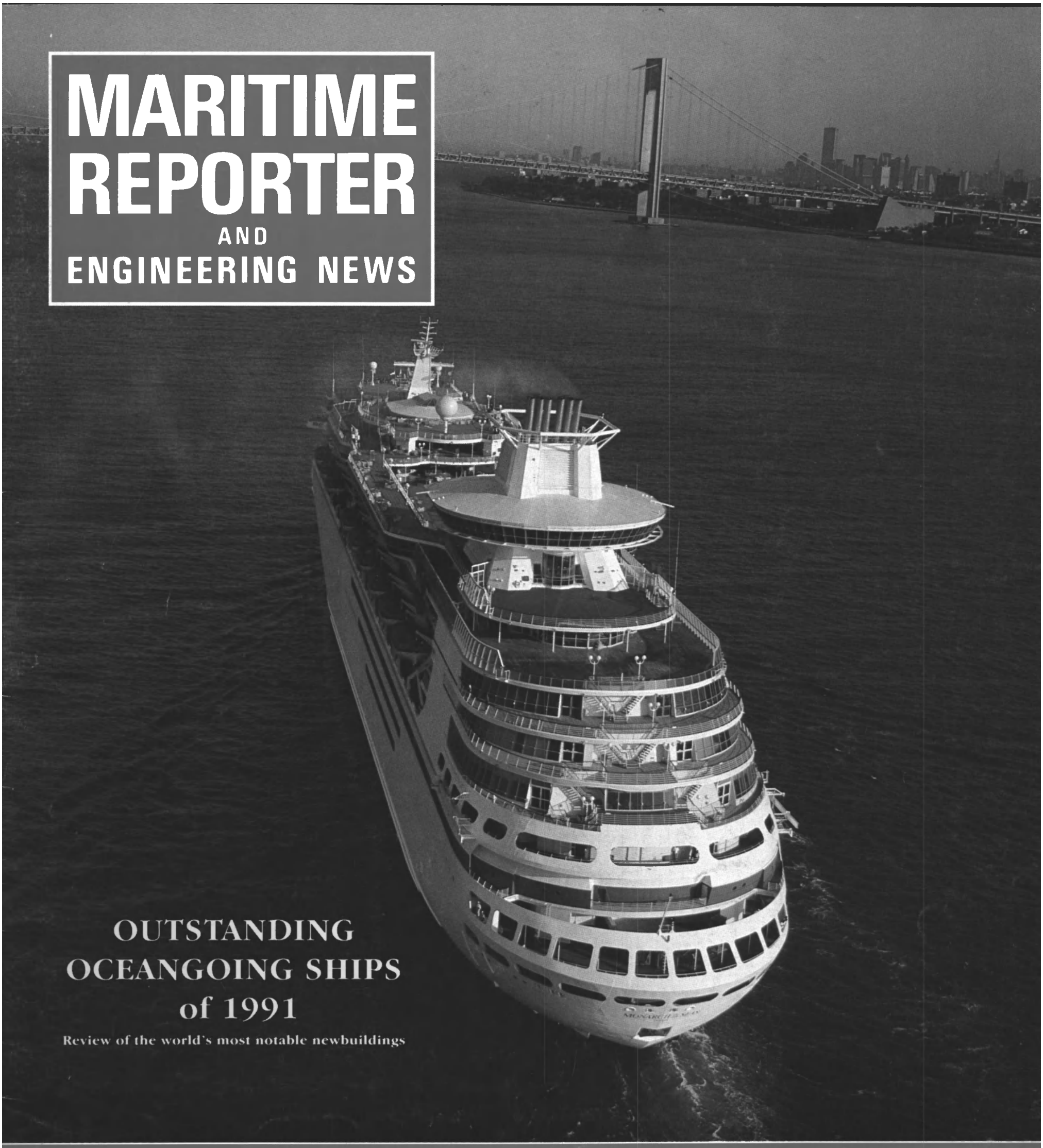
MARITIME REPORTER
AND
ENGINEERING NEWS



OUTSTANDING OCEANGOING SHIPS of 1991

Review of the world's most notable newbuildings

NAVAL TECHNOLOGY & SHIPBUILDING

DECEMBER 1991 ISSUE

NEW YORK SHIPYARD CORPORATION

COME TO NEW YORK: WE'LL GO THE EXTRA MILE FOR YOU!

We'll get your ship back in service -- on schedule and on budget.

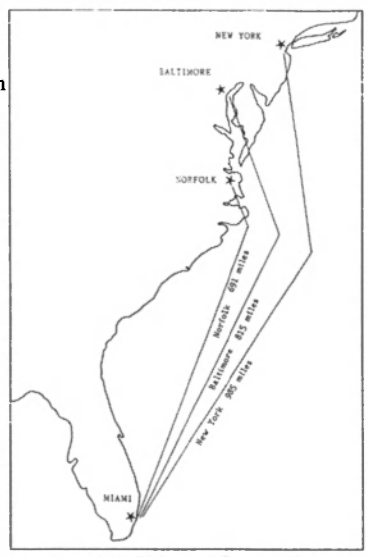
New York Shipyard is the only fully equipped deep draft shipyard operating in the Port of New York. We operate on a 24-hour basis with three fully staffed shifts and are capable of performing full turnkey repair operation.

Contact us for your next scheduled drydocking or emergency repairs.

DRY DOCKS - Certified Graving Dock and two Floating Dry Docks to 40,000 Tons.

MACHINE SHOP - Fully equipped Machine Shop capable of machining tail shafts to 55' lengths, babbitted bearings, milling machines - 40-ton lifting capacity, turbine blade balancing, metal locking, stainless clad welding. All work conforming to U.S.C.G. and A.B.S. requirements.

PLATE SHOP AND MOLD LOFT - Equipped to roll plate to 40' lengths, angle and frame bending, 400-ton cold press. Experienced loftsmen, shipfitters, and certified welders.



SANDBLASTING AND COATING DEPARTMENT - Experienced in external and internal coating systems.

PIPE SHOP - Capable of pipe fabrication, pipe bending, targetry skilled in stainless steel, black iron, and copper nickel.

EXPERIENCED SUPERVISION - in all ship repair skills capable of supervising a work force on a three-shift basis.

PIERS: Five (5) piers up to 1250' in length with deep water, full services including steam, shore current, water compressed air, fire protection - available for topside repairs and long term wharfage.

CRANE SERVICE - Up to 100 tons.

WAREHOUSE SPACE AVAILABLE - Long term, up to 150,000 square feet.

MANAGEMENT with five generations of service to the Marine Industry in the Port of New York.

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NY
New York Shipyard Corporation

Circle 25 on Reader Service Card

SUPER ferry 92

Aboard the "Silja Serenade"

Next February 4-5, passengership owners, operators, brokers, designers, port developers, etc will be able to experience the "cruise ferry concept" for two days on the world's largest cruise ferry, sailing from Stockholm to Helsinki and back.

Focusing on the cruise ferry marketing strategy for the travel, recreation and business sectors of the market, the onboard programme of SuperFerry 92 will ensure that delegates and exhibiting companies have every opportunity to discuss the development of this type of ship. SuperFerry 92 will be a unique occasion to experience state-of-the-art cruise ferry operations and, during the voyage, many of the exhibiting companies will have the chance to demonstrate at first hand their systems which are installed on the ship.

But, the cruise ferry concept is more than just luxury ferry operation - it is new thinking on ways to increase revenue and profit from passenger shipping. The progress and innovation represented by the "Silja Serenade" and her sister, "Silja Symphony", are not only being applied to the Baltic, where 16 million passengers are carried annually, but also on cross-Channel operations, the North Sea, Mediterranean and in North America and the Far East, where there is considerable potential for superferries and their derivatives.

EXHIBITORS
current and options

- KVAERNER MASA-YARDS - Passenger shipbuilding
- SEAKING - Galley systems and equipment
- HOLLMING - Shipbuilding/ Marine electronics
- WARTSILA DIESEL - Propulsion systems
- SCHAUMANN WOOD - Plywood panels
- HARTEK BEVERAGE HANDLING - Beverage dispensing systems
- INMARSAT - Satellite communications
- SBA INTERIOR SVARTA BRUK - Interior outfitting, cabin furniture
- EURO CHEMIE TRADING - Waste treatment
- KURE SHIPPING - Beverage control systems
- MARKSPELLE SWEDEN - Textiles
- ABB FLAKT MARINE - Air conditioning
- MAGNAVOX - Satellite communications
- HALKAMA - KAAPELE- Cables
- APT - TRADING
- FINNISH FOREIGN TRADE ASSOCIATION
- GROUP STAND - "FROM FRANCE"
- APS SALES - Antenna direction systems, fire doors
- FINNISH SHIPBUILDING SUPPLIERS ASSOCIATION
- CAINBY - Information systems
- PAROL - Interior insulation systems
- NAUTEL - Electrical systems and installation
- CIL SHOPFITTERS - Interior outfitting
- METOS MARINE - Galley systems and equipment
- DELTAMARIN - Marine and engineering consulting
- MacGREGOR - NAVIRE - Elevator and access systems
- ABB STROMBERG DRIVES - Electrical and automation systems
- ELECTROLUX MARINE - Galley equipment
- INTERNATIONAL ENTERTAINMENT SERVICES - Shipboard entertainment programmes
- STAL REFRIGERATION - Marine refrigeration
- USON MARKETING - Waste treatment plants
- TRAVELERS COMMUNICATION CORPORATION - Passenger communication systems services
- J. SAAJOS - Fire doors
- RAUTARUUKKI STEEL DIVISION - Steel
- COMSAT - Satellite Communications
- BRITISH CONTRACT FURNISHING ASSOCIATION
- NAPA - Architectural software and calculation systems
- SUOMEN VESIKALUSTE THERM - Shipboard water systems

Contact the Secretariat for exhibition reservations

PROGRAMME OF EVENTS

FEBRUARY 4th

12.00-17.00
Delegates board ship and register

14.00
Exhibition opens

17.00
Conference commences

Welcome Address from
Hans H. Christner,
President, EffJohn International.

SESSION 1
17.15
Forward thinking on the Cruise Ferry Product.
M. Saarikangas, Chief Executive, Kvaerner Masa-Yards Inc, Helsinki

SuperFerries on the North Sea - different to the Baltic? How & Why
J. Charlier,
Institute of Geography, UCL, Belgium

Tampa to Mexico - an ideal SuperFerry Route?
J.Valenti, Port Director, Tampa Port Authority, Florida

Panel Session: The opening speakers will be joined by
H. Kulovaara, Operations Vice President, Silja Line and C. Michielini, Managing Director, Brittany Ferries, France

19.00-20.30
Welcome Cocktail hosted by Wartsila Diesel

FEBRUARY 5th

08.00
Breakfast

SESSION 2
08.30
Reservation Systems for SuperFerry Operations
A. Hammarskjold, President, Stena Data AB, Gothenburg

FEBRUARY 5th continued

Business Communications for the SuperFerry - new systems
L.G. Brodje, Maritime Adviser, Inmarsat, London.
(A Inmarsat Business Centre will provide immediate communication to and from the "Silja Serenade" during SuperFerry 92)

SESSION 3
10.30
Taking on the Channel Challenge with a new generation of SuperFerry
C. Michielini, Managing Director, Brittany Ferries, France

Upgrading to SuperFerry?
G. Strintzis, Managing Director, Strintzis Lines, Piraeus

Cruise or Ferry?
N. Costa, President, Costa Crociere, Genoa

12.00
Aperitif in Exhibition Area

13.00
Lunch

SESSION 4
14.00
Conference Restarts

Refitting and refurbishing - the key to maintaining a SuperFerry
B.Mickwitz, Export Manager, Finnish Shipbuilders Suppliers Association, Helsinki

Complex superferry newbuilding and conversion - recent experiences are to the benefit of both owners and shipyards
A.Bjorkman, Managing Director, Deltamarin Ltd, Raisio

Environmental considerations for machinery in Cruise Ferries
G.Hellen, Emission Control, Wärtsilä Diesel International, Vaasa

FEBRUARY 5th continued

SESSION 5
16.30
Panel Session on the Cruise Ferry Shipboard Environment
Swimming & Saunas - *Arkitektbyrán AB, Gothenburg*

Conference/Exhibition Areas - *Virkkunen & Co.,Helsinki*

Shopping Malls - *FFNS, Stockholm*

Entertainment - *IES, Helsinki*

Gambling - *Cherryforetagen, Solna*

Passenger Information - *Cainby AB, Mariehamn*

Exterior Design - *Windell & Riikonen, Helsinki*

18.00
Conference ends
Delegates free until 20.00

20.00
Cocktails

21.00
Gala Dinner with address from
The Marine Technology Group of the Finnish Foreign Trade Association

23.00
SuperFerry 92 Cabaret
provided by IES, Helsinki

FEBRUARY 6th

08.00
Farewell Champagne Breakfast

09.00
Ship arrives Stockholm

Delegates Disembark

09.15
Optional tours of non-public ship areas i.e. Galleys/Bridge/Engine-room, etc

CONFERENCE REGISTRATION

I/We wish to make Conference Registration(s) for____ delegate(s) and enclose a cheque for £ _____ made payable to: BML Business Meetings Ltd. (£395.00 per person)

Name _____ Company _____

Title _____ Address _____

Name _____

Title _____

Name _____

Title _____

Telephone _____ Fax _____

Please return this form to the SuperFerry 92 Secretariat at:
2 Station Road, Rickmansworth, Hertfordshire WD3 1QP, England
Tel: +44 923 776363 Fax: +44 923 777206 Telex: 924312

For cabin reservations contact Oy Silja Line AB, Ms Anne Kopio, PO Box 880, SF-00101 Helsinki Finland (Fax: + 358 0 1804 353)

ON THE COVER

The giant cruise ship Monarch of the Seas, one of this year s Outstanding Oceangoing Ships, in New York Harbor. The 75,000-grt megaliner was built by Chantiers de l'Atlantique of France. Photo: **Moran Towing.**

INSIDE

Ingalls Awarded $27.2 Million Contract For Navy Cruiser Work

Litton Industries' Ingalls Shipbuilding division, Pascagoula, Miss., has been awarded a $27.2 million contract by the U.S. Navy to provide continuing engineering and support services for the Ticonderoga Class (CG-47) Aegis guided missile cruiser program.

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"Engineer a better fiber, and ultimately you've engineered a better product."

Because of the challenge faced by rope, cordage and fiber manufacturers — to construct a better polyester product for the wet environment — engineers at Allied-Signal Inc. were persistent until they discovered a solution — SeaGard®. The motivation for this was a basic part of the Allied Fibers philosophy: "engineer a better fiber, and ultimately you've engineered a better product". By utilizing Allied Fibers' high tenacity ACE polyester and then applying the SeaGard finish to the fibers, a better-performing, wet abrasion resistant rope was now able to be constructed.

In independent testing and in field testing by several rope manufacturers, ACE polyester SeaGard ropes — 3-strand and braided — outlasted and out-performed ordinary polyester ropes by incredible margins, even under the most severe wet abrasion conditions.

Today, many rope manufacturers have found that they require a higher level of performance plus cost-effectiveness for the most demanding applications, such as: tethers for balloons, underwater surveillance systems, offshore oil rigging and transmission & distribution (T&D) lines. ACE polyester SeaGard meets these requirements. And, for the sailor who wants the best in performance, SeaGard ropes offer that certain added security plus easy, smooth handling.

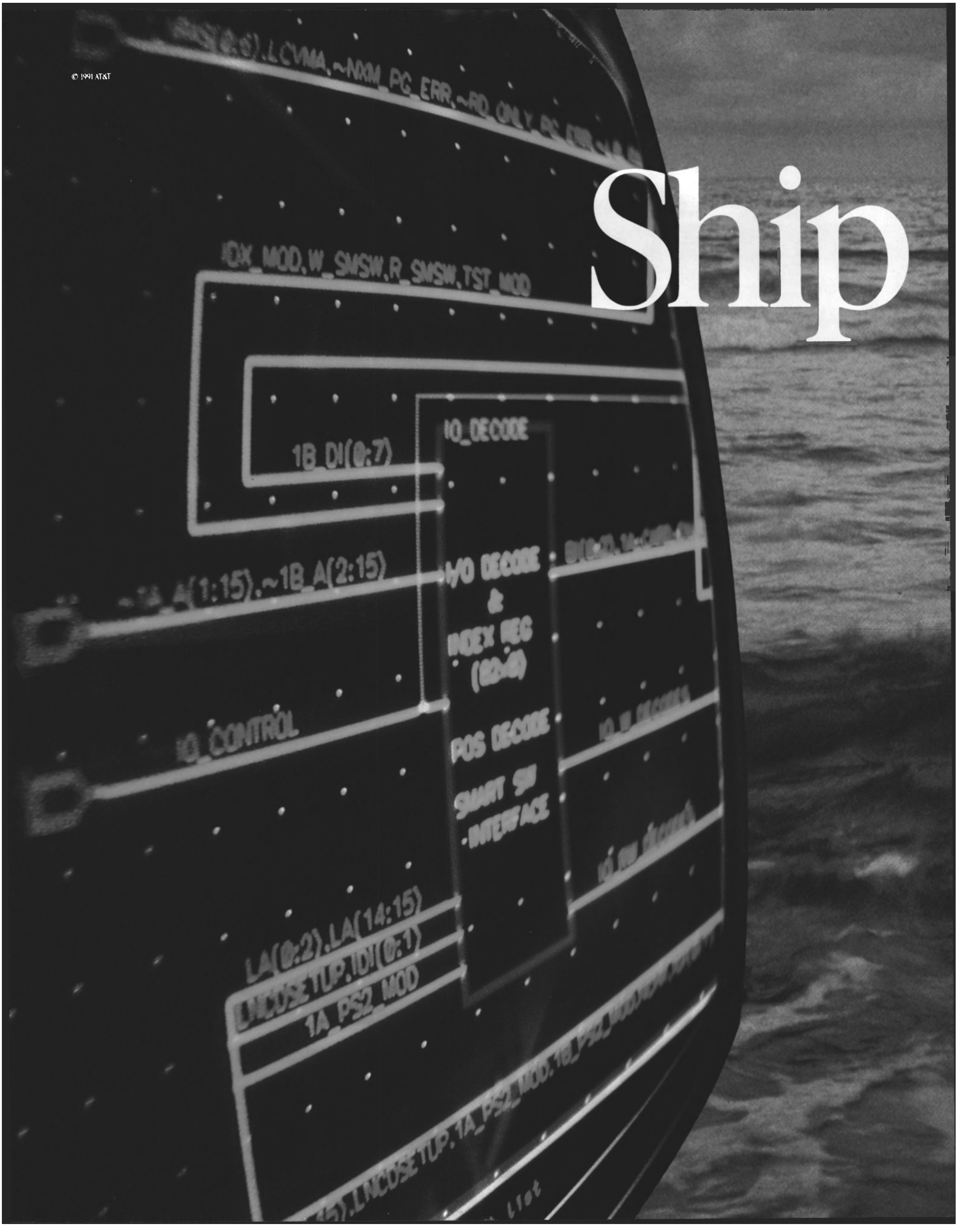
For further information and test results, contact: Dept. A-S, Suite 1500, 224 West 35th Street, New York, NY 10001.

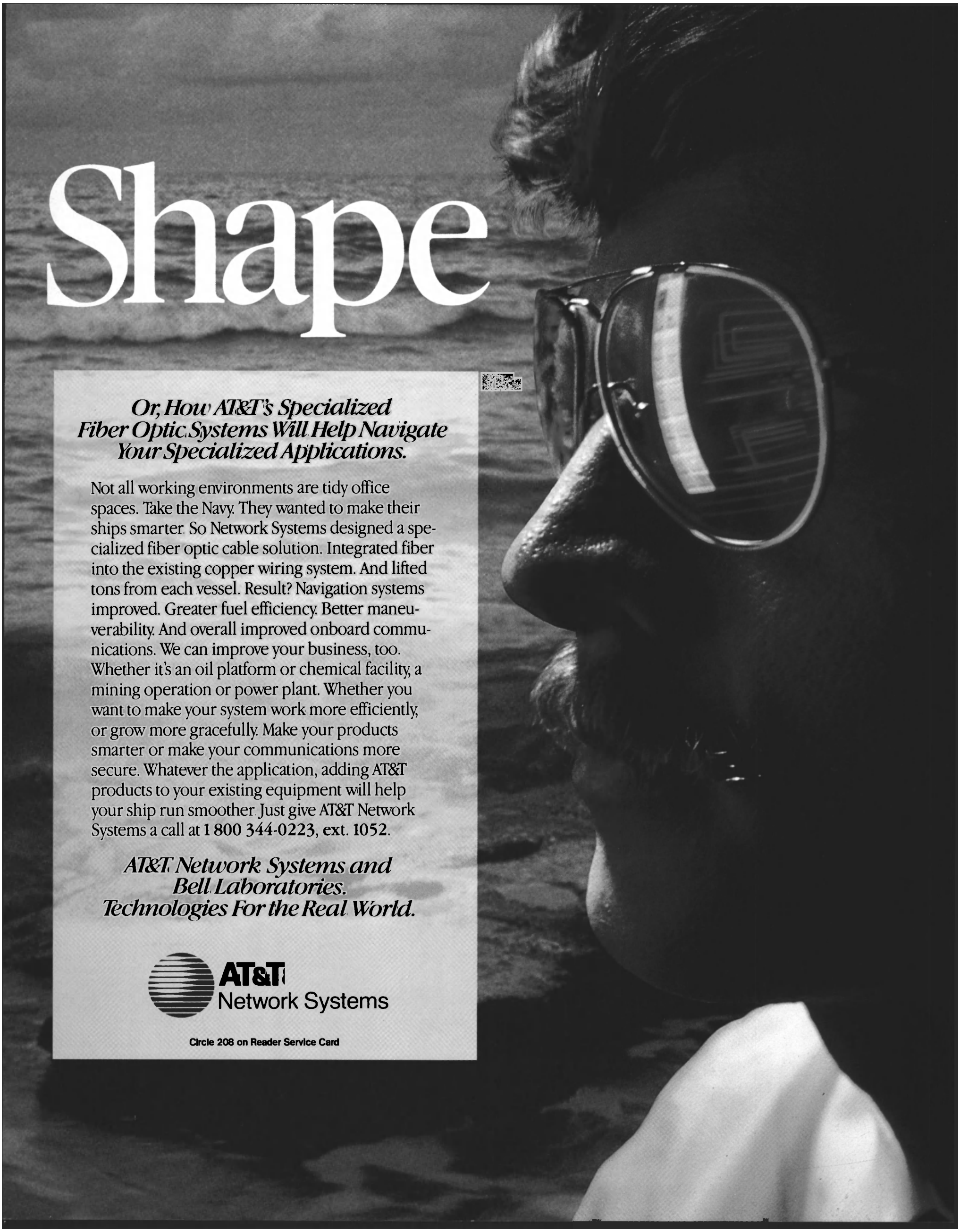
Allied Fibers

Circle 242 on Reader Service Card

Allied Signal

Ship





Or, How AT&T's Specialized Fiber Optic Systems Will Help Navigate Your Specialized Applications.

Not all working environments are tidy office spaces. Take the Navy. They wanted to make their ships smarter. So Network Systems designed a specialized fiber optic cable solution. Integrated fiber into the existing copper wiring system. And lifted tons from each vessel. Result? Navigation systems improved. Greater fuel efficiency. Better maneuverability. And overall improved onboard communications. We can improve your business, too. Whether it's an oil platform or chemical facility, a mining operation or power plant. Whether you want to make your system work more efficiently, or grow more gracefully. Make your products smarter or make your communications more secure. Whatever the application, adding AT&T products to your existing equipment will help your ship run smoother. Just give AT&T Network Systems a call at 1 800 344-0223, ext. 1052.

AT&T Network Systems and Bell Laboratories. Technologies For the Real World.

AT&T
Network Systems

Circle 208 on Reader Service Card

Anschutz Supplies Navigation Package For 'Hannover Express'

One of this year's "Outstanding Oceangoing Ships," the modern containership Hannover Express, sails with a complete navigation package from Anschutz & Co. GmbH, Kiel, Germany.

In accordance with the "Ship of the Future" concept, the components of the navigation equipment are integrated in a modern operations and onboard management system, fulfilling the requirements for one-man bridge operation.

For safe navigation, a gyrocompass twin equipment (Standard 4/ Standard 12) and a magnetic compass (Reflecta 1) are available as course sensors. Via the course reference managing system Nautocourse, all compasses are combined and are monitored by the signal units Nautoalarm. The course output of the gyrocompasses is speed error-corrected and the course output of the magnetic compass is deviation and variation corrected by Nautocourse. A number of repeater compasses on the bridge, wings and in the rudder machine room indicate the actual course.

A great help for the ship's personnel is an Automatic Chart Table, the Nautoplot, by which the current ship's position is indicated on a standard Mercator sea chart by a light spot.

An analogue follow-up steering control serves as main steering for the officer on duty. A take-over system permits "authorized" steering places port or starboard wing. With the onboard autopilot Nautopilot A, the ship's crew is relieved from making adaptions to changing environmental conditions to achieve optimum navigation.

On long sea voyages, the Nautopilot A can be switched from the mode "exact course" to "economy" in order to reduce uneconomical rudder deflections and reduce strain on the rudder machinery.

It is possible to manually interrupt the automatic steering process by an override-system and later the Nautopilot A can be reactivated by pressing a button.

For maneuvering, the non-follow-up can be selected by the steering selector switch. This facilitates ship control depending on situation.

The course and rudder angle indicator from Anschutz records the transversed course and the corresponding rudder angle on diagram paper.

The direct switching over of the non-follow-up steering in the rudder machine room in emergency situations also guarantees safe guidance of the ship.

All Anschutz operation panels are incorporated as standard units in a desk section, offering an ergonomical design.

For free literature on Anschutz navigation equipment,

Circle 66 on Reader Service Card

IPD Offers Piston Replacements For Major Diesel Engines

Industrial Parts Depot (IPD), Torrance, Calif., manufactures and sells replacement parts for many of the major marine diesel engines through distributors all over the world.

IPD, for example, manufactures and sells two-ring and three-ring model replacements for the pistons normally found in diesel engines from one major marine supplier. Customers report improvement in fuel economy, decreased oil consumption and blowby, therefore reducing total operating costs. The application pistons are available in standard and high compression.

For another manufacturer's marine engines, IPD offers standard and hardened replacement liners.

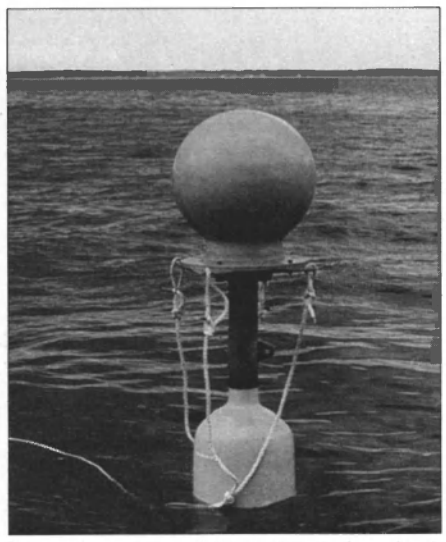
The wear surface on the "IPD Extra" liners for the engines is induction hardened. That means the wear surface is more than twice as hard. This product is available in IPD's Lifesaver Inframe Kit or as individual liner kits.

In fleet service, these liners can deliver the extra miles of service between replacement—an obvious cost savings to the operator.

For free literature detailing the replacement parts available from IPD,

Circle 67 on Reader Service Card

Seaward Delivers New Specially Designed Foam-Filled Spar Buoy



Seaward's new specially designed, foam-filled marine spar buoy.

Seaward International, Inc., Clearbrook, Va., recently delivered a specially designed, foam-filled marine spar buoy to the Naval Air Center in Patuxent River, Md.

Because the operating parameters of this buoy were unusually tight, it was essential for Seaward engineers to evaluate every aspect of spar buoy behavior to meet the strict requirements. This included close examination of a range of operating loads and wave action harmonics on the buoy at various sea states.

Although relatively small (only 475 pounds of displacement), the buoy supplied by Seaward was required to hold its mounting platform at a stable vertical elevation above the waterline while restricting the degree of sway from the vertical to an absolute minimum. In addition, these parameters had to be held tight in sea states having 5 feet of wave action.

Seaward International, Inc. is an Elastomer Technology Company serving the needs of the marine market through the production of foam-filled fenders, buoys, coatings and composite materials.

For further information on Seaward products,

Circle 22 on Reader Service Card

Nigel Fountaine Joins Comsat As Director, Maritime Consumer Sales

Comsat Mobile Communications, Washington, D.C., has appointed **Nigel P. Fountaine** as director, maritime consumer sales, reporting to **Ed Ryznar**, vice president, maritime sales.

