard recently delivered the first of four 1,234-TEU containerships, the Bunga Bidara, to Malaysian International Shipping Corporation (MISC).

The Bunga Bidara, plus sister ships Bunga Delima and Bunga Kenari, which are both due for delivery by the end of this year from the same yard, will replace smaller tonnage on the Far East-Australia service.

Another vessel, so far unnamed, is due for delivery next year and will be used to expand operations on the Straits-Taiwan-Japan service. The four vessels are valued at an overall \$104 million.

MISC also signed a contract for a 4,400-TEU post-Panamax fully cellular containership from Hyundai for delivery in December 1991.

For free literature detailing the facilities and capabilities of China Shipbuilding,

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Diversified Technologies Supplies Launch/Retrieval System For Steam Tanker

Diversified Technologies (Dt) of Chesapeake and Alexandria, Va., re-

cently delivered one of its patented Launch and Retrieval Systems (LARS) to Houston Ship Repair, Houston, Texas, for installation on board the steam tanker Chesapeake. It is the second of a series of SALM-LARS, the first having been installed on the S/T American Osprey, which is en route to support Operation Desert Shield.

The S-LARS is tailored to launch and recover a reusable Single An-

chor Leg Mooring (SALM) from the deck of a handy-sized tanker.

The LARS is both the method and the equipment used for the recovery and launch of marine structures onto and from the decks of ships or large barges in a timely, controlled and safe manner. The LARS provides an alternative method to lift platforms, heavy lift cranes, beam climbers, and a variety of other arrangements.

The LARS has proven applications in the fields of marine salvage, construction, offshore development, and remote logistics support, as well as military and commercial rapid deployment projects.

For free literature detailing the LARS from Diversified Technologies,

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(1) 4BT3.9-G	Emergency Generator	40 kW @ 1800 rpm
(1) NT-855-M	Bow Thruster Engine	300 hp @ 1800 rpm

Cummins Engine Company, Inc., MC 60011, Box 3005, Columbus, IN 47202-3005



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Circle 273 on Reader Service Card

88-043

BOATS & BARGES

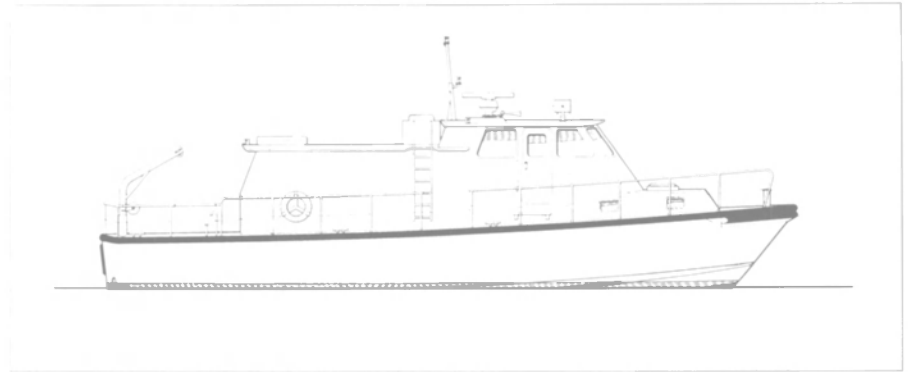
Gladding-Hearn Building N.Y. City Harbor Survey Boat

Gladding-Hearn Shipbuilding, The Duclos Corporation, Somerset, Mass., has begun construction of a harbor survey vessel for the New York City Department of Environmental Protection.

The shipyard is building the relatively compact 55-foot-long by 16-foot-beam, all-aluminum vessel for

year-round use by a two-person crew and four scientists and technicians, who will study water and sediments found in the city's waterways and offshore, said company officials.

In addition to two bunks forward, a head and fully equipped galley, the vessel, designed by C. Raymond



Outboard profile drawing of the harbor survey boat under construction at Gladding-Hearn Shipbuilding for the New York City Department of Environmental Protection.

Hunt Associates of Boston, Mass., will feature a small laboratory equipped with a vacuum filtration system, incubators, refrigerators, freezers, laboratory countertops, safety shower and storage lockers and drawers. Two one-ton hydraulic, swivel cranes will be mounted on a large work deck aft to collect bottom samples.

The survey boat will be finished with Awlgrip®, which according to Peter Duclos, vice president of engineering at Gladding-Hearn, will require less maintenance and look better longer than a conventionally painted aluminum boat.

Scheduled for delivery in March 1991, the vessel will be powered by twin eight-cylinder 375-hp Detroit Diesel engines driving 30-inch four-bladed Nibral propellers through

ZF IRM-320 PL-1 reduction gears. For free literature detailing the shipbuilding capabilities of Gladding-Hearn,

Circle 62 on Reader Service Card

HARBOR SURVEY BOAT Equipment List

Main engines(2)	Detroit Diesel
Gears	ZF
Engine controls	Morse
Gensets	Onan
Steering system	Hynautic
Radar	Raytheon/Furuno
VHF	Raytheon
Loran	Furuno
Depth sounder	Horizon
Compass	Richie
Loud hailer	Raytheon
Music system	Audiovox

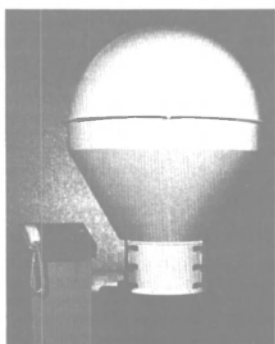
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\$342-Million Offshore Platform To Be Built By Fincantieri

Fincantieri recently announced that a \$342 million order for a Sana 15,000 offshore platform for Midland Scottish Group will go ahead. The Group's financing problems appear to have cleared up.

The Italian state shipping company of Almare is negotiating with Fincantieri for two 130,000-cubic-meter gas carriers with a total value of \$855 million. Fincantieri will supply the designs with containment technology from France.

Kobelt Offers 32-Page, Full-Color Brochure On Pneumatic Controls

Kobelt Manufacturing Company Ltd. of Richmond, British Columbia, Canada, one of the leaders in quality marine controls and disc brakes, has published a 32-page, full-color brochure on the pneumatic controls manufactured by the company.

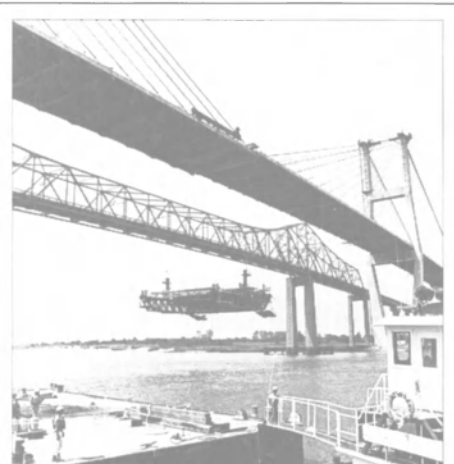
The publication points out that Kobelt pneumatic control components are one of the most reliable means of control for marine propulsion packages and deck machinery. All components are made from die-cast brass with stainless steel hardware. Designs have been simplified by eliminating many moving parts and yet retaining all the essential safeguards for propulsion package timing.

The brochure lists Kobelt prod-

ucts and applications, along with descriptive text, photos, mechanical drawings, etc.

For further information and a free copy of the 32-page brochure from Kobelt,

Circle 23 on Reader Service Card



SPAN WITH \$800 MILLION IMPACT economically over the next 22 years is how the result of opening the new bridge linking Savannah, Ga., and South Carolina was described. The traditional removal of the construction "traveler" from beneath the new bridge (shown above) signifies completion of the main span. Bridge ramps are under construction and the new span will open in early 1991. The new bridge, replacing the Talmadge Memorial Bridge, will enable even the world's largest containership to sail upriver into Georgia's busiest port. The economic impact is also expected to generate 23,000 additional jobs and add \$80 million annually to federal and state revenues.

NKK To Build First LNG Carrier To Use Technigaz Mark III Membrane-Type Cargo Tank System

NKK Corporation recently announced that it has received an order from Nippon Yusen K.K. (NYK) and Perbadanan Nasional Shipping Line Berhad (PNSL), Malaysia's leading shipping company, to build a 18,000-cubic-meter LNG (liquefied natural gas) carrier. The agreement was signed between NKK and NYK and PNSL, the vessel's joint owners, in Kuala Lumpur.

The carrier, which will have a steam turbine main engine, is to be built at NKK's Tsu Works, with delivery scheduled for July 1993. It will become the world's first LNG carrier to use the Technigaz Mark III membrane-type cargo tank system, based on technology licensed to NKK by France's Societe Nouvelle

Technigaz in 1971. NKK's extensive LNG technology, developed over 20 years, will be incorporated in the building of the vessel.

The 426-foot-long by 84-foot-wide LNG carrier has the following features: a compact hull form without unused space, ensuring high economic efficiency; freely selectable hull design, enabling optimum tank size and shape; good bridge visibility; excellent maneuverability due to small sail area; easy maintenance due to low, flat upper deck; and complete double-hull structure.

For free literature on the facilities and capabilities of NKK,

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Artist's conception of the LNG carrier that is to be built by NKK.

BOATS & BARGES

Balehi Marine Delivers 1,800-HP Towboat 'Lake Charles' To Conoco Oil Company

Balehi Marine, Inc., Lacombe, La., recently delivered the 1,800-horsepower towboat Lake Charles to Conoco Oil Company. Based on Balehi Marine's standard 1,800-2,400-hp towboat design, the Lake Charles has a length of 81 feet, beam of 28 feet, depth of 11 feet and draft of 7 feet 6 inches. She has a fuel oil capacity of 42,200 gallons, lube oil capacity of 337 gallons, dirty oil capacity of 337 gallons and freshwater capacity of 14,700 gallons.

All steel-hulled boat is powered by twin GM 16V-149 diesel engines driving a pair of four-bladed stainless steel Kahlenberg propellers via Twin Disc MG 540 reduction gears with a reduction ratio of 7:1 with 7-inch diameter Aquamet shafting.

Keel cooling is provided by Fernstrum Grid coolers in recessed pockets.

Electrical power is supplied by two GM-4-71 diesel-driven generator sets rated at 50 kw at 1,200 rpm, 220 V-AC, three-phase, 60-cycle.

The Lake Charles, yard hull number 56, is fitted with two 40-ton electrohydraulic NABRICO winches. Electronics, searchlights, horns, air compressors, steering, fendering, air conditioning and other major equipment will be fitted according to the customer's specifications.

Quarters have been provided for a crew of six.

A sister vessel of the Lake Charles, the Choctaw, is expected to be delivered in January 1991.



The GM-powered towboat Lake Charles is based on a standard Balehi Marine design.

For free literature detailing the boatbuilding services of Balehi Marine,

Circle 64 on Reader Service Card

LAKE CHARLES Equipment List

Main engines (2)	GM
Reduction gears	Twin Disc
Generator sets	Detroit Diesel
Engine controls	Kobelt
Keel cooling	Fernstrum
Shafting	Aquamet
Propellers	Kahlenberg

Bilge & freshwater pressure pumps	Peabody Barnes
L/O & dirty oil stripping pump	Viking
Air compressors	Quincy
Steering system	Custom Hydraulics
Searchlights	Carlisle & Finch
Compass	Danforth
Windshield wiper	American Bosch
Radar	Furuno
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Antennae	Shakespeare
SSB radio	Motorola
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Sea-Land To Repower Huge Containerships With MAN B&W Gensets

Sea-Land Service, Inc., Edison, N.J., has signed a multimillion-dollar contract with MAN B&W Diesel A/S, Holeby Diesel, Denmark, for repowering the generating sets on board its twelve 4,140-TEU Atlantic

Class containerships, formerly U.S. Lines' Econships.

Under the contract, Holeby Diesel will manufacture and install three diesel engines, model 6L28/32, per vessel, or a total of 36 engines. The engines are to be coupled together with existing alternators, each of 1,000 kw.

The contract between Sea-Land Service Inc. and Holeby Diesel is

noteworthy because the installation of the gensets will be completed during the vessels' normal liner service on the U.S. East Coast and in the Gulf of Mexico prior to their trans-Atlantic voyage to Europe. Both the shipowner and engine manufacturer believe that this comprehensive repowering program is a remarkable feat and a milestone in the history of the merchant marine industry, since the project will be

performed without disturbing the vessels' normal service.

Holeby Diesel's present order book stands at approximately 600 engines totaling 800,000 bhp, 400 of which are being manufactured by Holeby Diesel's licensees in South Korea, China, Brazil, Spain and Yugoslavia.

For free literature detailing the engine line of MAN B&W Diesel, Holeby Diesel,

Circle 70 on Reader Service Card

SNAME Names Kiss New President

The Society of Naval Architects and Marine Engineers (SNAME) recently elected **Ronald K. Kiss** president of the society for a two-year term beginning January 1, 1991.

Mr. Kiss is the Deputy Assistant Secretary of the Navy, Ships, Office of the Assistant of the Navy, Shipbuilding. Mr. Kiss will succeed **Arthur J. Haskell**, who has been the society president since 1988.

Mr. Kiss has made varied and substantial contributions to the marine field, primarily in the area of ship design and construction.

Alfa-Laval Separation Dedicates Headquarters In Warminster, Pa.

Alfa-Laval Separation, Inc. recently held "Inauguration" ceremonies to dedicate the company's \$20-million expansion and renovation of its Mearns Road facilities in Warminster, Pa. The ceremonies, which included a keynote address by Bucks County, Pa., Congressman **Peter Kostmayer**, officially designated Warminster as the company's North America headquarters.

Alfa-Laval has also undertaken a massive overhaul of the manufacturing operations within the Warminster plant.

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Charlotte, N.C.-based Erdle Perforating of Carolina, Inc., a metal perforating and fabricating company established in 1870, offers design and manufacturing assistance with specialized, shipboard habitability applications for perforated metals.

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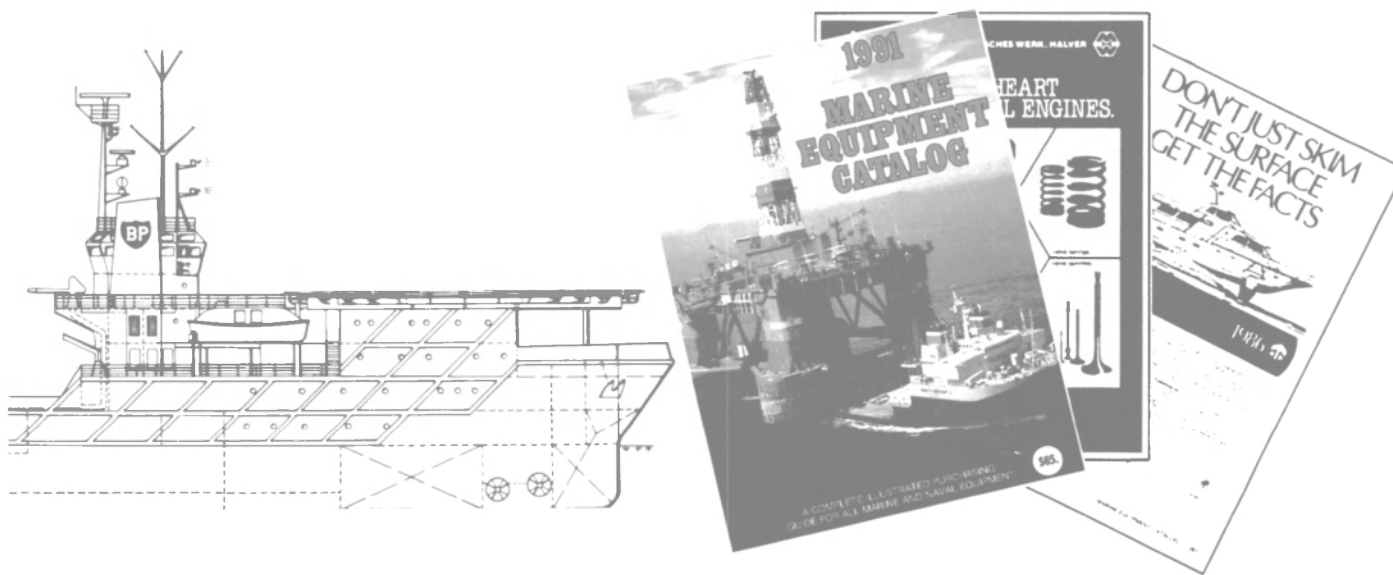
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Maritime Reporter/Engineering News

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NEI Syncrolift Receives Orders For Five New Lifts For Three Continents

NEI Syncrolift of Miami, Fla., one of the world leaders in shiplifting technology, recently announced orders for five more Syncrolifts for locations around the world in Europe, Japan and the Pacific. These new orders, worth a total of more than \$3 million, bring the total of Syncrolifts installed or ordered to 187 units in 61 countries.

One order is from the Italian Ministry of Transport for three Syncrolifts at the Tavernola Shipyard to service vessels operating on Lago di Como in Italy. A further order comes from Harbert International for a 12-hoist Syncrolift to be operated at Kwajalein in the Marshall Islands for the U.S. Corps of Engineers, Honolulu. The fifth Syncrolift demonstrates the flexibility of the Syncrolift system as it uses the components of a caisson lift originally installed at Kashiwazaki in Japan. Some of the Syncrolift hoists and platform beams are being put to good use by the Japanese construction company Penta-Ocean at the yard of Ishii Shipbuilding to handle vessels up to about 230 feet in length.

For free literature on NEI Syncrolift,

Circle 26 on Reader Service Card

Trinity Marine To Develop Process To Construct Double-Hull Tankers

The Trinity Marine Group, Gulfport, Miss., and a team of Swedish engineers have joined forces to develop the construction process for a new double-hull tanker design.

The new design is the Series 2000 double-hull tanker, developed by Rutger Deylin of Fram Shipping, in association with S.I. Shipping of Sweden. It incorporates a U.S.-patented bow and stern design which has been tank tested. According to the designer and building team, tests have shown that the vessel requires less horsepower and fuel consumption than other hull designs. Two design configurations are available, one suitable for smaller ports such as Boston, and another for larger ports.

According to a spokesman for Hvide Shipping Inc., Port Everglades, Fla., which is cooperating in the tanker project, Hvide is "looking forward to being operators, owners or managers of these type tankers. These tankers are made for the year 2000. They will meet the new stringent requirements of the Oil Spill Act of 1990."

Meyer Werft Delivers Third In Series Of Six Gas Carriers For USSR

Meyer Werft of Papenburg, Germany, recently delivered the LPG/

ammonia carrier Skriveri to AKP "Sovcomflot" of Moscow.

This newbuilding is the third ship in a series of six gas carriers for the USSR. Upon completion of the series by the autumn of 1991, the yard will have built a total of 45 liquefied gas tankers. In terms of tank volume, this corresponds to 20 percent of the world fleet of gas tankers capable of carrying their cargo in both refrigerated and pressurized

conditions.

Like the other ships of the series, the Skriveri is owned by "Sovcomflot" and will be operated on their behalf by Latvian Shipping Co., Riga.

The ship is capable of carrying the following products; propane, butane, propane-butane mixture, propylene, butylene, butadiene, ammonia, vinyl chloride and propylene oxide.

The 518-foot-long by 70-foot-wide Skriveri is propelled by one MAN B&W two-stroke main engine, type 6L50MCE. Electrical power is supplied by three MAN B&W generating sets with A. van Kaick generators.

For free literature detailing the facilities and capabilities of Meyer Werft,

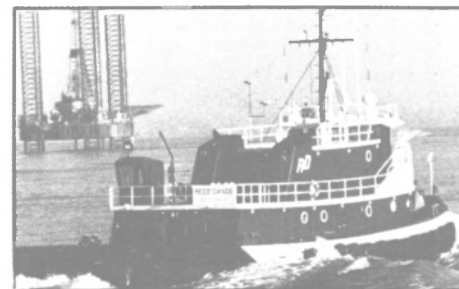
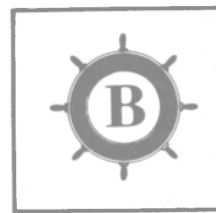
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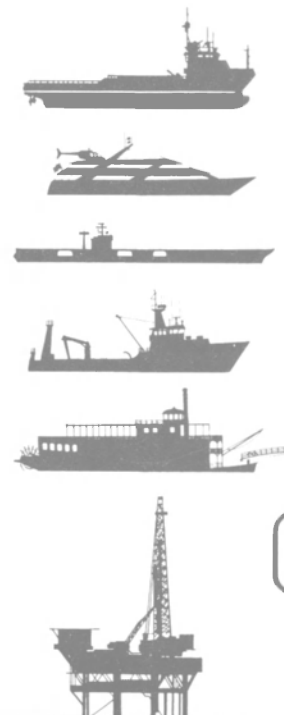
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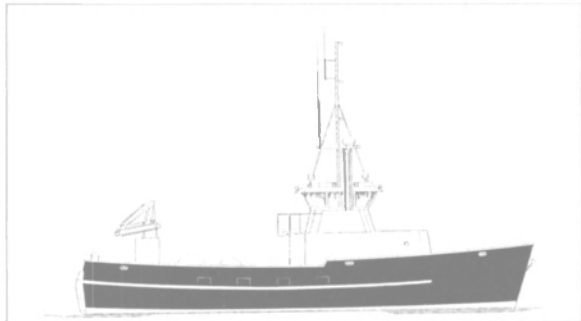
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MARCO Receives Order For Oil Spill Recovery Boat; Completes Trawler Lengthening



Outboard profile drawing of the new MARCO spill recovery vessel.

Burrard Clean Operations Ltd. of Vancouver, British Columbia, Canada, has contracted with MARCO Pollution Control, one of the world's largest builders of oil spill recovery vessels and systems, for the construction of a new design 75-foot spill recovery boat. Additionally, in an unrelated project, MARCO announced the completion of the lengthening of the RSW trawler Golden Dawn.

The new TOR-75R Class vessel, which will be built at a Vancouver area yard under the supervision of MARCO, will be of steel construction and feature a four-foot-wide version of MARCO's Filterbelt oil and debris recovery system.

The Filterbelt, which removes oil and debris from the water surface without taking the water aboard, recovers all types and grades of petroleum products, from light distillates to heavy weathered crude.

Construction will begin immediately on the 75- by 22-1/2-foot vessel, with delivery scheduled for the spring of 1991. When completed, the new TOR-75R will be capable of processing up to 10,000 gallons of oil/water mix per minute to recover up to 400 gallons of oil per minute.

The Seattle shipyard of MARCO completed the work on the RSW trawler Golden Dawn. The boat was lengthened by 27 feet and now has an overall length of 149 feet. The new midbody added a fishhold and increased carrying capacity to 12,270 cubic feet.

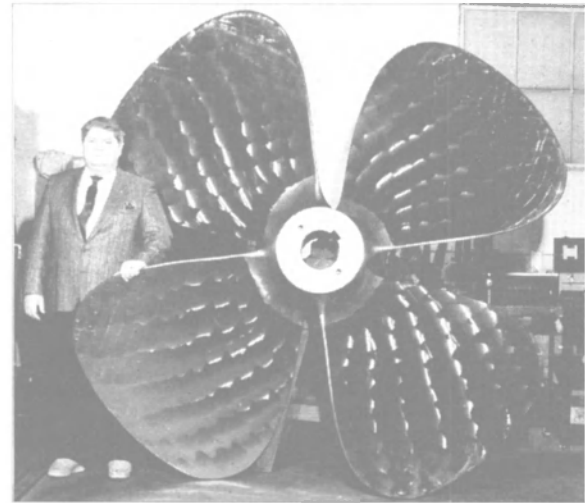
Other changes included an RSW System from Cold Sea, MARCO fish unloading system, switchboard from Harris Electric and a new Caterpillar 3406 290-kw genset.

For free literature detailing the boatbuilding facilities and capabilities of MARCO,

Circle 65 on Reader Service Card



The RSW trawler Golden Dawn, recently lengthened by MARCO Seattle.



WHALE OF A WHEEL—Karl W. Kahlenberg, president of Kahlenberg Bros., Inc., Two Rivers, Wis., poses with huge propeller, the largest stainless steel casting in Waukesha Foundry's 78-year history, before shipment to towboat customer. In designing the 102-inch wheel, Kahlenberg had to first determine what the horsepower absorption would be on the propeller. Blade Pressure loading was then calculated in terms of pounds per square inch, and then blade shape was determined by CAD. The propeller will absorb 2,150 hp at 267 shaft rpm, continuous.