Prior to joining Comsat, Mr. **Fountaine** was employed at Magnavox Marine and Survey Systems Division in Torrance, Calif., where he held the positions of North American sales manager and, most recently, Satcom product manager.

In his new capacity, Mr. **Fountaine** will be responsible for developing Comsat's entry into the consumer maritime market, which will rely heavily on two emerging technologies for smaller vessels; Inmarsat-C for data only, and Inmarsat-M for compressed voice, data and fax services.

Both will be promoted heavily to owners of motor yachts and sailing vessels in the 50- to 100-foot range, who sail into international waters and would greatly benefit from a global communications capability, but who have not considered an Inmarsat-A satellite system because of its size and cost.

Comsat Mobile Communications provides maritime, aeronautical and international land mobile communications to customers around the world through its Inmarsat land earth stations, located in Southbury, Conn., and Santa Paula, Calif. Comsat Corporation represents the U.S. in the 64-member Inmarsat and the 120-member International Telecommunications Satellite Organization (Intelsat).

For further information and free literature,

Circle 19 on Reader Service Card

Hyundai Mipo Dockyard Posts Successful First Half

Korean Yard Repairs 217 Vessels In Six-Month Period

South Korea's Hyundai Mipo Dockyard Co., Ltd. (HMD) is known as one of the leading companies in the ship repair and conversion field, and it confirmed its position by performing repair work on its 4,000th vessel. HMD makes full use of its modern facilities, including four graving docks and over 2.5 kilometers of berthing.

Located in the inner port of Ulsan on the southeastern coast of Korea, historically one of the best ports in terms of geography and topography, HMD offers the advantages of an efficient arrangement of repair facilities to ships that visit Korea.

Fully supported by the technical expertise and extensive facilities of Hyundai sister companies such as Hyundai Heavy Industries Co., Ltd., and Hyundai Electrical Engineering Co., Ltd., HMD, one of the world's largest single complexes for ship repair and conversion, is making noteworthy advances into a new phase of its activities.

Holds Premier Position In Ship Repair Sector

Since its establishment in 1975, HMD has continuously accumulated accomplishments and is now firmly established among the premier world ship repair and conversion companies, both in quality and quantity. Backed by modern facilities and technology, HMD specializes in a wide range of services from general repairs, damage repairs and conversion projects, to renovation of special types of vessels and offshore facilities.

Hyundai Mipo's Main Repair Facilities

Repair Docks (4):
1082 ft x 213 ft x 41 ft, with 300,000 dwt capacity;
1246 ft x 213 ft x 41 ft, with 400,000 dwt capacity;
1246 ft x 213 ft x 41 ft, with 400,000 dwt capacity;
984 ft x 213 ft x 41 ft, with 280,000 dwt capacity.

Repair Quays (4):
2296 ft, 656 ft, 2853 ft and 2706 ft.

HMD's accumulated expertise in the field of general repairs covers such works as hull repairs (steel, blasting and painting), engine repairs (machining and balancing) and electric and electronic repairs. With over 600 technicians and welders certified by international classification societies, HMD has extensive experience in every kind of damage repair.

The company's four large scale graving docks spread over a yard area of 465,000 square meters with a 1.38 million deadweight ton drydock capacity are able to repair some 450 vessels annually.

Other major works carried out by HMD include conversion projects, such as converting a ship from one type to another, forebody replacement, hull elongation, re-engining, engine modification and shortening. In parallel with repair and conversion, HMD also participates in the design and construction of various offshore equipment and special-purpose vessels.

Good First Half Of 1991

HMD has customers all over the world, including Eastern Bloc countries and the USSR. In the first half of 1991, HMD repaired a total of 217 vessels, an 11.2 percent increase compared with the corresponding period in 1990.

HMD started repair business with the USSR in November 1988 by drydocking the ship M/V Khudozhnik Kraynev from Far Eastern Shipping Co. (FESCO). Following that first drydocking in 1988, 96 Soviet-flagged ships were repaired or converted by HMD over the next two years.

In addition, HMD recently landed its first award for repair of a Chinese-flagged 120,000-dwt bulk/container ship, the M/V Tao Jiang Hai, from Chinese Ocean Shipping Co. (COSCO), the world's largest state-run shipping company. The shipping line operates 620 vessels.

HMD is now heavily booked with various jobs, to the extent that its brisk business prevents it from accommodating all the repair orders coming from shipowners.

For free literature detailing the ship repair, retrofit and conversion capabilities of Hyundai Mipo,

Circle 71 on Reader Service Card

New Oil Discoveries Made Off Nigeria By Mobil Corp.

Two new offshore oil discoveries with expected potential reserves of about 450 million barrels of crude have been reported by Mobil Corp.

The discoveries were announced in Nigeria by **Allen Murray**, Mobil chairman, who also commissioned the 250,000-barrel-a-day Edop production platform and a 24-inch-diameter pipeline from the Edop field to the Qua Iboe terminal.

The $600 million Edop project, when completed, will include 42 wells.

Microtechnica Offers 'Nautamaster' Integrated Steering Control Stand

A sliding drawer inside the Nautamaster steering control stand allows mounting of the Polaris MK2 gyrocompass, thus providing easy access for maintenance and service operations; incorporated in the upper steering console plate of the Nautamaster is the control panel of the gyrocompass equipment.

Ergonomic design, compactness and rugged construction are the main features which characterize the new Nautamaster integrated steering control stand offered by Microtechnica of Torino, Italy. Its essential design makes it suitable for installation either as a unit by itself at the center of the bridge or as an integral part of the navigation console. Also, its overall dimensions are such that it can be installed on ships of any type and tonnage.

The Nautamaster, designed and built in accordance with IMO and SOLAS regulations, is supplied standard with double follow-up steering facility by means of a steering wheel and double non-follow-up steering by means of a tiller (emergency overriding).

The Nautamaster, in its basic configuration, also includes the steering repeater with double graduated card and the microprocessor controlled digital automatic pilot Supernauta complete with the dedicated software for connection to the Selesmar Vector and Racal MNS 2000 integrated navigation systems.

As the Nautamaster is supplied factory pre-wired, its installation allows considerable space-saving and reduction in the cabling to be done by the shipyard.

For further information and free literature from Microtechnica,.

Circle 21 on Reader Service Card

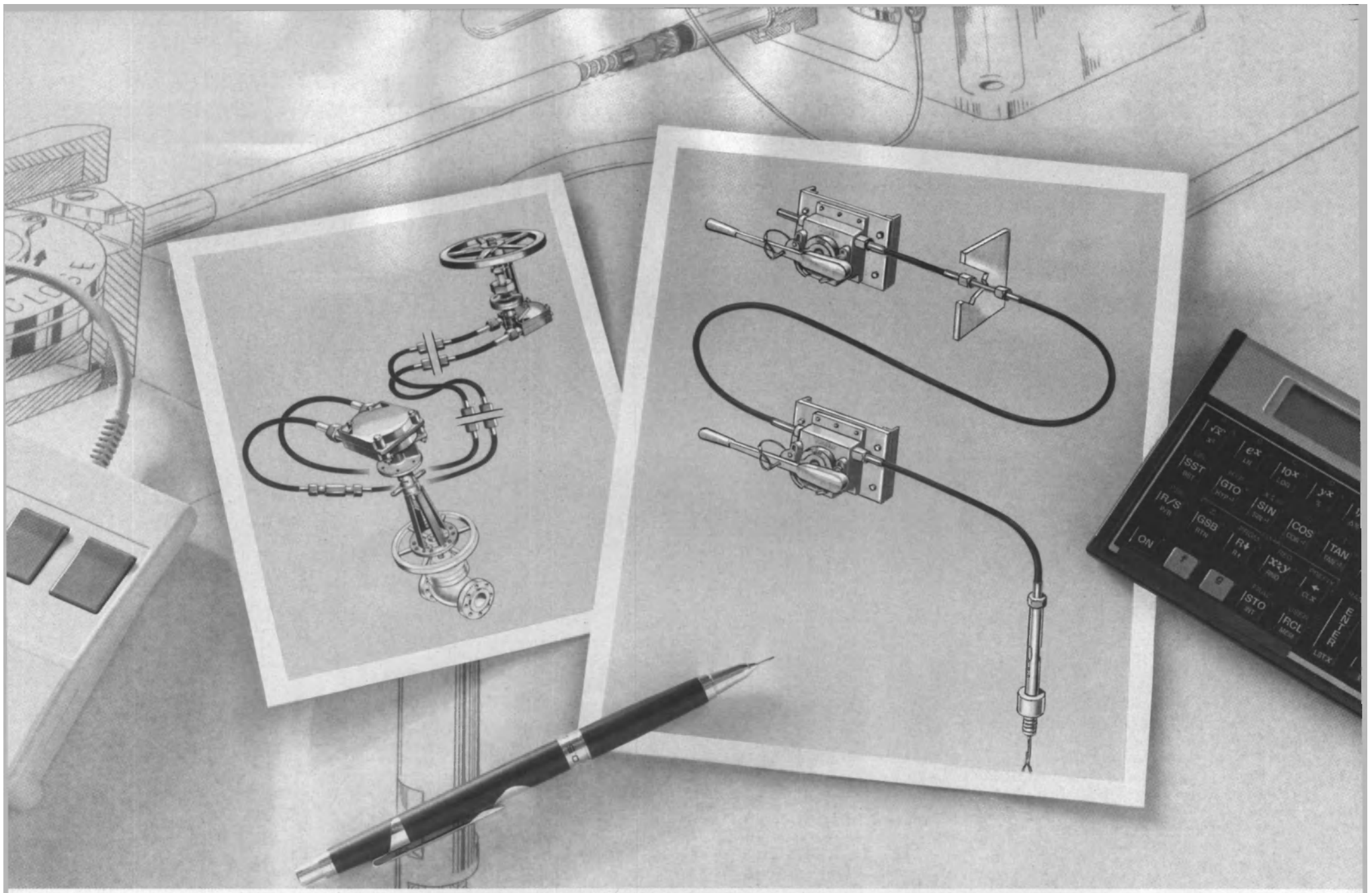
MarAd Approves Five Title XI Applications Totaling $73.2 Million

Warren G. Leback, Maritime Administrator, has approved five applications from barge operators for ship financing guarantees under Title XI of the 1936 Merchant Marine Act. The applicants, projects and the approved guarantees were:

- American Commercial Lines, Jeffersonville, Inc., financing construction of 50 hopper barges and eight river tank barges, $11.2 million.
- Central Gulf Lines, New Orleans, financing reconstruction and reconditioning of up to 500 LASH barges, up to $15 million.
- General Electric Credit Corporation of Georgia, Stamford, Conn., refinancing of part of existing Title XI obligations in the construction of two integrated tug/barge units, $30.9 million.
- Ingram Barge Company, Nashville, Tenn., financing construction of 44 open hopper barges and 15 double-skinned chemical tank barges, $12.2 million.
- Parker Towing Company, Tuscaloosa, Ala., refinancing construction of 25 dry cargo barges, $3.9 million.

NASSCO Awarded $5.4 Million Contract For Phased Maintenance

National Steel & Shipbuilding Co. (NASSCO), of San Diego, Calif., was recently awarded a $5.4 million U.S. Navy contract for the phased maintenance availability of the USS Dixon (AS-37).



Left: Remote Mechanical Valve Actuator. Right: Remote Trip Valve Actuator.

RMVA, and now RTVA Teleflex designs solutions for Remote Valve Operation

Engineering solutions aren't born. They're carefully designed. Consider RMVA, the Remote Mechanical Valve Actuator System from Teleflex, Inc. Naval Technologies Division.

The RMVA System serves as the industry standard for quality and performance in remote valve operation, and has been installed on virtually every ship class in the U.S. Navy.

Teleflex engineers solve problems using first-hand knowledge gained through years of experience on Naval vessels.

Teleflex has now found the solution to the problems long associated with Trip Valve Operators: the Remote Trip Valve Actuator System, or RTVA.

The RTVA System is designed first for survivability, as it eliminates shock-induced valve closures associated with the current cable/pulley systems.

The RTVA System is cost effective. It is completely sealed, permanently lubricated and corrosion resistant.

It's maintenance-free operation saves valuable manpower—allowing the ships' force to work on more critical tasks.

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San Diego Shipbuilding Launches Cummins-Powered Sightseeing Vessel 'Maui-E-Ticket'

Artist's rendition of the sightseeing vessel Maui-E-Ticket, built by San Diego Shipbuilding & Repair, Inc. for Corporate E-Ticket, Inc.

San Diego Shipbuilding & Repair, Inc., located in Chula Vista, Calif., recently launched the Maui-E-Ticket, a unique sightseeing vessel destined for the coastal waters off the Island of Maui in the Hawaiian Islands.

The Maui-E-Ticket is a 56-foot-long catamaran that carries 22 passengers in each hull, comfortably seated before large polycarbonate viewing windows. Each passenger wears a personal headset to monitor a running account of the wonders passing outside the viewing compartments.

Technically, the Maui-E-Ticket is a semisubmersible displacing 115 tons that can be ballasted low in the water for stability and better viewing from the passenger compartments.

This 25-foot-wide vessel is powered by three Cummins 4BT3s coupled through Borg Warner 72C direct drives to Stern Power 113E out-drives. The engines are controlled by Mathers Micro Commander electronic controls from port or starboard steering positions.

In addition to six passenger viewing compartments in the hulls, passengers can purchase refreshments in the midships lounge and bar. The evening underwater view is enhanced by high intensity lights. To enable the pilot to show his passengers particularly interesting scenes, from the pilothouse he monitors forward port- and starboard-looking color video cameras.

The Maui-E-Ticket is expected to make eight to 10 trips a day, escorting tourists through the aquatic wonders in the reefs surrounding Maui. It was conceived by **Curtis Jackson Jr.**, and is owned by Corporate E-Ticket, Inc.

San Diego Shipbuilding & Repair, Inc. specializes in unique passenger vessels of all types. Besides shallow water-viewing vessels similar to the Maui-E-Ticket, it has has a contract to build a submarine for deep viewing. The yard's wide-ranging capabilities also include construction of high-speed SES vessels using sandwich panel technology. In association with the Norwegian company Cirrus, San Diego Shipbuilding will be constructing a fleet of modified 50-knot, 350-passenger Cirrus 120s for use in Hawaii and up and down the coast of southern California.

For free literature detailing the facilities and capabilities of San Diego Shipbuilding,

Circle 10 on Reader Service Card

$2.3 Billion Taiwan Contract Awarded France For Six Frigate Hulls

The Republic of China (Taiwan) Navy has placed an order for six La Fayette class frigates in France under a $2.3 billion contract. The Thompson-CSF Group was awarded the prime contract to supply hull sections pre-outfitted with electronic equipment to Taiwan.

The hull sections will be built by the French Defense Ministry's Shipbuilding Directorate, Direction des Constructions Navales (DCN), at their Lorient Shipyard, and then the sections will be shipped to Taiwan for assembly and outfitting by the China shipbuilding company. Hull section delivery will start in 1994 and the Thompson-CSF coordination and Lorient Shipyard technical assistance in Taiwan is scheduled for completion in 1997. France will not provide any weapons. The agreement is a cash deal with no offsets.

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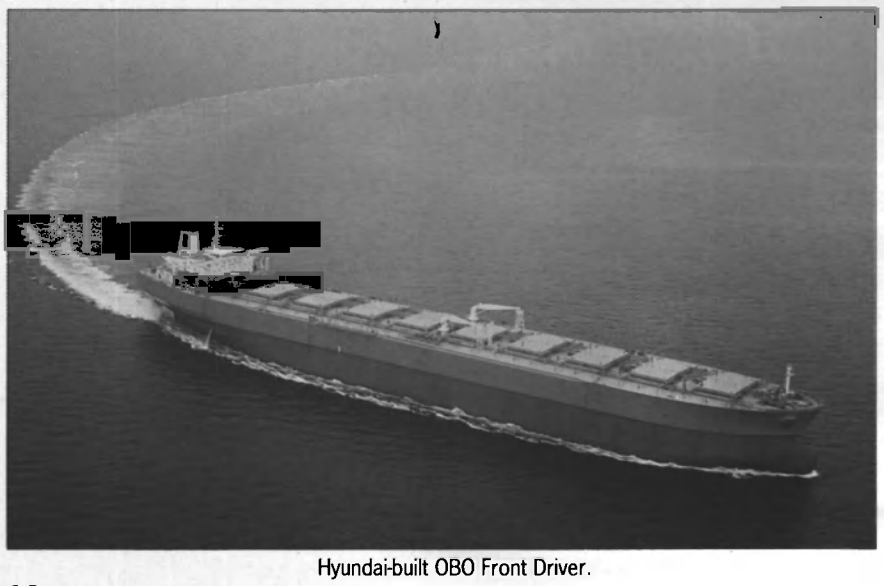
Circle 245 on Reader Service Card

OUTSTANDING OCEAN

Hitachi Zosen-built tanker Salamina.

Containership Hannover Express, built by Samsung.

Reefer Ditlev Lauritzen, constructed by Danyard.



Hyundai-built OBO Front Driver.

Following a slight downturn, due mostly to the Gulf conflict and global economic recession, ship orders have picked up once again in the third quarter. Most major yards around the world, in fact, have full order books well into 1993.

This year's "Outstanding Oceangoing Ships" reflect the various pressures driving world ship construction, including the need for replacement tonnage, increased trade in the LPG market, the growth of containerization, continuing expansion in the competitive cruise market, and, of course, the significant impact of the Oil Pollution Act of 1990.

Award winners for 1991 span a gamut of different designs, from the world's largest reefer (Ditlev Lauritzen) to the world's largest Panamax containership (Hannover Express), from the Navy's first SWATH (USNS Victorious) to the world's largest cruise ship (Monarch of the Seas). Others include new double-hull configurations and new tonnage for the LPG, OBO and bulk trades.

Information Available

Information on any of the shipbuilders in this article is available by circling the appropriate Reader Service number on the card bound into to the back of this issue.

BERGE COMMANDER
NKK

Circle 85 on Reader Service Card

The first of four 78,543 cubic meter capacity multipurpose LPG carriers, the Berge Commander, was delivered by the Tsu shipyard of Japanese shipbuilder Nippon Kokan K.K. (NKK) to owner Bergesen of Norway during this past year. Designed to carry eight different types of cargo—liquefied propane, butane, propane/butane mixture, butadiene, butylene, propylene, ammonia and naptha, the Berge Commander has an overall length of 734 feet, breadth of 118 feet, depth of 71-1/2 feet and summer draft of 41 feet.

The Berge Commander is equipped with a central Valmet control system which enables simultaneous cargo and engine monitoring within the same room.

Cargo is carried in four prismatic self-supporting tanks, all fitted with two Kvaerner Eureka vertical deepwell centrifugal pumps, each with a capacity of 560 cubic meters per hour. Two Kvaerner Eureka horizontal booster pumps, rated at 300 cubic meters per hour, are also fitted onboard, making it possible to discharge to pressurized shore storage tanks.

Propulsion is supplied by a Diesel United-Sulzer 7RTA62 main engine with a maximum continuous rating of 17,790 bhp at 101 rpm. Fuel efficiency is enhanced by a swept backup thrusting rudder fin, reportedly providing a three to seven percent energy savings.

Auxiliary power is provided by three 720-rpm Bergen Diesel engines driving Taiyo alternators and a Shinko/Taiyo shaft alternator. Emergency power generation is provided by a Yanmar/Taiyo genset.

One of the first ships built in Japan which is equipped with a complete GMDSS, the Berge Commander has Inmarsat standard A and standard C equipment supplied by JRC and Skanti radio equipment.

BERGE COMMANDER
Equipment List

Main engine	Diesel United-Sulzer
Centrifugal pumps	Kvaerner Eureka
Booster pumps	Kvaerner Eureka
Auxiliary engines	Bergen Diesel
Alternators	Taiyo
Shaft alternators	Shinko/Taiyo
Emergency genset	Yanmar/Taiyo
Inmarsat A & C equipment	JRC
Radio equipment	Skanti
ARPAs	Krupp Atlas
Collision avoidance system	JRC
Satnav	Robertson Shipmate
Echo sounder	Krupp Atlas

Cruise ship Regal Princess from Fincantieri.

OING SHIPS OF 1991

BRUCE SMART
Ishibras

Circle 91 on Reader Service Card

Ishikawajima do Brasil Estaleiros S.A. (ISHIBRAS) shipyard in Rio de Janeiro, Brazil, has delivered the third in a series of four 150,000-dwt tankers, the Bruce Smart, to Chevron Corporation.

Christened in honor of a director of Chevron Corporation, the Bruce Smart has an overall length of 900 feet, beam of 164 feet, depth of 82 feet and summer draft of 54 feet. The 149,995-dwt tanker is owned and operated by Chevron Transport Corp. and registered under the Liberian flag. She is powered by a single slow-speed IHI-Sulzer 6RTA72 main diesel engine, rated at 18,900 bhp at 86 rpm, directly coupled to five-blade fixed-pitch Nakashima propeller.

Auxiliary power is supplied by three 900-kw Wartsila Vasa 6R22/26 diesel generators.

The Bruce Smart is equipped with 10 cargo tanks, two slop tanks and four ballast tanks. With the addition of the Bruce Smart, Chevron's worldwide tanker fleet now stands at 41. These four new identical tankers, under contract with Mitsui & Co./Ishikawajima Harima Heavy Industries Company, Ltd. (IHI), are being built by IHI and its Brazilian affiliate, Ishibras. The last vessel of this series is scheduled for delivery in February 1992. These four new tankers are replacing older vessels as part of an ongoing Chevron fleet retirement and renewal program.

BRUCE SMART
Equipment List

Main engine	IHI-Sulzer
Generators	Wartsila Vasa
Steering controls	Nippon Airbrake
Steering gear	Kawasaki
Winches & windlass	Nippon Pusnes
Cranes	Hagglunds
Radar	Krupp Atlas
Centrifugal pumps	Shinko
Main boiler	IHI
Oil purifiers	Alfa Laval

The Bruce Smart can carry approximately 1,100,000 barrels of crude oil on each voyage. Its first delivery is scheduled to be a cargo of West African crude oil to Chevron's Philadelphia Refinery.

CONGER
Lindenau Shipyard

Circle 73 on Reader Service Card

The largest ship ever to emerge from the Kiel yard of German shipbuilder Lindenau GmbH, the 23,400-dwt chemical tanker Conger, was delivered to Partenreederei "Conger," c/o Carl Buttner GmbH & Co.

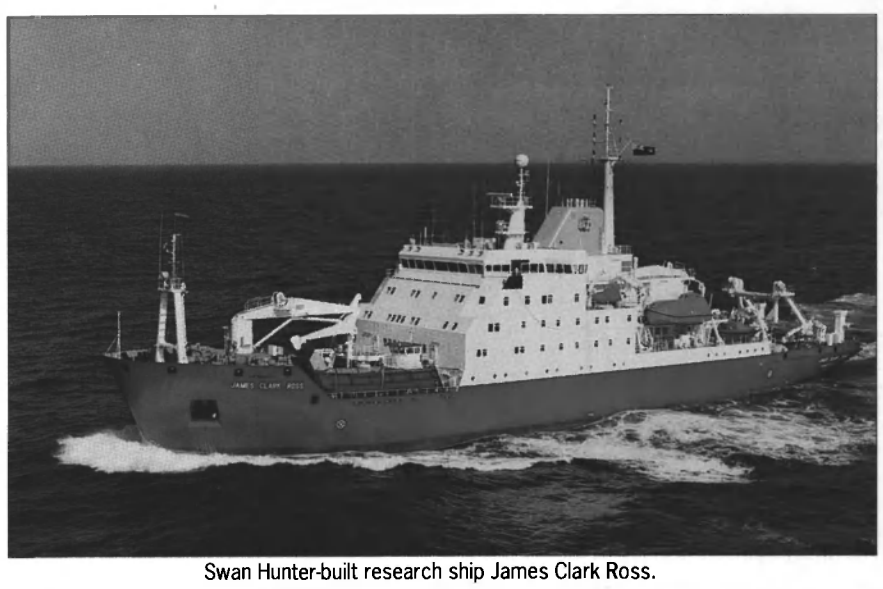
The double-hulled ship can transport chemicals up to IMO type I, product oils and crude oil.

A new design from Lindenau, the tanker has specially developed ship lines for an optimized speed/power characteristic and good seakeeping properties, resulting in a trial speed of 15.5 knots at an engine output of 8,850 hp. Her 735-kw Jastram-Werke bow thruster improves her maneuverability, while her double bottom and double side shell lower the risk of environmental pollution.

Constructed under the class and supervision of Germanischer Lloyd, the 557.5-foot-long by 89-foot-wide Conger is powered by a MAN B&W 6L 58/64 main engine with 9,977 hp at 499 rpm. Other machinery includes Renk-Tacke reduction gear, Vulkan coupling for the main engine, KaMeWa controllable pitch propeller and Yanmar auxiliary engines. She is equipped with 17 cargo tanks which are divided into 12 side tanks (including two slop tanks) and five center tanks. The total volume is 27,740 cbm. Smooth inner tank walls provide for better and faster cleaning of the tanks, less slop and, therefore, less pollution.

The tanker has received the Finnish ice class "Ice IA" and is suited for flat ice up to a thickness of 31 inches. A special stem is fitted to enhance icebreaking capability.

(continued on page 19)

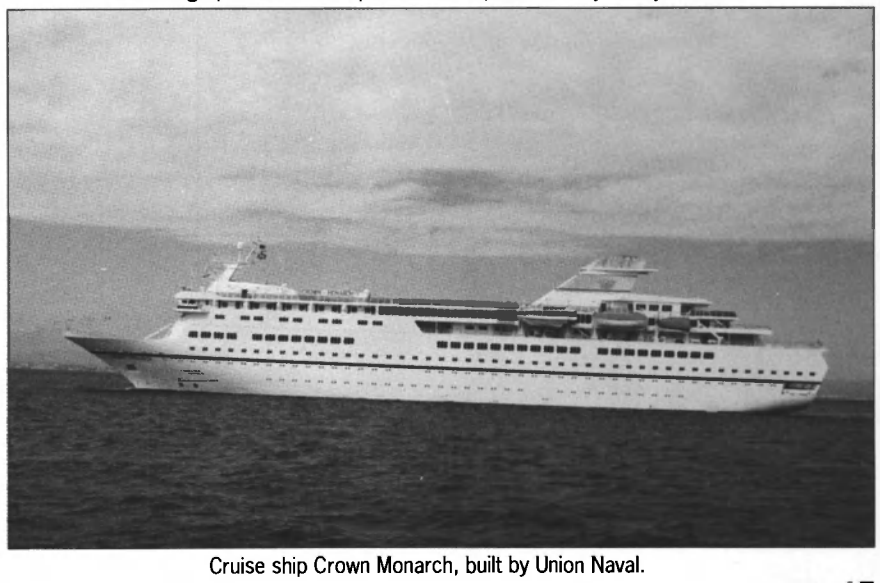


Swan Hunter-built research ship James Clark Ross.

LPG carrier Helice, built by Kvaerner Govan.

Oceanographic research hip USNS Thompson, built by Trinity Marine.

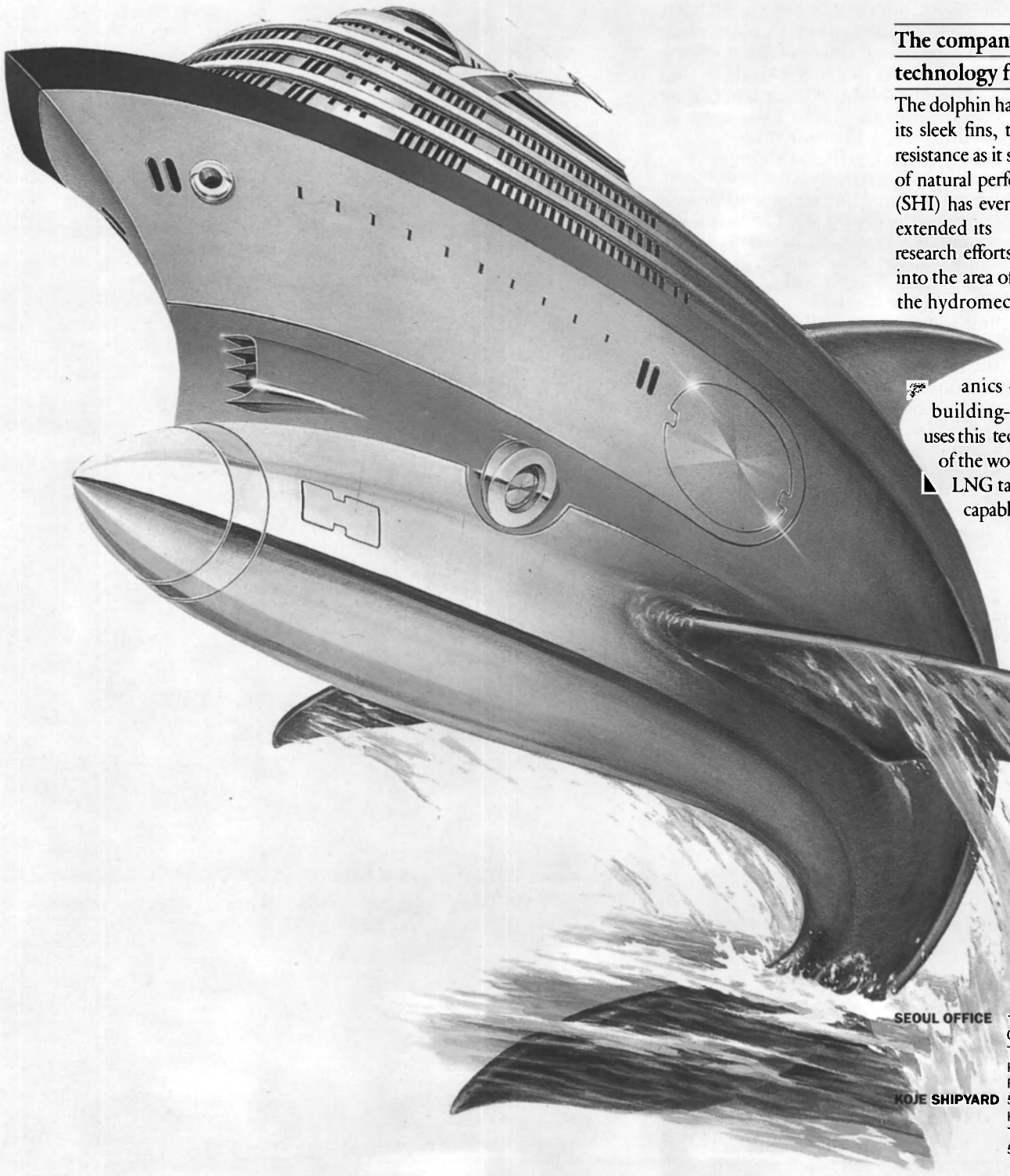
Ulstein-built research/passenger ship Polar Circle.



Cruise ship Crown Monarch, built by Union Naval.

A revolutionary era is facing us today

"Making the impossible possible through technology"



The company which is developing new technology from nature and its principles.

The dolphin has evolved over a vast period of time, its sleek fins, tail and skin surface minimize any resistance as it swims through water – an example of natural perfection. Samsung Heavy Industries (SHI) has even extended its research efforts into the area of the hydromechanics of water and fish to create new ship-building-related technology. The company uses this technology to design and build some of the world's largest container ships and LNG tankers as well as superfast vessels capable of cruising at over 50 knots.

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SAMSUNG HEAVY INDUSTRIES

(continued from page 17)

Complete accommodations for a crew of 28 persons is located in a separate fully air-conditioned deckhouse aft.

CONGER
Equipment List

Main engine	MAN B&W
Reduction gear	Renk-Tacke
Propeller	KaMeWa
Auxiliary engines	Yanmar
Generators	STN
Steering gear	DAN Svendborg
Bow thruster	Jastram-Werke
Bow thruster starter	Asea Brown Boveri
Steam boilers	Aalborg Ciserv
Fresh water generator	Alfa Laval
Sewage treatment plant	Hamworthy
Deck auxiliaries	Ulstein Norwinch
Engine room lighting	Aqua-Signal
Inert gas generator	Kvaerner Eureka
Radar	Krupp-Atlas
Echo sounder	Honeywell-Elac Nautik
Portable cargo pump	Frank Mohn
Stern tube seals	Blohm & Voss
Separators	Westfalia Separator

CROWN MONARCH
Union Naval de Levante

Circle 83 on Reader Service Card

Spanish shipbuilder Union Naval de Levante of Valencia has delivered the 556-passenger luxury cruise ship Crown Monarch to Crown Cruise Lines of Florida. The almost 500-foot ship will be operated in the Caribbean by Palm Beach Cruises, Inc., out of her homeport in West Palm Beach.

In order to obtain a high degree of comfort, a noise and vibration study was carried out while the ship was in the design phase. The ship was designed in such a way that the passenger areas are totally separated from the crew's.

Built under the supervision of Det norske Veritas, as well as the Spanish administration Inspeccion de Buques, the 494-foot Crown Monarch has 232 standard cabins on her Marina, Palm Beach and Coral Decks; 23 deluxe cabins on her Caribbean Deck; and 10 suites on her Monarch Deck. Deluxe cabins and suites have sitting rooms and bathtubs. Suites are also outfitted with jacuzzis and balconies.

On the Marina Deck there is a platform where passengers can disembark on tender boats for excursions to coves and beaches which may be inaccessible by land.

The main recreation area is on the Crown Deck, which features the dining room, casino, bar, two boutiques, and photography exhibition area. Other public spaces include the Crown Cabaret and Vision Lounge. The Ocean Terrace, a buffet area, the swimming pool, two jacuzzis and Splash Bar are located on the Monarch Deck. A disco is located on the Sun Deck.

CROWN MONARCH
Equipment List

Main engines (4)	Bergen Diesel
Propellers	Ulstein
Thrusters	Ulstein
Generator engines	Bergen Diesel
Generators	Stromberg
Reduction gears	Lohmann & Stolterfoht
Engine controls	Aries Electronica
Deck machinery	Hydraulik Brattvaag
Coatings	Jotun
VHF radios	Marconi
SSB radio	Saturn
Radar	Racal Decca
Autopilot	Anschutz
Purifiers, F/W generators	Alfa Laval
Steering gear	Tenfjord
Firefighting systems	Unitor
Stabilizers	Sperry Marine
Incinerator	Teamtec/Golar

The 15,271 gross ton cruise ship is propelled by four Bergen Diesel model BRM9 main engines, developing 4,500 bhp at 750 rpm, which drive four highly skewed variable pitch Ulstein propellers via Lohmann Stolterfoht reduction gears.

Bergen also supplied two BRG6 diesel engines, which drive two Stromberg 710 alternators.

DEL MONTE QUALITY
Astilleros Espanoles

Circle 87 on Reader Service Card

The second in a series of three 580,000-cubic-foot reefers, the Del Monte Quality, was delivered this past year by the Seville shipyard of Astilleros Espanoles S.A. of Spain to

her owner, Del Monte Fresh Fruit International.

The 519-foot-long by 77-foot-wide Del Monte Quality is powered by AESA-MAN B&W 6L60 MC six-cylinder derated 13,750-hp main engines, each turning a Navalips fixed-pitch propeller, allowing for a normal service speed of 20 knots at the full load draft.

Auxiliary power is supplied by four 1,400-hp Bazan MAN B&W Holeby gensets.

The reefer is able to carry either goods put into containers or palletized refrigerated cargo of all kinds, including bananas, pineapples, citrics and frozen meats, at any temperature between +150 C and -250 C, in her four refrigerated holds.

The Del Monte Quality carries ABS classification and is designed to comply with ACCU-class. Control of the refrigerating plant, propelling machinery, auxiliary machinery and generating plant is carried out by an integrated computer system. Watch and control of the different parameters is carried out by means of cathodic ray monitors with menu controls located in different places of the ship.

For easy handling of containers, the Del Monte Quality is equipped with two sets of twin-mounted cargo cranes, built by Fabrica San Carlos under license from Hagglunds, with equalizers and spreader incorporating powered rotation, twist-lock operation and hydraulic open/close gravity point adjustment.

DEL MONTE QUALITY
Equipment List

Main engines	AESA-MAN B&W
Propellers	Navalips
Auxiliary diesels	Bazan MAN B&W Holeby
Cargo cranes	Fabrica San Carlos Hagglunds

DITLEV LAURITZEN
Danyard

Circle 90 on Reader Service Card

The world's largest refrigerated cargo ship, the 765,000-cubic-foot, 422-TEU Ditlev Lauritzen, was delivered this year by Danyard A/S of Denmark. The first of four of a new class, the Ditlev Lauritzen sails under the Danish flag as part of the Lauritzen fleet.

Developed as part of Denmark's "Project Ships," the reefer is equipped with a Lyngso Valmet A/S Integrated Ship Control System, which allows one man to supervise the vessel's navigation and monitor and control all machinery and cargo systems. As a result of her ISC technology, the Ditlev Lauritzen is approved for operation by a six-man crew.

The ISC integrates navigation and the monitoring and control of machinery in a single computer system. The operator supervises and administers ISC from the ship's bridge.

The navigation systems includes route planning and automatic adjustment of course and speed to conform with planned route. A Sperry Marine Route Control System is integrated with the ISC system through a Lyngso Valmet bridge system.

DITLEV LAURITZEN
Equipment List

Main engine	MAN B&W
Propeller	KaMeWa
Gear	Renk-Tacke
Generators	Kaick
Steering gear	Frydenbo
Bow thruster	Brunvoll
ISC	Lyngso Valmet
Route Control System	Sperry Marine
CO2 plant	Ginge-Kerr
Davit	Schat Davit
Auxiliary engines	MAN B&W Holeby
Cranes	O&K
Refrigerating plant	Sabroe
Ceilings	Dampa
Log, radar and gyrocompass	Sperry Marine
Paint	Hempel

With an overall length of 539 feet, breadth of 79 feet and scantling draft of 33 feet, the single-screw Ditlev Lauritzen has five cargo holds and five electrohydraulic O&K cranes. Three of the cranes are rated SWL 36/8 tons with an outreach of 57/60 feet and two, SWL 8 tons with an outreach of 57 feet.

Propulsion is supplied by a single two-stroke turbocharged MAN B&W 6L60MC crosshead diesel engine, with an output of 15,300 bhp at 121 rpm. The engine is directly coupled to a four-blade highly skewed KaMeWa controllable-pitch propeller.

ECSTASY
Kvaerner Masa-Yards

Circle 80 on Reader Service Card

The second "floating city" built by the Helsinki, Finland, shipyard of Kvaerner Masa-Yards for Carnival Cruise Lines, Inc., the 70,000-grt M/S Ecstasy, was delivered during the past year.

The Ecstasy, sister of the M/S Fantasy, which made her debut last year, operates in the Caribbean on weekly cruises to Nassau, San Juan, St. Thomas and on alternating weeks to Playa del Carmen, Cozumel, Grand Cayman and Ocho Rios.

With her gross tonnage of 70,637, the Ecstasy is able to carry almost 2,600 passengers in 1,020 cabins, served by a crew of over 900. She has an overall length of 855-1/2 feet, waterline beam of 103.4 feet and draft of 25.3 feet. The propulsion system is a diesel-electric plant featuring Sulzer type engines with electrical shaft drives. The total power developed is 42 MW. There are six thrusters, three forward and three aft, with a total of 12,000 hp. She has a speed of 21 knots.

ECSTASY
Equipment List

Main engines (6)	Sulzer
Alternators	ABB Drives
Electric propulsion motors	ABB Drives
Engine controls	KaMeWa/Stromberg/Valmet
Propellers	KaMeWa

From the Ecstasy's seven-deck-high Grand Atrium, passengers can walk the "City Lights" promenade and enjoy the urban conviviality of such rooms as the Metropolis Bar, Chinatown, Rolls Royce Cafe and the Neon Bar.

FRONT DRIVER
Hyundai Heavy Industries

Circle 76 on Reader Service Card

The first of three 167,000-deadweight ton OBO carriers, the Front

(continued)

Driver, was delivered to Swedish owner Frontline AB in early April of this year by South Korean builder Hyundai Heavy Industries Ltd. (HHI).

The 934-foot Front Driver has a breadth of 148 feet, depth of 98 feet and scantling draft of 61 feet. The vessel has nine cargo holds and five pairs of side water ballast tanks. The ballast tanks are common with the double bottom spaces in way of the cargo holds. There are also three slop tanks.

FRONT DRIVER
Equipment List

Main engine	Hyundai-MAN B&W
Hose handling & provision cranes	Hyundai-Normarine
Cargo hatch covers	Hyundai-Kayaba
Monitoring system	Hyundai-Terasaki
Fire detection	Salwico
Auxiliary engine	Ssangyong-Wartsila
Emergency generator	MAN B&W-Demp
Echo sounder	Furuno
Magnetic compass	Plath
Log	JRC
Satnav/weather fax	Furuno
Radio direction finder	JRC
Radar	Krupp Atlas
Gyrocompass/autopilot	Plath

The Front Driver is able to load or discharge three different kinds of cargo oil simultaneously. The cargo pumping system is designed to achieve a maximum discharge rate of 12,000 cubic meters per hour with all three Shinko vertical centrifugal main cargo pumps and the maximum loading rate is about 14,800 cubic meters per hour. There is also a steam-driven cargo stripping pump of 200 cubic meters capacity and a cargo oil stripping eductor rated at 450 cubic meters per hour.

Propulsion is provided by a Hyundai-built MAN B&W low speed 6S70MC diesel, with an MCR of 15,400 kw (20,940 bhp) at 88 rpms. The main engine burns 600 cst heavy fuel oil at 50 degrees C and drives an 8-meter-diameter NiAl propeller of a right-hand rotating type. The electrohydraulic, two-ram four-cylinder steering gear is rated at 300 tm.

Electric power is supplied by three Ssangyong-Wartsila auxiliary diesel generating sets. Two of these are 6R22/26 with an output of 720 kw at 720 rpm, while the third is 6R32D rated at 1,100 kw. The ship is also fitted with an emergency generating set with an output of 150 kw.

HANNOVER EXPRESS
Samsung Shipbuilding

Circle 75 on Reader Service Card

The largest Panamax class containership built to date, the 4,422-TEU Hannover Express, was delivered by Samsung Shipbuilding in the first quarter of 1991. She is capable of loading up to 11 rows of boxes below deck, and up to 13 rows above hatches.

The first of a series of five ships contracted with Samsung by German shipping line Hapag Lloyd, the 965-foot boxship has a 106-foot breadth, design draft of 39 feet and deadweight of 67,686 tons at her scantling draft of 44 feet.

The Germanischer Lloyd-classed, German-flagged Hannover Express has a total of seven cellular container holds, six forward and one aft, arranged with cellguides to accommodate mixed stowage in TEUs and FEUs.

The forward container holds are designed to carry dangerous goods containers, while the aft hold is designed for normal dry container goods. The two lowest tiers of the No. 3 hold can also be used for the transport of normal bulk cargoes.

Of particular note on the Hannover Express is a complete navigation package from Anschuetz of Kiel. In accordance with the "Ship of the Future" concept, the components of the navigation equipment are integrated into a modern operations and onboard managing center. The system, therefore, fulfills the requirements for one-man bridge operation. For details, see "Anschutz Supplies Navigation Package For 'Hannover Express'" in this issue.

Conger, chemical tanker built by Lindenau.

HANNOVER EXPRESS
Equipment List

Main engine	Hyundai-MAN B&W
Propeller	Thyssen (Ostermann)
Diesel generator engine	Daihatsu
Bow thruster	Lips
Gyro/autopilot	Anschuetz
Radio/satcom	Hagenuk
Radar/total navigation system	Krupp Atlas
Switchboard/starters	ABB
Automation/M/E BMS	DMT
Paint	Hempel/IPK
Steering gear	Hatlapa
Deck machinery	Broehl
Hatch cover	MacGregor Navire-Kayaba
Lifeboat	E. Hatecke
Anti-heeling system	Hoppe
Container fittings	MEC
Paneling system	B + V
Refrigeration plant	Sabroe
Tank level gage	CWSS
Boiler and economizer	Aalborg
Centrifugal pump	Allweiler
FW generator	Serck Como
Purifier	Westfalia
Lighting	Aqua Signal

The single-screw boxship is powered by a Hyundai-MAN B&W super-long stroke 9K90MC diesel engine, rated at 49,640 hp at 93 rpm and incorporating a Turbo Compound System of 1,450 kw. Her service speed is 23 knots.

The boxship is also equipped with a 2,500-kw Lips bow thruster with an anti-suction tunnel to aid maneuverability.

HELICE
Kvaerner Govan

Circle 86 on Reader Service Card

The first in a series of four 56,700-cubic-meter-capacity LPG carriers, the Helice, has been delivered to owner Spey Marine by the Glasgow shipyard of Kvaerner Govan.

Now operating as part of the Myre Havtor pool in worldwide trading, the 672-foot Helice has a breadth of 105-1/2 feet, hull depth of 66 feet, design draft of 34 feet and deadweight of 49,513 tons.

The Helice incorporates a number of firsts. Besides being the first in a series of four, she also is the first LPG carrier built by Kvaerner Govan. Additionally, the Helice is reportedly the first merchant ship to enter service fully equipped with GMDSS. The system includes JRC Inmarsat standard A and standard C terminals; four fixed Raytheon VHF radiotelephones; three Jotron EPIRBS; a Raytheon GPS satnav; and a JRC MF/HF back-up radio station.

As for her cargo flexibility, the Helice is able to carry cargoes with a specific gravity of 0.97 at 98 percent capacity in cargo tanks No. 2 and No. 3, as well as 70 percent in her other two tanks. This is unusual, since most LPG carriers can only carry cargoes with high specific gravities in tanks at 70 percent capacity.

Propulsion is provided by a Kvaerner Kincaid-Sulzer 6RTA62 slow-speed diesel engine, developing 15,000 bhp at 106 rpm. The main engine drives a four-blade fixed-pitch Stone Manganese propeller.

Three 1,200-kw Bergen KRG8 diesel alternators supply ship's electrical power.

HELICE
Equipment List

Main engine	Kvaerner Kincaid-Sulzer
Propeller	Stone Manganese
Diesel alternators	Bergen Diesel
Cargo pumps	Kvaerner Eureka
Bow thruster	Brunvoll
Steering gear	Frydenbo
Engine remote control	Sulzer
Inmarsat A & C terminals	JRC
VHF radiotelephones	Raytheon
EPIRBs	Jotron
GPS satnav	Raytheon
Back-up radio	JRC
Radar & ARPA	Raytheon
Gyrocompass/autopilot	Yokogawa
Echo sounder, doppler log and weatherfax	JRC
Central alarm monitoring	Autronica

JAMES CLARK ROSS
Swan Hunter

Circle 74 on Reader Service Card

A first class research vessel, the 7,400-ton RRS James Clark Ross, emerged from the Wallsend (U.K.) yard of Swan Hunter Shipbuilders and was delivered to the Natural Environment Research Council (NERC).

Designed as a multi-role ship, the 325-foot-long by 62-foot-beam James Clark Ross replaces the 35-year-old 1,554-grt John Biscoe. The Ross is capable of operating safely in Polar waters for the transportation of cargo and personnel from the U.K. and South Atlantic ports to research stations maintained by the British Antarctic Survey (BAS), one of the Council's component institutes, in the Antarctic. Additionally, she is able to discharge cargo without the assistance of normal port facilities such as quays and cranes, and carry out a wide variety of marine science programs in the Southern Ocean and worldwide.

JAMES CLARK ROSS
Equipment List

Propulsion engines (4)	Wartsila Vasa
Propeller	Stone Manganese
Thrusters	Elliot White Gill
Directional sonar	Furuno
Bow thruster motor	GEC-Alsthom
Stern thruster motor	Hydraulic Power Systems/Rexroth
Emergency generator engine	Caterpillar
Generators	GEC
Echo sounders	Simrad
Integrated bridge system	Sperry Marine
GPS receiver	Trimble
Gem-based joystick controls	GEC
Steering controls	Sperry Marine
Jib cranes	Hagglunds
Booms	Schat Davit
Hold covers	MacGregor Navire
Coatings	International Paint
Autopilot	Sperry Marine
Pumps	Hamworthy
Freshwater generators	Alfa Laval

(continued next page)

The research complex on the RRS James Clark Ross comprises nearly 400 square meters of wet, dry and environmentally controlled laboratories, workshops, cool and cold rooms, computer and data preparation suite, underway instrumentation and control room and conference/library facilities.

The cargo facilities consist of two holds capable of carrying 1,800 cubic meters of general cargo, as well as bulk aviation fuel and cargo diesel fuel tanks.

The propulsion system is diesel electric, based on the "power-house" principle comprising four Wartsila Vasa engines, two 8R32E models and a pair of 6R22/26 units, generating a total of 11,800 bhp at 160 rpm. This system provides the necessary power to permit the ship to break level ice up to 800 mm thick at a constant speed of 2 knots.

The centerpiece of the navigation equipment is a SeaNet fully integrated system supplied by Sperry Marine, which includes navigation and voyage management workstations, two Rascar touch-screen controlled ARPAs, a pair of interlinked MK 37 gyrocompasses, an Aquaprobe MK 5 electronic log, and an SRD-421S dual-axis doppler log. A Trimble 4000 GPS receiver and a 501 SatNav receiver, Loran C and Decca navigators, and an adaptive autopilot are integrated into the system.

JO ASPEN
SEC

Circle 84 on Reader Service Card

The first of eight chemical/parcel tankers, the 12,600-dwt Jo Aspen, was delivered by Societa Eserizio Cantieri (SEC) of Viareggio, Italy, to Jo Tankers of Norway.

Double-skinned and double-bottomed, the Jo Aspen has transverse cofferdams and is equipped with fully segregated ballast tanks. For worldwide chemical parcel service, the 456-foot Jo Aspen has a beam of 70 feet, depth of 34-1/4 feet, draft of 26-1/2 feet and cargo capacity of 14,000 cubic meters. She can handle up to 25 different grades of chemicals or a full cargo of high specific gravity chemicals, such as phosphoric or sulphuric acid, at any one time.

According to the builders, she is one of the first of her size to have each of her 25 completely segregated cargo tanks built of stainless steel, making her suitable for food products, chemicals and general petroleum products. All her tanks can carry IMO II cargoes, while her two center tanks, separated from the others, are rated to carry IMO I cargoes.

Main propulsion is provided by two Wartsila 8R32D medium-speed engines, developing a total of 8,160 hp, coupled to a single Lips controllable pitch propeller through a single reduction gear with two power take-offs for two shaft alternators rated at 1,650 kw each.

The Jo Aspen is equipped with a Saab MaC501 remote controlled combined cargo handling/monitoring system, which enables the operator to control all pumps and main cargo valves. The system also houses a Saab TankRadar level indicator system, alarms and tank temperature system.

LYS-SKOG
Titovo Shipbuilding

Circle 92 on Reader Service Card

The third in a series of paper/container/general cargo carriers, the Lys-Skog, was delivered this past year to Lys Skog A/S of Oslo, Norway, by the Titovo Brodogradiliste Shipyard, Kraljevica, Croatia.

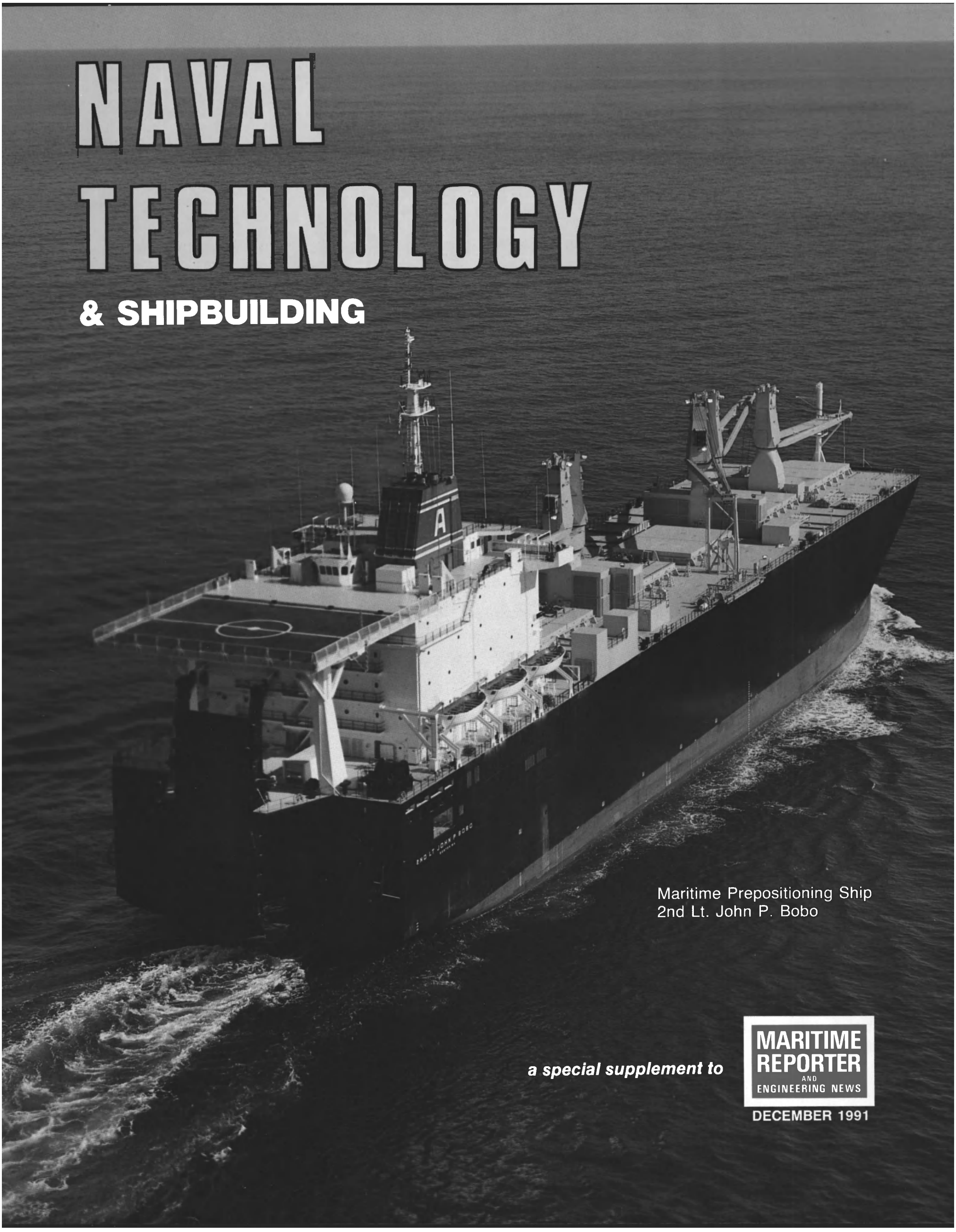
The 295-foot Lys-Skog has a beam of 56 feet, draft of 19 feet and tonnage of 3,900.

The machinery is fully computer controlled by an integrated ship control system supplied by Norcontrol Automation, and is visually monitored by a closed circuit TV system in the main engine room and four in the cargo hold. The Lys-Skog has the highest automation class and is operated by a crew of six.

Propulsion is provided by a single Wartsila Diesel 6R32E diesel engine, which drives a Wartsila-Wichmann four-blade stainless steel

(continued on page 41)

NAVAL TECHNOLOGY & SHIPBUILDING



Maritime Prepositioning Ship
2nd Lt. John P. Bobo

a special supplement to

MARITIME REPORTER AND ENGINEERING NEWS
DECEMBER 1991

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Circle 218 on Reader Service Card

GE Steam Team

Navy Plans To Spend Up To $11 Billion On Sealift Alone Over Next Six Years

Major New Business Opportunity For Yards, Equipment Manufacturers And Marine Suppliers

By James R. McCaul, President
IMA Associates, Inc.

The Army has been pressing since the early 1980s for additional sealift capability. However, warnings that sealift capability was inadequate had largely fallen on deaf ears—until Iraq kick-started defense planners' interest in sealift by invading Kuwait. Now sealift has become the "in thing" among Pentagon planners.

Current Inventory Of Sealift Ships

There are currently 34 ships in the Navy sealift core inventory. They include 8 SL-7 fast sealift ships, 13 prepositioning ships, two hospital ships, two aviation support ships and nine crane ships. Details are shown in Exhibit 1. In addition to this core inventory, the Navy has at its disposal almost 100 ships which are maintained in Ready Reserve status for sealift contingencies. Many of the Ready Reserve Force (RRF) ships were broken out and used in Operations Desert Shield and Desert Storm.

The PFC Obregon, built by NASSCO, one of the Navy's prepositioning ships.

Past Funding For Sealift Ship Construction

During the defense buildup of the 1980s, the Department of Defense (DOD) earmarked slightly more than $4.5 billion for construction or conversion of sealift ships. These funds were used to acquire the 34 ships now comprising the core sealift inventory. Details showing the level of spending for sealift ships over the past 10 years are provided in Exhibit 2.

The $600 million that Congress appropriated in FY 1990 to build additional sealift ships had been frozen by DOD—who had little interest in spending money for this purpose. Part of the funds were actually reallocated to other uses. Then Iraq invaded Kuwait—and a groundswell of support for sealift build-up took place.

Currently, the Navy has $1.275 billion available for sealift ship construction. Of this total, $375 million is left over from FY 1990 funds, and the remaining $900 million was included in the FY 1991 budget.