For more information and free literature on Kahlenberg propellers,

Circle 20 on Reader Service Card

Alaska Diesel Introduces New Lugger Model Engine

Alaska Diesel Electric, Seattle, Wash., has introduced an all-new Lugger marine diesel designated the L6108A. The new inline six produces 330 hp at 2,600 rpm and follows the same design criteria as the 460- and 600-hp Luggers.

"We see a strong demand for a premium engine in this size range," ADE's vice president Scott Kennedy said. "With its 436-cubic-inch displacement and a long list of heavy-duty features, it will appeal to fishermen who are uncomfortable with small bore, high-speed engines."

Touted features include replaceable cylinder liners, Bosch-type injection, liquid-cooled turbocharger, freshwater aftercooler, fuel-efficient four-cycle operation, VDO instrument panels and single side service.

For more information on the L6108A or any of the Lugger models from 61 to 600 hp,

Circle 19 on Reader Service Card



ALFA-LAVAL AWARD—Lt. Monica Allen-Cottrell and Lt. Robert Gray, U.S. Navy Supply Corps, present the planned producer award to Alfa-Laval Separation, Inc. president Claes Arnegren in recognition of the company's voluntary efforts to assist the Navy in its Industrial Preparedness Program. The main objective of the Preparedness Program, according to Lt. Allen-Cottrell, is to ensure that the supplier, in the event of conflict or war, is able to supply key parts in pre-specified quantities within a certain time frame. "We have over 90 percent availability of all parts at any given time," noted Mr. Arnegren.

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IDB-A Names Eichberg New VP, Maritime Sales



Robert Eichberg

IDB Aero-Nautical Communications, Inc. (IDB-A), Washington, D.C., a supplier of mobile communications services via satellite to the aviation and maritime industries, has named **Robert Eichberg** as its new vice president of maritime sales.

In his new position, Mr. **Eichberg** will market the "one-stop shopping" features of the company's end-to-end mobile satellite communications services.

He recently retired as vice president, maritime sales and marketing from Comsat, where he spent 16 years as one of the pioneers in sales of products and services on the Marisat and Inmarsat maritime communications satellite systems. With a wide background in seismology, oceanography and marine construction, Mr. **Eichberg** is widely regarded as an expert in maritime communications services for the offshore oil, passenger and government industry sectors.

Marine Electric Chosen To Supply Combat Support Ships Building At NASSCO

Marine Electric RPD, Inc., Clifton, N.J., has been chosen to supply the AOE-6 class Combat Support Ships being built by National Steel and Shipbuilding, San Diego, with state-of-the-art cargo refrigeration temperature monitoring, salinity monitoring (for service steam drainage/reserve feed for the main machinery room) and RTE signal conditioner and power supply (for stator winding temperatures).

Marine Electric RPD, Inc., is a leading designer and manufacturer of military and commercial shipboard salinity and temperature monitoring, public address and intercom systems, engine room and wheelhouse alarm panels and power support equipment.

For free literature detailing the products offered by Marine Electric,

Circle 54 on Reader Service Card

San Carlos Factory Offers Wide Range Of Marine Boilers And Equipment

Fabrica de San Carlos (FSC) (San Carlos Factory) of San Fernando (Cadiz), Spain, which began its ac-

tivities in the marine industry in 1964, has since specialized in the design, fabrication and startup of marine boilers.

In 1971, as a sister company of Astilleros Espanoles, San Carlos Factory started manufacturing a wide range of marine boilers and equipment, for which it acquired the proper and special technology as well as the required infrastructure,

making marine boilers one of the company's main products.

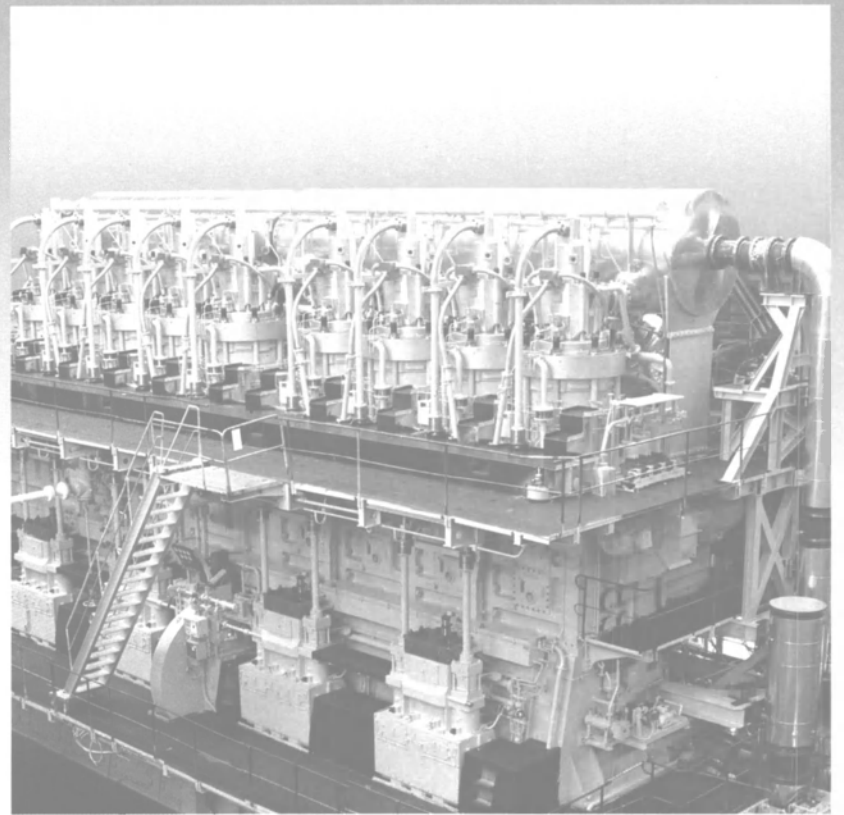
Besides the technology for boiler design and development, the company is a licensee of Aalborg Marine Boiler and Engineering, and also of Combustion Engineering which allows for manufacturing boilers of all capacities and services under the main classification societies' regulations.

FSC has a professional team to carry out repairs of their boilers, as well as other makes. FSC also offers assistance through the service centers of Aalborg in Rotterdam, Oslo, Singapore, Osaka, Curacao, Suez and Jakarta.

For free literature on marine boilers and equipment from FSC,

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European Yards Look To 'Formula' To Compete With Their Far East Counterparts

Judging from what was said at the Round Table organized by the Association of Marine Architects and Naval Engineers of Spain (AINE), held recently in Madrid, the European shipyards have found the formula that will enable them to compete successfully with their Far Eastern counterparts, and they are now putting it to work. This consists mainly of a radical new approach to production systems.

The language used by the chief executives of the large European shipyards seems to have changed a great deal over the last year or two. Instead of insisting on the absolute necessity for subsidies in order to withstand the competition from the giants of the Far East, talk centers around just how to win over the market without subsidizing the final product. The answer appears to be: (1) generous R&D investments intended to redesign the production process by incorporating mass-production techniques like those employed by other industries; (2) inter-yard cooperation, involving the exchange of technologies and joint development of new prototypes; and (3) rationalization of management and statistical control of production.

Even so, practically everyone was in agreement that at least minimum subsidies would have to continue being applied until the shipyards as a whole are able to reap the benefits of their investments in technological renovation and can put more competitive production processes in full operation.

Juan Saez Elegido, marine engineer, appointed president of the public group Astilleros Espanoles just a few months ago, is a key participant in this "new style of European shipbuilding." The Spanish

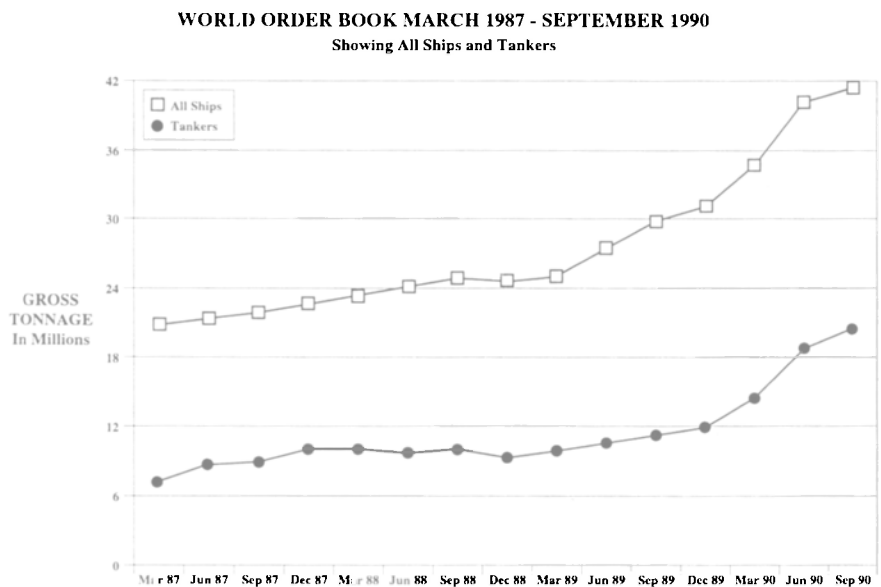
yard has achieved important advances in productivity. Perhaps the culmination of its ever-expanding market are the spectacular cruise ship conversion and newbuilding contracts it has recently signed.

Mr. **Saez** proposes to invest \$120 million in a three-year plan covering 1990-92 (exactly twice the amount invested in the previous three-year period) to transform production from functional systems to zones and stages. A key measure will be to devote 1.5 million hours ("the time it takes us to make two and a half oil tankers") to personnel training.

Kurt Andersen, president of Odense Steel Shipyard, affirmed that his yard has spent a decade readying itself to compete with any other builder in the world. The yard also allocates substantial investments to production equipment and management information systems,



Principals shown above during the conference are, left to right: **Anthony Morral**, general directorate of industry and internal market of the European Communities Commission; **Kurt Andersen**, president of Odense Steel Shipyard; **Juan Antonio Alcaraz**, president of AINE; **Juan Saez Elegido**, president of Astilleros Espanoles; **José Luis Cerezo**, technical secretary of shipbuilding management of the Spanish Ministry of Industry; **Enrique Kaibel**, president of Sercobe; **José Esteban Pérez**, vice president of AINE, and moderator.



1987-89), has given rise to spectacular increments in productivity, but this is only the first phase of the process. The coming phase, which requires much greater outlays, will be the one that enables the Spanish yards to compete successfully with their Japanese and Korean colleagues. This one, described in detail by Mr. **Cerezo**, will imply a total renovation of the production process.

But despite their recent gains in productivity, both Spain and Denmark, two of the more successful shipbuilding countries in Europe, trail Japan and South Korea by a substantial margin in tonnage under construction and on order.

According to the latest quarterly shipbuilding figures, the Far East once again dominated the list of shipbuilding countries.

With the world orderbook at its highest level since September 1977, totaling 41.6 million gross tons, Japan increased both its total orderbook, from 13.2 million gt to 15.1 million gt, and its lead over South Korea, whose orderbook fell from 9.8 million gt to 8.9 million gt at the end of the third quarter this year.

As detailed in Table 1, the People's Republic of China and Taiwan took third behind South Korea, followed by Denmark, Yugoslavia, West Germany, Italy, Spain, Brazil, Poland, East Germany, Romania, United Kingdom, Finland, Norway and Turkey.

However, the end September position changed dramatically, as did the world for that matter, on October 3 when the unification of the two Germanys resulted in a combined tonnage orderbook of 2.3 million gt, putting it in third place after Japan and Korea.

TABLE 1
LEADING SHIPBUILDING COUNTRIES

	TOTAL ORDER BOOK Gross tonnage
Japan	15,118,058
South Korea	8,911,316
*People's Republic of China	1,151,003
Taiwan	909,200
Denmark	1,694,513
Yugoslavia	1,559,578
West Germany	1,508,329
Italy	1,339,456
Spain	1,281,062
Brazil	1,172,943
Poland	1,127,342
*East Germany	782,959
[†] Romania	671,790
United Kingdom	635,696
Finland	477,069
Norway	362,460
Turkey	319,002

[†]Information incomplete

and these are generating savings that are used to finance further improvements.

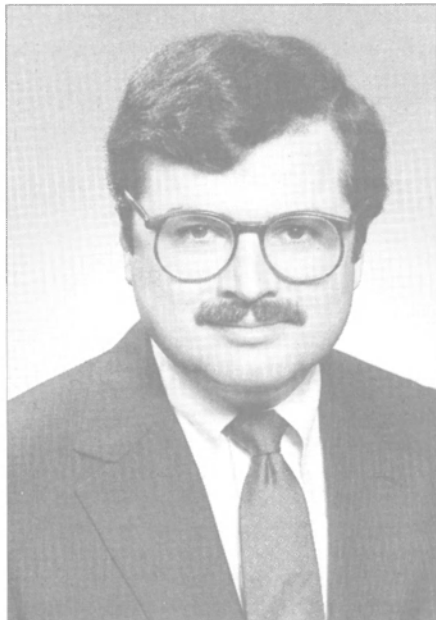
Much attention is also given to what Mr. **Andersen** calls "non-quantifiable" productivity factors (improved order, heightened motivation, zero task duplication). Above all, the yard makes a policy of producing ships in series: "We are not currently accepting orders to build a single unit of one design."

José Luis Cerezo, Technical Secretary General of the Management of the Marine Sector (pertaining to the Spanish Ministry of Industry), pointed out that the investment of the Spanish yards in R&D (\$40 million by private yards and \$60 million by public ones over

Are American Shipyards Competitive?

U.S. YARDS OPTIMISTIC ABOUT THEIR FUTURE

By John J. Stocker, President
Shipbuilders Council of America



It had been assumed by many observers that, with the termination of construction subsidies in 1981, American shipyards could not win competitively placed commercial ship orders. But current trends indicate that American yards are beginning to pay attention to the commercial market and to the potential that market has for future orders.

Overview

In 1981, the Office of Management and Budget (OMB) began efforts to terminate subsidies to the commercial shipbuilding industry and to freeze existing operating subsidy contracts for U.S.-flag operators. These actions were undertaken because the Reagan Administration believed that government should not be in the business of market interference. But, this philosophical argument was an ideological overlay for the real argument that OMB was advancing.

First, it was argued that American shipyards were hopelessly non-competitive. Some owners/operators complained that a 50-percent subsidy was insufficient to match a subsidized U.S. price with the world's price levels.

Second, OMB believed that there would never be a revitalization of the commercial shipbuilding market, either in the U.S. or abroad, because speculative demand in the 1970s would lead to severe overtoning for decades. OMB argued that since shipbuilding capacity was outstripping demand, the United States as a high-cost producer, should reduce excess capacity.

Third, internal OMB papers made it clear that it was cheaper for the U.S. Government to allow U.S.-flag operators to take advantage of foreign subsidy practices, rather

than try to compete with those foreign governments in a subsidy war.

Since the 1981 termination decision, American shipbuilders have seen their commercial market collapse. Ten years ago, 112,000 production workers were employed by 110 firms engaged in new construction and repair. Today, that number is down to 72,000 production workers in 60 firms.

The irony is that this decline has come in the face of the greatest peacetime naval construction build-up in our history.

Current Period

The termination of construction subsidies drew American shipyards into the military shipbuilding and repair markets. Throughout the 1980s, there was a continuous growth in the share of workload dedicated to Naval contracts as opposed to commercial contracts. In 1990, it is expected that more than 90 percent of the industry's workload will be performed for the U.S. Government.

And, although some observers believed that the Jones Act would be a basis for commercial market development, it has not. In fact, since 1984, only eight oceangoing Jones Act vessels have been ordered.

In addition, no U.S.-flag operator engaged in the foreign trade has ordered tonnage in the United States since 1981.

So, American shipyards are faced with virtually no commercial orders and a Navy market that is forecast to decline by 30 percent.

Key Events

And, yet, in this environment, four recent developments give rise to some hope for American shipyards.

First, despite a slight dropoff in the third quarter 1990 data, the international shipbuilding community has its largest backlog in 13 years. This boom comes in an international market where shipbuilding capacity has been cut back by about one-third in the last 10 years.

Second, the Shipbuilders Council campaign to end foreign shipbuilding subsidies practices (through negotiations at the Organization for Economic Cooperation and Development) is beginning to have some effect, with some of the most blatant of subsidy practices being restrained.

Third, with the growth in worldwide demand, the tightening of shipbuilding capacity, decline in Navy work and the scrutiny of foreign government subsidy practices, American shipyards are becoming

more interested in the commercial market. In fact, the Navy argues that to maintain the size of the current industry throughout the 1990s will require about 30 new commercial ships to be ordered each year. The level of commercial ship repair work in U.S. shipyards has increased, and there is a growing number of reports hinting at discussions between owners and yards about potential projects.

Fourth, recent competitions between American and foreign shipyards indicate that U.S. yards are closing the gap in some market niches. Southwest Marine's \$75-million conversion contract with Royal Caribbean Cruise Lines to double the cabin capacity on the Viking Serenade is the first major commercial export order in 30 years. Avondale has been awarded a contract to do a contract design and production proposal for the Phoenix World City project. Avondale's initial price estimate for this 5,600-passenger cruise ship newbuilding project was one-third lower than that of the European competition. Finally, Trinity Marine-Halter's bid on the British Columbia ferry project was the lowest (when Canadian tariffs were factored in) of all international bidders including Mitsui of Japan, Masa Yards of Finland, and Brodosplit of Yugoslavia. In any event, the highest bidding Canadian shipyard was given the contract, thereby making a mockery of Canadian adherence to the Free Trade Agreement. But, the point is, the American yard was the low bidder.

How Competitive?

The Council believed two years ago that in a nonsubsidized market, there were market niches in which U.S. yards could be immediately competitive. Thus, the first baseline requirement was to discipline foreign subsidy practices.

U.S. shipyards have seen the cost of the factors of production stabilize or decrease in the U.S., while world pricing levels are beginning to approach something closer to true production costs. In fact, Japanese sources continue to say that VLCC prices need to go up by another 20 to 25 percent to return Japanese yards to profitability.

Despite recent press comments, U.S. costs are no longer twice as high as the rest of the world. Labor rates in the U.S. now rank eighth in the world. For example, Germany's rate is \$6/hour higher, while Japan is approaching \$2/hour higher than comparable U.S. wage rates (about \$14.50/hour, including benefits). Even South Korean wages are above

\$8/hour compared to \$2.50/hour in 1986.

There is considerable debate about the cost of material, since it is likely that with the constraints on the international market in the supply of marine equipment, there will be price increases as demand accelerates. In addition, some foreign yards tell us that the cost of U.S. Coast Guard-approved systems adds 15 to 20 percent to the cost. The Coast Guard denies this, but this is an area where further investigation is warranted.

Despite the debate over production and material costs, it is clear that the competitiveness of U.S. yards in complex, high-outfit ships is improving. We should be cost-competitive when it comes to the export of military vessels as well.

But, saying this does not ignore the necessity with moving ahead with analysis and product development of new ship designs where series production has its learning curve pay-offs. This includes innovative double-hull tankers and self-unloading bulkers, where there is already some initial work being done in U.S. yards.

The Future For American Shipyards

Given nonsubsidized market niches, the answer is yes, American shipyards can build high-outfit ships at competitive prices. But, we cannot simply be satisfied with a single market niche. A single market niche is a prescription for downstream market maintenance problems. The world shipbuilding market goes to that industry capable of responding to standardized demand. And, in meeting that potential demand, a transitional effort will need to be undertaken—such as the Sealift program and meeting double-hull tanker requirements—where we can bring investment, training, and product development to bear on the larger market issues facing us. This transitional period of about three-to-five years will give us time to structure innovative and creative ship finance mechanisms and help us move out of the Navy and high-outfit, complex market niches into the mainstream commercial shipbuilding market.

There is a future for American shipyards in the post-Cold War period and that future lies in the commercial shipbuilding market. Further, it is that unthinkable of unthinkables, where the potential for growth and success lies—the international market—that the real future of American shipbuilding can be seen.

Survey Reveals Recovery Of Small- And Medium-Sized Yards

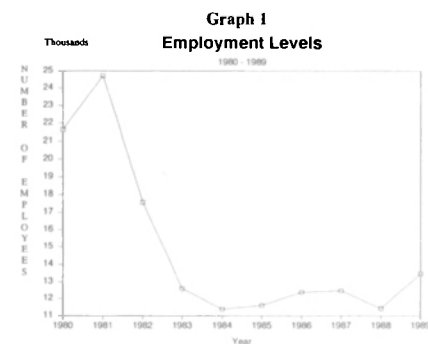
The American Waterways Shipyard Conference (AWSC), a conference within The American Waterways Operators, represents the interests of the small- and medium-sized or "second-tier" yards in the shipbuilding and repair industry. These yards build and repair the tugboats, towboats and barges for the domestic water transportation industry; the supply boats, crewboats, and other specialized vessels for the offshore service industry; and a wide variety of fishing vessels. They are also typically responsible for the construction and repair of the Navy's smaller vessels, the Coast Guard fleet, and vessels operated by the Army Corps of Engineers and NOAA.

In order to develop an accurate statistical profile of the industry, which can be utilized to identify trends for use in legislative and regulatory issues which affect second-tier shipyards, this survey has been conducted under the auspices of the Economic and Commercial Committee of the American Waterways Shipyard Conference.

Information on employment, new construction, and repair activities for this survey were compiled on a voluntary basis from approximately 250 second-tier shipyard facilities, and includes data from the years 1980 to 1989. The American Waterways Shipyard Conference is the only association which collects this type of information for the second tier of the shipbuilding industry.

Employment Trends

The "Employment Information and Trends" section of the survey contains information on activities directly related to employment in the shipyard facility.



The surveyed group contains a majority of the major employers found within the second tier commercial shipbuilding industry.

Table 1, "Employment Levels in Second Tier Shipyards, 1980-1989," shows the number of employees for each given year for the statistical pool. Employment levels peaked in 1981 at 24,699 and had declined by 54 percent to a low of 11,393 in 1984. That was the last year to show a decrease in employment. Since

1984, employment has gradually increased each year until dropping again in 1988 to a level of 11,424. Then, in 1989, there was a 15 percent increase in employment.

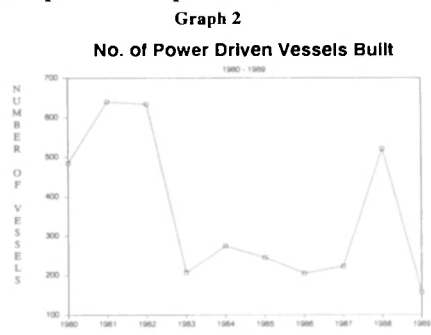
Table 1.—Employment Levels in Second Tier Shipyards (1980-1989)

Year	# of Employees
1980	21,638
1981	24,699
1982	17,570
1983	12,590
1984	11,393
1985	11,608
1986	12,366
1987	12,454
1988	11,424
1989	13,478

Graph 1, "Employment Levels, 1980-1989," visually depicts the employment situation for the second-tier shipyards. This graph illustrates the rapid decrease in employment levels for the smaller shipyard facilities from 1981 to 1984, stabilization of employment levels from 1985 to 1988, and growth from 1988 to 1989.

New Construction and Repair

In 1989, ninety-four percent of all respondents provided information

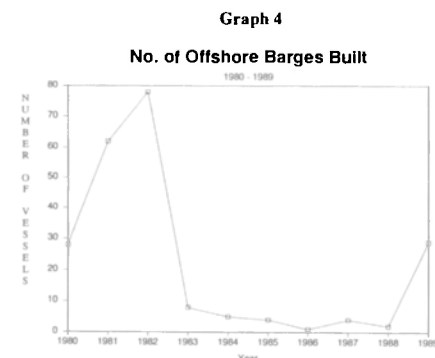
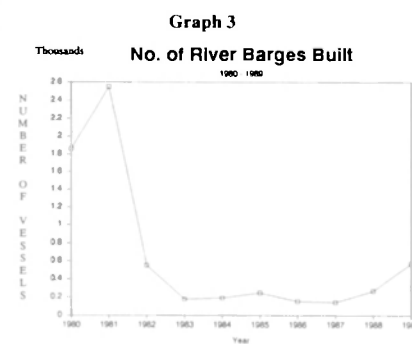


on new construction and repair activities. Of all the respondents, 86 percent reported having done repair work, while 53 percent of the respondents said that they had worked on new construction projects in 1989. Six percent of the respondents advised that they had not done either repair or new construction work in 1989.