Sealift Plans: Up To $11 Billion Over Next 6 Years

DOD has projected a serious deficiency in the number of U.S. merchant ships available for meeting future sealift requirements. By the year 2000, defense planners see only 47 merchant ships available for sealift use—vs. a requirement of 99 to 119 ships.

Reflecting the concern about sealift deficiency, DOD has developed a long term plan to acquire an additional 28 to 49 ships. Ultimate capital expenditures of $7 billion to $11 billion are being discussed.

The Navy's plan is to earmark an additional $2.495 billion for sealift ship construction over the next six years. Of this, $1.275 billion are funds already appropriated, but not yet spent. Exhibit 3 provides funding details for the next six years.

Design Competition For Near Term Ship Construction Contract

The Navy has divided its efforts into design of near term, medium term and long term sealift ships. The near term ship is one which uses readily available technology—and is essentially a take-off of the prepositioning ships built in the 1980s.

(continued)

A design competition has been initiated for the near term ship which is to ultimately result in a design/construction contract in the spring of 1992. In August, the Navy issued a Request for Proposal (RFP) for the initial design of two classes of sealift ships. One design calls for a ship not to exceed 950 feet in length, to be used for prepositioning purposes. The second design calls for a ship not to exceed 700 feet in length, to be used for both commercial as well as military purposes. Both designs will be fitted with movable decks, slewing ramp and side ramps. Propulsion will be either gas turbine or diesel.

In September, nine shipbuilders received contracts from NAVSEA to begin the initial design work. Each yard received a contract for approximately $250,000. The initial design work is to be completed by mid-January 1992. Following review of the design results, NAVSEA will prepare a baseline design incorporating desired features. A second

Exhibit 1
Core Components of the Navy Sealift Ship Inventory

Ship/Type	Shipyard	Delivery Date
Fast Sealift Ships:		
Algol (T-AKR-289)	NASSCO	1984
Bellatrix (T-AKR-288)	NASSCO	1984
Denebola (T-AKR-289)	PennShip	1986
Pollux (T-AKR-290)	Avondale	1986
Altair (T-AKR-291)	Avondale	1985
Regulus (T-AKR-292)	NASSCO	1985
Capella (T-AKR-293)	PennShip	1984
Antares (T-AKR-294)	Avondale	1984
Prepositioning Ships:		
Col. Hauge (MPS)	BethSteel	1984
Pfc. Bouch (MPS)	BethSteel	1985
Pfc Anderson (MPS)	BethSteel	1985
1st Lt. Bonnyman (MPS)	BethSteel	1984
Pvt. Harry Fisher (MPS)	BethSteel	1985
Sgt. Kocak (MPS)	NASSCO	1984
Pfc Obregon (MPS)	NASSCO	1985
Maj. Pless (MPS)	NASSCO	1985
Lt. Bobo (MPS)	GD-Quincy	1985
Pfc. Wilkams (MPS)	GD-Quincy	1985
1st Lt. Lopez (MPS)	GD-Quincy	1985
1st Lt. Lummus (MPS)	GD-Quincy	1986
Sgt. Button (MPS)	GD-Quincy	1986
Hospital Ships:		
Mercy (T-AH-19)	NASSCO	1986
Comfort (T-AH-20)	NASSCO	1987
Aviation Support Ships:		
Wright (T-AVB-3)	Todd-Galveston	1986
Curtiss (T-AVB 4)	Todd-Galveston	1987
Crane Ships:		
Keystone St. (T-ACS-1)	Bay Shipbuilding	1984
Gem State (T-ACS-2)	Dillingham	1985
Grand Canyon St. (T-ACS-3)	Dillingham	1986
Gopher State (T-ACS 4)	Norshipco	1987
Flickertail St. (T-ACS-5)	Norshipco	1988
Cornhusker St. (T-ACS 6)	Norshipco	1988
Diamond St. (T-ACS-7)	Tampa	1989
Equality St. (T-ACS-8)	Tampa	1989
Green Mtn. State (T-ACS-9)	Norshipco	1990

Exhibit 2
Funding for Sealift Ship Construction Over the Past Ten Years

Fiscal Year	Millions of $
1982	$407
1983	3,009
1984	527
1985	97
1986	314
1987	134
1988	53
1989	—
1990	600*
1991	900

*A portion of these funds was subsequently reallocated to other programs—leaving $375 million to be carried forward for sealift ship construction.

Source: IMA Associates

Exhibit 3
Outlook For Sealift Ship Funding

Fiscal Year	Cumulative Funds Available for Sealift Ships (millions of $)
1990	$375
1991	1,275
1992	1,275
1993	1,475
1994	1,780
1995	1,985
1996	2,290
1997	2,495

Source: IMA Associates

RFP will be issued and the nine yards will be asked to bid on the baseline ship construction contract.

Meanwhile, the Navy is preparing a report to Congress which will delineate long term mobility requirements. The plan will identify actions to be taken to meet these requirements.

Longer Term Plans For Advanced Sealift Design

In addition to the near term program, the Navy has begun a design effort to develop an advanced sealift ship. The design work has been divided into mid- and long-term ship concepts.

Notional characteristics have been developed for the mid-term ship. They are based on a displacement monohull of approximately 1,000 feet in length. Original plans called for operating speeds of 29 to 33 knots—though speeds in the 25-knot range are now being considered.

More recently, the Maritime Administration has developed a mid-term sealift ship design which incorporates features suitable for commercial operation. The ship would essentially be configured to operate as a straight container carrier—but have the capability to be rapidly converted for RO/RO use. Slow speed diesel propulsion has been fitted in the design.

The Navy is also examining more radical options which incorporate a wide range of novel concepts for a long term sealift ship design. They include new semi-planing monohulls and surface effect ships able to operate at speeds from 40 to 50+ knots. New forms of propulsion, cargo handling systems, manning improvements, etc. are to be addressed. Power requirements are an astronomical 400,000 bhp—to deliver 5,000 or fewer tons of cargo.

Expected Sealift Ship Orders

IMA expects construction contracts to be awarded next spring. It is likely that the Navy will award two contracts—a contract for one ship, a second contract for two ships. Both contracts will have option provisions for three or four ships. Exercise of these options will likely result in at least 10 sealift ships being ordered over the next five years.

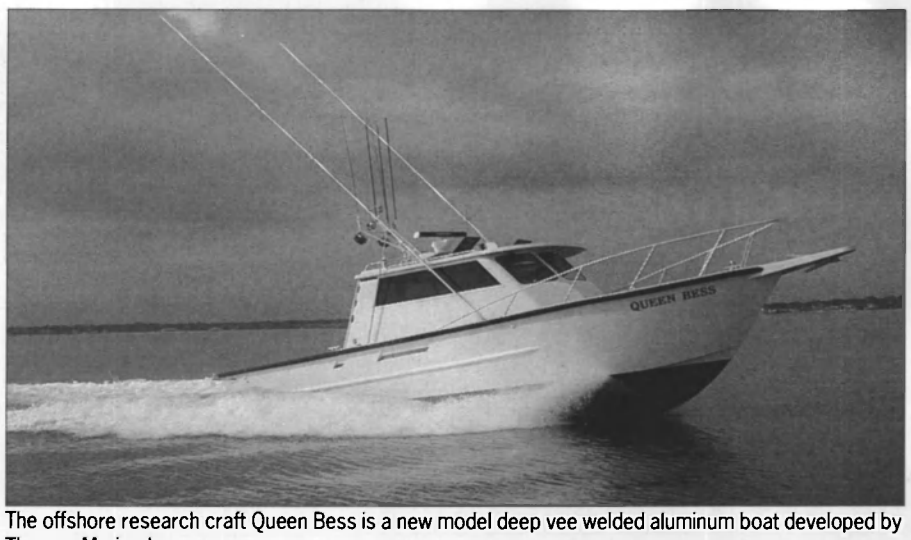
$50 Billion For Other Navy Programs

Excluding sealift ship construction, the Navy plans to spend almost $50 billion on ship construction alone over the next six years. Future orders are to include an additional aircraft carrier, seven Seawolf submarines, 22 Aegis destroyers and four amphibious warfare ships. However, budget pressures and changing military requirements are likely to impact full execution of this plan.

The Navy has been exploring new ship designs which would be cheaper to build and operate. Included among these is a proposed follow-on, simpler design attack submarine—currently named Centurion. This submarine is to be considerably smaller than the Seawolf—and less expensive to build. The Navy is also looking at a low cost variant to the Aegis destroyer. In a recent industry meeting, a Navy official described 10 possible destroyer variants based on the DDG-51 hull and power plant. Each of these variants is less complex and would be less costly to build.

$33.2 Million Appropriated For NOAA Ships

The House/Senate conferees on the FY1992 Commerce, State, Justice Appropriations bill approved $33.2 million for expenses necessary for the construction, acquisition, leasing, or conversion of vessels, including related equipment, for the National Oceanic and Atmospheric Administration. The money, which is to remain available until expended, was an add-on to the appropriations bill. No funds had been requested by the Administration.



The offshore research craft Queen Bess is a new model deep vee welded aluminum boat developed by Thomas Marine Inc.

Thomas Marine Delivers New All-Aluminum Model Offshore Research/Patrol Boat

Patchogue, New York-based Thomas Marine, Inc., recently delivered the Queen Bess, a custom deep vee offshore research and patrol boat, to S.P. Research Inc., Brookhaven, N.Y.

The fourth boat built by Thomas Marine Inc. for S.P. Research Inc., the Queen Bess is a custom-designed 41-foot welded aluminum deep vee boat, a new model developed and offered by Thomas Marine Inc. Designed for commercial operations, she can be outfitted for patrol, rescue and research work. Plating and framing schedules exceed U.S. Coast Guard NAVIC 11-80 recommendations.

"This is the first time we've built a boat strictly for deep-water service," said **Thomas Carney**, president of Thomas Marine Inc. "The boat has a full keel that extends below its propeller tips."

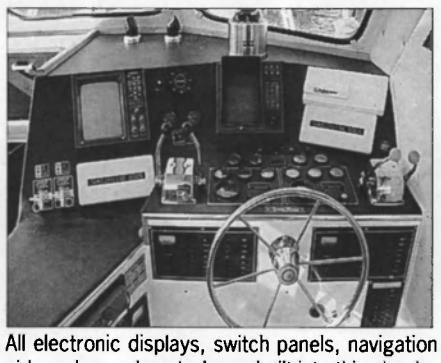
The speedy craft, which can cruise at 28 knots and dash at 33 knots, is powered by Volvo TAMD72 main engines rated at 430 hp at 2,500 rpm, with a Michigan 28-inch by 36-inch three-blade propellers and ZF reduction gears, with a 2:1 reduction ratio. Western Branch Metals supplied 2-1/4-inch Aquamet 22 stainless steel shafting.

Auxiliary power is provided a Northern Lights 8 kw diesel genset.

Capable of operating year-round, the Queen Bess's cabin heat, defrosters and deicing equipment operate off engine heat and electric.

The sophisticated onboard electronics suite includes an ICOM M120 VHF radio, Furuno 1040 radar and CH04 sonar, Ritchie compass, Northstar 800X Loran, Robertson AP200DL autopilot, Raytheon color fathometer, and an AT&T cellular phone. All electronic displays, switch panels, navigation aids, and vessel controls are built into a circular console.

Sal Palacino, president of S.P. Research Inc., said the Queen Bess is "everything I wanted. For its size, I don't think there is anything comparable." Mr. **Palacino** will use the Queen Bess for research on the numerous wrecks located off Long Island and studying resident and migratory codfish. The sophisticated Furuno radar is used to locate the wrecks. With the Queen Bess, Mr. **Palacino** hopes to expand his research work to as much as 150 miles off shore.


All electronic displays, switch panels, navigation aids and vessel controls are built into this circular console.

A special feature of the vessel includes starboard side cockpit controls which allow the operator to perform safe and efficient rescue through a slide-in-place stern door.

Other recent deliveries by Thomas Marine Inc. include a pair of 22-foot, 42-knot Dolphin model patrol/rescue craft and a 28-foot 8-inch Enforcer model patrol/rescue boat for the Washington, D.C. Police Department, and a single 35-foot, 32-knot Guardian model law enforcement boat for the Norwalk County Police Department.

Besides its line of stock boats ranging in size from 22 to 50 feet, Thomas Marine Inc. offers engineering services, application recommendations and custom design. The Patchogue, New York, company is capable of constructing vessels for a wide range of service applications including military and law enforcement, firefighting, survey work and diving, launch service, pollution control and clean up, as well as push boats, tugs and U.S. Coast Guard-certified ferry boats.

For free literature detailing the boatbuilding capabilities of Thomas Marine,

Circle 72 on Reader Service Card

QUEEN BESS
Equipment List

Main engines	Volvo
Propellers	Michigan
Reduction gears	ZF
Generators	Northern Lights
Engine controls	Morse
Steering controls	Hynautic
Shafting	Aquamet
Deck machinery	Ideal Windlass
Epoxy coatings	Ameron
VHF radio	ICOM
Radar	Furuno
Sonar	Furuno
Compass	Ritchie
Loran	Northstar
Autopilot	Robertson
Fire/bilge pump system	Jabsco
Fathometer	Raytheon

Bender Awarded Major Contract On Dredge Wheeler

Bender Shipbuilding & Repair Co., Inc. has been awarded the overhaul and repair contract for the Dredge Wheeler.

The vessel, a 384-foot by 78-foot oceangoing hopper dredge used on the East and Gulf Coasts, is managed by the New Orleans office of the U.S. Army Corps of Engineers.

The base contract amount is approximately $5.5 million with potential growth to $9.1 million. Bender is accomplishing the work using over 100 employees. The work, which began on November 18, 1991, will be completed in late December.

Bender is a full-service shipyard that has built, converted and repaired vessels for commercial and governmental owners and operators for over 70 years.

For full information on the shipbuilding and repair services offered by Bender,

Circle 32 on Reader Service Card

U.S. Yards Awarded Navy Repair Contracts

A number of U.S. shipyards recently received contract awards for ship maintenance, repair and overhaul projects.

In the Northeast, the USCG cutter Lupine will undergo drydocking and dockside repair at Boston Graving Dock Corp. The contract is worth $491,782.

Detyens Shipyards, Inc., Mt. Pleasant, S.C., was awarded the technical availability for the submarine tender USS Frank Cable (AS-40). The contract was worth $442,593.

Two regular overhaul contracts totaling over three quarters of a million were awarded to Intermarine USA, Savannah, Ga. A $282,761 contract was for work on the fuel oil barge YON-98. A second contract, worth $508,372, covered the overhaul of the floating crane barge YD-188.

In Charleston, S.C., the Braswell Services Group received a restricted availability of the large auxiliary floating drydock AFDB-7 worth $131,778.

In the Pacific Northwest, Foss Shipyard of Seattle received a $205,820 contract to prepare for and accomplish restricted availability of the minesweeper USS Esteem (MSO-438).

The contract for deactivation, drydocking and NRDF layup of the oiler USNS Hassayampa (T-AO-145) was awarded to Cascade General, Inc. The contract is worth $1,470,591.

In Oakland, DONCO Industries received $144,910 for the restricted availability on the combat store ship USS Mars (AFS-1). Additionally, the firm also received $367,698 for the decommissioning restricted availability of the frigates USS Meyerkord (FF-1058) and USS Lang (FF-1060).

Across the bay, the San Francisco Division of Southwest Marine was awarded the drydocking restricted availability of the USS Kansas City (AOR-3). The amount of the contract was $3,028,456.

Service Engineering Co. has been awarded a $349,112 contract to carry out the deactivation and layup of the oiler USNS Navasota (T-AO-106).

In San Diego, Continental Maritime of San Diego, Inc., was awarded two recent contracts. The first, worth $547,796, was for the drydocking phased maintenance of the amphibious assault ship USS New Orleans (LPH-11). The second, worth $250,000, was for the technical availability of the frigate USS Mahlon S. Tisdale.

Southwest Marine's San Diego Division was awarded two contracts worth over $1.4 million. The first, worth $1,271,041, was for the phased maintenance availability on the cruiser USS Leahy (CG-16). The second contract, worth $190,000, was for the restricted availability of the destroyer USS Waddell (DDG-24).

Campbell Industries of San Diego will perform the restricted availability on the ASDV-1 under a $485,677 contract.

Two contracts for A&E Industries of National City, Calif., totaling $428,606 called for the deactivation of the frigate USS Hepburn (FF-1055) and work on the cruiser USS Chancellorsville (CG-62).

Bay City Marine, Inc., also of National City, received a $110,184 contract for work on the minecountermeasure ship USS Champion (MCM-4).

OMI Will Spin Off Foreign Ships, Affiliates Into New Company

OMI, the bulk and tanker shipping company, recently announced that it will spin off all its foreign ships and affiliates into a new European-based company.

OMI said the spinoff company, to be called Universal Bulk Carriers, will be established through a public stock offering in Europe. The company had said earlier that it was considering such a spinoff.

OMI said the timing of the stock offering depends on conditions in European financial markets, especially in Scandinavia. UBC Management Ltd. is being set up in London to investigate and develop new investment opportunities.

A substantial interest in shares of the new company will continue to be held by OMI.

SNAME NY Metropolitan Section Discusses 'Fuel Quality Complaints' At Fall Meeting In New Jersey

Show during the fall meeting of the SNAME NY Metropolitan Section, left to right: **Alfred Bozzuffi,** secretary; **Phil Kimball**, vice chairman; Dr. **Rudolph Kassinger**, author; and **Richard Gilmoore**, chairman.

The New York Metropolitan Section of The Society of Naval Architects and Marine Engineers met recently at the Clam Broth House in Hoboken, N.J.

The section's guest of honor was **Walter C. (Bud) Cowles**. **Wesley Wheeler** gave a synopsis of Mr. **Cowles** 40 years of naval architectural contributions to the marine industry and presented him with a certificate of appreciation.

The technical presentation was a dissertation on "Fuel Quality Complaints," presented by Dr. **Rudolph Kassinger**, consultant for Veritas Petroleum Services (USA), Inc.

The presentation began with background information on marine bunker fuel, including pricing, fuel composition, refinery blending practices and factors that affect fuel quality. A description followed of bunker fuel sampling techniques, sampling devices and procedures for acquiring representative samples. A review of seven actual case histories was described, including disputes between ship operators and fuel suppliers involving excessive catalyst levels, fuel stability problems and excessive density and viscosity of fuels. The presentation concluded with guidelines for recommended strategies for prevention of disputes prior to receiving fuel or after receiving a suspected poor quality fuel.

A prepared discussion was presented by **Norman Brubaker** of the American Bureau of Shipping (ABS); in which he emphasized the requirement for representative sampling, and the blending of fuels at terminals that result in modified ash content and viscosities of the fuels. He also described a unique problem encountered that resulted in a water "sandwich" in a fuel that caused a subsequent plant failure.

A question and answer period followed with lively discussion related to fuel impurities and what can be done, if anything, to resolve resulting problems.

Alfred Bozzuffi presented a certificate of appreciation to Dr. **Kassinger** for his presentation.

Gladding-Hearn Delivers Detroit Diesel-Powered Research Vessel To U.S. Navy

The 60-foot research vessel built by Gladding-Hearn Shipbuilding, Somerset, Mass., for use by U.S. Navy's David Taylor research facility in Bayview, Idaho.

Gladding-Hearn Shipbuilding, The Duclos Corp., Somerset, Mass., recently delivered a new 60-foot-long research vessel built for the U.S. Navy's research center in Bethesda, Md.

The company was awarded the contract in April. According to **George Duclos**, president of the shipyard, the vessel was completed within the contracted 90 days before being trucked 3,200 miles to Bayview, Idaho, where the David Taylor Research Center Acoustical Research Detachment will conduct tests for the Navy on Lake Pend Oreille.

Mr. **Duclos** said the yard's last Navy contract was for a tugboat in 1972.

The unpainted all-aluminum vessel, designed by C. Raymond Hunt Associates of Boston, carries a 19-foot beam, 6-foot draft, and the fuel tanks holds 600 gallons. It is powered by twin Detroit Diesel 12V-92TAs rated at 900 shp each turning at 2,300 rpm. The engines turn a pair of Columbian 36- by 34-inch, four-bladed propellers through 2:1 Twin Disc reverse/reduction gears. Generators are Cummins Onan 20 kw and 45 kw. The vessel is equipped with an Industrial Power Systems generator control panel and Teleflex Seastar Hydraulic steering system.

The research boat, which is designed to tow more than 3,000 pounds at 15 knots, delivers a top speed of 30 knots (fully loaded) with a range of 1,200 nautical miles.

The hull's four watertight compartments house the forepeak, forecastle, which includes an enclosed head, wheelhouse amidships, engine room and auxiliary machinery space, and laboratory aft.

For free literature detailing the facilities and capabilities of Gladding-Hearn Shipbuilding,

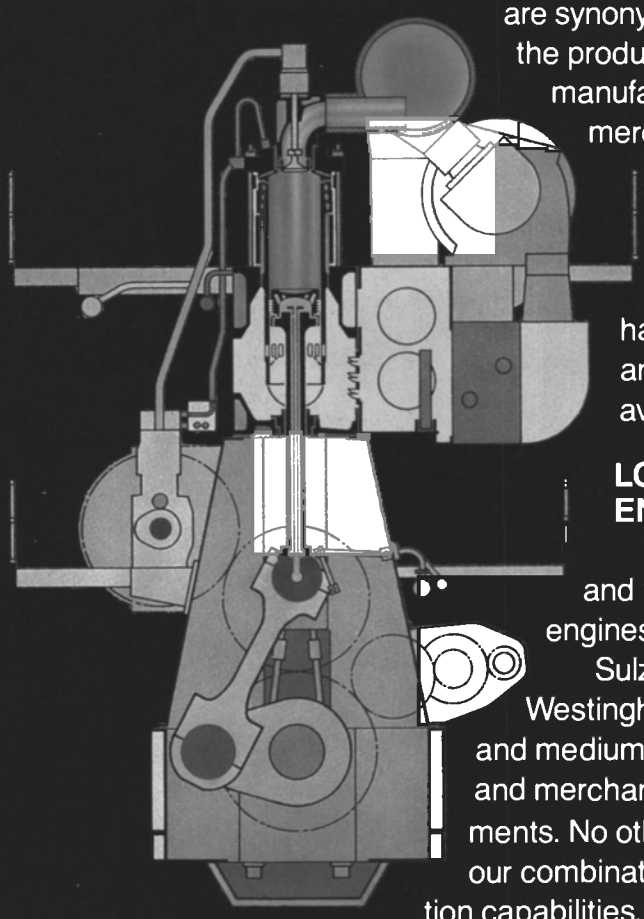
Circle 30 on Reader Service Card

Chinese Yard To Build Indonesian Tanker

China State Shipbuilding Corporation (CSSC), the People's Republic of China-owned builder, will construct a tanker for Indonesia. Under the contract, CSSC will also arrange for a technology transfer and send engineers to Indonesia to train Indonesian shipyard workers. No details of the contract amount or delivery schedule were revealed.

DIESEL PROPULSION

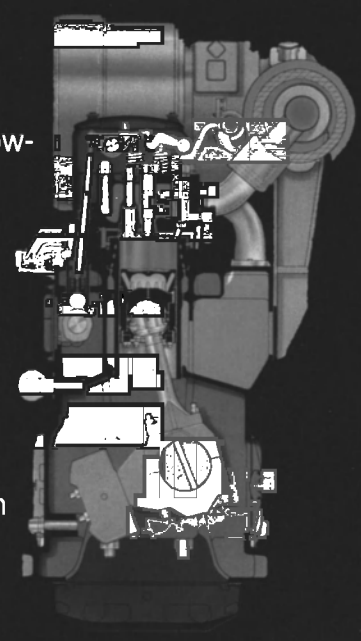
INTRODUCING WEST



The names Westinghouse and New Sulzer Diesel Ltd are synonymous with quality engineering in the production of marine propulsion systems. No manufacturer has served the U.S. Navy and merchant marine longer than Westinghouse. And New Sulzer Diesel's tradition in diesel engines dates back to the production of the first marine diesel engines. Now Westinghouse and New Sulzer Diesel Ltd have joined forces. The most sophisticated and advanced marine diesel engines are now available in the United States.

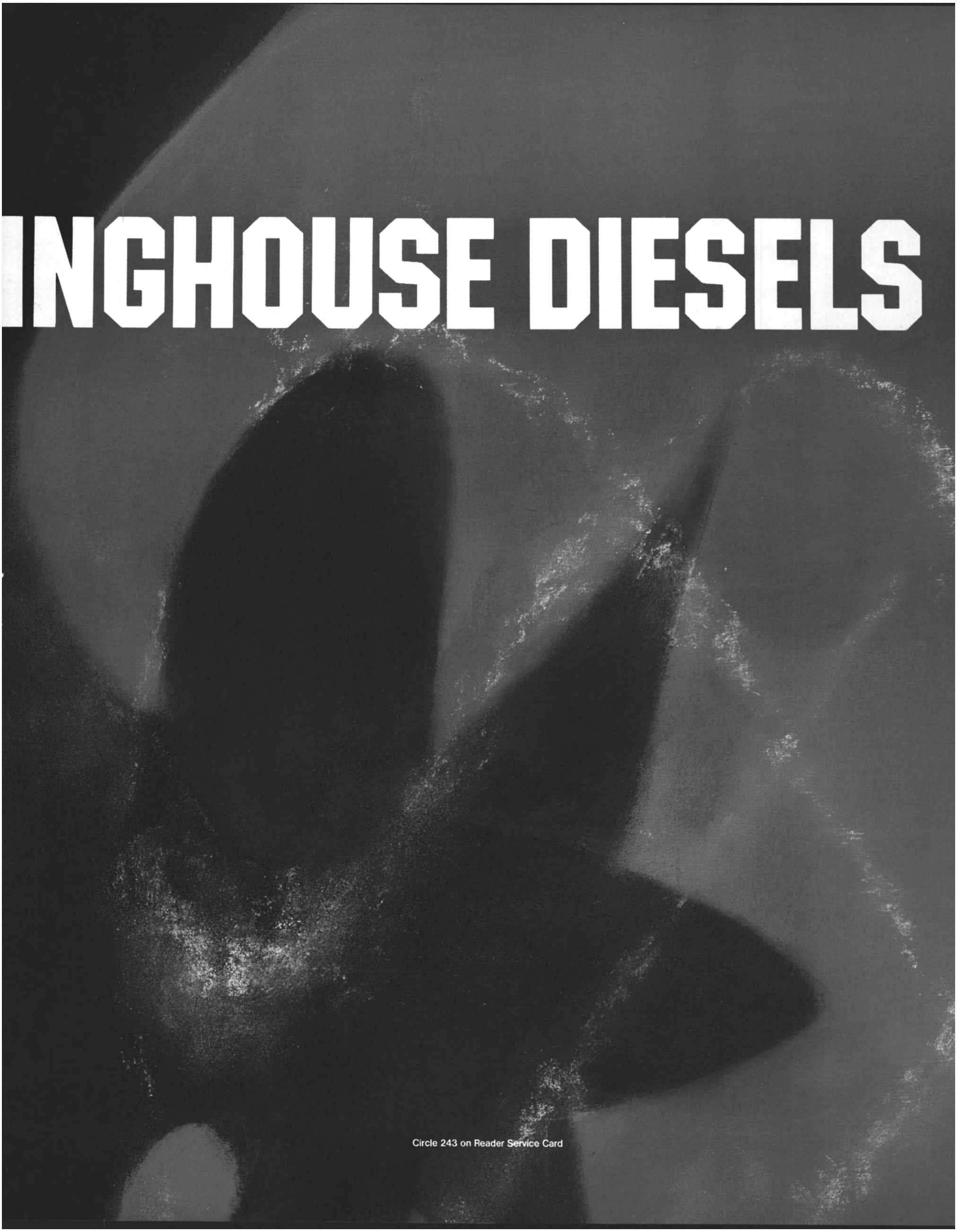
LOW- AND MEDIUM-SPEED ENGINES FROM ONE SOURCE

Only now, is it possible to obtain both low- and medium-speed marine diesel engines from one American source. Sulzer diesel engines built by Westinghouse cover the full range of low- and medium-speed models to meet Navy and merchant vessel propulsion require-ments. No other supplier can match our combination of experience and integration capabilities. That means we can tailor the propulsion system to the shipbuilder's and operator's requirements.



The team of Westinghouse and New Sulzer Diesel Ltd has created a new dimension for American shipbuilders. Simply stated, you cannot make a better choice for marine diesel propulsion systems than Westinghouse.

WESTINGHOUSE ELECTRIC CORPORATION
New Sulzer Diesel Ltd



Stolt-Nielsen To Move Shipowning Division To Houston, Texas

Stolt Tankers and Terminals (Holdings) S.A. recently announced that it will relocate its Shipowning Division from Panama City, Fla., to Houston, Texas. The Port of Houston has grown steadily to become one of Stolt-Nielsen's most active tanker ports of call, and in addition is the site for Stolthaven, the company's main Owner's Berth cargo consolidation terminal in the U.S., as well as the hub of the U.S. Gulf barge and rail activity. Shipowning will relocate to a new building adjacent to the Stolthaven Houston facility. The move will be completed by mid-1992.

The Shipowning Division provides crewing, repair, provision, and insurance services to the majority of the Stolt Tankers fleet, including all of the company-owned ships. The move to Houston will put this staff nearer to the ships they serve and improve communication between sea and shore personnel. Since all the other Stolt businesses already have an established presence in the port, the addition of Shipowning should further enhance customer service.

"Shipowning moved to Panama City from Greenwich, Conn., in 1986 to reduce the overhead of the division," said **Stanley Symon**, executive vice president of Shipowning. "The move did cut costs as expected. After only five years, however, it was increasingly apparent that the staff was somewhat isolated from the company's other businesses. In addition, we recognized the need for the outside professional contracts available only in a major chemical shipping and maritime center like Houston."

General Motors Locomotive Group Appoints Lagomarcino

Mark A. Lagomarcino has been appointed manager, Power Products Service. Mr. **Lagomarcino** will be responsible for coordinating the power, marine and industrial service activities in support of the commercial department.

Marine Electric RPD To Supply P/A System For Coastal Patrol Craft

Marine Electric RPD, Inc., Clifton, N.J., was recently awarded a contract by Bollinger Machine Shop & Shipyard, Lockport, La., to supply the public address (P/A) system for the Navy's new class of Coastal Patrol Boats (PBCs).

Marine Electric RD, 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.

The company has been supplying the U.S. Navy and commercial market for over 40 years.

For free literature detailing the extensive line of equipment offered by Marine Electric RPD,

Circle 62 on Reader Service Card

MarAd Sells LASH Vessel To Coastal Barge Corp. For $3.38 Million

The Maritime Subsidy Board has sold the LASH vessel American Veteran to Coastal Barge Corp., a Delaware corporation, for operation in compliance with provisions of the Merchant Marine Act of 1936, as amended. The sale, for $3,380,000 was on an "as is, where is" basis and includes the transfer of all obligations on the vessel to the purchaser.

The vessel was built in 1973 with the aid of construction subsidy for Pacific Far East Line, Inc. It was subsequently transferred to Farrell Lines, Inc., in 1976 and United States Lines in 1982. MarAd acquired the vessel last year.

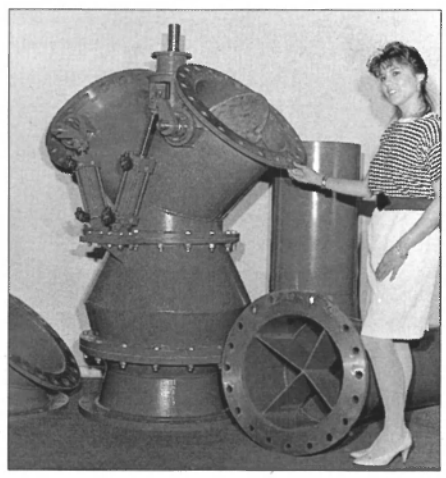
New Line Of Kinetic Converters From Omnithruster For Thruster Applications

Omnithruster has designed and developed a new series of kinetic converters (those devices associated with its marine maneuvering devices that convert mechanical energy to hydraulic fluid energy).

This new series of devices has been designed from the ground up to exhibit special characteristics necessary to develop maximum thrust for a given horsepower input to maximize efficiency and performance in marine jet-powered thrusters and propulsion systems.

Some of the features embodied in the new Gamma I design are: stainless steel specially finished impellers to give high efficiency and low cavitation parameters; extra strength welded metal casings and diffuser sections; optional stainless steel wearing rings and the impeller seats; easily-replaceable impellers by means of two-part intake sections.

The machines are so designed that the operating characteristics enable a soft start with an AC motor with minimum in rush current demand. Especially applied finish is used on the surface in contact with seawater; utilized in vessels from small workboats and tugboats with 75 horsepower installations to large displacement vessels, naval, cruise ships, containerships, and tanker installations with up to 3,000 and 4,000 horsepower. The units also use newly designed control systems.



Omnithruster RPV 575-A Gamma series rated at 250 hp DC motor drive, Canadian Coast Guard, Navaids vessel Provo Wallis.

These new Gamma series systems are being manufactured from American-made materials at the Omnithruster facility in Santa Fe Springs, Los Angeles County, Calif.

For more information,

Circle 31 on Reader Service Card

GE General Services Awarded Contract Worth $8.4 Million By Navy

GE Government Services, Inc., General Electric Co., Cherry Hill, N.J., was awarded an $8.4 million cost-plus-fixed-fee Navy contract.

$140.6 Million Contract Signed For Multipurpose Icebreaker For Finland

The Hollming Oy-Rauma Yards Oy consortium recently signed a contract to build a multipurpose icebreaker for Finnish National Board of Navigation. The vessel is to be delivered in March 1993.

The value of the order, including the cost of financing, is around FIM 580 million (about $140.65 million).

In addition to icebreaking, this new generation icebreaker is intended for a range of summer duties in offshore oil and gas fields. The consortium will design and build the vessel using a basic concept developed by the Finnish National Board of Navigation and ILS Engineering Consultants. The hull concept is designed for icebreaking, yet at the same time will provide the seagoing characteristics of an offshore vessel. The result is an ocean-going icebreaker.

One important feature of the multipurpose icebreaker is its large open afterdeck, which can be fitted with various types of equipment for operations during summer. The afterdeck is strengthened to carry equipment for laying and repairing flexible cables and for handling anchors and various cargoes.

The vessel will have a length overall of about 337.3 feet, a beam of 85.3 feet and a height from side to top deck of 41 feet. The design draft will be approximately 22.9 feet in winter work on the Baltic and 27.5 feet in summer offshore operations. The vessel's deadweight will be 1,700 tons in winter and 4,500 tons in summer.

The propulsion system will be diesel-electric, featuring two Aquamaster-Rauma Oy stern propeller units, shaft power 2 x 7.5 MW. The Aquamaster system will develop a bollard pull of 200 tons and provide the vessel with excellent steering characteristics both in ice and in open water. For offshore work the vessel will be fitted with three transverse bow thrusters and a dynamic positioning system.

For free literature on the facilities and capabilities of Hollming Oy-Rauma Yards Oy,

Circle 12 on Reader Service Card

Finneran Appointed President Of CIRM

Thomas J. Finneran, executive vice president of Mackay Communications, In.c, has been appointed president of The Comite International Radio Maritime (CIRM).

CIRM ia a private organization based in London and composed of leading international marine equipment manufacturers. The bylaws of CIRM preclude any government agency from being a member, but allow their participation in CIRM meetings and conventions of pertinent international organizations including IMO where they assist in avoiding the adoption of regulations that are technically impractical. CIRM meets twice a year, usually in Europe, and holds working group meetings in London.

SHIP FINANCE

The Third Annual Conference

January 28-29, 1992 • The Park Lane Hotel • New York City

Institute for International Research

JANUARY 28, 1992

9:00 **CHAIRPERSON'S OPENING REMARKS:**

Marlene D. Daniels, Partner
Hill, Betts & Nash

Recent Environmental Laws and Regulations - Have They Affected the Availability of Ship Finance?

9:15 **EVALUATING THE DESIRABILITY OF PROJECTS AND RELEVANT COST FACTORS**

- The challenges in raising capital for tomorrow's fleet
- Assessing the state of the financial markets
- Will financial institutions impose tighter credit standards?
- What are the implications of environmental regulation for shipowners and bankers?

Adrian W. Doherty, Jr., Managing Director
J. P. Morgan & Co.
Bruce Lambie, Deputy Managing Director
Den norske Bank, PLC

10:00 **ATTRACTING CAPITAL AND MAINTAINING INVESTOR CONFIDENCE**

Don Kendall, Managing Director
Kendall Capital Partners
Edmond Lincoln, Vice President
Kidder Peabody & Co., Inc.

10:45 Coffee/Tea

11:00 **IS THERE ANY FUTURE FOR PUBLICLY TRADED SHIPPING STOCKS...HOW MANY CANDIDATES ARE THERE?**

- What are the characteristics of likely successes?
- What appeals to institutional investors?
- How can the shipping industry tap into public money?

Joel Pack, Senior Vice President
Shearson Lehman Brothers

11:30 **THE SHIPYARDS' PERSPECTIVE - YARD CREDITS, YARD RISKS**

- Title XI - Future possibilities?
- How can Ex-Im Bank provide a basis for ship finance: A real life case
- Newbuildings: What is in demand?
- The impact of subsidy cutbacks on ship finance

John Stocker, President
Ship Builders Council of America

12:00 **LEASING: ALIVE OR NOT?**

- Has the fear of liability effectively eliminated ship leasing?
- Is there any profit left in leasing?
- Tax considerations for shipowners

Charles S. Wassell
Assistant General Counsel
PLM International, Inc.

12:30 Luncheon for Speakers and Delegates

THE VIEW FROM CONGRESS

A Representative of the Committee on Merchant Marine & Fisheries, United States House of Representatives

Changes in the Structures of Ship Financing Transactions by Reason of Increased Environmental Regulation

2:00 **THE IMPACT OF OIL CLEAN-UP AND RESPONSE ON SHIP FINANCE**

Charles Fabrikant, President
Sansar Holdings, Inc.

2:30 **WHAT ARE FINANCIERS REQUIRING BORROWERS DO DIFFERENTLY?**

- Warranties and covenants...Do they mean more "control"?
- Strategies for borrowers to meet new financing requirements
- What aspects of a borrower's business are financiers scrutinizing for pollution concerns?

Gary J. Wolfe, Partner
Hill, Betts & Nash

3:00 **INSURERS' RESPONSES TO THE EVOLVING NEEDS OF SHIPOWNERS AND LENDERS IN LIGHT OF RECENT DEVELOPMENTS**

- What is adequate coverage today?
- Are these new products responsive to industry needs?
- Reducing risk factors through insurance
- What should a shipowner require?

Eric Carlstrom, Vice President
Alexander & Alexander, Inc.
Michael Northmore, Assistant Director
Johnson & Higgins

3:45 Coffee/Tea

4:00 **WHAT SHIPOWNING STRUCTURES ARE BEING DEVELOPED IN RESPONSE TO ENVIRONMENTAL CONCERNS**

- What can new structures really accomplish?
- Examples of effective shipowner structures

Sue A. Wright, Partner
Norton Rose

4:36 **DOES VESSEL FLAG MATTER? IS CHEAPER VESSEL REGISTRATION WORTH IT?**

- What are the environmental responsibilities of the Flag State?

Guy E.C. Maitland, President
International Registries, Inc.

5:15 Close of Day One

5:30 COCKTAIL RECEPTION
Sponsored by: HILL, BETTS & NASH

JANUARY 29, 1992

9:00 **CHAIRPERSON'S COMMENTS:**

Marlene D. Daniels, Partner
Hill, Betts & Nash

Current Issues In Ship Finance - What's New?

9:15 **U.S. FLAG SHIPPING - AND EVERYONE USED TO THINK IT WAS BORING?**

- **AN OVERVIEW**

Eugene McCormick, President
Lykes Brothers Steamship Co., Inc.

- **AN AMERICAN INTERNATIONAL SHIP REGISTRY?... WHO'S INTERESTED IN U.S. FLAG?**
  - Are there real opportunities?
  - Who is supportive?

David Fobes, Larry Ruthowski, Partners
Hill, Betts & Nash

- **THE FUTURE OF U.S. FLAG BULK SHIPPING**

Philip Shapiro, President
Liberty Maritime Corp.

10:30 **RAISING CAPITAL THROUGH INTERNATIONAL MARKETS AND CROSS NATIONAL LISTINGS**

Einar J. Greve
Oslo Stock Exchange

11:00 Coffee/Tea

11:15 **EASTERN EUROPE AND THE SOVIET UNION: OPPORTUNITY OR CHAOS?**

- What is the future of joint ventures between the East and West?
- What is the condition of and how large are the fleets of Eastern Europe and the Soviet Union?

Hilary Wild, Assistant Director
Kleinwort Benson

11:45 **IS CANADA THE NEXT LAND OF OPPORTUNITY?**

- Ship finance from a Canadian perspective
- Vancouver, a new international maritime center?
- Recent changes in Canadian Tax Laws

Pierre Cote, Partner
Ogilvy Renault
Bruce C. Bell, Partner
Russell & DuMoulin

12:15 Luncheon for Speakers and Delegates

WASHINGTON...THE WILD CARD IN THE GAME OF SHIP FINANCE

Philip J. Loree, Chairman
Federation of American Controlled Shipping

1:45 **SHIPPING AND THE EQUITIES MARKETS**

Changing self liquidating funds into permanent structures
Problems with regulation disclosures and projections of income

Richard B. Tshaas, Partner
Winston & Strawn

2:15 **A NEW LOOK AT STRATEGIC ALLIANCES IN SHIP OWNERSHIP AND MANAGEMENT**

Political issues ... How do joint ventures work out?
What new joint venture structures are being developed?
Examples of successful joint ventures
Are tax benefits a principal motivation?
The pros and cons of shared financing

AN OWNER'S PERSPECTIVE ON JOINT VENTURES

Jack Goldstein, President
OMI

A LAWYER'S VIEW OF JOINT VENTURES

Richard Barnett, Partner
Height, Gardner, Poor & Havens

3:00 Coffee/Tea

3:15 **CREATIVE USE OF CROSS BORDER TRANSACTIONS FOR LOWERING INTEREST RATE COSTS**

J.E. Lawrence, Publisher
Marine Money International

3:45 **ASSET SECURITIZATION - IS IT RELEVANT?**

What new players are in the market?
What types of deals are being developed?
Market supply and demand
Risk/Reward considerations

Barbara C. Hewson, Partner
Watson, Farley & Williams

4:15 End of Conference

FOR MORE INFORMATION CALL:
(212) 826-1260 OR OUTSIDE NEW YORK (800) 345-0016 or Fax (212) 826-6411

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New York, New York 10022

U649

Circle 247 on Reader Service Card

Product Tanker Prospects

Outlook For Trade And Profitability

The latest comprehensive survey to be published reviews in detail recent market activity and highlights the way in which future products movements will determine the operating environment over the remainder of the decade.

The main conclusions focus on the developments of products exports from the main source refiners to the principal consuming nations. The report examines the way in which operating profitability will be substantially improved in the middle of the decade, but warns of the need for ordering restraint at this time.

The nature of the product tanker market has changed steadily since the oil crisis of the late 1970s. This brought about a progressive change in the location of refining capacity, the consequence of which was an increase in products exports from the source refiners.

The product carrier fleet expanded rapidly during the late 1980s, bolstered by demand for larger tankers, to meet growing shipments from the Middle East. This may be clearly illustrated, by making reference to the year of build and corresponding average tanker size.

Cargoes of around 50,000 dwt are now relatively commonplace on trades from the Middle East to the Far East, and one or two 70,000 dwt cargoes are noted in most months. This contrasts sharply with the 30,000 dwt cargoes which are the norm for movements elsewhere in the world.

Over the same period, many new product tankers have been characterized by an increase in their sophistication. In particular, there are now a large number of vessels which may be regarded as "dual purpose"—i.e. capable of working chemical or crude, as well as product trades.

Nevertheless, many constraints are still apparent for the larger and newer vessels, by way of limited draft ports, poor terminal facilities, and a non-availability of suitably sized cargoes. The future structure of the fleet will depend on how these issues are addressed.

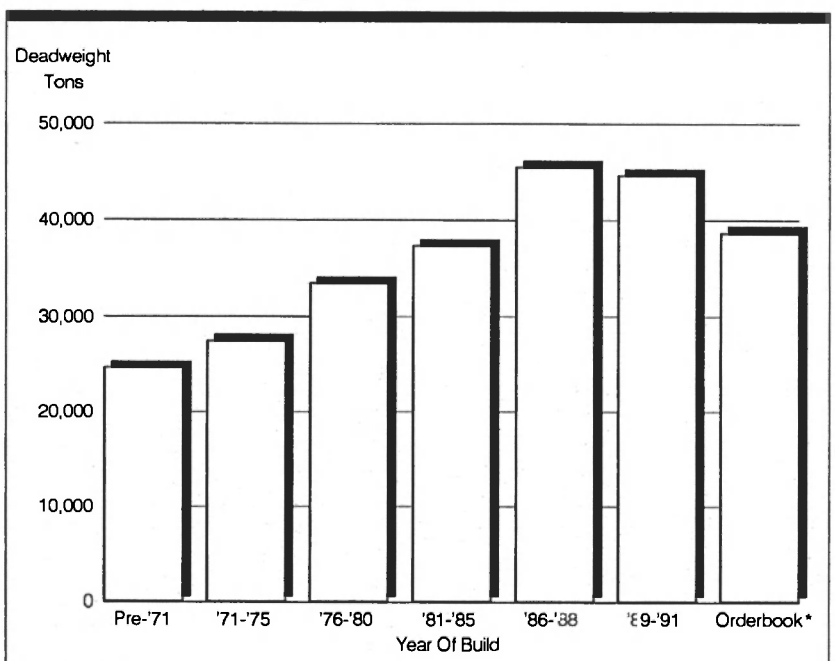
Product carrier fleet development during the 1990s will reflect a continued growth in export volumes from the source refiners which will provide the basis for new trade opportunities.

In any event, rapidly escalating cost pressures will provide the stimulus for a significant realignment in freight rates. This will be prerequisite if the necessary capital is to be secured for future investment in the industry.

For further information regarding "Product Tanker Prospects", or any inquiries regarding the report, please contact Drewry Shipping Consultants Ltd., 11, Heron Quay, London E14 4JF.

Product Carrier Fleet

Average Deadweight vs. Year Of Build



* As of April 30, 1991

Source: Drewry Shipping Consultants Ltd.

MarAd Receives Three Ship Financing Guarantee Applications

The Maritime Administration recently received three ship financing guarantee applications.

—Bean Dredging Corp., a subsidiary of C.F. Bean Corp., Belle Chasse, La., is requesting a Title XI financing guarantee to aid in refinancing the existing Title XI bonds on the self-propelled, twin-screw, suction dredge Eagle I. The vessel was built by Avondale Industries (formerly Avondale Shipyards, Inc.) New Orleans, La., in 1981. The 10-year Title XI guarantee would cover $18,583,000. The vessel operates in the domestic commerce of the U.S.

—OMI Hudson Transport, Inc., a subsidiary of OMI Corp., New York, N.Y., is seeking a Title XI financing guarantee to provide refinancing of a portion of the Title XI debt outstanding on the 50,852-dwt chemical/product carrier OMI Dynachem. The vessel was built by Avondale Industries, Inc., Avondale, La., in 1981. The 10-year ship financing guarantee would cover $16,250,000. The vessel operates in the domestic commerce of the U.S.

—OMI Maverick Transport, Inc., a subsidiary of OMI Corp., has applied for a ship financing guarantee to aid in financing six 40,000 to 50,000-dwt, slow-speed diesel-powered tankers. Each vessel is projected to cost $60 million. The Title XI guarantee would cover $270 million of the $360 million actual estimated construction cost. The vessels would be used in the domestic commerce of the U.S. No proposed builder or delivery date has been established.

Newport News Awards Washington Aluminum $450,000 Contract

The Washington Aluminum Company, Inc. has been awarded a $450,000 contract by Newport News Shipbuilding, Inc. for telescopic battens on aircraft carriers under construction by the Virginia shipbuilder.

Gregg Smith, marketing manager of Washington Aluminum Company, said: "Washington Aluminum Company was involved in the original design of a variety of aluminum products for the Navy since 1947. We are pleased that Newport News has selected us for this portion of the carrier project."

Washington Aluminum has provided over 40 years of continuous service in the design and manufacturing of products for the Navy.

For further information and free literature from Washington Aluminum Company,

Circle 38 on Reader Service Card

GD-Electric Boat Awarded $6.8 Million Modification By Navy

General Dynamics Corp., Electric Boat Division, Groton, Conn., was recently awarded a $6.8 million cost-plus-fixed-fee contract modification to exercise an option for OMNIBUS engineering and technical services for Ohio Class submarines. The contract is expected to be completed September 30, 1995.

Industry Survey Reveals Substantial Rise In Shallow-Draft Vessel Construction

Tank, Deck Barge Construction and Repair Jump In 1990

A recent report released by an organization representing American shipyards who serve the shallow-draft, coastal and harbor sectors of the U.S., revealed that there was a substantial increase in tank and deck barge construction and repair activity during 1990.

The report, the "1990 Annual Shipyard Survey," was published by the American Waterways Shipyard Conference (AWSC) and is based on its members' responses. Member yards of the organization, which is a conference of the American Waterways Operators (AWO), stretch along the East, West and Gulf Coasts, as well as the banks of inland waterways of the U.S.

The Viking 2000 towboat Karen K. under construction at Avondale Boat Division.

Employment Levels Best In 10 Years

One important trend revealed in the survey is the significant recovery in the employment sector at these second-tier yards, a clear indication of an improvement in work activity in this area of the marine market. Table 1, "Employment Levels in Second-Tier Shipyards, 1981-1990," which shows the number of employees for each given year, indicates that employment levels at small- and medium-sized yards have reached their best levels in 10 years. Employment levels peaked in 1981 at 91,125 and had declined by 58 percent to a low of 37,398 in 1985. Since 1985, however, employment has gradually increased, showing jumps of 32 percent in 1989 and 28 percent in 1990.

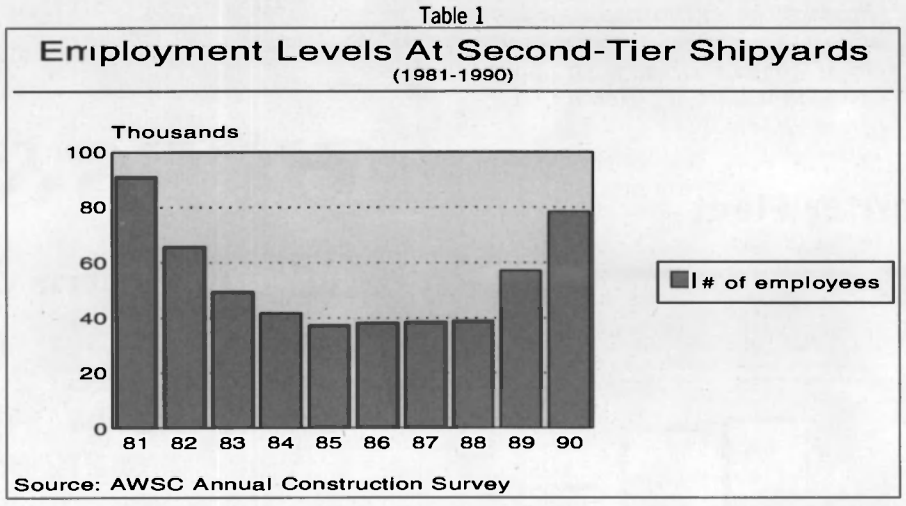
Construction Of Power-Driven Boats Shows Drop-Off

The responses from the second-tier facilities substantiate the fact that there is a recovery being experienced in this sector. Although there was a drop-off in the number of power-driven vessels, which range from towboats, tugs and fishing vessels to offshore supply boats, crew boats, ferries, excursion/dinner boats and military vessels.

Although not specifically discussed in the survey, the area of riverboat gambling represents a significant growth sector for second-tier shipyards. With the passage of legislation legalizing gambling in certain counties of Iowa, Illinois and Mississippi, the first orders for gaming vessels and casino riverboats were placed in 1990. With other states like Louisiana joining the gaming circuit, some analysts expect as many as 50 vessels to be built for this sector over the next five years.

Nineteen-ninety also saw the first significant number of orders for offshore supply vessels since the boom years in the early 1980s.

Table 1



Tanker, Deck Barge Construction Up

Although the survey indicates a slight decrease in river barge construction, from 2,180 barges in 1989 to 2,128 barges in 1990, certain areas of this category showed a marked improvement. The total number of river tank and deck barges, for instance, jumped four-fold and three-fold from 1989 to 1990. The number of tank barges under construction went from 62 in 1989 to 234 in 1990. Deck barge construction jumped from 121 vessels in 1989 to 375 vessels in 1990. Hopper barge construction slipped from 1,937 vessels in 1989 to 1,456 in 1990.

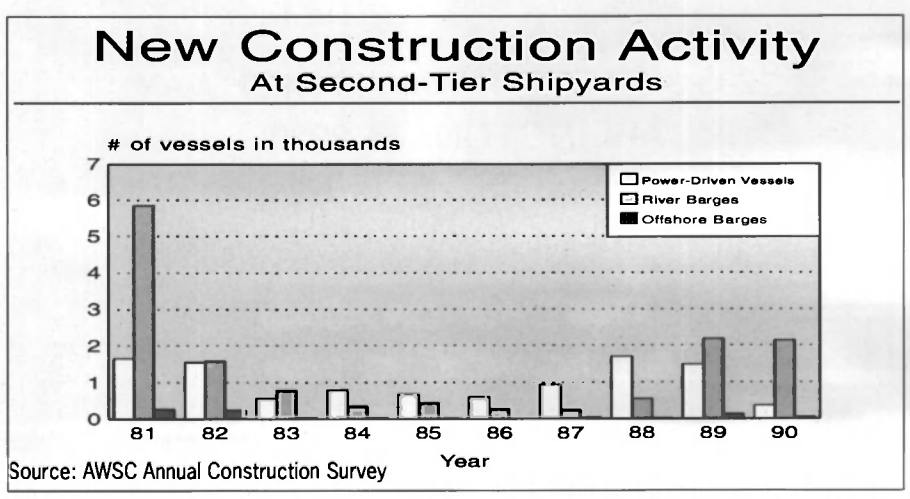
Offshore barge construction across the board—dry cargo hopper and deck barges, tank barges, machinery, work and miscellaneous barges—also decreased.

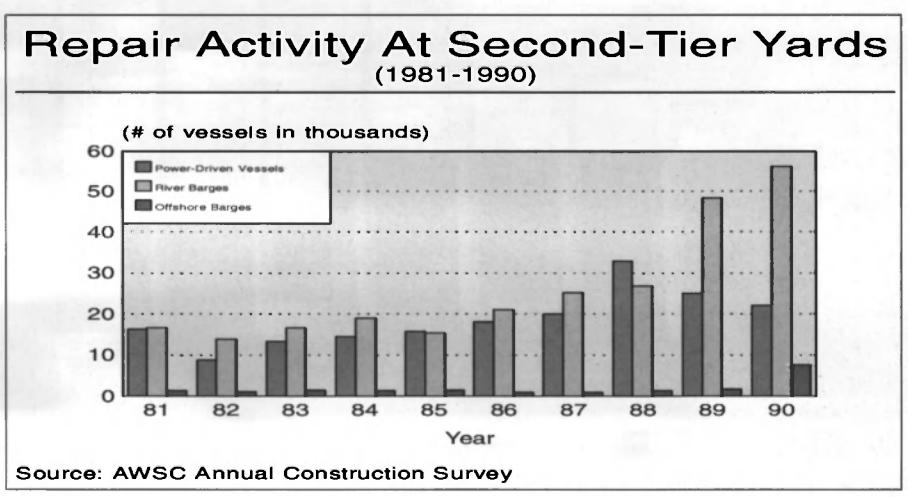
Repair Activity Up In Offshore Barges

Increases in offshore barge repair activity were substantial based on the respondents' answers, increasing from 1,655 vessels in 1989 to 7,629 vessels in 1990—a whopping six-fold increase. The survey projects that there was a 78 percent increase in offshore barge repair activity nationwide in the second-tier shipyard industry, based on a statistical formula applied to the data.

The survey shows that, in particular, offshore dry cargo hopper and deck barge repair activity almost doubled, while offshore tank barge repair leaped almost ten-fold—from 572 vessels repaired in 1989 to 5,546 in 1990.

River barge repair activity was up as well, jumping from 48,407 barges repaired in 1989 to 56,297 repaired in 1990. Repairs to hoppers, LASH and Seabee type barges were responsible for most of the increased activity.





Reasons for repair at Astilleros?

We stick to Repairs
At Astilleros we're proud of a growing inflow of conversions.
But repair is -and will always be- our main daily concern.

Four yards to choose
Cadiz, Astano-Ferrol, Santander and Bilbao. Nine dry docks or floating docks, and capacities up to 400,000 dwt.

Strategic locations
Covering your lanes on the Atlantic, the Bay of Biscay or the Mediterranean.

Non-stop work
Our industrial flexibility allows us to comply with your tightest schedules, working 24 hours a day.