Tables 6 and 7 contain information generated on new construction and repair activities for the years 1980 to 1989. Tables 6 and 7 further substantiate evidence of the recovery being experienced by small- and medium-sized shipyards. Between 1988 and 1989, there was a 70 percent decrease in the number of power-driven vessels constructed. Most of the decrease, however, was in the category of military vessels; 417 built in 1988 and 39 built in 1989. There was a 53 percent increase in the construction of river barges. Most of this increase was in the category of hopper barges; 217 built in

1988 and 484 built in 1989. Another factor in this growth of new construction is the construction of offshore barges; two built in 1988 and 29 built in 1989.

Increases in repair activity were substantial with repair of river barges actually increasing 33 percent. In this category of power-driven vessels there was a 7 percent decrease, while there was a 5 percent increase in the repair of off-



shore barges. Graphs 2, 3 and 4 visually depict new construction activities for the second-tier shipyards for the years 1980 to 1989. The graphs are divided by vessel category—Power Driven Vessels (Graph 2), River Barges (Graph 3), and Offshore Barges (Graph 4). Each graph represents the new construction activities for all specific types of vessels which fall under each general category.

TABLE 6

New Construction Activity 1980 - 1989

Year	Power Driven Vessels	River Barges	Offshore Barges
1980	485	1,863	28
1981	640	2,551	62
1982	634	554	78
1983	207	179	8
1984	274	191	5
1985	245	250	4
1986	205	156	1
1987	222	145	4
1988	521	270	2
1989	157	571	29

TABLE 7

Repair Activity 1980 - 1989

Year	Power Driven Vessels	River Barges	Offshore Barges
1980	3520	6,200	149
1981	2,828	6,224	134
1982	2,780	5,425	148
1983	3,821	6,752	218
1984	3,319	5,423	179
1985	4,176	5,874	242
1986	5,335	7,498	210
1987	6,153	10,519	220
1988	6,419	10,062	339
1989	5,969	13,810	356

New Tugboat Is First In Delaware Waters In Over 50 Years



The Bridget 30 tugboat's 30-foot length, 8-foot beam and draft of 2 feet allow her to move easily through the water, achieving speeds up to 10 knots.

Beckman, Limited of Wakefield, R.I., builder of antique and classic launches and tugboats, recently delivered a 30-foot steam tugboat to **Peter Van der Veld** of Malvern, Pa. Moored on the Chesapeake and Delaware Canal, this new tugboat is the first in Delaware waters in over fifty years.

The Bridget 30 tugboat is one of several steam and diesel tugboats, ranging in length from 22 to 45 feet, built by the Rhode Island firm. She is powered by an oil-fired steam boiler made by Hobby Steam Boilers, Limited, of Slocum, R.I., driving a Semple Model 354 compound steam engine.

Designed as a pleasure vessel, the tug sleeps two forward, has an enclosed head, complete galley, and living area with settees for four aft. The steam boiler, engine and machinery are located amidships in a well-ventilated engine room. Cruising range is about 500 miles, which permits her to fully explore her home waters of the Chesapeake and Delaware Bays.

HamiltonJet Names Hough Marine Distributor For Pacific Northwest

HamiltonJet, one of the world's largest specialist manufacturers of waterjets, recently announced the appointment of a new distributor for the Pacific Northwest area, bringing to 11 the total number of distributors for its product throughout the U.S. and Canada.

Hough Marine & Machine, Inc., of Seattle will assume responsibility for the sales and service of the complete range of Hamilton's commercial waterjets and can offer units matching gasoline or diesel engines from 100 to 6,500 hp for a wide range of work and patrol boats, fast ferries and pleasure craft.

For full details on the Hamilton-Jet range of waterjets,

Circle 55 on Reader Service Card

Comsat Introduces New SeaMail® Electronic Service

Comsat Maritime Services recently introduced its new SeaMail® service, a satellite-based electronic

Circle 243 on Reader Service Card →

mail service for mariners.

According to **John R. O'Brien Jr.**, Comsat's vice president of marketing and program management, "The new SeaMail electronic mail service lets mariners send and receive messages to and from locations around the world, 24 hours a day, and also lets them access a variety of marine-oriented information

services such as news, ocean and weather maps, and navigation advisories.

"SeaMail provides user-friendly, cost-effective messaging from personal computers (PCs) aboard ship," Mr. O'Brien said. "Subscribers can create and edit messages, send telex, Group III facsimile, spreadsheets, computer-generated

data files, customized forms and reports on ship operations. Comsat SeaMail also offers interconnection with other electronic mail systems," he said.

For more information on Comsat's SeaMail and other maritime services,

Circle 30 on Reader Service Card

IRI GROUP



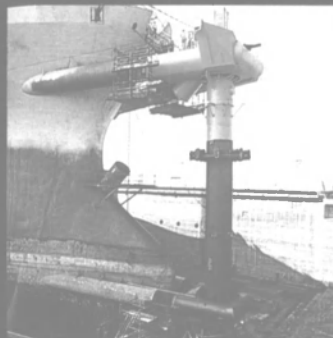
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OUTSTANDING SHIPS OF



In the midst of a world shipbuilding boom, with the highest level of tonnage under construction and on order in 13 years, shipyards are once again producing a number of interesting, economical and innovative designs. The highly competitive, burgeoning cruise industry has been a particular source of ingenious and often very imaginative design.

This group of award winners, MARITIME REPORTER's "Outstanding Oceangoing Ships of 1990," reflects the sophisticated vessels being produced by the world's shipyards. Highly efficient propulsion, reduced crew requirements, versatile cargo carriage and enhanced maneuverability are just a few of characteristics displayed by this year's selectees.

tanker Apache Spirit, built for the TeeKay Company, is no exception to this design philosophy. She has an overall length of 809-1/2 feet, molded breadth of 139 feet, design draft of 47 feet and scantling draft of 50 feet. Her deadweight is 111,809 tons at her scantling draft.

With a trial speed of 14.6 knots, she features a 3.Maj-Sulzer 5 RTA72 main diesel engine, rated at 18,614 bhp, which provides the Apache Spirit with optimum performance and minimum fuel consumption. All of the ship's systems have been carefully chosen and arranged to save space aboard, while providing simple and trouble-free maintenance. The cargo tanks and cargo-handling systems provide both efficient unloading/loading operations and maximize safety against cargo spillage.

Another prominent feature of the Apache Spirit is her shape, designed by 3.Maj and tested by the world renowned Naval Institute of Zagreb. The vessel's hull form enabled her to achieve excellent results during her sea trials and, according to 3.Maj, should enable her to maintain them during normal service.

APACHE SPIRIT Tanker 3.Maj

For the fourth consecutive year, a newbuilding from Yugoslav shipbuilder 3.Maj of Rijeka has been selected as one of the annual "Outstanding Oceangoing Ships." This, according to 3.Maj, is no accident.

From its first appearance in the world shipbuilding market, 3.Maj developed a design philosophy based on building custom-tailored vessels.

This year's award winner, the oil

Equipment List

Main engine	3.Maj-Sulzer
Auxiliary engines	Litostroj-MAN B&W
Generators	Rade Koncar
Radars	Kelvin Hughes
Radio station	STC
Gyrocompass/autopilot	Anschutz
Remote sounding	Saab
Purifiers	Alfa Laval
Fire equipment	Walter Kidde
Hose-handling cranes	3.Maj-Hagglunds
Paints	Hempel/Sigma



Award winners, from top of page: Tanker Dicto Knutsen, built by AESA; cruise ship Delfin Caravelle, from Rauma Yards; Navy oiler Pecos, built by Avondale Industries; cruise ship Horizon, from Meyer Werft; and (above) tanker Apache Spirit, built by 3.Maj.

OCEANGOING 1990

AUSTRALIA SKY Product Tanker Samsung Shipbuilding

The 33,000-dwt product tanker Australia Sky, delivered by the Kojima shipyard of Samsung Shipbuilding & Heavy Industries Co., Ltd., to Caltex Petroleum Company (Australia) Pty., Ltd., is reportedly the first large tanker vessel fitted with a twin schilling rudder system. The Industromar Vectwin Schilling Rudder system provides the vessel with excellent maneuverability in such areas as small harbors and narrow waterways, which are normally under tidal restrictions and offer limited tug assistance.

Designed to minimize operating costs, with such features as a bulbous bow, automated main engine bridge maneuvering system, and a single 8,200 bhp (derated) Hyundai-built MAN B&W Diesel model 5S50MC main engine, the Australia Sky carries product oil in eight pairs of tanks from the Australia coast to New Zealand. She has double bottom and double hull construction and is divided into port and starboard tanks by a centerline longitudinal bulkhead.

The Australia Sky is manned by a complement of 26, with an overall length of 592 feet, molded breadth of 88 feet, molded depth of 54 feet and draft of 35 feet.

Some of the special features offered by the Vectwin Schilling Rudder include full 360 degree control of speed and direction by use of a simple joystick control, excellent

course keeping under manual or autopilot control, remarkable control and turning ability at any ship's speed from full to zero, and reportedly markedly less vibration than for a conventional rudder system running astern.

Equipment List

Main engine	Hyundai-MAN B&W
Generator engine	SSangyong-MAN B&W
Vectwin rudder	Industromar
Level gauge	Saab
A/C plant	Flakt
Propeller	Hyundai
Freshwater generator	Nagase-Alfa-Laval
Purifier	Nagase-Alfa-Laval
Satellite communication	SAIT-EB
Gyrocompass/autopilot	Anschutz
Satellite navigator	JRC

CAP POLONIO Containership Flender Werft

In the third quarter of this year Flender Werft AG, Lubeck, Germany, delivered the 33,000-dwt containership Cap Polonio to the shipping group Hamburg-Sud-Amerikanische Dampfschiffahrtsgesellschaft in Hamburg, Germany.

Employed worldwide in the shipowners' liner service, the Cap Polonio, with an overall length of 657 feet, molded breadth of about 105 feet, and draft of approximately 39 feet,

(continued)



Selectees, from top page: Cruise ship Crown Princess, built by Fincantieri; cruise ship Nordic Empress, from Cantiers de l'Atlantique; railferry Railship III, built by Schichau Seebeckwerft; cruise liner Crystal Harmony, from Mitsubishi Heavy Industries; and (above) LPG carrier Jane Maersk, built by Hyundai Heavy Industries.

Outstanding Ships

(continued)

is capable of carrying 2,000 TEUs, 650 TEUs of which are the Conair system for transporting refrigerated cargo.

She is powered by a single 22,080-

hp Sulzer main diesel engine and has a service speed of 18.5 knots.

This vessel embodies a development of Flender Werft's successful standard geared containerships, "Flender 2000," which incorporate some of the major "Ship of the Future" principles. These principles

form part of a comprehensive scheme aiming at improved operating efficiency and reduced manning levels. The Ship Operating Center, for example, is arranged for one-man watch-keeping at sea. All the necessary controls and instruments are provided on the bridge.

Equipment List

Main engine	Sulzer
Auxiliary diesel engine	MAN B&W Holeby
Propeller	KaMeWa
Bowthruster	Lips
Generators	AEG
Boilers	Aalborg

CEMTEX ORIENT

Bulk Carrier

Hitachi Zosen

The Cemtex Orient, a 71,435-dwt bulk carrier ordered by U-Ming Marine Transport Corp. of Taiwan, was completed and delivered this year by Hitachi Zosen's Maizuru Works.

The 705-foot-long by 105-foot-wide carrier is the third vessel of the Panamax Optima type developed by Hitachi Zosen as the largest Panama-passable standard economy ship. The Cemtex Orient has a molded depth of 61 feet and scantling draft of 44 feet. She is capable of multi-cargo transportation, such as grain, ore and coal.

The main engine is the energy-saving Hitachi Zosen-MAN B&W 6S60MCE-type diesel which, with derated use, enables it to save fuel significantly. The engine has a maximum continuous rating of 10,360 hp at 102 rpm. Service speed for the bulker is 16 knots.

The Hitachi Zosen Super Stream Duct is installed astern to improve propulsion efficiency.

Four 25-ton deck cranes are installed to enhance cargo-handling efficiency.

CROWN PRINCESS

Cruise Ship

Fincantieri-CNI

The first of two luxurious 70,000-grt cruise ships, the Crown Princess, ordered by P&O Cruises was delivered this past year by the Monfalcone yard of Fincantieri Cantieri Navali Italiani.

With a length overall of 804 feet, beam of 106 feet, draft of 26 feet and passenger capacity of 1,950, the Crown Princess is one of the largest cruise ships afloat. She features extensive passenger facilities including lounges, night clubs, disco, casino, shopping arcades, cafeteria, conference room/cinema, two swimming pools, two Jacuzzis, and other amenities. About 80 percent of the 792 passenger cabins have outer balconies.

Alfa-Laval, SpA, Italy, supplied the complete cooling system for the liner.

The ship's graceful and very distinctive silhouette looks somewhat like that of a dolphin. The profile of the "head" constitutes a large front dome over the Belvedere Bar/Casino.

Designed for worldwide cruising, the vessel is powered by a highly advanced diesel-electric plant consisting of four 6.6KV, 60-Hz main alternators driven through flexible couplings by four MAN B&W eight-cylinder, in-line L58/64 four-stroke, medium-speed engines, with a maximum continuous rating of 9,720 kw at 400 rpm. These alternators supply power through transformers to the two 12,000-kw, three-phase syn-



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chronous-type propulsion motors, each directly driving a fixed-pitch propeller via shafting.

CRYSTAL HARMONY Cruise Ship MHI

Built at a cost of \$200 million, the 48,621-ton luxury cruise liner Crystal Harmony, constructed by the Nagasaki shipyard of Mitsubishi Heavy Industries (MHI), is the first luxury ship for Los Angeles-based Crystal Cruises, a subsidiary of Japan's NYK Line.

Reportedly one of the most spacious ships in her class, the Bahamas-registered Crystal Harmony carries 960 passengers in first class luxury. Almost all of her passenger cabins are situated on the outside, more than half of which have a private veranda. She also features one of the largest penthouses afloat and the first floating casino to be operated by Caesars Palace of Las Vegas.

The Crystal Harmony's propulsion power is generated by four Mitsubishi-MAN B&W 8L58/64 large bore medium-speed diesel alternator sets. The output is fed via a 6.6 kv main switchboard to two 12 MW Cycloconverter drives, each serving its own 11.5 MW synchronous propulsion motors. ABB Marine supplied and engineered the Cyclo propulsion drives, generators, switchboard, bowthruster motors, integrated machinery and auxiliary automation system.

Plate coolers were installed on the vessel by Kyoto Machinery Co., Ltd., the Japanese division of Alfa-Laval.

Passenger amenities aboard the liner include two heated freshwater pools fitted with movable roofs called Magrodomes, a special piano lounge area with foliage on the Lido Deck, an Italian restaurant and Japanese restaurant.

Equipment List

Main generator engines	MHI-MAN B&W
Main generator engine turbochargers	MHI
Auxiliary generator engine	Wartsila Diesel
Auxiliary boiler	MHI
CP propeller	MHI-KaMeWa
Emergency generator engine	GM/Tominaga & Co.
Electric propulsion system	ABB
Main & auxiliary generator	ABB
High voltage switchboard & motor	ABB
Power management system	ABB
Radar & ARPA	Krupp Atlas
Doppler sonar	Krupp Atlas
Integrated position indicator	Racal Decca
INMARSAT	Magnavox & JRC
Garbage plant	Norsk Hydro
Vacuum toilet system	EVAC
Fin stabilizer	Sperry Marine
Potable water sterilizer	Serck Como
Plate type heat exchanger	Alfa-Laval

DELFIN CARAVELLE Cruise Ship Rauma Yards

This past year Finnish shipbuilder Rauma Yards Oy delivered the

second of two smaller luxury cruise liners to Delfin Cruise Ltd., a shipping company based in Nauvo, Finland.

Christened the Delfin Caravelle by Mrs. Leena Matomaki, wife of the president of the Rauma-Repola Group, Tauno Matomaki, the liner has an overall length of 382 feet, breadth of 56 feet and draft of 14 feet. Her pair of Wartsila Vasa 6R32Ds produce a total of 3,017 hp at 750 rpm. She can accommodate up to 330 passengers in her 178 cabins, including her eight luxury suites fitted with Jacuzzis and balconies.

Delivered by the yard in about one year, the Delfin Caravelle has conference facilities for 200 participants, saunas with a swimming pool and Jacuzzi, duty-free shop, saloon, casino, club/restaurant with dancing, nightclub/disco, beauty salon, and hospital quarters. The ship's main restaurant can accommodate all 330 passengers at a single seating.

The Delfin Caravelle will cruise during the summer and autumn from Turku to Visby three times per week, Gotland-Borgholm cruises and trips to Tallinn and the isle of Saaremaa in Estonia. The line will also arrange 24-hour cruises as well as conference and charter cruises.

Equipment List

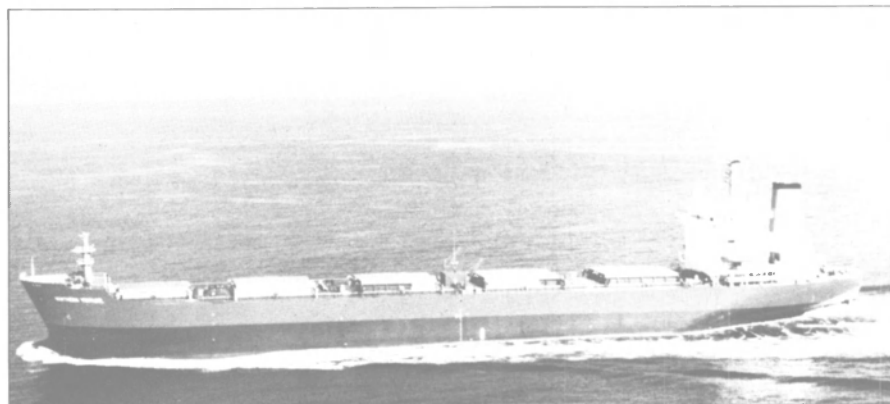
Main engines(2)	Wartsila Vasa
Auxiliary engines	Wartsila Vasa
Alternators	Leroy Somer
Propellers & shafts	JW Berg
Reduction gears	Renk-Tacke
Shaft bearings & seals	Waukesha-Lips
Steering equipment	Wartsila-EES
Bowthruster	Ulstein-Liaaen
Fin stabilizers	Blohm & Voss
Diesel generators	Leroy Somer
Shaft generators	Leroy Somer
Heat exchangers	GEA Ahlborn/Alfa-Laval
Emer. generator	Stamford
Emer. generator engine	Cummins
Vacuum toilet	Evac
Air cooling compressors	Sabroe
Davits	Schat-Davit
Evaporators	Alfa-Laval Nirex
Oil purifiers	Alfa-Laval
Radars, log & echo sounder	Krupp Atlas Elektronik

DICTO KNUTSEN Crude Oil Tanker Astilleros Espanoles

This year the 797-foot crude oil tanker Dicto Knutsen joined the Knutsen O.A.S. Shipping A/S fleet, following her delivery by the Bilbao yard of Spanish shipbuilder Astilleros Espanoles S.A. (AESA).

Owned by K/S Knutsen AABY Tank, the Norwegian-flag single-screw tanker is fitted with 11 cargo tanks, eight segregated ballast tanks and two slop tanks. She has a deadweight of 113,131 metric tons at a summer freeboard draft of about 20 feet and 110,135 dwt at a winter freeboard draft of about 21 feet.

Designed with a bulbous bow with transom stern and two-part, fully balanced Willi Becker spade rudder, the Dicto Knutsen is propelled by a single AESA-MAN B&W model 5S70MC diesel engine. The two-



The bulker Northern Venture, built by NKK, has an ice reinforced hull.

HORIZON Cruise Ship Meyer Werft

stroke, slow-speed directly reversible main engine has a nominal output rating of 14,630 bhp at 78 rpm.

Maneuverability is enhanced by a single 2,400-hp Lips controllable-pitch electric bowthruster.

Electrical power generation equipment includes two generating sets, each set consisting of a Bergen Diesel model KRG-8 engine rated at 1,800 bhp at 720 rpm and an Alconza NIR-6.350A-10 type generator of 1,200 kw, 450 V, 60 Hz.

Freshwater generation is supplied by an Alfa-Laval freshwater generator, producing about 30 metric tons per day.

This year Chandris Celebrity Cruises added the 46,811-grt luxury liner Horizon to its fleet following her delivery by Meyer Werft's shipyard in Papenburg, Germany.

The \$185-million Horizon along with her sister ship, the Zenith, currently under construction at Meyer Werft, are the largest passenger ships ever built in Germany.

The 47,000-grt Horizon has an overall length of about 681 feet, molded breadth of 95 feet and draft of about 24 feet.

The 12-deck ship is propelled by a father-and-son four-engine plant consisting of two MAN B&W 9 L 40/54 "father" engines with an output of 8,152 hp at 514 rpm each and two MAN B&W 6 L 40/54 "son" engines, each developing 5,435 hp at 514 rpm.

ABB supplied the complete modular low-voltage switchgear system type MNS for an installed capacity totalling 20,625 kva and a short-circuit current of 160 ka, and the three-phase AC motors for the auxiliary systems.

Alfa-Laval Industrie of Hamburg, Germany, supplied three separators for HFO with a three-phase motor and electric switching cabinet and a total of seven lube oil separators, two type WHPX 410 and five type WHPX 407, with three-phase motors and electric switching cabinets.

The Liberian-flagged, 1,354-pas-

(continued)

Equipment List

Main engine	AESA-MAN B&W
Generators	Alconza
Generator engines	Bergen Diesel
Emer. generator	Alconza
Emer. generator engine	Pegaso-Guascor
Oil-fired vertical boilers	San Carlos
Exhaust gas boiler	San Carlos
Freshwater equipment	Alfa-Laval
Spade rudder	Willi Becker
Bowthruster	Lips
Tank cleaning equipment	Gunclean
Fire extinguishing equipment	Walter Kidde
Gyrocompass & autopilot	Sperry Marine
Loran C	Furuno
Echo sounder	Simrad
Speedlog	Atlas
Radar	Kelvin Hughes
ARPA	Kelvin Hughes
Facsimile	Furuno
Decca	Robertson Shipmate
VHF radio telephone	Sailor
Mobile telephone	Siemens
Main receiver & emer. receiver	ITT Marine



The crude oil carrier Jahre Traveller, from Yugoslav builder Brodosplit, has a liquid cargo capacity of 170,000 m³.

senger vessel has 533 outside and 144 inside cabins.

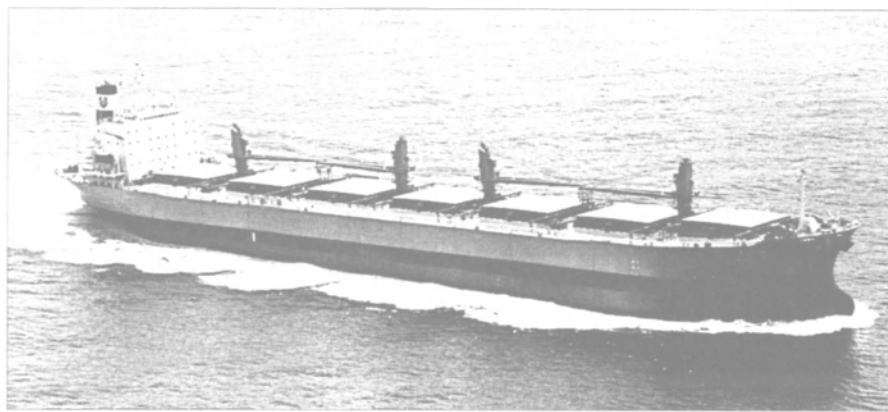
Equipment List

Main & auxiliary engines	MAN B&W Diesel
Gearbox	Lohmann & Stolterfoht
Bow & stern thruster	Lips
Emer. generator	Janssen
Electric motors & starters	ABB
Flap rudder	Willi Becker
Stabilizers	Sperry Marine
Magnetcompass	Anschutz
Echo sounder	Krupp Atlas Elektronik
Radar	JRC
Boilers	Aalborg Marine
Lighting fixtures	Aqua Signal
Anchor	Blohm & Voss
Liferafts	Viking
Evaporators	Serck Como
Davits	Schat Davit
Ceilings	Dampa

JAHRE TRAVELLER Crude Oil Carrier Brodosplit

The last of four Suezmax crude oil carriers for Jorgen Jahre of Norway was delivered by Split Shipbuilding Industry (Brodosplit), Split, Yugoslavia, this past summer.

Classed by Det norske Veritas, the 78,000-gt Jahre Traveller is a single-screw tanker used for transporting crude oil with one continuous deck, a bulbous bow, raked stem and transom stern. She is equipped with eight central cargo tanks, four pairs of wing cargo tanks



The Hitachi Zosen-built bulker Cemtex Orient is fitted with an HZ Super Stream Duct to improve propulsion efficiency.

Equipment List

Main engine	Split-MAN B&W
Generators engines	Jugoturbina-Sulzer
Generators	Uljanik-Pula
Cargo sounding system	Saab
Halon fire extinguishing	Walter Kidde
Radar & ARPA	Kelvin Hughes
SatNav	Magnavox
Autopilot	Anschutz
Gyrocompass	Anschutz
Doppler speed log	Raytheon
Echo sounder	Skipper

and two slop tanks at the aft end of the cargo space used as cargo tanks. She is also fitted with three pairs of segregated water ballast tanks, with the after peak and fore peak used for water ballast.

The Jahre Traveller has an overall length of 882 feet, molded breadth of 146 feet, molded depth to main deck of just over 79 feet. Her

scantling deadweight is 142,000 metric tons at a scantling draft of 54.4 feet.

She is propelled by a single supercharged, two-stroke six-cylinder Split-MAN B&W diesel 6S70MC engine, rated at 17,921 hp at 85 rpm mcr, directly coupled to a four-bladed propeller.

Brodosplit developed the ship's body line in cooperation with the Yugoslav Shipping Institute of Zagreb. The sea trials for the ship showed good performance in the areas of speed and seakeeping, according to Brodosplit.

In fact, encouraged by their success with this particular design, Split Shipyard has developed a new "environmental" design (a double-bottom/double-skin version) adhering to the same ship's main particulars and body lines.

JANE MAERSK LPG Carrier HHI

The first of four 35,000-cubic-meter LPG carriers, the Jane Maersk was delivered this past November by Hyundai Heavy Industries Co., Ltd. (HHI), Korea.

The Jane Maersk has an overall length of 607 feet, breadth of 90 feet and design draft of 31 feet. She has one continuous freeboard deck from the No. 1 cargo hold bulkhead to stern and the cargo space is divided into four holds by transverse bulkheads to suit four freestanding and self-supporting prismatic tanks.

The cargo handling system of the ship is designed for the simultaneous loading, reliquefying and discharging of two cargoes with full segregation.

The Jane Maersk is designed to carry such cargoes as anhydrous ammonia, propane with an ethane content of 7.0 mole percent, butane (ISO and normal), pure propane, butadiene, propylene, butylenes and VCM. Other cargoes may be carried provided that their toxicity, aggressiveness, pressure, temperature and specific gravity are within design limitations.

The Jane Maersk is powered by a single Hyundai-MAN B&W 6S60MC main engine developing an

(continued on page 37)

INTRODUCING THE EPOCH MARK II SERIES.

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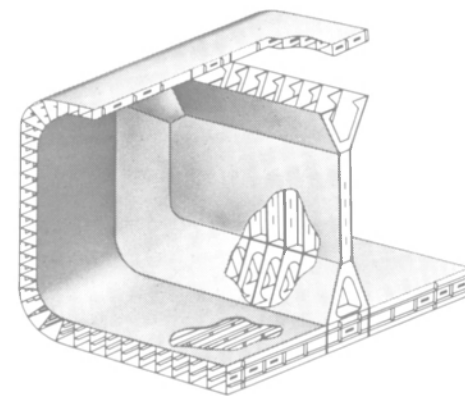
Revolutionary in concept, the MARK II incorporates a unidirectional girder system combined with a complete double hull structure.

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unrivalled advantages in performances over more conventional designs.

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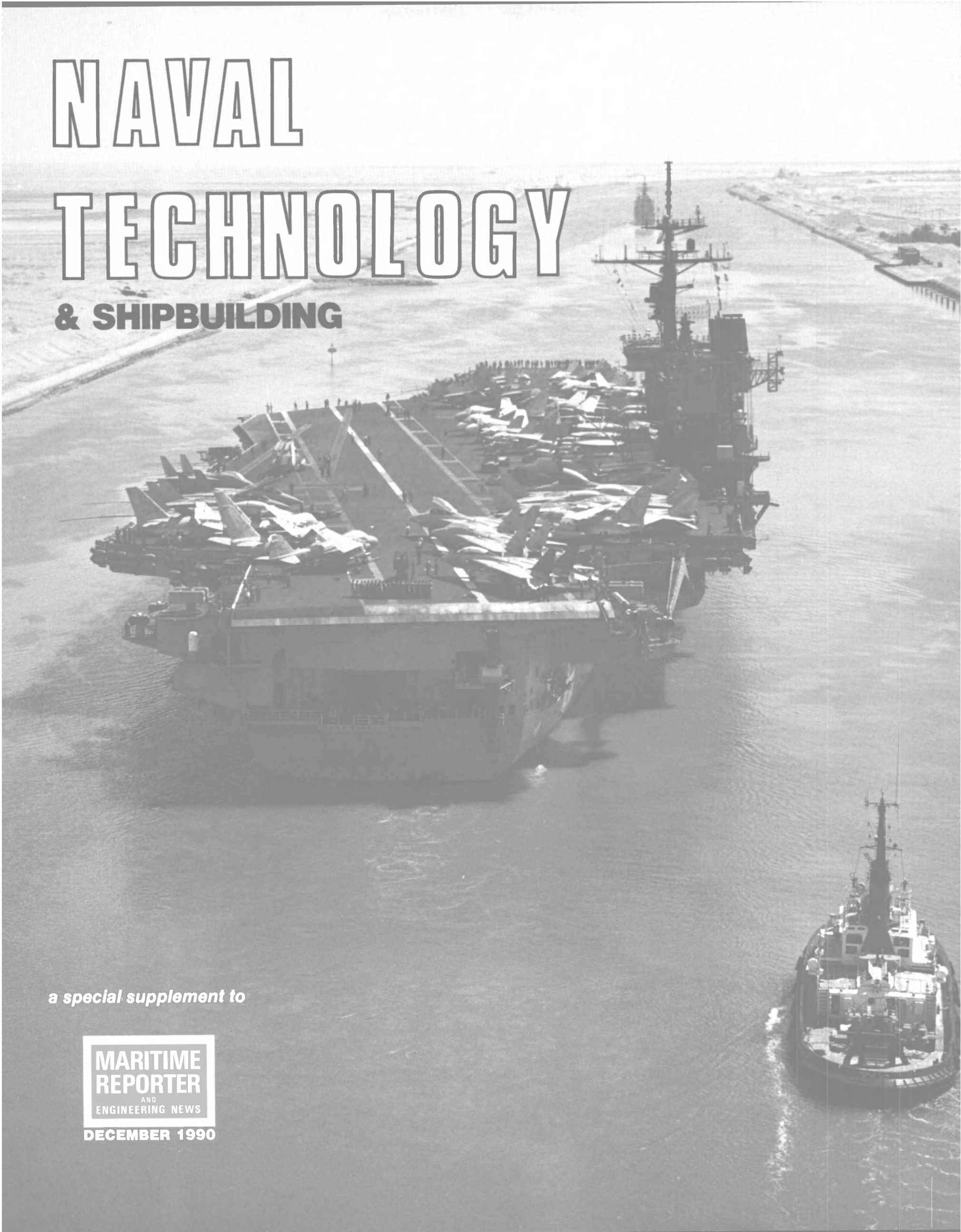
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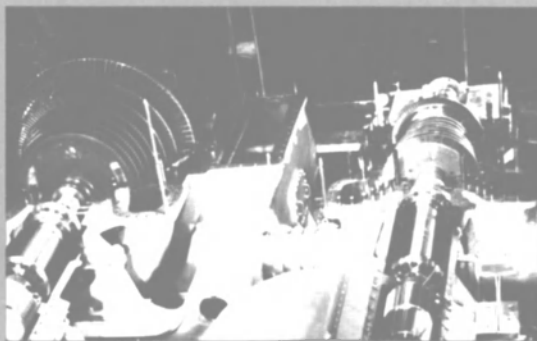


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\$1.3 BILLION AVAILABLE TO INITIATE SEALIFT SHIP CONSTRUCTION PROGRAM

By Jim McCaul, President
IMA Associates, Inc.

Congress, in late October, appropriated \$900 million to fund a new fast sealift program. When added to the \$375 million remaining from last year, a total of \$1.3 billion is now available for initiating a major ship construction effort. High priority has suddenly been accorded sealift—and it is highly likely that this program will proceed on an accelerated basis over the next year.

Construction of these ships represents the primary new business prospect for the U.S. maritime in-

Cover: Aircraft carrier USS John F. Kennedy (CV-67) transiting the Suez Canal. Her battle group is supporting "Operation Desert Shield." **Photo, top:** USS Thomas S. Gates (CG-51) in the Suez Canal.

dustry over the next six to 12 months. All of these ships will be built to commercial standards—allowing the maximum participation by equipment manufacturers.

Current Sealift Inventory

The U.S. Navy has an inventory of more than 60 sealift ships. Until the Kuwait invasion, about one-third of these ships had been in active service carrying dry and liquid cargoes for the military. Another third were deployed in forward locations—loaded with equipment and supplies which were intended to be available to troops flown to meet military emergencies. The remain-

ing third were rapid deployment ships maintained in ready reserve status. Exhibit 1 lists ships currently in the military sealift inventory.

Many of the ships in this inventory have been added during the early 1980s. The Navy funded a major effort to build a prepositioned/ready reserve fleet as a result of the Iran hostage situation. The program included acquisition of eight Sea-Land containerships for conversion to fast sealift ships, construction and/or conversion of 13 prepositioning RO/RO ships, conversion of two tankers to hospital ships and acquisition of five T-5 sealift tankers. Currently, there are no additional ships on order.

Sealift Planning

DOD's need to respond to military emergencies in distant locations drives the requirement for sealift capability. Essentially the Department of Defense plans its requirements around the amount of tonnage needed to be delivered immediately following a deployment decision.

The sealift requirement is divided into three phases: the initial phase handled by prepositioned ships; the surge phase handled by rapid deployment and other available tonnage; and resupply phase handled

(continued)

U.S. Navy

(continued)

by recurring voyages.

Sealift ships have never been a glamorous activity to Navy planners. Given the choice of spending scarce funds for combatant ships or sealift ships, the Navy will invariably choose the former. As a result, it has largely fallen on Congress to initiate requests for sealift ship construction.

Background of New Program

The decision to build more sealift ships began last year when Congress appropriated \$600 million in the FY '90 budget for this purpose. Congress acted in response to concerns that the U.S. had insufficient sealift capability. However, DOD subsequently reprogrammed some of these funds to pay for the military action in Panama and refused to release the balance to begin the program.

Then Iraq invaded Kuwait and suddenly sealift became a high priority to defense planners. As a result, Congress authorized a new fast sealift ship construction program for FY 1991 and appropriated an additional \$900 million for this effort. Following is the text of the report accompanying the appropriations legislation dealing with the sealift program:

Congressional Directive For The Sealift Program

"The House bill included a provision (sec. 1324) that would establish a program for the construction and commercial operation of commercially viable cargo vessels that incorporate features essential for military utility of the vessels in time of war or national emergency. The report accompanying the House bill (H. Rept. 101-665) suggested a specific design for the ships constructed under the program.

"The Senate Amendment contained no similar provision.

"The conferees agree to establish a fast sealift program for the construction and operation of cargo vessels that incorporate features essential for military use of the vessels. The Secretary of the Navy would be responsible for the design and construction of the vessels after consultation with the Administrator of the Maritime Administration. Ships constructed under the program could be dedicated to military use if the Secretary of the Navy determines that it is in the national interest for the ships to be immediately available. Ships dedicated to military use would be required to have a full or partial crew. The conferees are aware that there may be a number of options for dedicated military use with a full or partial crew and intend that it include operation of ships as is presently done with the prepositioned ship programs and with the SL-7 ship program, in which ships are maintained

Exhibit 1—Military Sealift Ships (as of June 1990)					
Ship Name	DWT in 000's	Year Built	Ship Name	DWT in 000's	Year Built
Tankers			Prepositioning Ships		
Sealift Antarctica	27.2	1975	PFC Eugene Obregon	25.1	1983
Sealift Arabian Sea	27.2	1975	Maj. Stephen Pless	25.0	1983
Sealift Arctic	27.2	1975	American Kestrel	29.8	1972
Sealift Atlantic	27.2	1974	Austral Rainbow	29.7	1972
Sealift Caribbean	27.3	1975	Green Island	46.1	1975
Sealift China Sea	27.3	1975	Green Harbour	46.1	1974
Sealift Indian Ocean	25.0	1975	Advantage	27.8	1977
Sealift Mediterranean	27.3	1974	Noble Star	18.2	1977
Sealift Pacific	25.0	1974	Santa Victoria	13.1	1969
Gus Darnell	30.1	1985	Fast Sealift Ships		
Lawrence Gianella	32.4	1986	Bellatrix	55.0	1972
Paul Buck	29.5	1985	Algol	55.0	1972
Richard Matthiesen	32.4	1986	Denebola	55.0	1973
Samuel Cobb	32.6	1985	Pollux	55.0	1973
OMI Champion	37.9	1969	Altair	55.0	1973
Overseas Alice	37.3	1968	Regulus	55.0	1972
Overseas Valdez	37.8	1968	Capella	55.0	1971
Overseas Vivian	37.8	1969	Antares	55.0	1972
Bravado	4.5	1977	Hospital Ships		
Courier	35.1	1977	Mercy	69.3	1975
Patriot	35.1	1976	Comfort	69.3	1975
Ranger	35.1	1976	Aviation Logistics Support		
Rover	35.1	1977	Wright	23.9	1970
Prepositioning Ships			Curtiss	23.9	1969
PFC James Anderson	57.6	1979	Dry Cargo		
PFC William Baugh	23.1	1979	American Eagle	20.7	1981
1st Lt. Alex Bonnyman	23.1	1980	Mercury	19.2	1977
2nd Lt. John Bobo	26.5	1985	Green Wave	13.1	1980
Sgt. William Button	26.5	1986	Green Ridge	12.5	1979
Sgt. Matej Kocak	24.1	1983	Maersk Constellation	21.6	1980
Pvt. Harry Fisher	23.1	1980	Santa Adela	14.0	1966
Cpl. Louis Hague	23.1	1979	Santa Juana	14.0	1966
1st Lt. Baldonero Lopez	26.5	1985	Rainbow Hope	2.0	1980
1st Lt. Jack Lummus	26.5	1986	Rover	15.7	1969
PFC Dewayne Williams	22.5	1985	Source: Military Sealift Command		

in a reduced operational status with a nucleus crew and planned to be able to deploy in four days. Ships not dedicated to military use would be leased for commercial operation.

"Two reports would be required. The first would be on the plan for the fast sealift program and would be required within six months of enactment of this bill. The second would be a report of activities under the program and would be required three years after enactment. The conferees expect that fundamental decisions on the nature of this program will be made within six months, which should be sufficient for the selection of design options and for completion of an updated mobility study, required under section 909 of this bill.

"The conferees agree not to recommend a particular design for ships built under the program."

(Source: FY 1991 Defense Appropriations Conference Report)

Current Plan

The Navy is responsible for design and construction of these ships—with MarAd in an advisory role. The ships are to be built to commercial specification. They can either be dedicated for military use or leased for commercial operation—at the Navy's option. A detailed plan of action is required to be prepared by April 1991.

There are two basic hurdles. First, DOD must release these funds

to the Navy—a problem in the past. Second, funding which has been provided must survive potential reprogramming actions resulting from spending constraints.

Design Features

The ships are to have RO/RO capability and be able to transport one heavy Army division. Current planning calls for 120,000 bhp on two shafts with CPPs. The Navy is currently studying prime mover options which include diesel electric, geared diesel, direct drive diesel and CODAG plants.

Acquisition Actions

The Navy, with MarAd and other input, will first decide on specific performance requirements. NAVSEA will then prepare a contracting package—inviting offers through issuance of a circular of requirements. It is likely that competing design contracts will be awarded to three or four teams—with one or two of these teams selected for the construction contract.

The construction contract is likely to be fixed price, probably with an incentive provision. Commercial standards will apply to most equipment. Only U.S. yards will be eligible to compete for construction. The contract terms may include a requirement for full or partial domestic production of prime movers.

Points of Buying Influence

A procurement of this magnitude involves a complex set of players. The Deputy Chief of Naval Operations for Logistics (OPNAV 04) will develop the performance criteria for inclusion in the circular of requirements. USTRANSCOM, MTMC and MSC will provide input for commercial viability.

The Naval Sea Systems Command (NAVSEA 377) will manage the program. NAVSEA 05 will perform design and engineering—with assistance from the David Taylor Research Center, MarAd and support firms. NAVSEA 02 will handle the contracting.

IMA is preparing an in-depth assessment of this business opportunity from the viewpoint of prospective bidders. A detailed report will be published in December—providing information highly useful to firms in structuring marketing and bid activities for the sealift program. Purchasers of the report will, over the following 12 months, receive advisory memos on key program developments. The report is available for \$1,200 by contacting: IMA Associates, Inc., 2600 Virginia Avenue, NW, Suite 901, Washington, D.C. 20037, telephone (202) 333-8501, fax (202) 333-8504.

MAJOR NAVY CONTRACTS

(Compiled by Maritime Reporter Staff)

Metro Machine Corporation, Norfolk, Va., was awarded a cost-plus-award-fee contract that, with options, is valued at **\$53,911,013** for phased maintenance of LSD-41 class ships homeported in Norfolk under the Phased Maintenance Program. This contract will require advance planning and actual repair and modernization work under short availabilities. It will also require some post shakedown availability work. The work is expected to be completed October 25, 1994. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-90-C-8530).

General Dynamics Corporation, Electric Boat Division, Groton, Conn., was awarded a **\$43,327,101** cost-plus-fixed-fee contract for development studies and design, fabrication and integration of engineering development models/prototypes related to the SSN-21 submarine program. Work is expected to be completed by September 30, 1992. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-90-C-2901).

Raytheon Company, Submarine Signal Division, Portsmouth, R.I., was issued a **\$6,146,379** modification to furnish 140 various line items to be used as spare parts in support of the Combat Acoustic Control System AN/BSY-1 Program for shipboard use. Expected completion date is in August 1993. The Navy Ship Parts Control Center, Mechanicsburg, Pa., is the contracting activity (N00024-90-C-6028). (Mod PK0001)

Sparton Defense Electronic, DeLeon Springs, Fla., was awarded a **\$9,116,336** firm-fixed-price order for the retrofit of 30,000 AN/SSQ-77A sonobuoys. The AN/SSQ-77A sonobuoys will have AN/SSQ-77B convergent zone beam pattern performance characteristics. Work is expected to be completed in March 1992. The Naval Avionics Center, Indianapolis, Ind., is the contracting activity (N00163-90-C-0179).

McDonnell Douglas Missile Systems Company, St. Louis, Mo., was awarded a **\$42,396,350** firm-fixed-price contract for 13 shipboard launch systems for the Harpoon missile. Work will be performed in St. Louis, Great Neck, N.Y., San Diego, Calif., and Baltimore, Md., and is expected to be completed in May 1992. This contract combines the purchases of the U.S. Navy with the governments of Turkey, Korea, Indonesia and Australia under the Foreign Military Sales Program. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-90-C-5561).

IBM, Manassas, Va., is being awarded an **\$8,655,071** modification for various quantities of 257 different line items of spare parts for use in the AN/BSY-1 system. Work is expected to be completed in August 1993. The Navy Ships Parts Control Center, Mechanicsburg, Pa., is the contracting activity (N00024-90-C-6031).

General Electric Company, Defense Systems Division, Pittsfield, Mass., was awarded a **\$56,830,800** firm-fixed-price contract for the FY 1990 option for the MK-15 PHALANX Close-In Weapon System production hardware. The option awards 18 systems and 11 Block 1 ORDALT kits. Work is expected to be completed July 31, 1992. The Naval Sea Systems Command is the contracting activity (N00024-89-C3130).

General Dynamics Corporation, Pomona Division, Pomona, Calif., was awarded a **\$63,753,856** firm-fixed-price contract for the FY 1990 option for the MK-15 PHALANX Close-In Weapon System production hardware. The option awards 18 systems and 10 Block 1 ORDALT kits. Work is expected to be completed July 31, 1992. This contract combines purchases for the U.S. Navy and Greece under the Foreign Military Sales

Program. The Naval Sea Systems Command is the contracting activity (N00024-89-C3148).

Construction and Rigging, Incorporated, Snohomish, Wash., was awarded a firm-fixed-price contract to upgrade and repair a crane with option to upgrade a second crane at the Trident Refit Facility, Naval Submarine Base, Bangor, Wash. (including the option, total contract value is expected to be **\$6,193,000**). Work is expected to be completed in July 1991. The Naval Facilities Engineering Command, Western Division, San Bruno, Calif., is the contracting activity (N62474-90-C-0094).

Avondale Industries, Incorporated, Shipyard Division, New Orleans, La., has been awarded a **\$63,642,207** fixed-price-incentive contract for construction of one MHC-51 class ship. Work will be performed in Gulfport, Miss., and is expected to be completed February 1994. The Naval Sea Systems Command is the contracting activity (N00024-90-C-2304).

United Technologies Corporation, Hamilton Standard Division, Windsor Locks, Conn., was awarded a **\$5,358,680** firm-fixed-price contract for six electrolytic chlorine generators for the SSN-688 class ship-

building program. Work is expected to be completed March 31, 1992. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-90-C-4125).

Halter Marine, Inc., Gulfport, Miss., was awarded a **\$5,227,839** option for the construction of three 77-foot PCFs (Patrol Craft, Fast) under a previously awarded firm-fixed-price contract. Work will be performed in New Orleans, La., and is expected

(continued on page 33)

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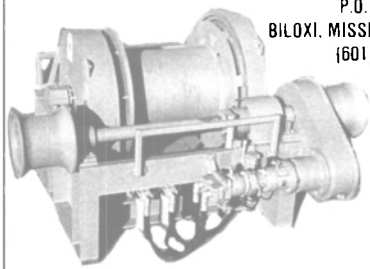


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Cost Of Naval Operations In Persian Gulf Region Continues To Escalate

Supplemental Funding Package Likely

The projected cost for U.S. naval operations related to Operation Desert Shield through September 30 has more than doubled—from \$230-million to \$490-million—according to figures released by the Pentagon recently. Pentagon officials attributed the increase to various factors, including a \$10-per-barrel increase in the price of oil, increased operating tempo for ship steaming and aircraft flight operations and additional personnel costs required by the call-up of Reserve units. The skyrocketing costs of U.S. operations in the Persian Gulf region has increased the likelihood that Congress will be asked to approve a supplemental appropriations bill soon after it reconvenes.

The combination of increased ship steaming and aircraft flight operations will add \$175-million to the overall bill for Desert Shield, the Pentagon says. Deployed ships usually only steam for 51 days per quarter but, those ships currently deployed as part of the "intercept" effort—designed to enforce U.N. mandated sanctions against Iraq—are expected to increase steaming to 90 days per quarter, a 76% increase.

Navy involvement in the deployment of other U.S. forces is also increasing Service costs. The eight SL-7 class Fast Sealift ships being used to transport equipment to Saudi Arabia have cost \$34-million to activate, crew, equip and deploy. The activation and operation of 16 Roll-On Roll-Off ships from the ready reserve fleet has cost an additional \$95-million. A further \$9-million in added costs has resulted from the activation and deployment of two Navy prepositioned ships required mainly for aviation logistics support.

The skyrocketing costs of Desert Shield and the looming end of the fiscal year will most likely cause the President to seek a supplemental funding package, Pentagon officials say. The DOD will have three options to fund operation in the Persian Gulf. These include seeking a supplemental appropriation; reprogramming funds between existing programs and soliciting contributions from foreign nations.