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The Shipbuilders of Spain

Five-Year Outlook For The U.S. Marine Industry

By James R. McCaul, President
IMA Associates, Inc.

IMA has just completed an in-depth study of the entire U.S. marine business. This article provides some of the study highlights.

U.S. Marine Industry Shift To Commercial Workbase

Changing military requirements and budget constraints will impact the composition of work available to the U.S. marine sector over the next five years. Industry focus in the U.S. will gradually shift from Naval ship construction, which drove much of the marine business through the 1980s, to a growing commercial market. There will be an increasing flow of orders for product tankers, offshore equipment, cruise ship refurbishments, small passenger vessels, megayachts, river barge construction, etc. Importantly, the future workbase will gradually shift from military specification to commercial standard construction. This will open opportunities for a number of companies not geared to military equipment requirements.

Increased Opportunities From Cruise Ship Refurbishment

There are currently 95 cruise ships servicing the North American cruise trade. Competition for passengers is intense—and owners find it necessary to continually upgrade and modernize equipment and facilities. As a result, cruise ships provide a continuing flow of repair and refurbishment opportunities. The report identifies 16 cruise ships which look like highly promising refurbishment prospects over the next five years. It is estimated the revenues associated with these refurbishments will total $800 million to $1.2 billion.

Cruise ship repair and refurbishment, like Bethship Sparrows Point's work on the Celebration, are expected to be a staple of U.S. yard's over the next five years.

OPA Will Force Coastal Tanker Replacement

The Oil Pollution Act of 1990 will have a major impact on the domestic tanker sector. It is estimated that 40 to 50 coastal tankers will be forced into retirement between 1995 and 1998 as a result of OPA 90 double bottom requirements. Replacement orders for coastal product tankers will begin in the near future. They will include some 20,000 to 40,000 dwt integrated tug barges. Replacement orders for Alaskan crude carriers are more distant prospects—but some very interesting mid-body contracts will be placed within the next year or two.

Orders For Navy Sealift Ships Expected In Spring

Construction of additional sealift ships has become a top priority to defense planners. A requirement for 28 to 49 additional ships has been sighted as a program objective. As described in a companion article in this issue, IMA believes at least 10 sealift ships will be ordered over the next five years. Final design/construction contracts will be placed next spring. All of the ships will be built to commercial standards.

Obsolete Equipment Will Spur Future Offshore Sector Orders

Low natural gas prices—compounded by a surplus of offshore equipment—will continue to dampen construction demand for rigs and support vessels over the next few years. However, a large number of these rigs and vessels are approaching physical obsolescence or becoming marginally marketable. As a result, IMA expects replacement orders for offshore rigs and support vessels to grow through the mid-1990s. Meanwhile, platform construction will continue to provide a flow of fabrication activity—including orders for a number of platforms for ultra deepwater production.

Continued Orders For Ferries & Small Passenger Vessels

Yards in this country have built an average of 190 ferries and small passenger vessels annually over the past ten years. This little—appreciated sector has been one of the most dynamic marine businesses in the U.S. over the past decade. Our analysis indicates that a substantial continued business base can be expected.

Megayacht Building: Market Bright Spot

A handful of U.S. builders have established a leading presence in the megayacht construction business. This is one of the few marine business sectors active in the export market. U.S. builders have delivered megayachts to customers in Asia and Europe. IMA's analysis indicates that megayacht construction will continue at a rapid clip—and provide a continued business base over the next five years.

Waterway Barge Construction Will Grow Rapidly

Construction of barges and towboats expanded at a rapid rate during the 1970s and early 1980s. The market collapsed—leaving behind a huge surplus of equipment and a number of bankrupt operators. IMA's analysis indicates that barge demand is coming more in line with equipment supply. IMA expects replacement requirements for barges to grow over the next several years—reaching a construction level of 750 to 1,250 barges annually in the second half of the 1990s.

IMA's new report, "Five Year Outlook for the U.S. Marine Industry," examines future prospects in each of 24 marine market segments. The newly published 190-page report examines ship construction and major modification prospects available to shipbuilders, equipment manufacturers and other supplies.

Report 7119 is available for $575. To order, contact: IMA Associates, 600 New Hampshire Ave., NW, Suite 140, Washington, D.C. 20037; telephone: (202) 333-8501; fax: (202) 333-8504.

(continued from page 22)

LYS-SKOG
Equipment List

Main engine	Wartsila Diesel
Propeller	Wartsila Wichman
Thruster	Brunvoll Molde
Generator engine	Scania Vabis
Thruster engine	Brown Boveri
Generator	Uljanik-Siemens
Deck machinery	Hydraulik Brattvaag
Shafting	Wichman
Coatings	Hempel
VHF radios	Sailor
SSB radios	Sailor
Pumps	Allweiler
Autopilot, compass	Anschutz
Navigation system	Racal Decca
Navtex	JRC
ISC	Norcontrol Automation

controllable-pitch propeller via Volda AC6 750 reduction gear.

Auxiliary power is supplied by Scania Vabis generator engines and Uljanik-Siemens generators. She also has a Uljanik-Siemens shaft generator.

Of particular note, the Lys-Skog features an interesting side-door construction, a combination of hydraulically operated side access door and forklift elevator.

MONARCH OF THE SEAS
Chantiers de l'Atlantique

Circle 78 on Reader Service Card

The latest giant for the passenger cruise industry, the 75,000-ton luxury megaliner Monarch of the Seas, emerged from the St. Nazaire, France, shipyard of Chantiers de l'Atlantique. Built for Royal Caribbean Cruise Line, the Monarch is 880 feet long and has a maximum passenger capacity of 2,766, with 1,177 cabins, 732 of which are outside units and 445 inside units. Included in the total are 12 luxurious suites and 50 deluxe cabins with a balcony, all of which are located on the Bridge Deck.

The Centrum, the ship's central meeting place from which most of its public spaces radiate was designed by Norwegian **Njal Eide**, whose Oslo-based form specializes in cruise vessel interiors. The centrum spans five decks, featuring curved staircases, glass-walled elevators and a lively plaza. At the base of the glass-walled elevators lie three pools of dancing water, an elegant piano platform and raised plaza linked by a parade stair. Forward of this area, the Centrum flows into the photo gallery with a stepped level fountain. Of particular note, Mr. **Eide's** firm also designed the 1,000-person "Sound of Music" Lounge which features a video wall—a first at sea. The wall consists of 50 individual monitors on two motorized movable banks of 25 screens each (stacked five by five), which can be used for a variety of entertainment purposes.

MONARCH OF THE SEAS
Equipment List

Main engines (4)	Pielstick
Propellers (2)	KaMeWa
Thrusters	KaMeWa
Generator engines	Wartsila Vasa
Generators	Alsthom
Reduction gears	Lohmann & Stolterfoht
Engine controls	KaMeWa
Coatings	Jotun/International Paint
VHF radios	Furuno
Radar, compass, loran, autopilot	Sperry Marine

Propulsion is supplied by four Pielstick nine-cylinder PC20L main engines which produce a total of 29,700 bhp (7,425 hp each at 475 rpm), while six four-stroke Wartsila Vasa 6R32 auxiliary diesel engines generate more than 13 million watts of auxiliary power (2,088 kw each at 720 rpm). Other propulsion equipment includes Lohmann Stolterfoht double input/double output reduction gears (approximately 3:1 reduction ratio) and twin highly skewed, 4.9-meter diameter KaMeWa controllable-pitch propellers.

POLAR CIRCLE
Ulstein Hatloe

Circle 81 on Reader Service Card

Norwegian shipbuilder Ulstein Hatloe A/S of Ulsteinvik delivered the unique 5,129-gt combination research/passenger ship Polar Circle

to Rieber Shipping Company Polar Circle.

Designed by Riebber Shipping in coopoeration with Ulstein Hatloe, Skipkonsulent, Marintek A/S, and Arkitekfirmaet Arnstein Arneberg A/S, the 300-foot Polar Circle can accommodate a total of 120 passengers and crew in 68 cabins. Passengers are accommodated in 4 single cabins, 41 doubles and three triples. Crew accommodations include 10 single cabins, five doubles and five triples.

Her public spaces include the 96-seat Antarctic Seasons Restaurant, the Polar Circle Lounge, Antarctic Ocean Lounge and Marco Polo Lounge. Other spaces include the Leif Eriksson Library and Discovery Room with bar.

Propulsion equipment includes twin Bergen Diesel BRG-8 main engines, rated at 4,020 hp at 750 rpm, Ulstein four-blade propellers and Renk-Tacke NDSHQL-2800 marine gears. The Ulstein propeller is fitted with nozzle with ice deflector fins.

Of particular interest in the Polar Circle is Robertson's Disc Navigation ECDIS (Electronic Chart Display and Information System). Robertson Disc Navigation is an electronic sea chart system which displays vessel position in real time on a high resolution color graphic monitor. The system is designed to satisfy IMO provisional performance standards for ECDIS.

Other equipment includes Valmet Automation engine room systems, deck cranes from Hagglunds, JRC satcom equipment, and MacGregor-Navire cargo and provisions hatches.

REGAL PRINCESS
Fincantieri

Circle 82 on Reader Service Card

In the third quarter of this year, the 70,000-grt, $200 million-plus cruise ship Regal Princess was delivered to P&O by Italian builder Fincantieri's Monfalcone yard.

One of two P&O flagships built by Fincantieri, the Regal Princess has an overall length of 811 feet, breadth of 105 feet and draft of 26 feet.

Designed for worldwide cruising, with seven-day Eastern and Western Caribbean and Alaska Inside Passage itineraries the Regal Princess 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 synchronous-type propulsion motors, each directly driving fixed-pitch propellers via shafting.

She has 14 decks with a total of 798 passenger cabins, of which 436 are outside cabins, 178 inside cabins, 134 cabins with a balcony, 36 deluxe cabins and 14 suites. She will be manned by a crew of 683.

In all, the Regal Princess carries 1,748 passengers. She is provided with numerous public spaces, the principal ones consisting of a cinema with 169 seats, a theater seating 740 and a restaurant able to serve about 844 people at one sitting.

SALAMINA
Hitachi Zosen

Circle 88 on Reader Service Card

The first of a new class of double-skinned product carriers developed by Hitachi Zosen Corp. was delivered this past year to Salamina Shipping Corporation of Liberia. Called the Salamina, the 45,425-dwt tanker is the first ship of the Epoch Mark II type developed by Hitachi Zosen exclusively to transport oil products.

Epoch Mark II product carriers have a total double-hull structure based on a completely new concept developed by Hitachi Zosen. The new unidirectional longitudinal design has a fundamentally different stress transference pattern from conventional oil carriers. All lateral loads affecting the structure are transmitted by longitudinal girders to the transverse bulkheads.

The easy handling/maintenance Product Oil Carrier built by Hitachi Zosen (EPOCH) design, according to the company, presents a number

of major advantages to the builder and the operator.

One advantage for the builder being that since there are no intersections between the transverse and longitudinal members, a great deal of automated welding can be used and welds mechanically checked.

For the owner, the Epoch Mark II design offers cargo flexibility, the eligibility of trading to the U.S., and improved maintenance, since her tanks have a flush interior.

The Salamina has an overall length of 600 feet, breadth of 105 feet, and design draft of 36 feet. She is powered by a single Hitachi Zosen-MAN B&W slow-speed 6S50MC diesel engine with a maximum continuous output of 9,200 hp at 106 rpm, producing a maximum trial speed of just over 15 knots.

SOLIDARNOSC
Burmeister & Wain

Circle 79 on Reader Service Card

The first of a series of six Panamax bulk carriers, Solidarnosc, for the Polish Steamship Company was delivered by Danish builder Burmeister & Wain (B&W) during the past year.

Based on B&W's BCT70 design, the Solidarnosc has a length of 750 feet, molded breadth of 106 feet, and design draft of 41 feet. Propulsion is provided by one MAN-B&W crosshead diesel engine of the five-cylinder, direct-reversible, single-acting, two-stroke, constant-pressure turbocharged 5S60MC, achieving a speed of 15.2 knots when the main engine is developing 9,800 bhp. Auxiliary engines consist of three diesels, type MAN-B&W 5L23/30 or equivalent, each directly coupled to an alternator, 550 kw, 720 rpm, 3 by 440 V, 60 Hz. There is also an emergency diesel generator of approximately 100 kw.

The BCT70 is a flexible type and can be delivered either as bulk carrier, product carrier or OBO-carrier. The vessel's design is such that the owner can postpone the decision as to whether it should be bulk carrier or OBO-carrier until the construction stage is reached when specialized equipment—auxiliary engines, pumps, etc.—must be ordered. It is a double hull vessel with all structural reinforcement between the inner and outer hull. As a consequence, the holds are completely free of sharp edges and, therefore, easy to clean and maintain.

USNS THOMPSON
Trinity Marine Group

Circle 77 on Reader Service Card

The first Navy oceanographic ship of a Halter Marine design, the Thomas G. Thompson (AGOR-23), was delivered during the past year, Trinity Industries, Inc.'s Halter Marine, Inc., New Orleans, La. Operated by the University of Washington under the University National Oceanographic Laboratory System (UNOLS) sponsored by the office of the Chief of Naval Research, U.S. Navy, the Thompson serves as a general purpose, all-season, oceanographic ship in coastal and deep ocean waters.

Typical scientific missions will include physical, chemical and biological oceanography, multi-discipline environmental investigations, ocean engineering, marine acoustics, marine geology and geophysics, and survey tasks such as bathymetry and magnetometry.

Based on a Halter design selected in national competition, the AGOR-23 has a diesel electric propulsion system with three 715-kw and three 1,500-kw diesel generators integrated to provide power for propulsion and ship service electrical systems. The propulsion package consists of three Caterpillar diesels with KATO generators and GE propulsion motors.

The ship is equipped with a dynamic positioning system which provides automated precision track-line and station-keeping capability. The system uses data from a global positioning system, an acoustic vertical reference system, the gyrocompass, and a wind sensor system to control the ship.

The Thomas G. Thompson is 274 feet in length, with a 52.5-foot beam, and a 18.5-foot draft. Full load displacement is 3,250 tons.

USNS VICTORIOUS
McDermott Shipyards

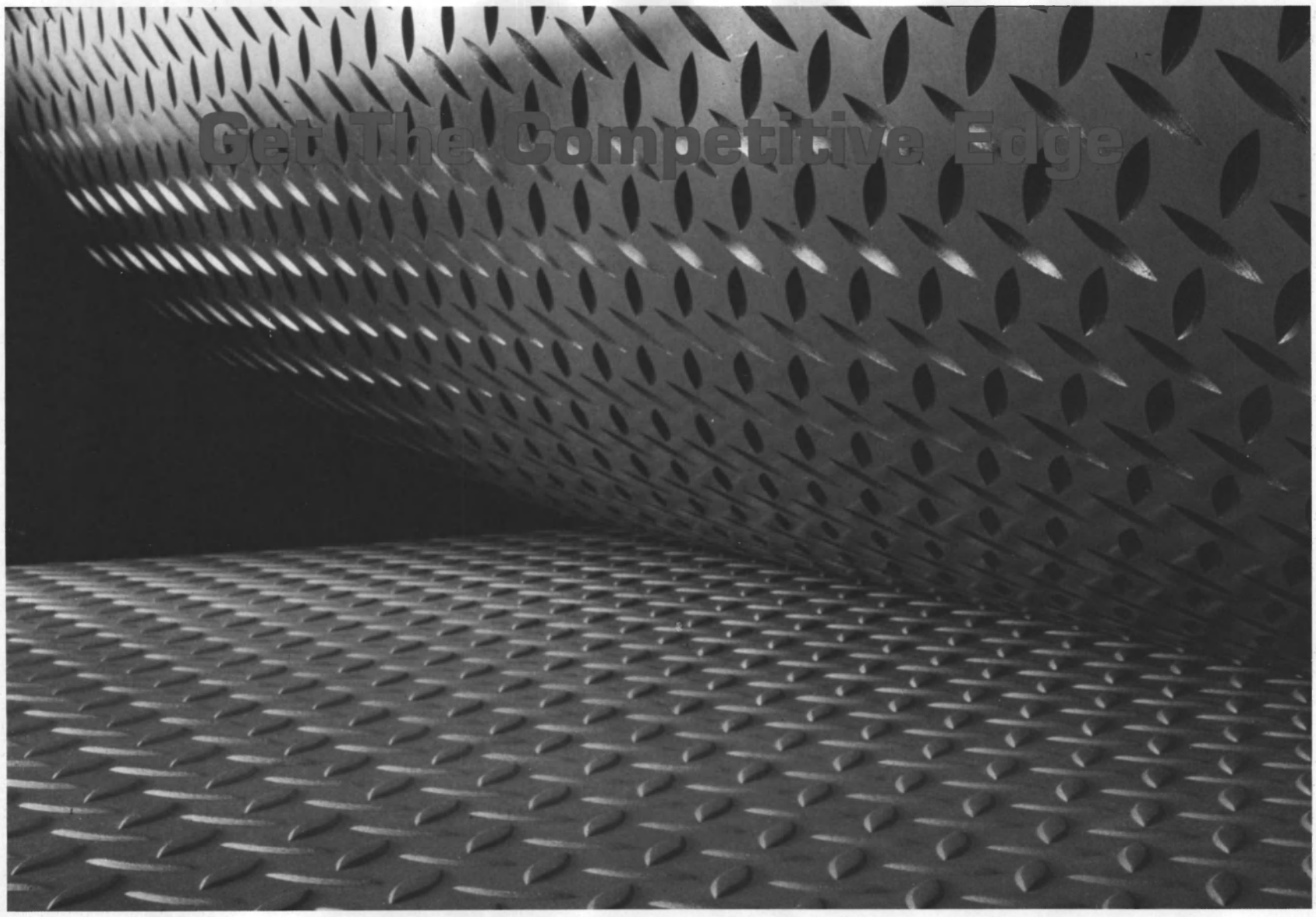
Circle 89 on Reader Service Card

The first of a new class of Navy SWATH ocean surveillance ships, the 232-foot USNS Victorious (T-AGOS-19) emerged from McDermott's Morgan City, La., shipyard. With a wide open deck mounted 25 feet above the water on twin hulls, the Navy's first in-service SWATH (Small Waterplane Area Twin-Hulled) vessel is uncommon in appearance but refined in its unique abilities.

The Victorious has a 94-foot beam and a 24-foot 9-inch draft. The small waterplane design, with its reduced buoyant forces in the area if wave action, was chosen specifically for its ability to provide a smooth ride in high sea states.

Among the additional benefits to the SWATH design is a large main deck area suitable for multiple applications.

The 3,380-long-ton Victorious is diesel-electric powered with the main gensets, consisting of four Caterpillar 3512 diesel with Kato generators, located in the upper hull. GE electric propulsion motors, rated at 1,600 shp, drive five-bladed propellers at the stern of each lower hull. Lister Chain & Forge supplied the vessel's anchor chain.



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Circle 217 on Reader Service Card

Raytheon Marine Expands With Addition Of Nautech

Introduces Pathfinder/ST Enhancement Package

SNA-91 Bridge Integration System Navigation Control Unit, at right, shown at console with the Raytheon Pathfinder/ST ARPA. The SNA-91 computerized system presents a total ship management picture at a glance, including: engine, hull, weather, autopilot, and navigation information.

Raytheon Marine Company of Hudson, N.H., expanded this year with the acquisition of Nautech, the manufacturer of Autohelm autopilots, plotters, and SeaTalk instrumentation for recreational and commercial boats. The three operating divisions now at the modern Raytheon facility are Autohelm, Apelco Marine Electronics (radiotelephones, radar, fishfinders, GPS, loran, plotters), and Raytheon Marine Company.

Raytheon manufactures and distributes a diverse line of marine electronics, including radar, ARPA, fishfinders, plotters, radiotelephones, loran, GPS, autopilots, satellite communication equipment, bridge integration systems, vessel traffic management systems, weather facsimile instruments and a full line of GMDSS (Global Maritime Distress and Safety System) equipment. Together with its European base of operation, Raytheon Marine Sales & Service Company, located in Harlow in the U.K., Raytheon Marine Company employs more than 500 people worldwide. In addition, its sales and service network includes over 200 U.S. dealers and 100 international agents.

Of key importance in the high seas market is the Raytheon Pathfinder/ST radar, with its patented Superior Technology (ST) signal processing which provides a high degree of target detection. The Pathfinder/ST is the ideal companion to the SNA-91 Bridge Integration System from Raytheon. In addition to having a built-in adaptive steering system, the SNA-91 interfaces with performance sensors to monitor engine, hull, weather and navigation data.

Raytheon's Pathfinder/ST ARPA is also at the heart of Raytheon's Vessel Traffic Systems operating in ports around the world including New York, New Orleans, San Francisco, Houston, Valdez, Alaska, as well as Mexico, Uruguay, Saudi Arabia, and the Panama Canal.

Raytheon Marine Company has introduced an Enhanced Navigation Package which allows all new and existing Pathfinder/ST radars to incorporate greater navigation capabilities.

Special features of the Enhanced Navigation Package (ENP) for all ARPA Pathfinder/ST systems include: stored navigation lines so that maps can be indefinitely stored on EPROM without battery support; 2,000 memory points for additional map storage; numeric and vector displays of set and drift; and serial data I/O port for printers and computer interface.

Additional features of the ENP for both the ARPA and TM/EP (True Motion with Electronic Plotting)

Manufactured in New Hampshire and introduced four years ago, Pathfinder/ST radars have already been installed on thousands of commercial and pleasure vessels worldwide.

Pathfinder/ST radar systems are: self-prompting menus for simplified operation; user-selectable readouts in nautical miles, kilometers or statute miles; backup plotting functions for safer navigation in case of gyrocompass failure or for Head-up RM operation; extensive automatic and off-line test programs for easier trouble shooting; high resolution speed log input for precise target and tracking information; true/parallel index navigation lines for simplified plotting; and automatic map positioning by latitude/longitude.

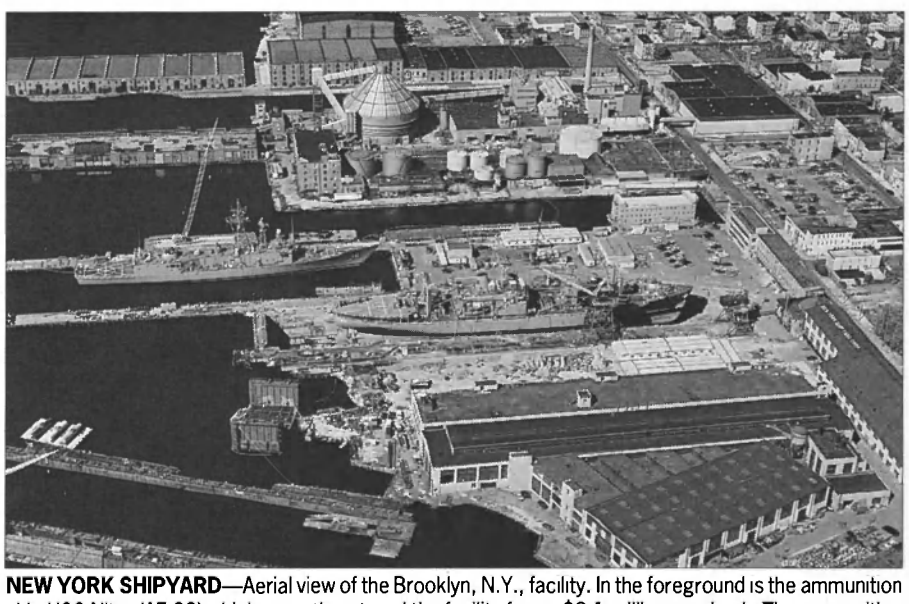
In addition, with Raytheon's Printed Circuit Board Exchange Program, the Enhanced Navigation Package is available to Pathfinder/ST radar owners at a special price when existing PCBs and modules are returned to Raytheon.

In the decade ahead, passenger vessels and cargo ships of 300 gross tons and over will be required to comply with GMDSS rules. To help meet these needs, Raytheon Marine Company and Japan Radio Company (JRC) have worked closely with shipowners and the international maritime community to develop a complete line of easy-to-use reliable GMDSS products. Raytheon is the exclusive distributor of JRC GMDSS products in North America, Central America, South America, and Europe. Raytheon is also the exclusive distributor of the JRC series of Ship Earth Station (SES) satellite communication systems.

At Manchester, N.H., Raytheon operates a Training Center which offers advanced courses on cover maintenance and trouble shooting, systems integration, as well as navigation and communication to marine service engineers, vessel operators and dealers. Over 2,500 participants have attended Raytheon courses since the center opened in 1976.

For free literature detailing marine electronics manufactured and distributed by Raytheon Marine,

Circle 9 on Reader Service Card



NEW YORK SHIPYARD—Aerial view of the Brooklyn, N.Y., facility. In the foreground is the ammunition ship USS Nitro (AE-23) which recently entered the facility for an $8.1 million overhaul. The ammunition ship had served in the Persian Gulf Desert Storm Operation and delivered ammunition to the battleship USS Wisconsin three days before the start of military action.
Next to the USS Nitro is the USS Clifton Sprague (FFG-15), which recently completed her $5.2 million drydock repair availability.

A GUIDE TO U.S. MARINE SALES IN THE NEXT FIVE YEARS

NEW 1992 EDITION

FIVE YEAR OUTLOOK FOR THE U.S. MARINE INDUSTRY

An Assessment of Ship Construction and Major Modification Prospects Available to Shipbuilders, Equipment Manufacturers and Other Suppliers

Report No. 7119 - $575.00 per copy

The totally new, 1992 edition of IMA's marine indusry outlook has just been published.
Under one cover is a totally objective, in-depth assessment of the business outlook for the entire U.S. marine sector. The report documents the size and composition of 24 individual market segments, analyzes underlying market drivers, forecasts construction and modification activity over the next five years, identifies regulatory and legislative actions likely to affect future suppliers.