Pentagon spokesman Pete Williams said there "is some cost sharing going on" but declined to specify what countries were giving and how much they have contributed. Mr. Williams also noted that it would be possible for the President to utilize a little known law, the so-called "Feed and Forage Act" of 1861 that would allow DOD to "spend now and send Congress the bill later." This act has been used by DOD seven times since 1963, often due to late appropriations, he said.

Mr. Williams also noted that naval forces of other nations are actively participating in the U.S. organized blockade of Iraqi and other regional ports. However, while U.S. ships have boarded several vessels to examine cargo and determine destination, Mr. Williams said he was unaware of any boardings undertaken by foreign naval vessels. The multinational naval force now in the Gulf or on its way to the region represents the largest such flotilla in recent history. The Pentagon estimated the cost of the Desert Shield operation in Saudi Arabia to be \$2.5-billion through the end of the fiscal year. In early August the cost was estimated at \$1.8-billion. The cost includes support for ground troops, reserve call-up and deployment of three aircraft carrier battle groups to the area.

The Following Is A List Of Foreign Warships Deployed Or En Route To The Region:

BRITAIN:

York destroyer
Jupiter and Battleaxe frigates
Chatham, Londons and
Broadsword frigates en route
various patrol craft and three
mine-sweepers en route

FRANCE:

Carrier Clemenceau Battle Group
Colbert Cruiser
Var replenishment ship
Dupleix and Mountcalm
destroyers
Commandant Ducuing frigate
Protet Frigate

ITALY:

Minerva and Sfinge corvettes in
Mediterranean to replace U.S.
ships sent to Gulf
Libeccio and Orda frigates
en route to Gulf

WEST GERMANY:

Three Type 331 minehunters
Two Type 343 minehunters
Werra depot ship
Westerwald transport ship;
all to deploy in Eastern
Mediterranean

BELGIUM:

Iris and Myosotis minehunters
Zinnia support ship

NETHERLANDS:

Witte de With air defense frigate
Pieter Florisz frigate

AUSTRALIA:

Adelaide and Darwin FFG 7
type frigates
Success fleet replenishment ship

CANADA:

Terra Nova and Athabaskan
destroyers

SPAIN:

Santa Maria frigate
Descubierta and Cazadora
corvettes en route

Major Navy Contracts

(continued from page 29)

to be completed by March 18, 1992. This contract modification fulfills the requirements of the Republic of the Philippines under the Foreign Military Sales Program. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-89-C-2020).

Scientific Atlanta, Inc., San Diego, Calif., was awarded a **\$20,063,467** firm-fixed-price contract for (25) AN/BQR 22A EC-15 sonar receiving sets. Work is expected to be completed by December 30, 1997. The Naval Sea Systems Command is the contracting activity (N00024-90-C-6004).

Bollinger Machine Shop & Shipyard, Inc., Lockport, La., was awarded a **\$91,313,393** firm-fixed-price contract for construction of eight Coastal Patrol Boats (PCBs). Work is expected to be completed by April 20, 1993. The Naval Sea Systems Command is the contracting activity (N00024-90-C-2293).

Southwest Marine, Inc., San Diego, Calif., was awarded a **\$42,098,516** cost-plus-award-fee contract including options for the Phased Maintenance Program for LSDs homeported in San Diego. Work is expected to be completed October 14, 1994. The Naval Sea Systems Command is the contracting activity (N00024-90-C-8504).

Sperry Marine, Inc., Charlottesville, Va., was awarded a **\$9,101,285** firm-fixed-price contract for five Type 8J Mod 3 periscopes for SSN 21 and SSBNs 739, 740, 741 and 742. Work is expected to be completed by June 1993. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-90-C-4137).

Cincinnati Gear Company, Cincinnati, Ohio, was awarded a **\$5,000,000** firm-fixed-price contract to provide AOE class combat support ship reversing reduction gear design and manufacturing data rights to the U.S. government. This contract also provides for the conversion of the design and manufacture of three shipsets of reversing reduction gears from Contractor-Furnished Equipment (CFE) to Government-Furnished Equipment (GFE), plus an option for one additional shipset. These gear sets were originally being provided by National Steel and Shipbuilding under their contract for the design and construction of AOE 6 class ships. Work will be performed in Cincinnati and Lebanon, N.J., and is expected to be completed in June 1993. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-90-C-2312).

Raytheon Company, Equipment Division, Wayland, Mass., was awarded a **\$5,214,492** modification to a previously awarded cost-plus-fixed-fee contract to develop the advanced frequency agile X-band STAMO/Exciter for the T-2348/SPG transmitter in support of the Aegis Shipbuilding Program. Work is expected to be completed in February 1993. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-90-C-5144).

Newport News Shipbuilding and Dry Dock Company, Newport News, Va., was awarded a **\$1,100,930,506** cost-plus-incentive-fee modification for the refueling and overhaul of USS Enterprise (CVN-65). Work is expected to be completed May 4, 1994. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-86-C-2078).

Simplex Wire & Cable Co., Newington, N.H., was recently awarded a **\$5.9-million** firm-fixed-price contract for oceanographic equipment. Space and Naval Warfare Systems Command, Washington, D.C., awarded the contract (N00039-90-C-0005).

Sofec, Inc., Houston, Texas, was recently awarded a **\$6.2-million** modification to a firm-fixed-price contract for offshore petroleum discharge system equipment. Naval Sea Systems Command, Washington, D.C., awarded the contract (N00024-86-C-2212).

Raytheon Co., Wayland, Mass., recently received a **\$9.2-million** modification to a firm-fixed-price contract to refurbish and upgrade the Mk 74 Mod 14 missile fire control systems of CGN 36, CGN 37 and CGN

40. Naval Air Systems Command, Washington, D.C., awarded the contract (N00024-89-C-5607).

Westinghouse Electric Corp., Annapolis, Md., was recently awarded **\$6.6-million** contract under a basic ordering agreement for various quantities of eight different line items of support spares for AN/AQS-14 weapon systems. Navy Ships Parts Control Center, Mechanicsburg, Pa., awarded the contract (N000104-85-G-A090).

Unisys Corp., Great Neck, N.Y., was recently awarded a **\$180.6-million** firm-fixed-

price contract for seven Mk 92 fire control system coherent receiver/transmitter ordnance alteration kits and four Mk 92 (Mod 2) fire control systems with CORT upgrade. Naval Sea Systems Command, Washington, D.C., awarded the contract (N00024-89-C-5626).

Textron Marine Systems, New Orleans, La., was recently awarded an **\$8.4-million** modification to a fixed-price-incentive con-

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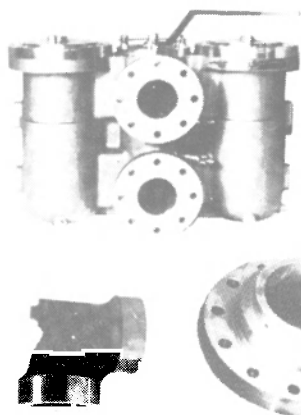
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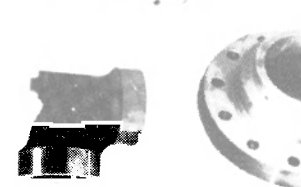
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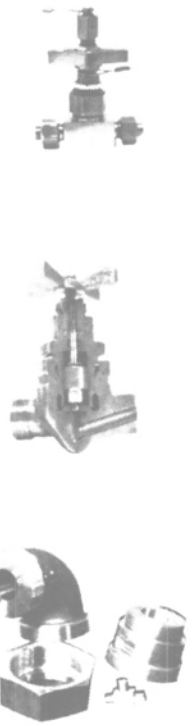
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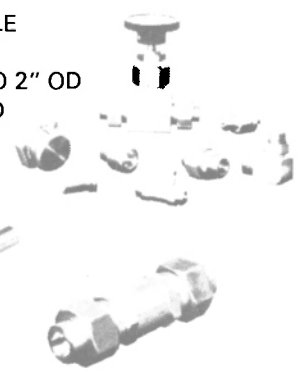
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Major Navy Contracts

(continued)

tract for spares acquisition integrated with production spare parts for the landing craft, air cushion program. Naval Sea Systems Command, Washington, D.C., awarded the contract (N00024-89-C-2028).

OMI Bulk Transport, Inc., New York, N.Y., was awarded a **\$144.7-million** firm-fixed-price with reimbursable contract for the charter of M/V Ranger, M/V Rover, M/V Courier and M/V Patriot. Military Sealift Command, Washington, D.C. awarded the contracts (N00033-90-C-1704, N00033-90-C-1705, N00033-90-C-1706, N00033-90-C-1707).

Textron Inc., N.Y., was awarded a **\$30-million** firm-fixed-price contract for four AN/SPN-46 precision approach and landing systems for aircraft carriers (CV-64, CVN-74, CVN-75 and CVN-65). Naval Air Systems Command, Washington, D.C., awarded the contract (N00019-90-C-0258).

Newport News Shipbuilding and Dry Dock Co., Newport News, Va. was awarded a **\$27.2-million** cost-plus-fixed-fee contract to execute Post Shakedown Availability (PSA) for USS Albany (SSN-753). Supervisor of Shipbuilding, Conversion and Repair, Newport News, Va., (N00024-86-H-8002).

Newport News Shipbuilding and Dry Dock Co., Newport News, Va. was awarded a **\$16.-million** modification to a previously awarded cost-plus-fixed-fee contract for design agent services for SSN 668 submarines. Naval Sea Systems Command, Washington, D.C., awarded the contract (N00024-90-C-2032).

AT&T Technologies, Inc., Greensboro, N.C., was awarded a **\$6.3-million** modification to a previously awarded cost-plus-fixed-fee contract for oceanographic services. Space and Naval Warfare Systems Command, Washington, D.C., awarded the contract (N00039-90-C-0087).

STC Submarine Systems, Portland, Ore., was awarded a **\$15.5-million** fixed-price-incentive/cost-no-fee first article contract for oceanographic equipment. Space and Naval Warfare Systems Command, Washington, D.C., awarded the contract (N00039-90-C-0057).

Simplex Wire and Cable Co., Portsmouth, N.H., was awarded a **\$11.8-million** firm-fixed-price contract for oceanographic

equipment. Space and Naval Warfare Systems Command, Washington, D.C., awarded the contract (N00039-90-C-0413).

Valley Detroit Diesel Allison, City of Industry, Calif., was awarded a **\$5.2-million** firm-fixed-price contract for three 2,500-kilowatt diesel power plants for various naval activities. Naval Facilities Engineering Command, Atlantic Division, Norfolk, Va., awarded the contract (N47408-90-C-2017).

Swiftships, Inc., Morgan City, La., was awarded a **\$13.8-million** firm-fixed-price contract to construct two 88-foot Route Survey vessels. Naval Sea Systems Command, Washington, D.C., awarded the contract (N00024-91-C-2205).

Norfolk Naval Shipbuilding and Drydock Corp., Norfolk, Va., was recently awarded a **\$46.8-million** cost-plus-award-fee contract including options for the Phased Maintenance (PM) program for tank landing ships (LST) homeported in Norfolk, Va. Naval Sea Systems Command, Washington, D.C., awarded the contract (N00024-91-C-8505).

Newport News Shipbuilding and Dry Dock Co., Newport News, Va., was awarded a **\$26.6-million** cost-plus-fixed-fee contract for expanded planning yard services for SSN 688 class submarines. Naval Sea Systems Command, Washington, D.C., awarded the contract (N00024-91-C-2103).

Falcon Carriers Inc., Houston, Texas, was awarded a **\$9.4-million** firm-fixed-price with reimbursables contract to provide ocean transportation for point-to-point delivery of petroleum products to armed services users throughout the world. Military Sealift Command, Washington, D.C., awarded the contract (N00033-91-C-1701).

Texaco Inc., Port Arthur, Texas, was awarded a **\$11.3-million** firm-fixed-price with reimbursables contract to provide ocean transportation for point-to-point delivery of petroleum products to armed services users throughout the world. Military Sealift Command, Washington, D.C., awarded the contract (N00033-91-C-1702).

Philadelphia Tanker Corp., New York, N.Y., was awarded a **\$12.6-million** firm-fixed-price with reimbursables contract to provide ocean transportation for point-to-point delivery of petroleum products to

armed services users throughout the world. Military Sealift Command, Washington, D.C., awarded the contract (N00033-91-C-1700).

Ingalls Shipbuilding Inc., Pascagoula, Miss., was awarded a **\$30.1-million** cost-

plus-fixed-fee modification for planning yard services to support the fleet modernization program for DD-963 and DD-993 Class destroyers. Naval Sea Systems Command, Washington, D.C., awarded the contract (N00024-88-C-2081).

Ingalls Shipbuilding Christens Aegis Cruiser Anzio—15th Of 19 Being Built For U.S. Navy

CG-68, the 15th of 19 Ticonderoga Class Aegis guided missile cruisers to be built by Ingalls Shipbuilding division of Litton, Pascagoula, Miss., was recently christened Anzio.

Principal speaker for the event was Congressman **C.V. Montgomery** of Mississippi's Third Congressional District.

Aegis ships are designed and built to provide primary protection for the Navy's battle forces. Aegis cruisers are 567 feet long, with a beam of 55 feet. Four GE LM2500 gas turbine engines power the 9,500-ton ships to speeds in excess of 30 knots.

The CG-68's combat system, the heart of the ship's capability, is a significant advance in fleet air defense. Four fixed array radar antennae, mounted on the four sides of the ship's superstructure, replace conventional rotating radars, enabling the ship and her crew to scan in all directions simultaneously.

The Anzio is equipped with the MK 41 Vertical Launching System (VLS), a multiwarfare missile launching system capable of firing missiles against air, surface and underwater threats. VLS is composed

of modules symmetrically grouped to form launcher magazines, located both forward and aft on the ship's deck.

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As lead shipbuilder for the Aegis cruiser program, Ingalls has been contracted to build 19 of the 27 Aegis cruisers authorized for construction since 1978. Twelve Ingalls-built Aegis cruisers are now in the fleet, with the 13th, the Chosin (CG-65), delivered to the Navy last month. Ingalls is also building DDG-51 Class Aegis guided missile destroyers, with six ships under contract.

Other U.S. Navy shipbuilding contracts at Ingalls include three LHD amphibious assault ships. The Essex (LHD-2), now at approximately 70 percent complete, is scheduled for launch at the end of the year.

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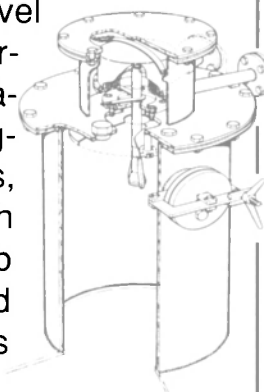
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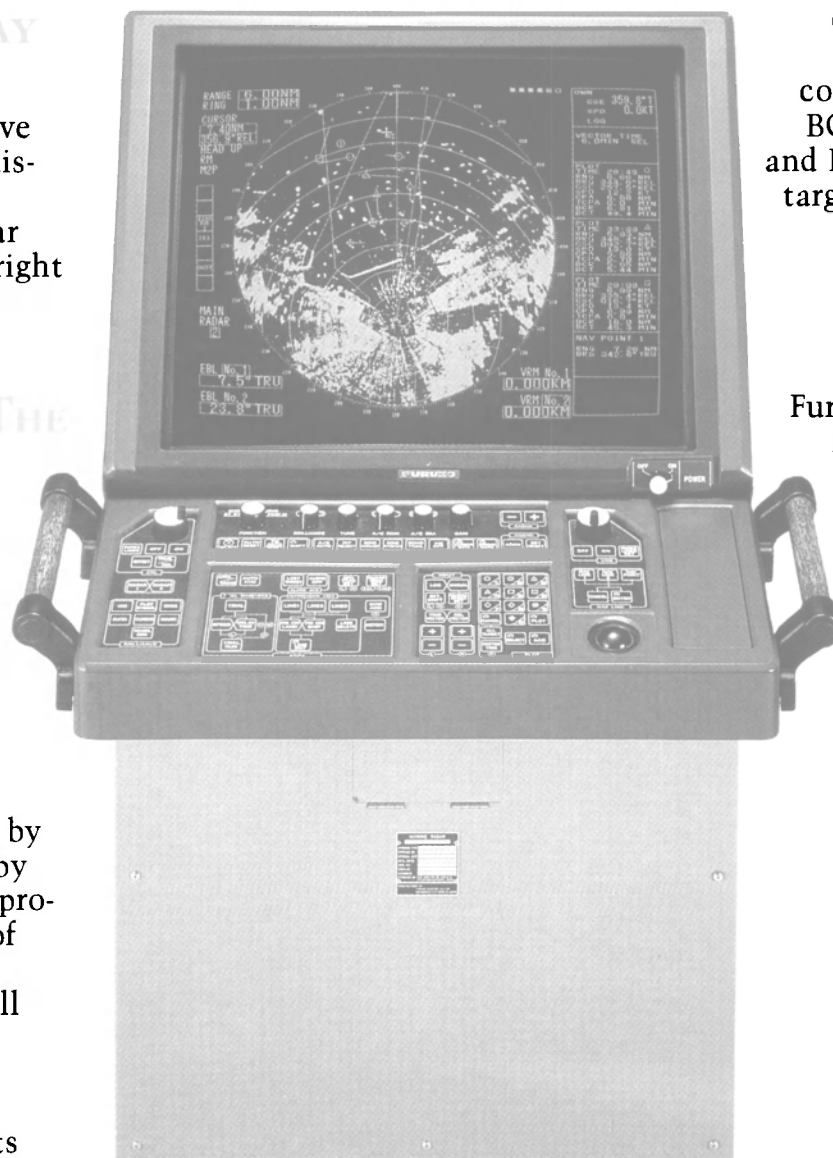
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- order for sealift ships—with the Kuwait invasion providing additional incentive
- continued orders of naval combatants, surveillance and survey ships—though at a slower pace than the preceding five years
- numerous ferries, municipal craft, Coast Guard cutters and tenders, and other smaller vessels
- a sharp increase in the offshore sector—spurred on by rapidly increasing oil prices
- orders for floating alcohol production plants—again spurred by rising oil prices
- continued growth in the megayacht business—already a sizable export business being developed by U.S. firms
- river barge orders approaching 1,000 annually—driven by replacement requirements

IMA's new report assesses underlying market drivers and forecasts construction in each of 38 individual market segments—taking into account recent developments such as the double bottom legislation, conflict with Iraq and eroding economic scene.

Large Commercial Ships

- cruise ships
- coastal container and ro-ro ships
- Alaskan crude carriers
- product and other crude carriers
- chemical and speciality tankers
- Great Lakes self-unloaders
- bulk carriers and seagoing barges

Major Government Ships

- combatants
- support ships
- sealift ships
- surveillance and research ships
- icebreakers
- foreign naval ship sales

Small Ships and Boats

- ferries
- dinner and excursion boats
- coastal and river cruise vessels
- municipal craft
- harbor and coastal tugs
- small naval craft
- Coastal Guard cutters and tenders
- Army watercraft
- FMS patrol boats

Offshore Equipment

- offshore rigs and drill ships
- production platforms
- offshore support vessels

Fishing Boats

- fish processing ships
- tuna seiners
- other fishing boats

Recreational Boats

- megayachts

Inland Waterway Equipment

- river towboats
- river barges

Dredges

- pipeline dredges
- seagoing hopper dredges
- mechanical dredges

Other Fabrications

- sunken tube tunnel sections
- floating plants
- modular assemblies
- accommodation barges

Nothing like this report is available anywhere. Under one cover is an in-depth assessment of the entire U.S. marine sector—present and future. The report is tailored for use by business planners and marketing managers. It provides a totally objective, analytical data base useful for setting strategy and long term business plans. Intended users are shipbuilders, machinery manufacturers, marine electronics firms and other suppliers to the marine business.

Telephone or telefax orders will be accepted.

**IMA Associates, Inc.—2600 Virginia Ave., NW—Suite 901—Washington, DC 20037—Tel: 202-333-8501—
Fax: 202-333-8504**

Outstanding Ships

(continued from page 24)

mer of 15,300 bhp at 102 rpm and an ncr of 13,000 bhp at 97 rpm. Electric power is supplied by three Ssangyong-MAN B&W generator engines driving HEECO generators producing 980 kw each. One 99-kw MAN B&W Demp emergency generator set is also provided.

Maneuverability is enhanced with the use of Lips CP bow and stern thrusters.

Equipment List

Main engine	Hyundai-MAN B&W
Auxiliary engines	Ssangyong-MAN B&W
Propeller	Hyundai
Bow & stern thruster	Lips
Main generators	HEECO
Emergency generator	MAN B&W/Demp
Radar	Krupp-Atlas
Lifeboat & life raft	Hyundai/Viking
Cargo compressors	Sulzer

NORDIC EMPRESS

Cruise Ship

Chantiers De L'Atlantique

This past year, Royal Caribbean Cruise Line (RCCL) of Miami entered the popular three- and four-night cruise market with its new 1,610-passenger Nordic Empress, delivered by GEC-Alsthom's Chantiers de L'Atlantique shipyard in St. Nazaire, France.

First class accommodation for 1,610 passengers is arranged in 801 two-berth cabins and four suites over five decks of the 12-deck ship. Sixty percent of all her staterooms have a view of the sea and 71 deluxe staterooms and suites have balconies.

The centerpiece and crowning achievement of the Nordic Empress is her spectacular atrium called the Centrum, which traverses nine decks and is crowned by a skylight. The atrium, which incorporates sculpture, plants and even waterfalls, is served by glass-enclosed elevators.

The 44,300-grt, 12-passenger deck Nordic Empress has an overall length of 692 feet, length between perpendiculars of 673 feet, 100-foot beam.

Propulsion power is supplied by two 12-cylinder V configuration Wartsila Vasa 32 and two eight-cylinder Wartsila Vasa 32 main engines. The geared diesels drive twin controllable-pitch propellers at 105 rpm.

Auxiliary power is generated by three Wartsila Vasa 8R32 diesel generator sets, producing a total of 9,300 kw.

Alfa Laval S.A., Les Claves Sous Bois, France, supplied nine separators mounted on modules with program units, S&T heaters, with sludge tanks, three boosters for ME

NORTHERN VENTURE

Bulk Carrier

Nippon Kokan

This past year Japanese ship-builder Nippon Kokan K. K.

(NKK) delivered the bulk carrier Northern Venture to her owner, Alcan/Bermuda Ltd. Completed at NKK's Tsu Works, the 36,766-dwt vessel has an ice-reinforced hull to permit year-round navigation to Alcan's Arvida plant on the St. Lawrence River which is frequently ice-bound. The Northern Venture is built to carry Jamaican alumina.

The Northern Venture will be joined later by the Northern Prog-

ress, also specially reinforced to Lloyd's Ice-Class 1A standards. She is also being delivered by the company's Tsu yards.

The Northern Venture has an overall length of 385 feet, molded breadth of 96 feet and draft of 49 feet. Propulsion is provided by an NKK-Sulzer 7RTA58 main engine with an output of 15,120 hp at 127 rpm, producing a service speed of 14.6 knots.

OSCO STRIPE

Product Tanker

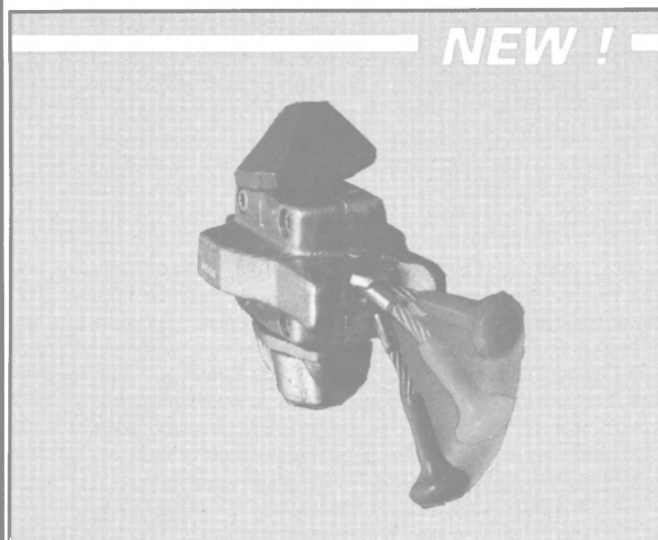
Uljanik

This past fall, the Pula, Yugoslavia, shipyard of Uljanik Shipyard delivered the third in a series of three 40,200-deadweight product tankers,

(continued)

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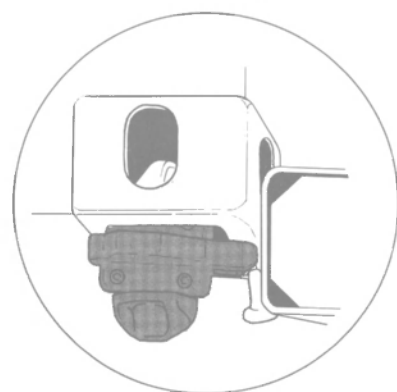


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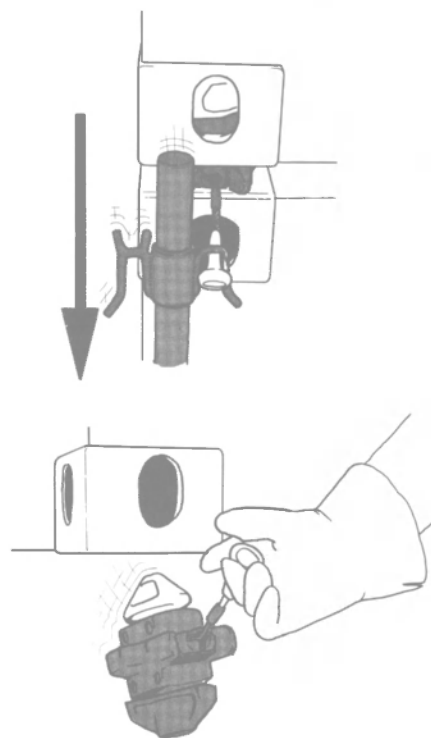
PAT. PEND

UNIQUE FEATURES:

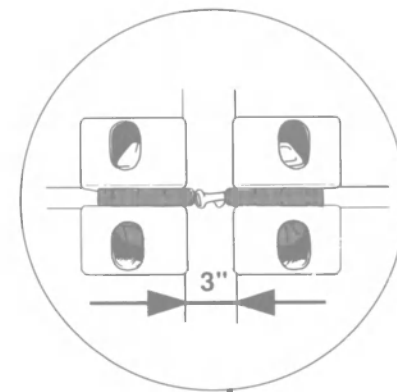
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Outstanding Ships

(continued)

the Osco Stripe, to the Osco Carriers Pool, under the commercial management of Osco Shipping A/S.

The Osco Stripe, like her sister ships, will serve to widen the scope and flexibility of the pool which currently totals 11 vessels.

Classed by Det norske Veritas as

+A1 Tanker for Oil and Caustic Soda, EO, COW, Inert, the 577-foot Osco Stripe is propelled by a MAN B&W-Uljanik slow-speed, long-stroke, direct reversible, constant turbocharged 5L50MC diesel engine. The specified power for propulsion without the shaft generator is 9,225 hp at 111 rpm. Maximum continuous output is 10,500 hp. Her four-bladed, fixed-pitch propeller was supplied by Lips BV.

Auxiliary power is supplied by two 6ATL250 Jugoturbina-Sulzer diesel generator sets, each developing 1,200 kw at 900 rpm. The generators are Uljanik-built Siemens type S7198 with nominal power of 1,350 kva.

The Osco Stripe has a molded beam of 105 feet, depth of 49.5 feet, summer draft of 36.8 feet deadweight at design draft of 34,300 dwt and deadweight at summer draft of

40,200 dwt.

Her cargo tanks are laid out in a configuration with six center tanks and 14 wing tanks with an aggregate capacity of 45,000 m³ when 100 percent filled. She has double bottoms beneath all her cargo tanks.

Equipment List

Main engine	MAN B&W-Uljanik
Shaft generator	Uljanik
Propeller	Lips
Auxiliary engines	Jugoturbina-Sulzer
Generators	Uljanik-Siemens
Alternator	Uljanik-Siemens
Speed log	Simrad
Echo sounder	Simrad
Gyrocompass, automatic pilot	C.Plath
Radar	Krupp Atlas Elektronik
Navigation system	Racal Decca
Facsimile recorder	Simrad
Sound-powered telephones	Debeg
Centrifugal pumps	IMO
Tank cleaning pumps	IMO
Sounding control system	Autronica
Hydraulic power plant for ballast & cargo valves	Skarpenord
Cargo hose cranes	Uljanik
Bow anchors	Blohm & Voss
Halon extinguishers	Walter Kidde

PECOS Fleet Oiler Avondale Industries

The U.S. Navy fleet oiler Pecos (T-AO-197) was delivered this year by Avondale Industries, Inc.'s Shipyards Division, New Orleans, La., to the U.S. Navy.

Built with the use of modern modular construction techniques, the Pecos is 667-1/2 feet long, with a beam of 97-1/2 feet and maximum draft of 36 feet. Her main propulsion consists of two 10-cylinder PC4.2 Colt-Pielstick diesel engines manufactured by Fairbanks Morse Engine, a division of Coltec Industries, Inc. (formerly Colt Industries). The engines are capable of burning heavy fuels of up to 3,500 sec Redwood at 100 degrees F. The fuel rate guarantee is 136 grams/metric horsepower hour. The twin-screw design provides the T-AOs with improved directional stability, ease of control and mission reliability.

Capable of speeds of 20 knots, the mission of the Pecos is the transport of bulk products and fuel to shore depots to combatants and support

Equipment List

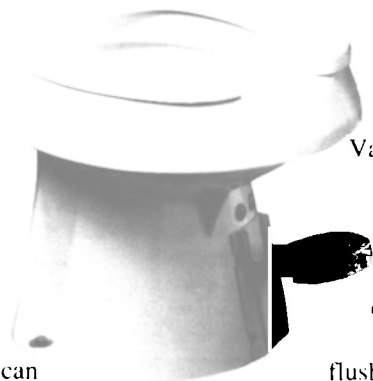
Main engines (2)	Colt-Pielstick
CP propellers	Bird-Johnson
Reduction gears	Falk
Generator engines	Bergen Diesel
Ship service generators	Cogenel
PTO ship service generators	Cogenel
Emer. generator	Rotary Energy
Emer. generator engine	Detroit Diesel
Clutch & shaft couplings	Airflex
Cargo booms & engine room cranes	Avondale
Steering gears	Jered Brown
Topping, saddle, gypsy, spanwire highline & hauling winches, anchor windlasses & sliding block drives	Lake Shore
Davits & lifeboat & rescue boat winches	Schat Davit
Motor lifeboats	Harding Safety
Rescue boats	Zodiac

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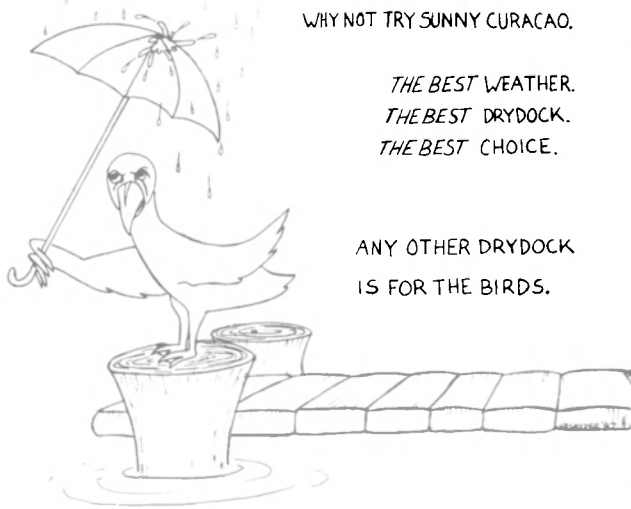
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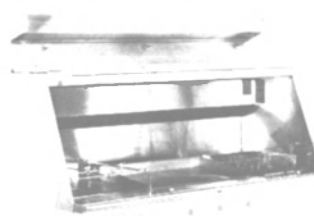
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forces underway. The new oiler has a cargo capacity of 183,500 barrels of oil in 18 cargo tanks and is capable of simultaneously receiving, storing and discharging two separate grades of cargo fuel. All cargo valve and pump operations and the ship's segregated ballast system are manipulated from the cargo control center located in the ship's aft superstructure, which has an overview of the entire underway replenishment deck.

Cargo underway replenishment is accomplished using transfer hoses suspended by a span wire automatically maintained in a constant-tension range.

RAILSHIP III

Train Ferry

Schichau Seebeckwerft

This year, Germany's Schichau Seebeckwerft AG, a member of the Bremer Vulkan Group, completed what is reportedly the world's largest train ferry, the 622-foot Railship III, for the Railship Group, Lübeck-Travemünde.

Managed by the German shipping company H.M. Gehrckens GmbH, Hamburg, the 10,000-dwt railferry adds about 2,000 meters of rail length on three decks to the Railship Group's total of 5,600. Like her sisters, Railship I and Railship II, the railferry operates between Travemünde in Northern Germany and Hanko in Southern Finland.

The Railship III, with a width of 70 feet and design draft of 19 feet, carries 90 railcars on three decks. Private cars can be loaded on the weatherdeck by car-loading/unloading davits on both sides of the ship.

Built to meet the requirements of Germanischer Lloyd Class E4 and Finnish Ice class 1A Super, the Railship III is propelled by a pair of Wartsila Vasa 46 main engines, the most powerful diesels built by Wartsila Diesel, which each generate 8,145 kw (10,922 hp) at 450 rpm. Designed for heavy fuels up to a viscosity of 700 cSt/50 degrees C, the engines drive a Lips CP propeller through Lohmann & Stolterfoht reduction gearing.

Auxiliary power is supplied by two Wartsila Vasa 4R32 heavy fuel engines, which produce 1,620 kw each at 720 rpm. The auxiliary engines operate on the same fuel as the main engines.

Equipment List

Main engines(2)	Wartsila Vasa
Generator engines	Wartsila Diesel
Reduction gears	Lohmann & Stolterfoht
CP propeller	Lips
Clutches	Voith Turbo
Separators	Westfalia Separator
Refrigeration	Sabroe
Radar	Krupp Atlas Elektronik
Gyrocompass	C. Plath
Signal lights	Aqua Signal

RELENTLESS

Ocean Surveillance Ship

Trinity Marine

The Trinity Marine Group's Halter Marine, Inc., Moss Point, Miss., shipyard completed a six-

ship, approximately \$85-million contract with the U.S. Navy, with delivery of the ocean surveillance ship USNS Relentless (T-AGOS 18).

The last of 18 planned monohull T-AGOS class ships to join the Navy's ocean surveillance program, the 224-foot-long Relentless has a beam of 43 feet and draft of 15 feet 1 inch.

Operated by the Military Sealift Command (MSC) and staffed by

civilian technicians, the Relentless will tow electronic devices to monitor the movement of submarines. The Relentless will deploy towed linear arrays of hydrophones known as the Surveillance Towed Array Sensor System (SURTASS). SURTASS is comprised of flexible, neutrally buoyant cable containing a large number of passive microphones, each tuned to specific frequencies enabling identification of noises made by submarines many

miles away.

The data is processed and transmitted to shore via satellite, where it supplements information from seabed arrays.

Main propulsion and other ship's service on the Relentless is diesel-electric, provided by four Caterpillar/Kato 600-kw generators driving two General Electric motors. Power is transmitted through two shafts

(continued)

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The Baltic cruise ferry Silja Serenade, built by Finnish yard Masa, features a five-deck-high promenade.

Outstanding Ships

(continued)

and full load displacement is approximately 11 knots and normal operating speed is about three knots.

The vessel will carry nine officers, 11 crew, and 10 technicians. In addition to the usual living spaces, the Relentless also has a recreation room, exercise room, ship's store, and a self-service laundry.

Equipment List

Main engines	GE
Propellers	Matsui/Nakashima
Thruster	Schottel
Thriuster motor	GE
Generator engines (4)	Caterpillar
Generators (4)	Kato
Engine controls	GE
Steering controls	Sperry Marine
VHF radios	ITT Mackay
Radar	Raytheon
Compass	Baker Lyman
Loran	Micrologic
Autopilot	Sperry Marine
Pumps	Aurora/Carver/Delaval
Towed array winch	Appleton Marine

SILJA SERENADE Cruise Ferry MASA-Yards

The Turku shipyard of Finnish builder Masa-Yards recently delivered the cruise ferry Silja Serenade to Silja Line. When she goes into service between Helsinki and Stockholm, the Silja Serenade will mark a new era in the ferry traffic in the

Baltic.

Masa-Yards and Silja Line have been actively developing the "Baltic Ferry Concept" since the late fifties and early sixties. The 665-1/2-foot Silja Serenade, although it incorporates many of the design achievements of the past, is unique because of the Silja Promenade. This "main street" is a huge atrium on her main deck, with a length of 470 feet, width of 27 feet and height of five decks. The promenade is accented by skylights atop and a glass wall at the aft end of the ship, thus providing passengers with a view of both the sea and sky. Restaurants, shops, and other recreational and entertainment facilities are accessible from the promenade.

In addition, two accommodation blocks are situated on each side of the promenade, with cabins facing either the sea or the main street.

The Silja Serenade will have a gross tonnage of 58,376 tons, breadth of 103 feet, and design draft of about 22 feet. She has a passenger capacity of 2,500 in 952 cabins. Additionally, the Silja Serenade can also accommodate 450 cars or 60 trucks.

Equipment List

Main engine	Wartsila Vasa
Auxiliary diesel	Wartsila
Reduction gear	Renk-Tacke
Clutch	Renk-Tacke
CP Propeller	KaMeWa
Shaft & stern tube bearings & shaft seals	Waukesha-Lips
Electric motors &	



The Cap Polonio is based on Flender Werft's steam-geared containership design "Flender 2000."

diesel alternator	ABB
Emer. diesel	Caterpillar
Emer. alternator	Stamford
Autopilot, radar, speed indicator & echo sounder	Atlas
Direction finder	C. Plath
Freshwater generator	Nirex
A/C refrig. plant	Stal-Laval
A/C, ventilation & fans for cargo & engine spaces	Flakt
Spot cooling units	Carrier
Screw pumps	Imo
Oil separators	Alfa-Laval
Side thrusters	KaMeWa
Fin stabilizers	Blohm & Voss
Side thruster motor	ABB
Slides	Viking
Lube oils	Shell
Paint	International
Cathodic protection	Wilson-Walton Int'l

TAIHE Containership Kvaerner Govan

Featured on this month's cover, the 2,716-TEU containership Taihe and her sister, the Puhe, both built by Kvaerner Govan, are the largest of their type ever built in the U.K. and largest in the China Ocean Shipping Company's (COSCO) Shanghai division.

With an overall length of 775 feet, beam of about 105 feet and draft of 39 feet, the 45,900-dwt Taihe operates in the Pacific, calling at ports on the U.S. West Coast, Vancouver, Japan and Hong Kong. Her draft, beam and Stone Vickers bowthruster enable her to operate and ma-

neuver in constricted, congested ports and transit the Panama Canal.

Propulsion power for the Taihe is provided by a derated Clark-Kincaid-MAN B&W 6L80MC engine, which develops 22,770 bhp at 88 rpm and a service power of 20,490 bhp at 85 rpm. The engine is capable of operating on MDO or HFO to a viscosity of 420 cSt at 56 degrees C to achieve a service speed of 19 knots. She is fitted with a Stone Manganese propeller supplied by Weardale.

The auxiliary power is produced by three Harland & Wolff 1,000-kw main alternators each driven by a MAN B&W Holeby 8L23/30 engine rated at 1,040 kw.

Built with a longitudinally framed hull, the Taihe's container capacity is provided by six fully cellular holds, which can be arranged for both TEU and FEU stacks.

Equipment List

Main engine	Clark-Kincaid-MAN B&W
Propeller	Stone Manganese
Main alternators	Harland & Wolff
Alternator engines	MAN B&W Holeby
Bowthruster	Stone Vickers
Bowthruster drive & motor	Siemens
Satcom	JRC
Satnav	Magnavox
Auxiliary switchboards	Siemens
Deck machinery	NEI Clark Chapman
Davits	Schat
Incinerator and sewage systems	Hamworthy
Purifier feed, heating & cooling equipment	Alfa Laval



The USNS Relentless is the last of a series of ocean surveillance ships built by Trinity Marine Group.



The product tanker Australia Sky, from SHI, has excellent maneuverability due to her Industramar Vectwin Schilling rudder system.

Sperry's Dual RASCAR For Vessel Traffic Monitoring Purchased By LOOP

Sperry Marine Inc. has been chosen to supply two RASCAR Radar/ARPA's to LOOP, The Louisiana Offshore Oil Port, the largest offshore oil port in the U.S. The dual interswitched S Band and X Band RASCARs, complete with navlines, target tails and a remote station, will be used to monitor vessel traffic from the Mississippi River to the huge offshore oil port. The system design provides for future expansion as requirements dictate.

Sperry Marine Inc., a leading developer and manufacturer of marine navigation, guidance and communications equipment, is a subsidiary of Newport News Shipbuilding, a Tenneco company.

For further information and free literature,

Circle 47 on Reader Service Card

Cruise + Ferry 91 Set For May 29-31 In London

Cruise + Ferry, a biennial trade show which focuses on the lucrative cruise and ferry market, has been scheduled for May 29-31, 1991 at the Olympia 2 Conference and Exhibition Center in London, England.

With the cruise industry in an explosive stage of passenger growth and supplier consolidation and with millions of dollars being spent on building new ships and refurbishing existing ones, Cruise + Ferry 91 is expected to draw even more participants than when the show was last held in 1989. A prime component of the show's audience will be senior cruise line executives, who will be able to view the latest developments in passenger ship operations, technology and services under one roof.

Reflecting the huge growth and ongoing investment in the cruise and ferry market, more than 150 companies participated at Cruise + Ferry 89.

The wealth of accumulated expertise represented the largest display ever of specialist know-how in designing, building, outfitting and providing increasingly sophisticated on-board services for the cruise ships and ferries of the future.

With a huge cruise market still largely untapped in the U.S., a resurgence of cruising interest in Europe and the dawn of a new cruise era in Japan and the Pacific, prospects for growth have never looked better.

In the cruise ship business, passenger expectations are rising rapidly and, to stay ahead, owners are looking for new and innovative ideas in design, construction and materials and in providing an ever widening range of passenger services.

The Cruise + Ferry 91 Exhibition will be a unique showcase for these new developments and will provide effective support for companies already active in the industry and for those seeking new market opportunities.

The Olympia, located in the heart

of London, was selected to accommodate exhibitors' every display requirement and the spacious display halls will feature the world's largest international exhibition serving every aspect of cruise and ferry operations.

The market for fast ferries has also experienced rapid growth during the last 20 years. There has been a constant increase in demand from operators worldwide and advanced design and technological develop-

ments have opened up many more routes for high-speed ferries.

At the Cruise + Ferry 89 Exhibition, international builders of these ever increasingly sophisticated ships were present from Australia, the U.K., Scandinavia and the U.S., and coverage of this large market will once again be highlighted and increased at Cruise + Ferry 91.

Shipbuilders and specialist suppliers will be able to effectively demonstrate developments in de-

sign, equipment, and the increasingly comprehensive on-board services now offered to maximize passenger comfort.

For further information on registration and exhibiting at Cruise + Ferry 91, contact: **John Gwynn-Jones**, exhibition director, Cruise + Ferry Secretariat, 2 Station Road, Rickmansworth, Herts WD3 1QP England; telephone: + 44 (923) 776363; and fax: + 44 (923) 777206.

The Power Behind the Power



This artist's impression portrays the vital electrical systems and circuitry on which the ship's mission depends.

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Behind every advanced weapons system is an equally advanced electrical system. Consider today's fighting ship — and tomorrow's. In battle its every action and reaction will depend on clean, uninterruptible, survivable electric power.

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Every AEGIS cruiser and destroyer in the U.S. Navy fleet receives controlled 400-Hertz power from MagnéTek frequency converters. MagnéTek is the only manufacturer of both 60- and 400-Hertz naval Mil-Spec distribution transformers. MagnéTek fault isolation units and current limiting devices are now being installed on Navy vessels. And MagnéTek is the leading

supplier of secondary propulsion systems and Service-A motors to the Navy.

On land and in the air? MagnéTek electrical products perform critical power supply functions on advanced land-based weapons systems and combat aircraft as well.

Wherever the "battleground" may be, if you are working on a new weapons system, or retrofitting an existing platform, MagnéTek can help you deliver the power behind the power.

Contact **MagnéTek Defense Systems**. In the United States: 901 E. Ball Rd., Anaheim, CA 92805, (714) 956-9200, FAX: (714) 956-5397. In Europe: Zum Panrepel 2, 2800 Bremen 45, Federal Republic of Germany, (0421) 48693-0, FAX: (0421) 48693-41.

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**1991 Ship Production Symposium,
San Diego, September 4-6, 1991,
Issues Call For Papers**

The 1991 Ship Production Symposium, sponsored by the San Diego Section of The Society of Naval Architects and Marine Engineers and the Ship Production Committee, National Shipbuilding Research Program, has been scheduled to be held in San Diego, Calif., September 4-6, 1991.

Technical session subjects to be considered include: Facilities/Environmental Effects; Outfitting and Production Aids; Design/Production Integration; Planning/Control; Contracts and Producibility; Human Resource Innovations; Marine Industry Standards; Supplier/Production Integration; Welding; Industrial Engineering & Automation; Education and Training; Surface Preparation and Coatings; Quality Control; Accuracy Control & Measurement; Advanced Materials; and Lessons Learned from Other Industries.

A "Call for Papers" has been issued, with a one-page abstract required to be submitted by December 15, 1990. Authors of accepted abstracts will be notified by February 1, 1991. First draft manuscripts are required by April 15, 1991.

For further information, contact **Jay Car-**

son, Co-Chairman, Technical Program Committee, 1991 Ship Production Symposium, c/o Engineering Department, M/S 05, NASSCO, P.O. Box 85278, San Diego, Calif. 92186-5278, fax 619-544-3543.

**Hitachi Zosen Completes
275,993-Dwt Tanker Sea Duke**

Hitachi Zosen's Ariake Works in Japan recently completed the 275,993-dwt tanker Sea Duke, a very large crude carrier (VLCC) which was delivered to the owner, Resilience Shipping Company Limited.

The 1,070-foot-long by 185.7-foot-wide tanker is a sister ship of the M/T Sea Prince, which was completed and delivered this past May.

The vessel is powered by an HZ MAN B&W 6S80MC type main diesel engine with a maximum continuous output of 23,090 hp x 73 rpm, producing a speed of 14 knots. It is equipped with a Hitachi Zosen-developed Super Stream Duct nozzle in front of the propeller, and a large bulbous bow below the bow waterline, a design feature that achieves highly improved propulsion efficiency. To cut fuel expenses, fuel consumption is greatly reduced by the use of a low-rpm, long-stroke, turbocharged diesel engine operated in a derated mode.

The cargo oil pipes are arranged to allow simultaneous storage of three types of crude oil,



The Sea Duke's Hitachi Zosen-MAN B&W main engine can be operated from the wheelhouse with microcomputer-based remote control equipment. Automated monitors permit navigation without operator attendance in the engine room.

and are coated with high-grade paint to ensure corrosion protection. The tanker is equipped with a self-stripping system to shorten cargo loading time and reduce labor costs.

Remote-control level gages for the cargo oil tanks and the water ballast tanks enable tank levels to be monitored even from the cargo control room.