REPORT OUTLINE

1. EXECUTIVE SUMMARY
2. CRUISE SHIPS OPERATING FROM U.S. PORTS
   - Cruise Industry Market Segments
   - Trend in Cruise Travel
   - Outlook for the Cruise Market
   - Forecast of Cruise Ship Construction
   - Cruise Ship Refurbishment Opportunities
   - Key Players in the Cruise Ship Business
3. JONES ACT CONTAINER AND RO/RO SHIPS
   - Ships Currently in Domestic Container Service
   - Business Conditions& Outlook in the Three Domestic Trades
   - Forecast of Ship Construction
   - Ship Modernization Plans
   - Key Players in the Domestic Container Trades
4. FEDERALLY SUPPORTED LINER OPERATORS
   - Current Fleet and Replacement Schedule
   - Ship Construction Requirements
   - Section 615 Foreign Construction Waivers
   - Prospects for Ship Replacement -- in U.S. or Foreign Yards
   - The Four Federally Supported Liner Operators
5. TANKERS - GENERAL
   - Profile of Current Tanker Fleet
   - Oil Pollution Act of 1990
   - Impact of Single Skin Restriction
   - Inventory of Tanker Fleet
6. ALASKA CRUDE CARRIERS
   - Ships Currently in the Alaskan Crude Trade
   - Trend in North Slope Output
   - Impact on Shipping Requirements
   - Arctic National wildlife Refuge Controversy
   - Alaskan Oil Export Ban
   - Forecast of Alaska Crude Carrier Construction
   - Modernization Requirements
   - Key Players in the Alaskan Crude Trade
7. DOMESTIC TRADING PRODUCT TANKERS
   - Product Tankers Currently in Service
   - Demand for Coastal Products Transportation
   - Trend Toward Import Substitution
   - Outlook for Domestic Tanker Requirements
   - Impact of Oil Polluition Act of 1990
   - Forecast of Product Tanker Construction
   - Key Players in the Product Tanker Sector
8. CHEMICAL AND SPECIALTY TANKERS
   - Chemical Ships Currently in Domestic Service
   - Utilization of the Wrecked Vessel Act
   - Outlook for Domestic Chemical Shipments
   - Future Signifigance of MTBE
   - Future Chemical Ship Construction
   - Key Players in Domestic Chemical Shipping
9. GREAT LAKES SELF-UNLOADERS
   - Current Great Lakes Fleet
   - Requirement for Great Lakes Carriers
   - Forecast of Ship Construction
   - Key Players in Great Lakes Trade
10. SEAGOING BARGES
    - Profile of Current Inventory
    - Trend in Seagoing Barge Construction
    - Outlook for the Next Five Years
    - Key Players in Seagoing Barges
11. NAVY- GENERAL
    - Navy Ship Construction Over the Past 20 Years
    - Outlook for Naval Ship Construction
12. COMBATANT SHIPS
    - Current Combatant Fleet Inventory
    - Combatant Ships Under Construction
    - Outlook for an Additional Aircraft Carrier
    - Future Seawolf Submarine Construction
    - Plans for Additional Aegis Destroyers
    - Navy Shipbuilding Plan vs. Our Projection
    - Shipbuilders Involved in Combatant Ship Construction
13. SEALIFT SHIPS
    - Current Inventory of Sealift Ships
    - Past Funding for Sealift Ship Construction
    - Plans for Additional Sealift Ship Funding
    - Design Competition for Ship Construction Contract
    - Longer Term Plans for an Advanced Sealift Ship Design
    - Forecast of Sealift Ship Orders
    - Key Players in the Sealift Program
14. AMPHIBIOUS, MINE WARFARE AND SUPPORT SHIPS
    - Amphibious Warfare Ships
    - Mine Warfare and Support Ships
    - Outlook for Future Construction Orders
    - Shipbuilders Involved in this Market Segment
15. OFFSHORE RIG AND DRILL SHIPS
    - Current Offshore Rig Inventory
    - Conditions in the Offshore Drilling Sector
    - Drilling Sector Outlook
    - Outlook for Future Rig Construction
    - Principal Players in the Offshore Rig Sector
16. OFFSHORE PRODUCTION PLATFORMS
    - Annual Rate of Platform Installations and Removals
    - Rate of Well Completions
    - Trend Toward Deepwater Production & Efficient Platforms
    - Outlook for Platform Construction
    - Major Players in U.S. Offshore Production
17. OFFSHORE SUPPORT VESSELS
    - Inventory of Offshore Support Vessels
    - Oultook for Support Vessel Construction
    - Key Players in the Support Vessel Sector
18. FERRIES AND SMALL PASSENGER VESSELS
    - Profile of the Existing Fleet
    - Recent Vessel Construction Activity
    - Demand for Commuter Ferries
    - Interest in Riverboat Gambling
    - Availability fof Ferry and Passenger Vessel Financing
    - Pending Changes in Coast Guard Subchapter T Rules
    - Outlook for Vessel Construction
    - Key Players in the Ferry and Small Passenger Vessel Market
19. HARBOR AND COASTAL TUGS
    - Recent Vessel Construction
    - Outlook for Future Tugboat Orders
    - Key Players
20. PATROL BOATS, CUTTERS AND SERVICE CRAFT
    - Current Small Craft Inventory
    - Recent Orders for Watercraft
    - Foreign Millitary Sales of Naval Craft
    - Outlook for Futute Orders
    - Key Players in Small Naval and Coast Guard Programs
21. FISHING VESSELS
    - Size and Composition of the U.S. Fishing Fleet
    - Current Factory Trawler Fleet
    - Tuna Seiners
    - Outlook for Fishing Boat Construction
    - Principal Players in the Fishing Sector
22. MEGAYAGHTS
    - Output of Pleasure Boat Manufacturers
    - Pleasure Boat Export Sales
    - Megayacht Production
    - Outlook for Megayacht Construction
    - Key Players
23. DREDGES
    - Types and Number of Dredges in Service
    - Outlook for Dredge Construction
    - Key Players in the Dredging Sector
24. RIVER TOWBOATS AND BARGES
    - Inventory of Towboats and Barges
    - Supply and Demand for Waterway Equipment
    - Recent Construction Activity
    - Outlook for Ruture Waterway Equipment Construction
    - Principal Waterway Operators and Equipment Builders
25. SPECIALTY FABRICATIONS
    - Prision and Accommodation Barges
    - Production and Power Platforms
    - Sunken Tube Tunnel Sections

Subscribers will receive the 190 page report immediately -- plus a market update in April 1992.

The report is available for $575.00 per copy. To order please contact: IMA Associates - 600 New Hampshire Ave., NW - Suite 140 - Washington, DC 20037 USA - Telephone: 202-333-8501 - Fax: 202-333-8504. An order form is enclosed for your convenience. Telephone or fax orders will be accepted. The report will be sent the day your order is received.

Cincinnati Gear Awarded $5.6 Million For AOE Parts

Cincinnati Gear Inc., Cincinnati, Ohio, was recently awarded a $5.57 million U.S. Navy contract for unpriced contract modification to provide 35 bearing sleeves, 19 gear elements and 73 miscellaneous items for support of the Fast Combat Support Ship AOE-6 program for shipboard use. The contract is expected to be completed in June 1994.

New Aegis Destroyer Launched by BIW

Bath Iron Works (BIW), Bath, Maine, recently launched the Arleigh Burke Class (DDG-51) destroyer John Paul Jones (DDG-53). The 466-foot ship is the second Aegis destroyer launched by the yard.

Crane Offers Literature On Hydraulically Actuated Diaphragm Metering Pumps

Crane Chem/meter Series 200 spring return hydraulically actuated diaphragm metering pumps, manufactured by Chempump Division of Crane Co., Warrington, Pa., feature reliable reduced maintenance operation.

The Series 200 metering pumps with modular construction are available in 316SS, Alloy 20, or PVC materials of construction.

Bulletin 200 provides more details on its unique steady flow operation which eliminates the need for pulsation dampeners. For a free copy,

Circle 42 on Reader Service Card

Marine Travelift Introduces Mariner Forklift Line

Gerald P. Lamer, president and CEO of Marine Travelift, Inc., recently announced the acquisition of the complete line of Mariner forklift trucks (forklifts designed specifically for the marine industry for boat-handling), from The Gradall Company of New Philadelphia, Ohio.

The Mariner product line of negative drop forklift trucks consists of five models in capacities ranging from 6,500 to 20,000 pounds, all at 96-inch load centers.

The five Mariner models, added to the existing 25,000-pound unit, round out the Marine Travelift line of negative drop forklifts.

Worldwide, Marine Travelift manufactures straddle-type boat-handling equipment from 15- to 500-ton capacities, with over 2,500 units in service.

For complete design specifications from Marine Travelift,

Circle 33 on Reader Service Card

New Munson Catalog Features Latest In Aluminum Boat Technology

Demonstrating once again that Munson Manufacturing has models and configuration for virtually any purpose, the Volume 11 Munson catalog of aluminum boats is now available.

Featuring over 250 photographs on 84 pages, Volume II is a showcase for the newest in aluminum boat technology from one of the most respected builders in the industry.

Munson Manufacturing offers a full line of industrial and utility vessels, including emergency response, oil pollution control, passenger, pilot, cargo, dive, survey, patrol and fishing vessels.

Although the emphasis is on work and commercial boats, buyers of utility-type sports craft will also be interested in Munson's designs, particularly the Hammerhead line. These models are available in lengths from 21 feet to 72 feet and can be outfitted in a tremendous variety of ways.

In addition, Munson's latest innovation, the Hammercat line of catamarans, is also featured in Volume II.

For a copy of the newest Munson Manufacturing catalog,

Circle 20 on Reader Service Card

Aluminium Craft Delivers Two 20-Passenger High-Speed Launches

Two high-speed patrol launches built at a cost of $2 million by Aluminium Craft (88) (Aluminium Craft), a subsidiary of Singmarine Industries Ltd., were recently delivered to their owner, Customs and Excise Department in Singapore.

The director of the Customs Department said these light, speedy and rugged 50-foot launches are the most modern patrol craft constructed under the Customs' fleet renewal program. Robust and with good seakeeping qualities, they will be used to maintain round-the-clock surveillance against ship-to-shore smuggling activities and also to ferry ship-searching parties to board vessels in the port area for rummaging.

The 20-passenger high-speed launches have the latest facilities, such as radar equipment and air-conditioning. The hull, deck and superstructure are constructed with welded marine grade aluminum alloy, which is corrosion resistant and light in weight. The wheelhouse has windows all round for clear visibility and ventilation. Each launch is powered by twin diesel engines, producing 680 hp each at 2,300 rpm, and is able to attain a speed of 31 knots.

With the commissioning of these two new launches, the Customs now has an efficient, fast and rugged fleet of eight launches and 12 speedboats to combat smuggling of dutiable goods, control drugs, firearms and other items which may pose a threat to national revenue, health and security.

Wong Kok Weng, chairman of Aluminium Craft and executive director of Singmarine Industries, said: "Aluminium Craft is privileged to build the two vessels for the Customs. With increasing activities in offshore exploration, marine leisure such as yachting, and interisland transportation in the region, we could expect growing demand for aluminum vessels."

For free literature detailing the facilities and capabilities of Aluminium Craft,

Circle 11 on Reader Service Card

Keystone, Dixie Carriers To Use ABS Quality Systems Services

Keystone Shipping Co. and Dixie Carriers Inc.'s Offshore Division will enlist the services of ABS companies to provide assistance in their preparation and certification for quality management. Keystone is the first major owner and operator of oceangoing ships and Dixie's Offshore Division is the first oceangoing tug/barge owner and operator to take advantage of these newly initiated ABS services.

The Quality Management System consists of establishing and implementing policies, procedures, and instructions that ensure delivery of products and services which consistently meet customer/charterer requirements.

In the first phase, ABS Marine Services Inc., a subsidiary of ABS, will act as consultant to both companies in preparation for the assessment and certification of their Quality Management Systems.

In the second phase, Keystone and Dixie's Offshore Division will have their quality systems audited for certification by ABS Quality Evaluations Inc., which has been accredited as a certifier of ISO 9000 quality systems by the Registrar Accreditation Board (United States) and Raad voor de Certificatie (the Netherlands) and has developed a guidance document to specifically assist in the implementation of quality systems in the marine industry.

Dixie Carriers Inc., based in Houston, Texas, is a wholly owned subsidiary of Kirby Corporation. The fleet of Dixie's Offshore Division consists of seven tug/barge units with six dry bulk covered hopper barges and one petroleum-products tanker barge.

Keystone is a privately owned, Philadelphia-based company that has been operating ships for more than 70 years. Its fleet consists of 15 American-flag tankers and one self-discharging collier. It also assists in certain management functions of two Liberian-flag tankers.

Dixie and Keystone expect the successful completion of these projects in 1992.

Westinghouse, New Sulzer Agreement Brings A Century Of Propulsion Experience To U.S. Navy & Commercial Markets

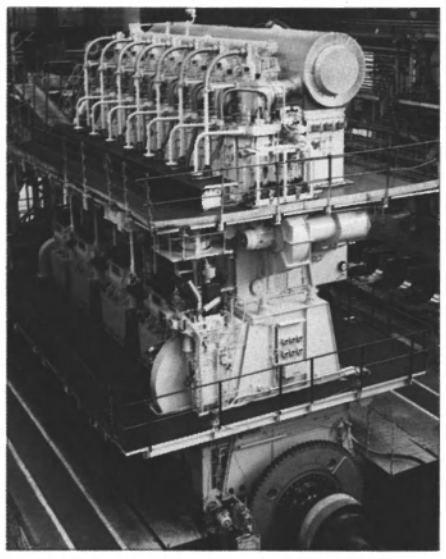
Westinghouse New U.S. Source For Slow-, Medium-Speed Diesels

The recent agreement between Westinghouse Electric Corporation's Marine Division in Sunnyvale, Calif., and New Sulzer Diesel Ltd. of Winterthur, Switzerland for Westinghouse to market and manufacture slow- and medium-speed diesel marine propulsion systems in the U.S. brings together two companies with century-long traditions in marine propulsion.

Westinghouse recently announced its intent to build Sulzer diesel engines and complete engine systems for the U.S. Navy's Strategic Sealift ships, as well as for U.S. commercial ships. The Navy has awarded contracts to nine U.S. shipyards for initial designs for two classes of sealift ships. The replacement of Jones Act vessels is expected to be a significant market for the team, Westinghouse officials said.

Westinghouse and New Sulzer Diesel bring to the agreement long histories in marine propulsion system development. Since the turn of the century, Sulzer has been a leading designer and builder of marine diesel engines. Sulzer engines propel 84 U.S. merchant marine vessels, and approximately 1,100 of its RTA and 900 of its Z type four-stroke engines are in service or on order.

The Westinghouse Marine Division was recently selected by the Navy to produce its two latest submarine propulsion systems, including those for the Seawolf Class. Westinghouse reduction gears drive more than 100 Navy ships, including DDG-963 Spruance Class destroyers, DDG-993 Kidd Class destroyers and CG-47 Ticonderoga Class cruisers. Westinghouse has designed and manufactured propulsion turbines, reduction gear sets, control systems and turbine generator sets for ship electrical service for much of this century.



The Westinghouse Marine Division in Sunnyvale, Calif., will build slow-speed diesels much like this completed seven-cylinder Sulzer RTA engine.

"The manufacture of slow and medium speed diesels in the U.S. will help keep the nation's high-technology manufacturing capabilities available," said **Jack Orme**, Westinghouse Marine Division Diesel Propulsion manager. "With only one or two submarine plants being produced each year, the production of Sulzer diesels will enhance our ability to produce high-tech propulsion systems when the Navy needs them.

"We aren't just engine manufacturers," he continued. "As a systems integrator, we supply the complete design and manufacturing package—from propulsion plants to engine room peripherals to after-sales service. We will work with naval architects and provide the engineering services to properly integrate these engine systems with ship designs," Mr. **Orme** said.

Westinghouse-built Sulzer slow and medium-speed diesels will operate in the power range between 2,000 to 62,400 bhp.

The slow-speed diesels are Sulzer RTA Series two-stroke, crosshead, direct-drive systems. These engine are offered in 11 different models ranging in configuration from four to 12 cylinders.

Roughly 75 percent of the world's shipping fleet over 2,000 dwt is powered by slow-speed diesel propulsion systems. Slow-speed diesels are popular for both new ships and conversions since these engines provide operators with low fuel oil consumption and low maintenance costs.

The agreement to build Sulzer engines makes Westinghouse the only U.S. manufacturer of slow-speed diesel plants.

The medium-speed diesels are the Sulzer ZA40S four-stroke engines. This engine is available in both in-line models of six to nine cylinders, as well as V12 to V18 configurations.

Medium-speed diesels are most commonly used for propelling roll-on/roll-off ships, ferries and passenger cruise ships.

"The dimensions of medium-speed engines are well-suited for ships requiring a compact, high-horsepower system," said Mr. **Orme.**

"Both the slow- and medium-speed systems give high reliability service and offer extended periods between overhauls," said Mr. **Orme**. "We can cut operating costs immediately," Mr. **Orme** stated, "because both systems provide low specific fuel oil consumption, particularly the slow-speed engine. Operators will reduce long-term costs as well when factors such as system reliability and operating life come into play.

"What this agreement between Westinghouse and New Sulzer Diesel really does is create a high-quality single source for both slow- and medium-speed diesels made in America," Mr. **Orme** said.

For free literature detailing the line of slow- and medium-speed diesel engines offered by Westinghouse,

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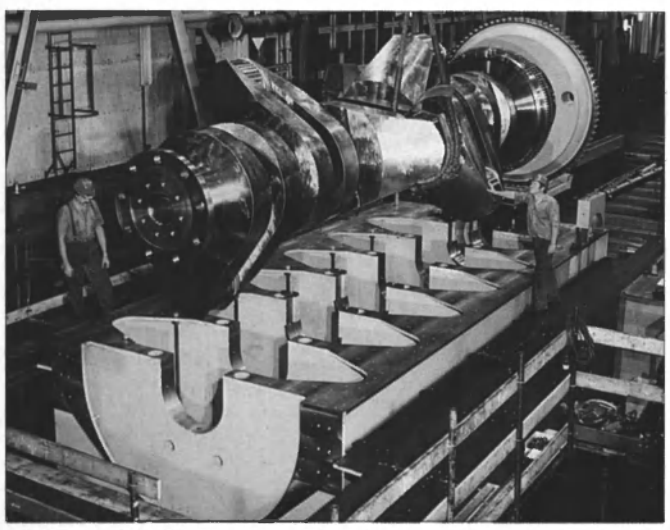

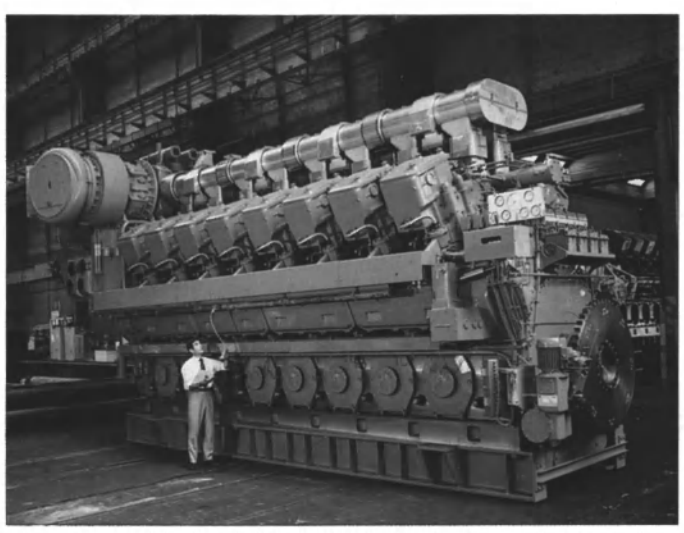

At left, a crankshaft is fitted into a Sulzer slow-speed RTA series diesel engine similar to those which will be built in the U.S. by Westinghouse. At right, medium-speed diesel engines such as this Sulzer Z-type will also provide high horsepower in compact applications.

Navy Awards Litton $20.1 Million Addition On Previous Contract

Litton's Guidance & Control Systems division has been awarded $20.1 million in new funding on a previously awarded U.S. Navy contract for production of inertial navigation sets for various classes of surface combatant ships.

The order, including funding for foreign military sales, provides for 30 additional AN/WSN-5, Standard U.S. Navy Surface Ship Inertial Navigation Systems, including spares and support. Four of the systems and applicable spares will be delivered to Japan under the foreign military sales program for use in two Japanese destroyers which are being built around parts of the Aegis combat system design.

Total systems contracted for delivery since 1978 is currently 276 units with 226 already delivered.

Ship types using the AN/WSN-5 includes guided missile cruisers, guided missile destroyers, battleships, destroyers, and amphibious assault ships.

Work under the new order is expected to run through December 1993 and will be accomplished at Litton's facilities in Woodland Hills, Calif., Grants Pass, Ore., Salt Lake City, Utah, and Toronto, Canada.

The AN/WSN-5 is a surface ship navigation system which provides latitude and longitude position information. It also provides data for three-axis velocity, roll, pitch and heading and attitude rate. In addition, the system receives and transmits data on the Navy Tactical Data System (NTDS) and the low-level serial data bus. The system is designed for updating by satellites through the Global Positioning System.

Guidance & Control Systems division based in Woodland Hills, Calif., is a unit of Litton's Navigation, Guidance & Control Systems group. It is a world leader in military inertial navigation systems.

Litton is a technology-based company providing resource exploration services, industrial automation systems and advanced electronic and defense systems to U.S. and world markets.

For more information,

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Future Developments Of LPG And Chemical Gas Trades

As the world has become more and more environmentally aware, consumption of LPG has risen. In 1990, worldwide demand was close to 120 million tons—some 22 million tons above the 1985 level. LPG is cleaner to use and transport than some of the heavier fossil fuels—features which have boosted its use. In the forecast period, demand is predicted to grow in line with production as the LPG and chemical gas markets remain supply driven. Inevitably over the past year supply has been affected by the war in the Gulf. But the repercussions of the war, however, were not as devastating as many analysts had expected, with Saudi Arabia and later Iran making up some of the shortfalls in supplies. As to the future, Drewry Shipping Consultants in its new study, "Future Developments of the LPG and Chemical Gas Trades," expects Kuwaiti supplies to recover between 1992 and 1993, but LPG exports from Iraq are not likely until the mid-1990s.

One of the areas on which the Drewry report focuses is the continued Japanese dominance of seaborne trade; Japanese import requirements are expected to reach 17.5 million tons by 1996—up from 14.6 million tons in 1990. Although this in itself is nothing new, there has been a noticeable change in the source of supplies away from the Middle East. This trend was emphasized during the Gulf War, when North African and Far Eastern suppliers took advantage of the reduction in Middle East exports and stepped in to fill the gap in the market. Ammonia—the foundation of nitrogen-based fertilizer—was similarly affected, and this may encourage the movement towards the establishment of domestic ammonia plants.

Despite projected increases in seaborne LPG trade in the early 1990s (31.3 million tons in 1990 to 40 million tons in 1996), the report concludes that the supply of tankers is likely to outstrip the pace of additional vessel demand in the period to 1993/94. Supply is on the increase, as the renewed strength of the freight market has fed through into new ordering. At the end of June 1991 a total of 105 LPG carriers were on order, with a combined capacity of 2.5 million cubic meters—equivalent to nearly 30 percent of the existing fleet. As a result of this large order book, and low levels of scrapping, the LPG fleet is expected to rise to 10.7 million cubic meters by 1993.

Over the past few years the combination of a static fleet together with increases in trade and vessel employment, have resulted in a much tighter balance between supply and demand. Freight rates responded accordingly and between 1988 and 1990 recorded some very healthy gains. At their peak towards the end of 1989, spot rates for a 75,000 cubic meter ship rose to $2 million per month on a time charter equivalent basis. In 1990, however, there were the first signs of a weakening in the market, and following the events in the Gulf, rates have defiantly come off the boil. Neither spot nor time charter rates are likely to reach the highs recorded in 1989-90, until this new tonnage is mopped up by rising demand.

'Fascination' To Employ ABB Propulsion Plant

ABB Marine in Helsinki, Finland (ABB Stromberg Drives Oy) has signed a contract with Kvaerner Masa-Yards New Helsinki Shipyard for the delivery of the electric propulsion and power plant to be installed in Fascination, the fourth 70,000-grt superliner to be built for Carnival Cruise Lines (CCL) of Miami. The ship will enter service in 1994. Total installed power of the plant is 42 MW. The Cyclo propulsion system drives two propeller shafts, each rating at 14 MW.

The Fantasy, brought into service by CCL in 1990, and her sister ship the Ecstasy, in operation since June 1991, have been extremely successful in terms of bookings and operation of the machinery. This has led to the order of two additional sister ships, the Sensation (last spring) and Fascination (early September).

This order consolidates ABB Marine's leading position in this sector as a supplier of marine electric propulsion and power systems for half a century. During the 1980s, cycloconverters driving synchronous propulsion motors have proven their outstanding reliability on several icebreakers. In addition to the above mentioned four CCL vessels, orders have been received for similar propulsion systems for one Japanese cruise ship, the Crystal Harmony, and three cruise vessels being built by Fincantieri Cantieri Navali SpA in Italy for Holland America Line.

For free literature on ABB Marine propulsion systems,

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LIEBHERR

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The Coast Guard

DISTRICT BY DISTRICT

Pacific Area

District / Headquarters

11th District / Long Beach, CA

Active	1,347
Reserve	1,751
Civilian	75
Auxiliary	3,369

13th District / Seattle, WA

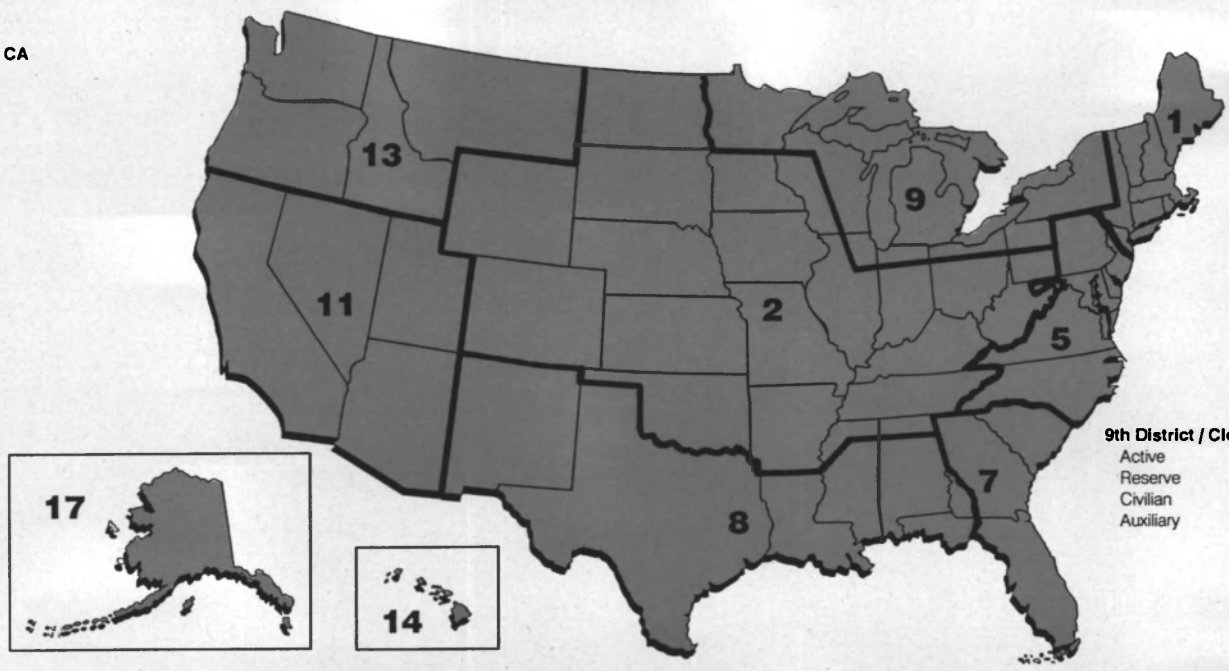
Active	3,300
Reserve	1,000
Civilian	150
Auxiliary	2,100

14th District / Honolulu, HI

Active	1,300
Reserve	200
Civilian	65
Auxiliary	500

17th District / Juneau, AK

Active	2,441
Reserve	78
Civilian	52
Auxiliary	345



Atlantic Area

1st District / Boston, MA

Active	3,000
Reserve	3,000
Civilian	234
Auxiliary	7,000

2nd District / St. Louis, MO

Active	800
Reserve	1,000
Civilian	75
Auxiliary	3,500

5th District / Portsmouth, VA

Active	2,392
Reserve	1,700
Civilian	126
Auxiliary	7,755

7th District / Miami, FL

Active	4,500
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Civilian	250
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8th District / New Orleans, LA

Active	2,800
Reserve	1,250
Civilian	200
Auxiliary	2,200

9th District / Cleveland, OH

Active	2,100
Reserve	1,250
Civilian	96
Auxiliary	5,527

BUDGET

Search and Rescue

	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92**
SAR	520.8	531.9	488.1	351.0	452.5	447.0	531.7	411.3	419.6	443.9
OE	410.0	415.0	385.9	319.5	408.8	423.8	453.6	332.0	349.2	383.8
AC&I	107.6	111.8	97.0	28.3	39.8	19.9	74.2	75.5	64.5	54.6
RDT&E	3.2	5.1	5.2	3.2	3.9	3.7	3.9	3.8	5.9	5.5

Minimizing the loss of life, injury, or property damage by rendering aid to persons and property in distress in the marine environment has always been a Coast Guard priority.

Search and rescue (SAR) is its best-known mission. Coast Guard SAR response involves multi-mission stations, ships, aircraft and boats linked by communication networks.

FY '92: $443.9M

Marine Environmental Protection

	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92**
MEP	127.1	137.3	126.2	144.0	140.7	146.7	172.1	216.4	223.7	263.7*
OE	111.1	120.7	112.6	127.9	134.0	136.0	140.5	181.0	197.0	223.6
AC&I	7.2	10.4	10.6	14.4	5.0	9.1	30.1	31.1	22.5	34.3
RDT&E	8.8	6.2	3.0	1.7	1.7	1.6	1.5	4.3	4.2	5.8

This program aims to minimize damage caused by pollutants released in the coastal zone; overcome, or reduce threats to marine environments posed by potential spills of oil or hazardous substances; and assist in national and international pollution response planning efforts.

Since the 1972 enactment of the Federal Water Pollution Control Act (FWPCA), the U.S. has developed a national oil and hazardous substance spill response system.

FY '92: $263.7M

Enforcement of Laws and Treaties

	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92**
ELT	634.3	678.8	810.0	841.6	823.0	805.9	996.5	1125.0	1147.4	1176.3
OE	434.0	460.8	531.7	584.7	618 7	628.2	756.4	879.2	936.6	994.3
AC&I	199 9	217.1	276 3	251.2	197.7	171.4	235.6	239.8	204.9	172.8
RDT&E	0.4	0.9	2.0	5.7	6.6	6.3	4.5	6.0	5.9	9.2

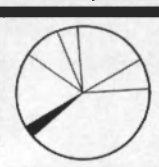
ELT is the Coast Guard's oldest mission. The suppression of smuggling was the main reason for forming the "fleet of cutters" in 1790. Today, the Coast Guard: Interdicts drug smuggling (seizing nearly $8 million in illegal drugs each day); interdicts illegal aliens; enforces fisheries laws and regulations relating to the Exclusive Economic Zone and other U.S. territories and international agreements; and assists other agencies to enforce laws.