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Congressional Leaders Take Hard Line On Foreign Shipbuilding Subsidies

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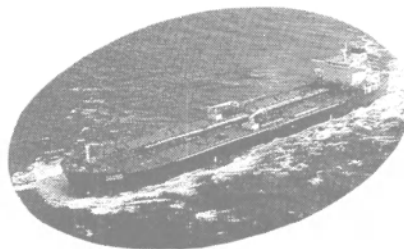
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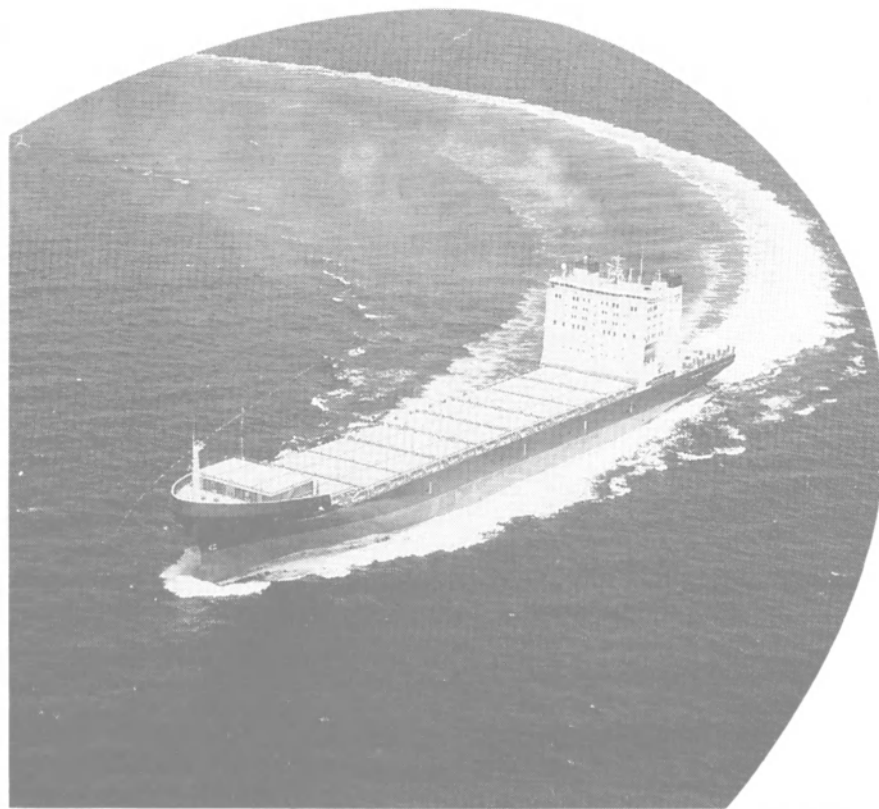
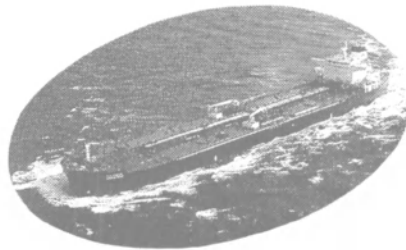
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BOATS & BARGES

4,000-HP Tug Delivered By Main Iron Works To Coastal Tug & Barge

Coastal Tug & Barge, Inc., Miami, Fla., recently announced the completion of its newest tug, the Coastal Florida. The innovative design of this motor vessel incorporates the latest advances in marine engineering into Coastal's towing services.

The 90-foot-long, 4,000-horsepower class vessel is powered by two EMD-645 diesel engines coupled to two Ulstein Maritime 1350H Z-drive propeller units capable of rotating 360 degrees under the vessel's stern, eliminating the use of rudders. More importantly, the tug is built and designed to respond quickly, efficiently and safely to the pilot's command.

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Hailer/intercom	Standard Marine
SSB	Sea
Fire pump engine	Detroit Diesel

fleet enhances the ship berthing and firefighting capabilities in the Port of Miami," said **Al Espino**, senior vice president of Coastal Tug and Barge, Inc.

Classed by the American Bureau of Shipping, "A-1 Maltese Ocean Towing Service," the Coastal Flori-



The Coastal Florida, recently delivered by Main Iron Works, is fitted with Ulstein Maritime Z-propeller units which rotate 360 degrees, eliminating the need for rudders.

da is equipped with two 1,500-gpm fire monitors. The fire pump is driven by a Detroit Diesel 471 engine. Auxiliary power is supplied by two 75-kw Kato generators driven by two Detroit Diesel 671 diesels. The fully fendered tug also is equipped with two hydraulic cranes, one fore and one aft, and a 60-ton quick release hook.

The Coastal Florida, built by Main Iron Works In Houma, La., with a beam of 32 feet and depth of

13 feet, will provide fueling service and ship docking assistance for vessels employed in the passenger and freight trades of the South Florida area. The tug, stationed in the Port of Miami, joins the company's fleet of 39 tugs and barges operating in the Gulf of Mexico, the Atlantic Coast and the Caribbean.

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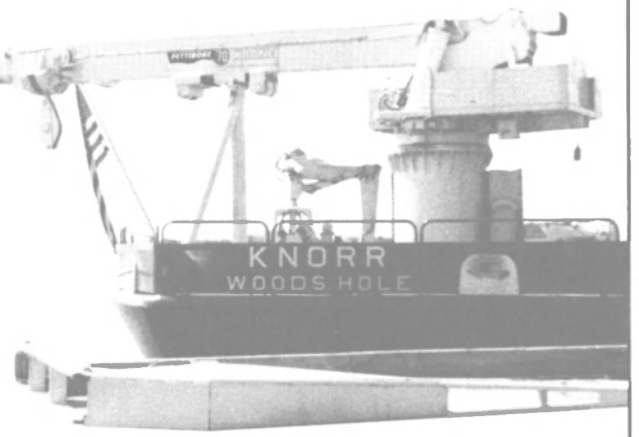
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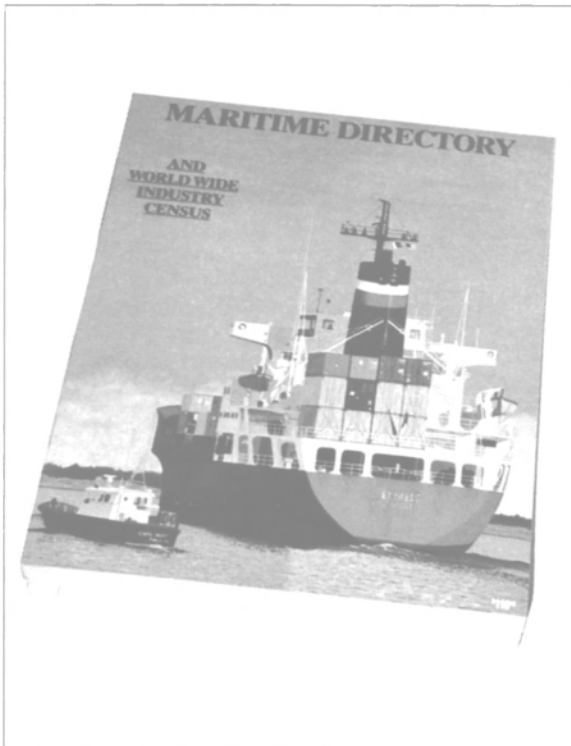
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Hitachi Zosen Selects Argo Marine As U.S. Agent For Engine Parts Sales

Hitachi Zosen Corporation, a large worldwide supplier of marine manufacturing and engineering products, recently selected Argo Marine, a division of Argo International Corporation, to be one of its agents for marine diesel engine replacement parts sales in the U.S.

Argo will promote Hitachi Zosen's replacements parts sales, especially for diesel engine parts manufactured by the Japanese firm under licensing agreements with Sulzer, MAN B&W, and others.

"We are delighted to cooperate with Hitachi Zosen in the United States," said **Thomas J. Calicchio**, vice president of Argo Marine. "Hitachi Zosen is an excellent company with products that sell into more than 60 countries. Argo Marine is a natural choice since we maintain 20 strategically located, fully stocked warehouses throughout the United States."

Argo also represents the General Electric Company, Siemens Corporation, and several other manufacturers of marine and related equipment.

For free literature detailing the services of Argo Marine,

Circle 73 on Reader Service Card

Major Growth Predicted For World Cruise Market

At the recent Holidays at Sea Convention in London, an optimistic forecast was made that by the end of the century the world cruise market will have jumped from the present 3.7 million to 10 million passengers.

Jim Godsmann, president of the industry's trade association in the U.S., Cruise Lines International Association, told the conference that in terms of money the industry had a \$50 billion business opportunity over the next five years.

The number of first-time cruisers was an encouraging sign. A study in 1986 showed that they accounted for 38 percent of all business. Two years later, this had grown to 44 percent, and this year the figure was 50 percent, according to Mr. Godsmann.

Three Quays Sign Agreement For Ultramar Newbuildings

U.K.-based Three Quays Marine Services has recently signed an agreement with Ultramar for technical support and inspection during construction of three 148,500-dwt

(Suezmax) tankers.

Three Quays has been involved with Ultramar's newbuilding project since inception, providing assistance during the design study, preparation of bidding specifications, assessing responses from shipyards and eventual contract negotiations leading to signing of the three con-

tracts with Samsung Shipbuilding and Heavy Industries in August of this year.

The vessel design includes a double hull and double bottom in the cargo area, ice strengthening and a shallow draft. The first two vessels are due for delivery in the second half of 1992, with the third one dur-

ing the following spring.

The sister ships will have an overall length of about 899 feet and breadth of 156.8 feet. Main propulsion will be by one MAN B&W type 6S70MC slow-speed diesel with a maximum continuous rating of 20,940 bhp. Service speed is 14.3 knots.



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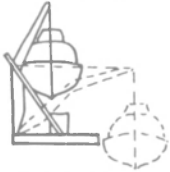
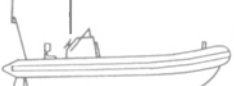


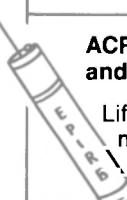


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Hull Electronics Announces New Linear Amplifiers

Hull Electronics Company, San Diego, Calif., recently announced their new family of linear amplifiers and matching power supplies. These broadband solid-state amplifiers are offered in three configurations:

1,000 watts PEP and CW; 1,000 watts PEP, 500 watts CW; 500 watts PRP and CW. The amplifiers can be linked to Hull's model 230 SSB (or an equivalent radio) via a radio/amplifier interface unit. All combinations operate in the 1.6 to 30 MHz frequency range and may be used with Hull's antenna couplers or new broadband antennas.

The power supplies may be wired at the factory for either 115 or 230

VAC, with the exception of the power supply for 1,000 watts CW, which is only available for 230 VAC operation. If your location has 28 VDC, the amplifiers may be operated directly from that power source and the AC power supply may be eliminated.

For further information and free literature from Hull Electronics,

Circle 45 on Reader Service Card

Deere Commercial Marine Engine Marketing Plans On Stream For Early 1991

Deere & Company's Engine Group will begin to market John Deere marine engines for commercial applications in 1991.

According to Deere, two marine models, rated at 80 to 250 hp (propulsion), are slated for introduction in early 1991. Three more models will be available later in 1991, with the final engine coming about a year later. The engines will be used in propulsion, gen set, and auxiliary power applications for fishing craft and workboats.


Fred Thorne, Deere's director of engine marketing, explained that the company's decision to enter this market is based on several factors including Deere's experience in designing and manufacturing reliable, durable, heavy-duty diesel engines.

Deere brings 40 years of diesel design and manufacturing to the marine market. Since introducing its first diesel in 1949, Deere has produced nearly three million diesels for its own products and a growing number of OEMs.

For free literature giving full information on John Deere marine engines,

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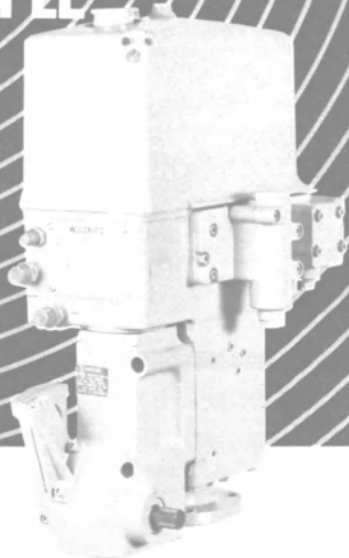
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Homeport Marine Services Completes Rework Project On 180-Foot 'Ebb Tide II'

Homeport Marine Services, Inc. of Moss Point, Miss., has completed a rework project on the 180-foot supply vessel Ebb Tide II, owned by Tidewater Marine Services, Inc. of New Orleans, La.

Services performed included extensive repairs within the vessel's tanks, hull structure and steering and piping system. The yard also performed work on the vessel's propellers, propeller shafts, rudders and other associated underwater gear.

Hull painting, as well as deck plating repair, was performed along with necessary cleaning and testing for compliance with regulatory body

specifications.

Two-year-old Homeport Marine Services is a local and privately owned company located on a 17-acre site next to the Escatawpa River in Moss Point. The company does repair work and maintenance on any type of floating equipment as well as industrial maintenance and repair, including blasting and painting, specialized welding and fitting. Homeport has a 195-foot fish ten-

der presently under construction for Arctic Alaska Fisheries, Inc. of Seattle, Wash.

For more information on the facilities and capabilities of Homeport Marine Services,

Circle 39 on Reader Service Card



Diamond Cruises Orders Second SWATH Cruise Ship

Diamond Cruises, Ltd., a new Finnish cruise line with shareholders from around the world, recently placed an order worth \$130 million for a second Small Waterplane Area Twin Hull (SWATH) cruise ship.

The vessel, which will carry 354 passengers, will be constructed by Rauma Repola shipyard in Finland.

The first ship, the SSC Radisson Diamond, is due for delivery in May 1992. Diamond Cruises Ltd. has until April of 1992 to decide on an option for a third vessel.

Onan Introduces Sea Aux® Gensets

Cummins Engine Company and Onan Corporation, Minneapolis, Minn., recently announced the completion of a joint venture development program. The result is a line of midsize auxiliary generator sets for the commercial marine industry.

Rated for prime power duty in worldwide shipboard applications requiring 1,000 or more hours of operation per year, the new Sea Aux™ gensets provide electric power for tug and pushboats, commercial fishing vessels, passenger ferries, cruise boats, megayachts and others. Twelve models are available in the Sea Aux line and include 35 to 95 kw (60 Hz at 1,800 rpm) or 30 to 75 kw (50 Hz at 1,500 rpm) operation in various voltage configurations.

The Onan® 12 lead reconnectable alternator is rated for 80 degree rise at 40 degree ambient with Class H insulation. The main alternator and exciter insulation systems are impregnated for operation in severe marine environments where salt air, sea spray, chemical corrosion and engine room conditions are installation factors.

"The Cummins and Onan joint venture development program enables the buyer to easily specify not only a generator set but also the production engines as a complete package," said Dennis Wagner, product manager for the Sea Aux development program.

Furthermore, the Cummins/Onan worldwide distribution network offers application expertise and factory trained service technicians with direct access to replacement parts.

For free literature detailing the new Sea Aux gensets from Onan,

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 Aeroquip Corporation, 3000 Strayer, P.O. Box 631, Maumee OH 43537-0631
 Deutsch Metal Components, 14800 S. Figueroa, Gardena, CA 90248
 IMO Industries Inc., Wiggins Connectors Div., 5000 Triggs St., P.O. Box 22228, Los Angeles CA 90022

PORT SERVICES
 Port of Iberia, P.O. Box 897, New Iberia LA 70561
 Port of Orange Texas, P.O. Box 516, Orange, TX 77630
 Port of Portland, 5555 N. Channel Ave., Portland, OR 97217

PROPULSION EQUIPMENT—Bowthrusters, Diesel Engines, Gears, Propellers, Shafts, Turbines
 American Air Filter, P.O. Box 35690, Louisville, KY 40432
 ASEA Brown Boveri, 1460 Livingston Ave., North Brunswick NJ 08902
 ASEA Brown Boveri (Stromberg), P.O. Box 185, 00381 Helsinki, FINLAND
 Argo International, 140 Franklin Street, New York, NY 10013
 Bergen Diesel A/S, P.O. Box 924, N-5002, Bergen, NORWAY
 Bird Johnson Company, 110 Norfolk St., Walpole, MA 02081
 CWF Hamilton & Co., Ltd., P.O. Box 709, Christchurch, NEW ZEALAND
 Cincinnati Gear Co., 5657 Wooster Pike, Cincinnati, OH 45227
 Colt Industries Inc. (Fairbanks Morse Engine Div.), 701 Lawton Avenue, Beloit, WI 53511
 Cummins Engine Company, Mail Code 60011, Box 3005, Columbus, IN 47202-3005
 Electro-Motive Division of GM, 9301 W 55th St., LaGrange, IL 60525
 Fincantieri, Diesel Engines Division—GMT, Bagnoli della Rosandra 334, Trieste, ITALY
 GE Marine & Industrial, 1 Neumann Way N-158, Cincinnati OH 45215

GE Naval & Drive Turbine Systems Department, 166 Boulder Dr., Fitchburg MA 01420
 General Motors, Allison Gas Turbine, P. O. Box 420, U-6, Indianapolis IN 46206
 KaMeWa, P.O. Box 1010, S-681 01 Kristinehamn, SWEDEN
 Kahlenberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241
 Krupp MaK, 7555 Danbro Crescent, Mississauga, Ontario, CANADA L5N 6P9
 Mapeco Products Inc., P.O. Box 6, 725 Glen Cove Ave., Glen Head NY 11545
 Marine Gears, Inc., P.O. Box 689, Greenville MS 38707
 Marine Systems Inc., 2032 Atlantic Ave., Chesapeake VA 23324
 Markisches Werk, P.O. Box 1442, D-5884 Halver GERMANY
 MAN B&W Diesel, 50 Broadway, New York, NY 10004
 MAN B&W Diesel A/S, Ostervej 2, DK-4960 Høleby, DENMARK
 MAN B&W Diesel A/S, Alpha Diesel, Niels Juels Vej 15, DK-9900 Frederikshavn DENMARK
 MAN B&W Diesel GmbH, Stadtbachstrasse 1, D-8900 Augsburg 1 GERMAN- NY
 MTK Magnetek Inc., 11150 Santa Monica Blvd., Los Angeles CA 90025
 New Sulzer Diesel, Ltd., CH-8401, Winterthur, SWITZERLAND
 Northwest Marine Services Corp., 6452 So. 144th St., Tukwila WA 98168
 Omnithruster Inc., 9515 Sorensen Ave., P.O. Box 2144, Santa Fe Springs, CA 90670
 Ovako Steel Couplings AB Sweden, S-813 00 Hofors SWEDEN
 Propulsion Systems, 1441 N Northlake Way, Seattle WA 98103
 Rolla SP Propellers SA, Via Silva 5, P.O. Box 251, 6828 Balerna SWITZERLAND
 Rolla SP Propellers USA, 4030 Mustang Road, Melbourne, FL 32934, USA
 Karl Senner Inc., 25 W Third, Kenner LA 70062
 Schottel-Werft, D-5401 Spay, GERMANY
 Stewart & Stevenson, 1400 Destrehan, P.O. Box 8, Harvey LA 70059-0008
 Sulzer/Escher Wyss, Ravensburg GERMANY
 Ulstein International, A/S, N-6065 Ulsteinvik, NORWAY
 J. M. Voith GmbH, Dept. Werbung, Postfach 1940, 7920 Heidenheim/Brenz GERMANY
 Oy Wartsila Ab, Vasa and Abo Divisions, Vasa Factory, FINLAND
 Oy Wartsila, Stork Division, P.O. Box 244, SF 65100 Vasa, FINLAND
 WestTech Gear Corp., 2600 E. Imperial Highway, Lynwood, CA 90262
 ZF of North America, Marine Sales, 500 Barclay Blvd, Lincolnshire IL 60069

PROTECTIVE WRAPS
 FANA (Film Applicators of North America), 1260 E Woodland Ave., Springfield PA 19064

PUMPS—Repairs—Drives
 Coffin Turbo Pump, Inc., 326 S. Dean Street, Englewood, NJ 07631
 Del Gaudio, 207 W. Central Ave., Maywood, NJ 07607
 Galten Marine Company Inc., 160 Van Brunt Street, Brooklyn, NY 11231
 Houser Marine, Lario Division, 1713 S McKenzie St., Foley AL 36535
 Ima-Delaval, Inc., IMO Pump Division, Box 447, Monroe NC 28810
 Jim's Pump Repair, 48-55 36th St., Long Island City NY 11101
 Megator Corporation, 562 Alpha Drive, Pittsburgh, PA 15238
 Vita Motivator, 99 W Hawthorne Ave., Suite 622, Valley Stream NY 11580

REMOTE VALVE OPERATORS
 Teleflex, Inc., 771 First Ave., King of Prussia, PA 19406

ROPE—Manila—Nylon—Hawsers—Fibers
 Allied Signal Inc., Fibers Division, 1411 Broadway, New York, NY 10018
 Atlantic Cordage Corp., 60 Grant Ave., Carteret, NJ 07008
 Columbian Rope Corp., P.O. Box 270, Guntown, MS 38849
 Dupont Company, Montgomery 403, 1011 Centre Road, Wilmington, DE 19805

SANITATION DEVICES—Pollution Control
 Jered Brown Brothers, P.O. Box 2006, Troy, MI 48007
 Byrne, Rice & Turner, Inc., 1172 Camp Street, New Orleans, LA 70130
 Envirovac Inc., 1260 Turret Dr., Rockford, IL 61111
 FAST Systems, Inc., 3240 N. Broadway, St. Louis MO 63147
 Microphor, Inc., Marine Division, 452 E. Hill Rd., P.O. Box 1460, Willits, CA 95490
 Precision Control Inc., 3154 Martin Rd., Walled Lake MI 48088
 Research Products/Blankenship (Incoilet), 2639 Andjon, Dallas, TX 75220

SCAFFOLDING
 Spider Staging Corp., 12720 Gateway Dr., Seattle WA 98168

SCALE MODELS
 Sturgeon Bay Model Shop, 187 N Ninth Ave., Sturgeon Bay WI 54235

SCUTTLES/MANHOLE
 L.S. Baier & Assoc., 7527 NE 33rd Dr., Portland OR 97211

SHIPBUILDING EQUIPMENT
 MAN—GHH, Sterkrade Werfsrabe 112 D-4100 Duisburg 18, GERMANY
 MAN—GHH, P.O. Box 110240, D-4200 Oberhausen 11, GERMANY
 NEI Synrolift, Inc., 8970 S W 87th Ct., Miami FL 33176
 Offshore Industries, Inc., 144 Railroad Ave., Suite 206, Edmonds WA 98020

SHIPBUILDING—Repairs, Maintenance, Drydocking
 Astilleros Espanoles S.A., Padilla 17, 28006 Madrid, SPAIN
 Atlantic Marine, Inc., 8500 Heckscher Drive, Jacksonville, FL 32226
 Avondale Industries Inc., P.O. Box 50280, New Orleans LA 70150
 Bellinger Shipyard, Division of Jacksonville Shipyards, Inc., 13911 Atlantic Boulevard, Jacksonville, FL 32225
 Bender Shipbuilding & Repair Company, Inc., P.O. Box 42, Mobile AL 36601
 Bethlehem Steel, Martin Tower, Bethlehem PA 18106
 Bethlehem Steel, Baltimore Marine Div., Sparrows Point Yard, Sparrows Point MD 21219
 Blount Marine, Box 368, Warren RI 02885
 Bollinger Lockport & Larose, P.O. Box 250, Lockport, LA 70374-0250
 Brodosplit Shipbuilding Industry, Put Udarnika 19, P.O. Box 17, 58000 Split YUGOSLAVIA
 Conrad Industries, 1501 Front Street, P.O. Box 790, Morgan City, LA 70381
 Curacao Drydock (USA), Inc., P.O. Box 3012, Curacao, Netherlands Antilles
 Eastern Shipyards, Inc., Energy Centre, Suite 2900, 1100 Poydras Street, New Orleans, LA 70163
 Equitable Shipyards Inc., Trinity Marine Group, Box 29266, New Orleans LA 70189
 Fincantieri SpA Cantieri Navali Italiani, Via Cipro 11, 16129 Genoa ITALY
 Galveston Shipbuilding, 6800 Port Industrial Boulevard, P.O. Box 2660, Galveston, TX 77553
 Gladding-Hearn Shipbuilding, The Duclos Company, One Riverside Avenue, Box 300, Somerset, MA 02726
 Hitachi Zosen, Hitachi Shipbuilding & Engineering Co., 1-1-1 Hitosubashi, Chiyoda-ku Tokyo 100, JAPAN
 Houston Ship Repair, 1621 Woods Dr., P.O. Box 489, Channelview, TX 77530
 In-Place Machining Co., 1929 N. Buffum Street, Milwaukee, WI 53212-3793
 Jeffboat, Inc., P.O. Box 610, Jeffersonville IN 47130
 Koch Ellis Barge & Ship Service, P.O. Box 9130, Westwego LA 70094
 Lindenau Werft, Postfach 9060, D-2300 Kiel-Friedrichsort, GERMANY
 Lisnave, Apartado 2138, 1103 Lisbon, Cadex PORTUGAL
 MAN GHH Sterkrade, P.O.B. 110240, D-4200 Oberhausen 11, GERMANY
 MIL Davie, Inc., P.O. Box 130, Levis, Quebec, CANADA
 Marco, Inc., 2300 W Commodore Way, Seattle, WA 98199
 T. Mariotti, Calata Chiappella, 16126 Genoa (Port) ITALY
 Master Marine, Inc., P.O. Box 665, Bayou La Batre, AL 36509

Munson Manufacturing, 150 Dayton, Edmonds WA 98020
 Newport News Shipbuilding, 4101 Washington Ave., Newport News, VA 23607
 New York Shipyard Corp., One Beard St., Brooklyn NY 11231
 North Florida Shipyard, P.O. Box 3255, Jacksonville FL 32206
 Protecno, Ltd., Rua Eugenio Castro, 13A-r/c, 2800 Almada, PORTUGAL, U.S. Rep: Walter Thorsen, Inc., 79 Oweno Rd., P.O. Box 755, Mahwah, NJ 07430-0755
 SeaArk, P.O. Box 210, Monticello AR 71655
 Service Marine Industries, P.O. Box 3606, Morgan City LA 70381
 Skipperliner Shipyards, 621 Park Plaza Dr, Dept 21, LaCrosse WI 54601
 Southwest Marine, Inc., Foot of Sampson St., P.O. Box 13308, San Diego, CA 92113-0308
 Swath Ocean, 979 G Street, Chula Vista, CA 92011
 3 Maj Associates Shipbuilding Industry, P. O. Box 117, 51001 Rijeka YUGO-SLAVIA
 Textron Marine Systems, 6600 Plaza Drive, New Orleans, LA 70127-2584
 Trinity Marine Group, Box 3029, Gulfport, MS 39505-3029
 Willard Marine Co., Inc., 1250 N. Grove Street, Anaheim, CA 92806
 Zideil Explorations, Inc., 3121 S.W. Moody Street, Portland, OR 97201
 Zodiac of North America Inc., Thompson Creek Rd., P.O. Box 400, Stevensville, MD 21666

SIMULATOR TRAINING
 Marine Safety International, Marine Air Terminal, LaGuardia Airport, NY 11371

SILENCERS
 Beaird Industries Inc., P.O. Box 31115, Shreveport LA 71130

SMOKE CURTAINS
 HMS Marine Hardware, 333 W. Merrick Road, Valley Stream, NY 11580

STABILIZERS
 Seatrak Industrial Marine, 834 W. Production Place, Newport Beach, CA 92663

STAINLESS PLATE
 Eastern Stainless Division, Cyclops Corporation, P.O. Box 1975, Baltimore MD 21203

STUFFING BOXES
 Kahlenberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241

SURVIVAL EQUIPMENT
 Schat-Marine Safety Corp., P.O. Box 465, Foot of Industrial Rd., Farmingdale, NY 07727
 Stearns Manufacturing, P.O. Box 1498, St. Cloud MN 56302
 Viking Life Saving Equipment, 1625 N Miami Ave., Miami FL 33136

TANK CLEANING
 Houston Ship Repair, 1621 Woods Dr., P.O. Box 489, Channelview, TX 77530

TANK LEVELING INDICATORS
 Autronica Marine USA, 234 Industrial Parkway, Northvale, NJ 07647
 IMO Industries, Gems Sensors Division, One Cowles Rd, Plainville CT 06062
 MMC International, 60 Inip Dr, Inwood NY 11696
 Saab Marine Electronics AB, P.O. Box 13045, S-402 51 Goteborg SWEDEN

TESTING
 Barbee Valves, 205 W. 35th St., Suite A, National City, CA 92050
 Wyle Laboratories, 128 Maryland St., El Segundo CA 90245; P.O. Box 077777, Huntsville AL 35807-7777

TOOLS
 Derbyshire Machine & Tool, Belfield Ave. & Wister St., Philadelphia, PA 19144-1788
 LSP Industries, P.O. Box 5303, 2511-20th Street, Rockford, IL 61125

TORSIONAL VIBRATION SPECIALISTS
 T.W. Spaetgens, 156 W. 8th Ave., Vancouver, BC, CANADA, V5Y 1N2

TOWING—Barges, Vessel Chartering, Lighterage, Salvage, etc.
 Jack Faulkner, 2419 Caddy Lane, Flossmoor IL 60422

TURBINES
 IMO Delaval Inc., P.O. Box 6550, Lawrenceville, NJ 08648

TURBOCHARGERS
 Cooper Industries, Energy Services Group, North Sandusky St., Mt. Vernon, OH 43050

VALVES AND FITTINGS
 Aeroquip Corporation, 3000 Strayer, P.O. Box 631, Maumee OH 43537-0631
 American Vulkan Corporation, P.O. Drawer 673, 2525 Dundee Rd., Winter Haven, FL 33882-0673
 Circle Seal Controls, Brunswick Corporation, P.O. Box 3666, Anaheim, CA 92803
 Cla-Val Co., P.O. Box 1325, Newport Beach, CA 92663
 Cunica Corporation, 214 N Hawaiian Ave., P.O. Box 306, Wilmington CA 90748
 Elliott Manufacturing, P.O. Box 773, Binghamton, NY 13902
 Stanley G. Flagg Company, 1020 W. High Street, Stowe, PA 19464
 Loeffler Machine, US #1 & Robbins Ave., Penndel PA 19047
 MMC International, 60 Inip Dr, Inwood NY 11696
 Marotta Scientific Controls, Inc., 78 Boonton Avenue, P.O. Box 427, Montville, NJ 07045
 PBM, Inc., R.D. 6, Box 387-A, Sandy Hill Road, Irwin, PA 15642
 Research Tool & Die Works, 17124 S Keegan Ave., Carson CA 90746
 Stacey/Fetterolf, P.O. Box 103, Skippack, PA 19474
 Swagelok Company, 29500 Solon Rd., Solon, OH 44139
 Zideil Explorations, Inc., 3121 SW Moody Ave., Portland OR 97201

VIBRATION ANALYSIS
 DLI Engineering Corp., 253 Winslow Way West, Bainbridge Island, WA 98110
 T. W. Spaetgens, 156 W 8th Ave., Vancouver BC CANADA V5Y 1N2
 Vibration Analysis Engineering Corp., 4380 S. Wayside, Suite 100, Houston TX 77087

WASTEWATER TREATMENT
 EES Corporation/Omnipure, An Eltech Systems Company, 12850 Bourne-wood Dr., Sugarland TX 77478

WATER PURIFIERS
 Alfa-Laval, Desalt A/S, Stamholmen 93, DK-2650 Hvidovre, Copenhagen, DENMARK
 Alfa-Laval Separation Inc., 2115 Linwood Avenue, Fort Lee, NJ 07024
 Beaird Industries Inc., P.O. Box 31115, Shreveport LA 71130
 Everpure, Inc., 660 N. Blackhawk Dr., Westmont, IL 60559
 Matrix Desalination, Inc., 3295 SW 11th Avenue, Fort Lauderdale, FL 33315

WEATHER CHART RECORDERS
 Alden Electronics, 40 Washington St., Westborough, MA 01581

WELDING
 American Durweld Sales, P.O. Box 850, Scituate MA 02066
 Welding Consultants USA, 10399 Paradise Blvd. #101, St. Petersburg, FL 33706

WINCHES AND FAIRLEADS
 Braden Carco Gearmatic, P.O. Box 547, Broken Arrow, OK 74013
 Gearmatic—see 'Braden Carco Gearmatic' above.
 MMC International, 60 Inip Dr, Inwood NY 11696
 Markey Machinery Co., 79 South Horton St., Seattle, WA 98134
 Smith Berger Marine Inc., 516 S. Chicago St., Seattle, WA 98108

WINDERS
 ES Marine Systems Corp., 550 S. Fulton Avenue, Mount Vernon, NY 10550
 Marketec, Inc., P.O. Box 999, Pisgah Forest NC 28768

WIRE AND CABLE
 Seacoast Electric Company, Station Plaza, Rye NY 10580

MacPherson Maritime Services, 141 Jefferson Ave., Westfield NJ 07090
Fendall Marbury, 9 Neal Street, Annapolis MD 21401
Marine Design & Operations, Inc., 520 Westfield Ave., Elizabeth, NJ 07208
Marine Management Systems Inc., 102 Hamilton Ave., Stamford CT 06902
Marine Power Associates, 1010 Turquoise St., Ste 217, San Diego, CA 92109
Moritech, Seacliff, Bay Road, Newmarket, NH 03857
Maritime Design, Inc., 3020 Hartley Rd., Jacksonville, FL 32257
R.J. Mellusi & Co., 71 Hudson St, New York, NY 10013
Nautical Designs, Inc., 2101 S Andrews Ave, Suite 202, Ft Lauderdale FL 33316
Nelson & Associates, Inc., 610 Northwest 183rd St., Miami, FL 33169
Northern Marine, P.O. Box 1169, Traverse City, MI 49685
Ocean Oil International Engineering Corp., 3019 Mercedes Blvd, New Orleans LA 70114
Omega Marine Engineering Systems, Inc., 11757 Katy Freeway, Ste 1200, Houston TX 77079
Q.E.D. Systems Inc., 4646 Witchduck Rd., Virginia Beach, VA 23455
M. Rosenblatt & Son, Inc., 350 Broadway, New York, NY 10013 and 667 Mission St., San Francisco, CA 94105
Sargent & Herkes, 225 Baronne St., Suite 1405, New Orleans LA 70112
Sea School, 10812 Gandy Boulevard, St. Petersburg, FL 33702
Seaworthy Systems Inc., P.O. Box 965, Essex, CT 06426; 17 Battery Pl., New York, NY 10004; P.O. Box 205, Solomons MD 20688; 2 Skyline Pl., 5203 Leesburg Pike, Suite 700, Falls Church VA 22041; 1305 Franklin St., Suite 210, Oakland, CA 94612
Seaworthy Electrical Systems, 17 Battery Pl. N.Y. N.Y. 10004
George G. Sharp, Inc., 100 Church St., New York, NY 10007
R.A. Steam, Inc., 253 N. 1st Ave., Sturgeon Bay, WI 54235
Systems Engineering Associates (SEACOR), 200 East Park Dr., Suite 600, Mt Laurel NJ 08054
TIMSCO, P. O. Box 91360, Mobile AL 36691
NAVIGATION & COMMUNICATIONS EQUIPMENT
Comsat Maritime Services, 950 L'Enfant Plaza SW, Washington DC 20024
Furuno U.S.A., 271 Harbor Way, S. San Francisco, CA 94080
Henschel, Inc., 9 Hoyt Drive, Newburyport MA 01950
Hose McCann, 9 Smith Street, Englewood, NJ 07631
Kelvin Hughes Ltd., New North Rd., Hainault, Ilford, Essex IG6 2UR EN-GLAND
Hull Electronics, 7563 Convoy Court, San Diego, CA 92111
Mackay Communications, 441 US Highway #1, P.O. Box 331, Elizabeth NJ 07027
Magnavox MSS, 2895 Maricopa St., Torrance CA 90503
Marine Electric RPD Inc., 50 Carol St., P.O. Box 1135, Clifton NJ 07014-1135
Mobile Telesystems, Inc., 300 Professional Drive, Gaithersburg, MD 20879
Naval Electronics, 5417 Jetview Circle, Tampa FL 33634
Radio Holland USA B.V., 8943 Gulf Freeway, Houston, TX 77017
Robertson Marine Systems, 3000 Kingman Street, Suite, 207, Metairie, LA 70006
S.P. Radio A/S, DK-9200, Aalborg SV, DENMARK
Simrad, 620 Northwest Bait Street, Seattle, WA 98107
Singapore Telecom, Orchard Point Post Office, P.O. Box 38, SINGAPORE 9123
Sperry Marine Inc., 1070 Seminole Trail, Charlottesville VA 22901
Standard Communications, P.O. Box 92151, Los Angeles, CA 90009
Trimble Navigation, 585 North Mary Avenue, P.O. Box 3642, Sunnyvale, CA 94086
Watercom Communications Systems, 453 E. Park Place, Jeffersonville, IN 47130
NOZZLES
Nautican Enterprises Ltd., 407 Mountain Highway, North Vancouver, B.C. V7J 2L1
OILS—Marine—Additives
Castrol, Inc., Raritan Plaza II, Raritan Center, Edison, NJ 08837
Chevron, USA, 575 Market Street, San Francisco, CA 94105
Exxon Company International, 200 Park Ave., Bldg 222, Room A279, Floram Park NJ 07932, P.O. Box 4706, Houston, TX 77210-4706
Mobil Oil Corporation, 3225 Gallows Road, Fairfax, VA 22037-0001
Texaco, International, 2000 Westchester Avenue, White Plains NY 10650
OIL/WATER SEPARATORS
Alfa-Laval Separation, Inc., 955 Mearns Rd., Warminster, PA 18974-0556
Centrico, Inc. (Westfalia Separators), 100 Fairway Court, Northvale NJ 07647
FAST Systems, Inc., 3240 N. Broadway, St. Louis, MO 63147
Jofra, 22 Manhasset Ave., Port Washington, NY 11050
MMC International, 60 Inip Dr, Inwood NY 11696
PAINTS—COATINGS—CORROSION CONTROL
American Abrasive Metals Co., 460 Coit St, Irvington NJ 07111
Chugoku Marine Paints (USA) Inc., 1610 Engineers Road, Belle Chasse, LA 70037
Enviro Coatings, Inc., 4560 Belt Line Rd., Suite 300, Dallas, TX 75244
Esgard, Inc., P.O. Drawer 2698, Lafayette, LA 70502
International Paint (USA) Inc., 6001 Antoine Dr., P.O. Box 4806, Houston TX 77210-4806
LTC International, 101-G Executive Dr., Sterling VA 22170
Microphor, Inc., Marine Division, 452 E. Hill Rd., P.O. Box 1460, Willits, CA 95490
Sigma Coatings, 8979 Market St., Houston, TX 77029, 330 Rover Road, Harvey, LA 70059, 1100 Adams St., Hoboken, NJ 07030
Unitor Ships Service, Unitor Marine Chemicals Division, 3 High St., Rickmansworth, Herts, WD3 1SW UNITED KINGDOM
PIPE FITTINGS/CONNECTING SYSTEMS
Aeroquip Corporation, 3000 Strayer, P.O. Box 631, Maumee OH 43537-0631
Deutsch Metal Components, 14800 S. Figueroa, Gardena, CA 90248
IMO Industries Inc., Wiggins Connectors Div., 5000 Triggs St., P.O. Box 22228, Los Angeles CA 90022
PORT SERVICES
Port of Iberia, P.O. Box 897, New Iberia LA 70561
Port of Orange Texas, P.O. Box 516, Orange, TX 77630
Port of Portland, 5555 N. Channel Ave., Portland, OR 97217
PROPULSION EQUIPMENT—Bowthrusters, Diesel Engines, Gears, Propellers, Shafts, Turbines
American Air Filter, P.O. Box 35690, Louisville, KY 40432
ASEA Brown Boveri, 1460 Livingston Ave., North Brunswick NJ 08902
ASEA Brown Boveri (Stromberg), P.O. Box 185, 00381 Helsinki, FINLAND
Argo International, 140 Franklin Street, New York, NY 10013
Bergen Diesel A/S, P.O. Box 924, N-5002, Bergen, NORWAY
Bird Johnson Company, 110 Norfolk St., Walpole, MA 02081
CWF Hamilton & Co., Ltd., P.O. Box 709, Christchurch, NEW ZEALAND
Cincinnati Gear Co., 5657 Wooster Pike, Cincinnati, OH 45227
Colt Industries Inc. (Fairbanks Morse Engine Div.), 701 Lawton Avenue, Beloit, WI 53511
Cummins Engine Company, Mail Code 60011, Box 3005, Columbus, IN 47202-3005
Electro-Motive Division of GM, 9301 W 55th St., LaGrange, IL 60525
Fincantieri, Diesel Engines Division—GMT, Bagnoli della Rosandra 334, Trieste, ITALY
GE Marine & Industrial, 1 Neumann Way N-158, Cincinnati OH 45215

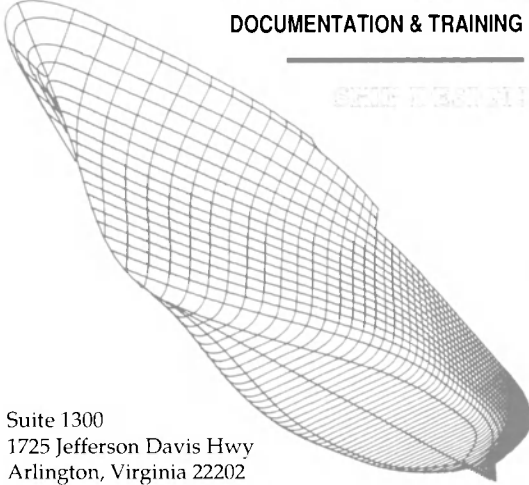
GE Naval & Drive Turbine Systems Department, 166 Boulder Dr., Fitchburg MA 01420
General Motors, Allison Gas Turbine, P. O. Box 420, U-6, Indianapolis IN 46206
KaMeWa, P.O. Box 1010, S-681 01 Kristinehamn, SWEDEN
Kahlenberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241
Krupp MaK, 7555 Danbro Crescent, Mississauga, Ontario, CANADA L5N 6P9
Mapeco Products Inc., P.O. Box 6, 725 Glen Cove Ave., Glen Head NY 11545
Marine Gears, Inc., P.O. Box 689, Greenville MS 38707
Marine Systems Inc., 2032 Atlantic Ave., Chesapeake VA 23324
Markisches Werk, P.O. Box 1442, D-5884 Halver GERMANY
MAN B&W Diesel, 50 Broadway, New York, NY 10004
MAN B&W Diesel A/S, Ostervej 2, DK-4960 Holeby, DENMARK
MAN B&W Diesel A/S, Alpha Diesel, Niels Juels Vej 15, DK-9900 Frederikshavn DENMARK
MAN B&W Diesel GmbH, Stadtbachstrasse 1, D-8900 Augsburg 1 GERMAN
NY
MTK Magnetek Inc., 11150 Santa Monica Blvd., Los Angeles CA 90025
New Sulzer Diesel, Ltd., CH-8401, Winterthur, SWITZERLAND
Northwest Marine Services Corp., 6452 So. 144th St., Tukwila WA 98168
Omnithruster Inc., 9515 Sorensen Ave., P.O. Box 2144, Santa Fe Springs, CA 90670
Ovako Steel Couplings AB Sweden, S-813 00 Hofors SWEDEN
Propulsion Systems, 1441 N Northlake Way, Seattle WA 98103
Rolla SP Propellers SA, Via Silva 5, P.O. Box 251, 6828 Balerna SWITZERLAND
Rolla SP Propellers USA, 4030 Mustang Road, Melbourne, FL 32934, USA
Karl Senner Inc., 25 W Third, Kenner LA 70062
Schottel-Werft, D-5401 Spay, GERMANY
Stewart & Stevenson, 1400 Destrehan, P.O. Box 8, Harvey LA 70059-0008
Sulzer/Escher Wyss, Ravensburg GERMANY
Ulstein International, A/S, N-6065 Ulsteinvik, NORWAY
J. M. Voith GmbH, Dept. Werbung, Postfach 1940, 7920 Heidenheim/Brenz GERMANY
Oy Wartsila Ab, Vasa and Abo Divisions, Vasa Factory, FINLAND
Oy Wartsila, Stork Division, P.O. Box 244, SF 65100 Vasa, FINLAND
WesTech Gear Corp., 2600 E. Imperial Highway, Lynwood, CA 90262
ZF of North America, Marine Sales, 500 Barclay Blvd, Lincolnshire IL 60069
PROTECTIVE WRAPS
FANA (Film Applicators of North America), 1260 E Woodland Ave., Springfield PA 19064
PUMPS—Repairs—Drives
Coffin Turbo Pump, Inc., 326 S. Dean Street, Englewood, NJ 07631
Del Gaudio, 207 W. Central Ave., Maywood, NJ 07067
Galten Marine Company Inc., 160 Van Brunt Street, Brooklyn, NY 11231
Houser Marine, Lario Division, 1713 S McKenzie St., Foley AL 36535
Ima-Delaval, Inc., IMO Pump Division, Box 447, Monroe NC 28810
Jim's Pump Repair, 48-55 36th St., Long Island City NY 11101
Megator Corporation, 562 Alpha Drive, Pittsburgh, PA 15238
Vita Motivator, 99 W Hawthorne Ave., Suite 622, Valley Stream NY 11580
REMOTE VALVE OPERATORS
Teleflex, Inc., 771 First Ave., King of Prussia, PA 19406
ROPE—Manila—Nylon—Hawsers—Fibers
Allied Signal Inc., Fibers Division, 1411 Broadway, New York, NY 10018
Atlantic Cordage Corp., 60 Grant Ave., Carteret, NJ 07008
Columbian Rope Corp., P.O. Box 270, Guntown, MS 38849
Dupont Company, Montgomery 403, 1011 Centre Road, Wilmington, DE 19805
SANITATION DEVICES—Pollution Control
Jered Brown Brothers, P.O. Box 2006, Troy, MI 48007
Byrne, Rice & Turner, Inc., 1172 Camp Street, New Orleans, LA 70130
Envirovac Inc., 1260 Turret Dr., Rockford, IL 61111
FAST Systems, Inc., 3240 N. Broadway, St. Louis MO 63147
Microphor, Inc., Marine Division, 452 E. Hill Rd., P.O. Box 1460, Willits, CA 95490
Precision Control Inc., 3154 Martin Rd., Walled Lake MI 48088
Research Products/Blankenship (Incinolet), 2639 Andjon, Dallas, TX 75220
SCAFFOLDING
Spider Staging Corp., 12720 Gateway Dr., Seattle WA 98168
SCALE MODELS
Sturgeon Bay Model Shop, 187 N Ninth Ave., Sturgeon Bay WI 54235
SCUTTLES/MANHOLES
L.S. Boier & Assoc., 7527 NE 33rd Dr., Portland OR 97211
SHIPBUILDING EQUIPMENT
MAN—GHH, Sterkrade Werksrabe 112 D-4100 Duisburg 18, GERMANY
MAN—GHH, P.O. Box 110240, D-4200 Oberhausen 11, GERMANY
NEI Syncrolift, Inc., 8970 S W 87th Ct., Miami FL 33176
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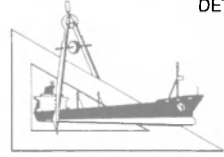
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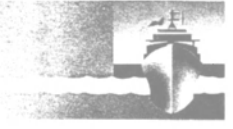
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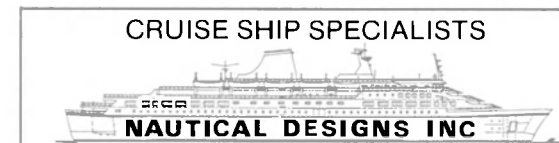
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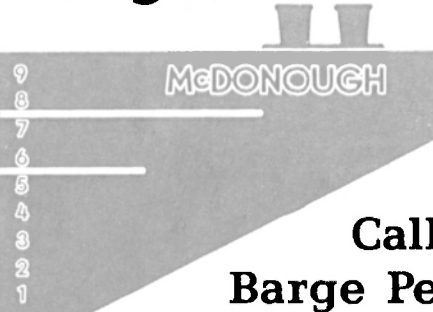
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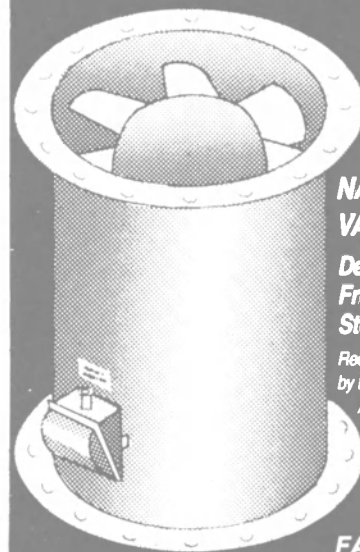
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