FY '92: $1,176.3M

Ice Operations

	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92**
Ice Ops	61.0	30.2	52.6	59.2	98.5	95.6	106.1	76.1	77.5	97.4
OE	27.0	27.6	50.5	56.3	91.0	92.1	97.4	66 7	69.3	75.5
AC&I	33.9	2.5	1.5	2.5	7.0	3.0	8.7	8 9	7.6	21.3
RDT&E	0.1	0.1	0 6	0.4	0.5	0.5	0.6	0.5	0.6	0.6

Ice operations promote maritime transportation and other national interest activities in ice-laden polar and domestic waters, and help meet the needs of marine safety and environmental protection in the ice environment. In 1936, President Roosevelt established icebreaking operations in U.S. channels and harbors. In 1965, the Navy transferred its icebreakers to the Coast Guard, who assumed all ice breaking responsibilities.



FY '92: $97.4M

Aids to Navigation

	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92**
ATON	424.9	430.2	443.0	399.0	449.1	426.3	502.1	517.9	541.2	618.4
OE	362.3	370.3	362.7	371.7	409.5	406.6	436.8	452.6	469.7	513.1
AC&I	58.9	57.3	77.3	24.1	35.7	16.0	61.1	62.2	66.3	101.3
RDT&E	3.7	2.6	3.0	3.2	3.9	3.7	4.2	3.1	5.2	4.0

The Coast Guard helps marine and air traffic through aids-to-navigation. These include: Loran-C stations, Omega stations, buoys, day markers and beacons, radar reflectors, radiobeacons, and large navigational buoys. The first U.S. lighthouse was built in 1716. The CG has since built, placed and maintained many aids, including metal buoys, whistle buoys, radiobeacons, battery-powered buoys, Loran during WWII, and today, global satellite positioning systems with accuracy within 10 meters.

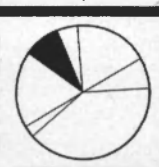
FY '92: $618.4M

Marine Safety

	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92**
Marine Saf	126.2	143.9	125.8	105.3	132.7	125.3	139.9	218.9	245.0	267.0
OE	116.0	129.9	114.9	99.5	126.1	120.8	126.5	205.9	216.3	243.5
AC&I	5.9	10.0	6.1	4.2	4.6	2.6	11.3	11.5	26.8	21.5
RDT&E	4.3	4.0	4.8	1.6	2.0	1.9	2.1	1.5	1.9	2.0

The marine safety program develops and enforces standards and policy for the safe design/construction, maintenance and operation of vessels and offshore facilities engaged in commercial, scientific or exploratory activity in the marine environment.

By doing so, Coast Guard marine safety personnel minimize deaths, injuries, property loss and environmental damage. It also helps insure that U.S. vessels are adequately manned with a minimum number of qualified crewmembers.

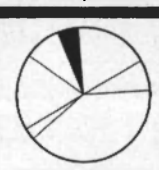


FY '92: $267.0M

Defense Readiness

	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92**
Defense	88.4	98.2	136.3	133.1	143.4	128.4	128.0	109.1	116.7	124.9*
OE	68 2	71.3	99.5	96.9	107.2	102.1	111.2	92.8	96.7	106.0
AC&I	19.9	26.4	36.4	35.2	34.8	25.0	14.8	15.1	18.7	17.2
RDT&E	0.3	0.5	0.4	1.0	1.4	1.3	2.0	1.2	1.3	1.7

Since 1790, the Coast Guard has served in every major national conflict, earning 33 battle and campaign streamers. Tb maintain the Coast Guard as an effective, ready, armed force (required by USC), units assigned naval warfare missions have needed weapons and combat systems, as well as training for operations and maintainence. The dual nature as an armed and humanitarian service also requires the defense operations program to support law enforcement and port security activities.



FY '92: $124.9M

OE – Operating Expenses AC&I – Acquisition, Construction & Improvements RDT&E – Research, Development, Test & Evaluation

** President's FY '92 Budget Request to Congress. * Includes Port Safety & Security Mission.

Source: U.S. Coast Guard, Commandant's Bulletin, "Overview" – October 1991.

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The name for cranes

The Coast Guard

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Pacific Area

District / Headquarters

11th District / Long Beach, CA

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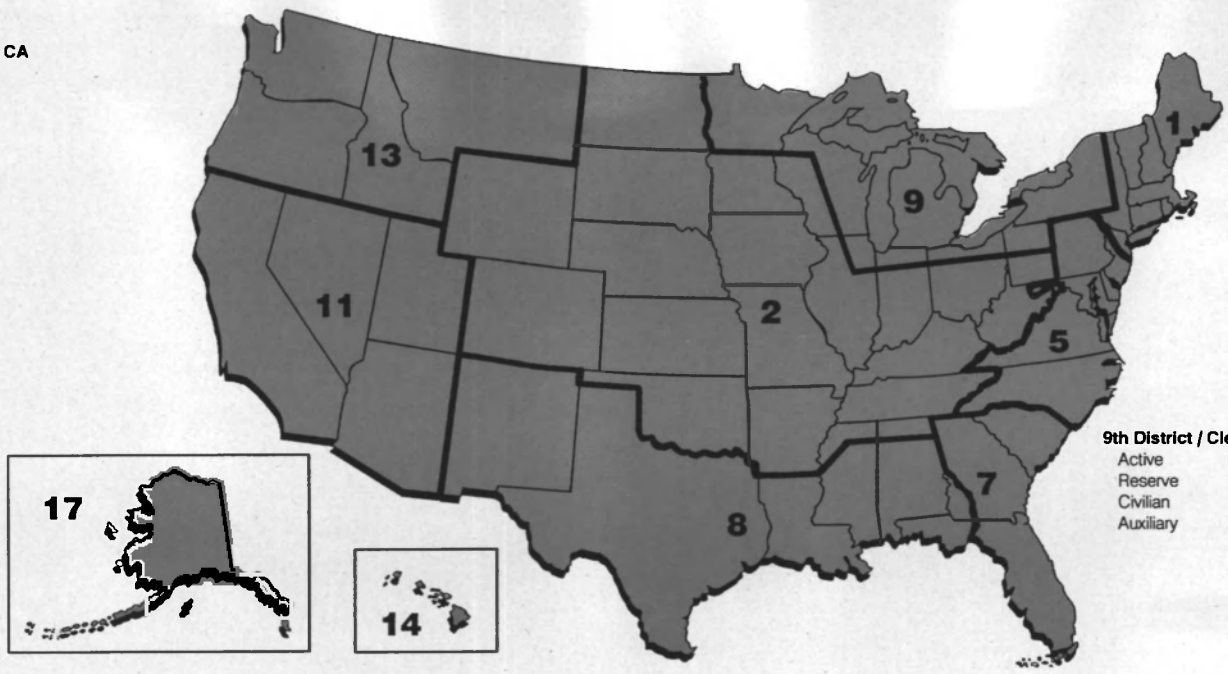

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AC&I	107.6	111.8	97.0	28.3	39.8	19.9	74.2	75.5	64.5	54.6
RDT&E	3.2	5.1	5.2	3.2	3.9	3.7	3.9	3.8	5.9	5.5

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FY '92: $443.9M

Marine Environmental Protection

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AC&I	7.2	10.4	10.6	14.4	5.0	9.1	30.1	31.1	22.5	34.3
RDT&E	8 8	6.2	3.0	1.7	1.7	1.6	1.5	4.3	4.2	5.8

This program aims to minimize damage caused by pollutants released in the coastal zone; overcome, or reduce threats to marine environments posed by potential spills of oil or hazardous substances; and assist in national and international pollution response planning efforts.

Since the 1972 enactment of the Federal Water Pollution Control Act (FWPCA), the U.S. has developed a national oil and hazardous substance spill response system.

FY '92: $263.7M

Enforcement of Laws and Treaties

	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92**
ELT	634.3	678.8	810.0	841.6	823.0	805.9	996.5	1125.0	1147.4	1176.3
OE	434.0	460.8	531.7	584.7	618.7	628.2	756.4	879.2	936.6	994.3
AC&I	199.9	217.1	276.3	251.2	197.7	171.4	235.6	239.8	204.9	172.8
RDT&E	0.4	0.9	2.0	5.7	6.6	6.3	4.5	6.0	5.9	9.2

ELT is the Coast Guard's oldest mission. The suppression of smuggling was the main reason for forming the "fleet of cutters" in 1790. Tbday, the Coast Guard: Interdicts drug smuggling (seizing nearly $8 million in illegal drugs each day); interdicts illegal aliens; enforces fisheries laws and regulations relating to the Exclusive Economic Zone and other U.S. territories and international agreements; and assists other agencies to enforce laws.

FY '92: $1,176.3M

Ice Operations

	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92**
Ice Ops	61.0	30.2	52.6	59.2	98.5	95.6	106.1	76.1	77.5	97.4
OE	27 0	27.6	50.5	56.3	91.0	92.1	97.4	66 7	69 3	75.5
AC&I	33.9	2.5	1.5	2.5	7.0	3.0	8.7	8.9	7.6	21.3
RDT&E	0.1	0.1	0.6	0.4	0.5	0.5	0.6	0.5	0.6	0.6

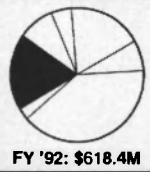
Ice operations promote maritime transportation and other national interest activities in ice-laden polar and domestic waters, and help meet the needs of marine safety and environmental protection in the ice environment. In 1936, President Roosevelt established icebreaking operations in U.S. channels and harbors. In 1965, the Navy transferred its icebreakers to the Coast Guard, who assumed all ice breaking responsibilities.

FY '92: $97.4M

Aids to Navigation

	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92**
ATON	424.9	430.2	443.0	399.0	449.1	426.3	502.1	517.9	541.2	618.4
OE	362.3	370.3	362.7	371.7	409.5	406.6	436.8	452.6	469.7	513.1
AC&I	58.9	57.3	77.3	24.1	35.7	16.0	61.1	62.2	66.3	101.3
RDT&E	3.7	2.6	3.0	3.2	3.9	3.7	4.2	3.1	5.2	4.0

The Coast Guard helps marine and air traffic through aids-to-navigation. These include: Loran-C stations, Omega stations, buoys, day markers and beacons, radar reflectors, radiobeacons, and large navigational buoys. The first U.S. lighthouse was built in 1716. The CG has since built, placed and maintained many aids, including metal buoys, whistle buoys, radiobeacons, battery-powered buoys, Loran during WWII, and today, global satellite positioning systems with accuracy within 10 meters.



FY '92: $618.4M

Marine Safety

	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92**
Marine Saf	126.2	143.9	125.8	105.3	132.7	125.3	139.9	218.9	245.0	267.0
OE	116.0	129.9	114.9	99.5	126.1	120.8	126.5	205.9	216.3	243.5
AC&I	5.9	10.0	6.1	4.2	4.6	2.6	11.3	11.5	26.8	21.5
RDT&E	4.3	4.0	4.8	1.6	2.0	1.9	2.1	1.5	1.9	2.0

The marine safety program develops and enforces standards and policy for the safe design/construction, maintenance and operation of vessels and offshore facilities engaged in commercial, scientific or exploratory activity in the marine environment.

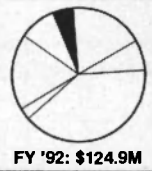
By doing so, Coast Guard marine safety personnel minimize deaths, injuries, property loss and environmental damage. It also helps insure that U.S. vessels are adequately manned with a minimum number of qualified crewmembers.

FY '92: $267.0M

Defense Readiness

	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92**
Defense	88.4	98.2	136.3	133.1	143.4	128.4	128.0	109.1	116.7	124.9*
OE	68.2	71.3	99.5	96.9	107.2	102.1	111.2	92.8	96 7	106 0
AC&I	19.9	26.4	36.4	35.2	34.8	25.0	14.8	15.1	18.7	17.2
RDT&E	0.3	0.5	0.4	1.0	1.4	1.3	2.0	1.2	1.3	1.7

Since 1790, the Coast Guard has served in every major national conflict, earning 33 battle and campaign streamers. Tb maintain the Coast Guard as an effective, ready, armed force (required by USC), units assigned naval warfare missions have needed weapons and combat systems, as well as training for operations and maintainence. The dual nature as an armed and humanitarian service also requires the defense operations program to support law enforcement and port security activities.



FY '92: $124.9M

OE – Operating Expenses **AC&I** – Acquisition, Construction & Improvements **RDT&E** – Research, Development, Test & Evaluation

** President's FY '92 Budget Request to Congress. * Includes Port Safety & Security Mission.

Source: U.S. Coast Guard, Commandant's Bulletin, "Overview" – October 1991.

Thrustmaster Installs Propulsion Units On Transport Barge

Three 255-hp Model OD250 Thrustmaster steerable propulsion units were recently installed on an Alaskan transport barge.

Thrustmaster of Texas, Inc., Houston, Texas, recently installed three 255-hp steerable propulsion units on a shallow-draft transport barge in Anchorage, Alaska for owner/operator Brice, Inc. The vessel is utilized to transport equipment and supplies to island locations and up rivers.

The thruster units, ABS certified, are completely steerable through 360 degrees continuously without stops. These steerable thrusters are powered with Thrustmasters' exclusive hydrostatic drive system. Propeller tilt, steering and depth adjustment operations are smooth and can be operated from the remotely mounted control station. All aspects of propeller control can be operated individually or in any combination during any phase of operation. The units feature the optional propeller depth adjustment mechanism, allowing the operator to vary the depth of the propeller to accommodate vessel draft variations in shallow waters.

For further information on these Thrustmaster steerable propulsion units,

Circle 93 on Reader Service Card

Diving Contractors To Host Underwater '92 Symposium

The Association of Diving Contractors, Inc., Mandeville, La., has announced that Underwater '92, which it has hosted for many years, will be held January 13-15 at the Westin Galleria in Houston, Texas.

Underwater '92 in a three-day program of workshops, presentations and exhibits expected to draw over 2,000 attendees and 100 exhibits. It has become one of the largest gatherings of its kind of diving industry personnel, representing operations from across the U.S. (including both inland and offshore markets). The symposium also includes a strong international interest. The event will feature the commercial underwater industry's latest technology while exploring its uses, safety aspects and cost considerations.

With 17 technical sessions, two topical luncheons, a special keynote address by national figures and a diving safety workshop, it is obvious why Underwater '92 has become one of the premier events for the commercial underwater industry. Information for the underwater market will be available that cannot, according to the sponsors, be obtained at any other marine event of 1992.

The trade show that runs in conjunction with the symposium has also experienced tremendous growth. Over 100 exhibitors are expected to be displaying the latest equipment and services.

For more information, contact Underwater '92, 4240 Highway 22, #3, Mandeville, La. 70448.

Ingalls Awarded $10.4 Million Pact

Ingalls Shipbuilding, Inc., Pascagoula, Miss., was recently awarded a $10.4 million contract for planning yard class service for the CG-47 Ticonderoga Class cruisers.

Newport News To Sell Sperry Marine Inc.

Newport News Shipbuilding, a Tenneco company, recently announced that it will sell its subsidiary, Sperry Marine Inc., as part of a $2 billion action plan announced by Tenneco Inc. in September.

Newport News Shipbuilding anticipates the sale will be accomplished in early 1992. An asking price has not been disclosed.

The $2 billion action plan was developed to strengthen Tenneco's balance sheet and enhance its financial flexibility through several measures including the sale of $1 billion in non-core assets.

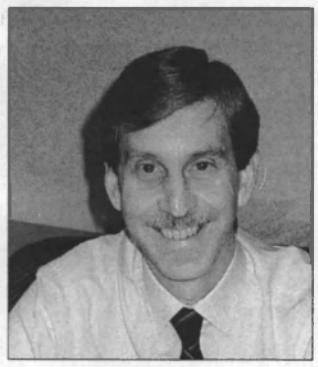
The remainder of the $2 billion action plan will be accomplished through capital spending cuts, company-wide cost reductions, an equity offering and a 50 percent cut in the dividend rate on the common stock announced earlier this month.

Sperry Marine Inc., headquartered in Charlottesville, Va., is a world leader in marine navigation and electronic systems.

Newport News Shipbuilding acquired Sperry Marine Inc. from Unisys in 1987.

Tenneco Inc. is a Houston-based diversified industrial corporation with major business interests in natural gas pipelines, agricultural and construction equipment, shipbuilding, automotive parts, packaging, chemicals and minerals.

Hagglunds Appoints Siegel, Manager, Marine Sales In U.S.



Jeffrey Siegel

Hagglunds Inc. recently announced that **Jeffrey Siegel** has been appointed manager, marine sales in the U.S.

Mr. **Siegel**, having served with the company in past years, comes to his new post with 15 years of marine sales and marketing experience.

In his new position, he will be responsible for sales of Hagglunds' full line of electrohydraulic cargo cranes and Hagglunds MTT hose handling and service cranes.

Coast Guard Seeks Comments On Rules For Single-Hull Tankers

The U.S. Coast Guard is seeking public comments on an Advanced Notice of Proposed Rulemaking (ANPRM) that addresses structural and operational requirements for tank vessels without double hulls.

The Oil Pollution Act of 1990 requires that, beginning in 1995, tank vessels without double hulls be phased out over the next 20 years. The phaseout period is provided to allow owners and operators adequate time to replace their fleets with double-hulled tank vessels, while ensuring a schedule that is responsive to worldwide shipping and shipbuilding.

OPA directs the Secretary of Transportation to determine requirements for existing vessels that will provide as much protection to the environment as is technologically and economically feasible during the phaseout period. OPA does not specify what structural or operational requirements are to be applied to the affected vessels.

Also, the Coast Guard is requesting comments on a proposal submitted by a number of delegations to the International Maritime Organization (IMO). These delegations are requesting that existing tankers involved in international trade be equipped with double hulls sooner than is currently required by the act.

Comments should be submitted to the Executive Secretary, Marine Safety Council, G-LRA-2/3406 (CGD 91-045), U.S. Coast Guard, 2100 Second St., SW, Washington, D.C. 20593-0001 on or before December 30, 1991.

FOR MORE INFORMATION

ON

EQUIPMENT AND SERVICES ADVERTISED IN THIS ISSUE

CIRCLE THE APPROPRIATE NUMBER ON READER SERVICE CARD OPPOSITE

ADVERTISER	EQUIPMENT /SERVICE	CIRCLE NO.
AT & T, FIBER OPTIC	CABLES	208
ALLIED-SIGNAL	MARINE ROPES	242
AMERICAN BUREAU OF SHIPPING	VESSEL CLASSIFICATION	274
ANSHUTZ & COMPANY	NAUTO CONTROL	205
ARGO INTERNATIONAL	STEAM TURBINES	218
ARNESSEN CORP.	CHIPPING HAMMERS	261
ASTILLEROS ESPANOLES	SHIPBUILDING/REPAIR	219
BAILEY REFRIGERATION	AIR CONDITIONING/REFRIGERATORS	255
BENDER, INC.	ELECTRICAL SAFETY	272
BOLLINGER SHIPYARD	SHIPBUILDING	265
CHRIS MARINE	DIESEL ENGINE MAINTENANCE	236
COFFIN TURBO PUMP	TURBO PUMPS	258
CUNNINGHAM MARINE HYDRAULICS	MARINE HYDRAULICS	256
CYCLOPS/EASTERN STAINLESS	STAINLESS FLOOR PLATE SHEET	217
DEL GAVIO	MARINE HYDRAULICS	206
DERBYSHIRE MACHINE & TOOL	EDUCTORS/STRAINERS/VALVES/FITTINGS	232
DIESEL AMERICA	DIESEL ENGINES	268
L.C. DOANE	LIGHTING EQUIPMENT	211
DIVERSIFIED MARINE BROKERAGE	BROKERS	225
DUPONT CO.	ROPE FIBERS	227
ESGARD	BALLAST/TANK COATINGS	210
FANA	ARMORSHIELD SHRINK WRAP	254
FERNSTRUM, R.W.	GRIDCOOLERS	228
FINCANTIERI	SHIPBUILDING	266
L.F. GAUBERT	ELECTRICAL CABLES	222
GAYLORD INDUSTRIES	GALLEY EXHAUST HOODS	207
GIBBS & COX	NAVAL ARCHITECTS/MARINE ENGINEERS	220
HAGGLUNDS INC.	CRANES	239
HITACHI ZOSEN	SHIPBUILDING	270
HOUSTON MARINE	U.S.C.G. LICENSES	212
INTERNATIONAL GRATING	FIBERGLASS LOUVERS	262
INTERNATIONAL MARITIME ASSOCIATES	MARKETING INFORMATION	248
JEAMAR WINCHES	WINCHES	235
JIM'S PUMP	PUMP REPAIR	216
LESLIE CONTROLS	VALVES/CONTROLS	264
LIEBHERR-WERK	DECK CRANES	250
LOEFFLER	BELLS/DECK DRAINS/VALVES	230
McELROY MACHINE	DECK EQUIPMENT	209
MMC INTERNATIONAL	GAS TIGHT GAUGE TAPE	253
MEGAPULSE	NAVIGATION RECEIVERS	259
MILLER ELECTRIC	INVERTER XMT SERIES	237
	DIESEL WELDER, MILLER AIR PAK	238
MOBIL OIL	MARINE OIL	245
NAVAL ELECTRONICS	NAVIGATION/COMMUNICATION SYSTEMS	231
NEW ENGLAND TRAWLER	DECK MACHINERY	204
NEW YORK SHIPYARD	SHIPBUILDING/REPAIR	251
NORCONSULT	SHIP REPAIR	215
NORDIC MACHINE	ANCHOR/WINCHES	224
OMNITHRUSTER	MODULAR THRUSTER SYSTEM	203
PROTECNO LTD.	AT SEA SHIP REPAIR	221
REVERE AEROSPACE	CABLE ASSEMBLIES	263
SAMSUNG HEAVY INDUSTRIES	SHIPBUILDING	246
SCALE REPRODUCTIONS	SCALE MODELS	240
SCHIESS-DEFRIES	LIFT DOCKS	260
SOUTHWEST MARINE	SHIP REPAIR/MAINTENANCE	267
SPECIAL FILMS	FLOOR/DECK PROTECTION SYSTEM	271
SUPERFERRY SECRETARIAT	SUPERFERRY '92	244
TELEFLEX	RMVA VALVES	226
	RTVA VALVES	273
TEXACO	MARINE OIL	252
WESTINGHOUSE MARINE	MARINE PROPULSION	243
WILLARD MARINE	RIGID INFLATABLES RAFTS	213
G.J. WORTELBOER	ANCHORS/CHAINS	214
WRIGHT-AUSTIN	GAS/LIQUID SEPARATORS	234
ZODIAC	RIGID HULL-INFLATABLES	202

The listing above is an editorial service provided for the convenience of our readers.

BUYERS DIRECTORY

This directory section is an editorial feature published in every issue for the convenience of the readers of MARITIME REPORTER/Engineering News. A quick-reference readers' guide, it includes the names and addresses of the world's leading manufacturers and suppliers of all types of marine machinery, equipment, supplies and services. A listing is provided, at no cost for one year in all issues, only to companies with continuing advertising programs in this publication, whether an advertisement appears in every issue or not. Because it is an editorial service, unpaid and not part of the advertisers contract, MR/EN assumes no responsibility for errors. If you are interested in having your company listed in this Buyers Directory Section, contact John C. O'Malley at (212) 477-6700.

ABRASIVES
Barton Mines Corp., 1658 Cole Blvd., Golden, CO 89401
Chesapeake Specialty Products, 5055 Northpoint Blvd., Baltimore, MD 21219
Ervin Industries, Inc., 3893 Research Park Drive, P.O. Box 1168, Ann Arbor, MI 48106-1668
Stan-Blast Abrasives, P.O. Box 968, 3300 River Road, Hawey, LA 70059

AIR CONDITIONING AND REFRIGERATION—Repair & Installation
Adrick Marine Corp., 320 Cantor Ave., Linden NJ 07036
Bailey Group, 2323 Randolph Ave., Avenel, NJ 07001
Carrier Transicold, P.O. Box 4805, Syracuse, NY 132211
Stal Refrigeration AB, Butangsgatan 16, S 601 87 Norrkoping, SWEDEN
York Int'l, P.O. Box 1592-083G, York, PA 17405

BALLAST
Chesapeake Specialty Products, 5055 Northpoint Blvd., Baltimore, MD 21219
Genstar Stone Products, Executive Plaza IV, Hunt Valley, MD 21031
Mineral Research & Recovery Inc.,P.O. Box 986, Sonoita, AZ 85637
Queen City Iron & Steel, P.O. Box 7205, Charlotte, NC 28241-7205

BARGE BUILDING
Conrad Industries, P.O. Box 790, Morgan City LA 70381
Maxon, South Boundary Street, P.O. Box 69, Tell City, IN 47586

BARGE—Leasing
McDonough Marine Service, 2300 Surekote Road, New Orleans, LA 70117
Zidell Explorations, Inc., 3121 SW Moody Ave., Portland OR 97201

BASKET STRAINERS
Beaird Industries, P.O. Box 31115, Shreveport, LA 71130

BEARING—Rubber, Metallic, Non-Metallic
B.F. Goodrich, Engineered Polymer Products, 150 Division Dr., Wilmington, NC 28401
Kahlenberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241
Thomson Gordon Ltd., 3225 Mainway, Burlington, Ont., CANADA L7M 1A6
Waukesha Bearings, P. O. Box 1616, Waukesha, WI 53187-1616

BOILER—Manufacturers
Aalborg Ciserv (Miami) Inc., 1539 SW 21st Avenue, Ft. Lauderdale, FL 33312

BROKERS
Captain Astad Company, Inc., P.O. Box 350486, Ft Lauderdale, FL 33335, 2900 Energy Centre, 1100 Poydras Street, New Orleans, LA 70163-2900
Diversified Marine Brokerage, 1201 Northern Blvd., Manhasset, NY 11030
Jack Faulkner, 2419 Caddy Lane, P.O. Box 371, Flossmoor IL 60422
Mowbray's Tug & Barge Sales Corp., 35 De Hart St., Morristown NJ 07960

BUNKERING
Zidell Explorations, Inc., 3121 SW Moody Ave., Portland OR 97201

CABLE ASSEMBLIES
Revere Aerospace, 845 N. Colony Rd. Wallingford, CT 06492

CARGO ACCESSORIES
Morgan Crane Company, Inc., 1300 Normandy Place, Santa Ana, CA 92705

CHAIN
Baldt, Inc., 6 M. Butler St., Chester, PA 19013
Crandall Dry Dock Engineers Inc./Marit Chain, 21 Pottery Lane, Dedham MA 02026
Milligan Marine Supply Inc., 5832 Harvey Wilson, Houston TX 77020
G.J. Wortelboer Jr. B.V., Postbus 5003, 3008 AA Rotterdam, NETHERLANDS

CHOCKING COMPOUNDS
ITW Philadelphia Resins, 130 Commerce Drive, Montgomeryville, PA 18936

CLAMPING—Pipe, Tubes, Hose
ZSI, 32497 Schoolcraft Road, Livonia, MI 48150

COMPACTORS
International Compactor, Inc., P.O. Box 5918, Hilton Head, SC 29938
A/S Vesta, Skudehavsvej 27, DK-2100 Copenhagen, DENMARK; Sales Agents: American United Marine Corp., 5 Broadway, Rt 1, Saugus, MA 01906, USA

COMPUTERIZED INFORMATION SYSTEMS
TIMSCO, P. O. Box 91360, Mobile AL 36691
Coastdesign, Inc., Unit 201, 12837 76th Avenue, Surrey, BC CANADA V3W 2V3

CONDENSERS/SEPARATORS
Beaird Industries Inc., P.O. Box 31115, Shreveport LA 71130
Standard Refrigeration Co., 2050 N. Ruby, Melrose Park, IL 60160
Wright Austin Co., 3250 Franklin St., Detroit MI 48207

CONTROL SYSTEM—Monitoring
Henschel, Inc., 9 Hoyt Drive, Newburyport MA 01950
IMO Industries, Gems Sensors Division, One Cowles Rd., Plainville CT 06062
Lyngso-Valmet Marine A/S, P.O. Box 130, N-3430 Spikkestad, NORWAY
MMC International, 60 Inip Dr, Inwood NY 11696
Marine Electric RPD, Inc., 50 Carol St., P.O. Box 1135, Clifton, NJ 07014-1135
Norcontrol A/S, P.O. Box 1024, N-3191 Horten, NORWAY
Robertson Marine Systems, 3000 Kingman St., Suite 207, Metairie, LA 70006
Robertson-Shipmate, 400 Oser Avenue, Hauppage, NY 11788
Teleflex Inc., 771 First Ave., King of Prussia, PA 19406

COUPLINGS
Lo-Rez Vibration Control Ltd., 156 West 8th Avenue, Vancouver, BC CANADA, V5Y 1N2

CRANE—HOIST—DERRICK—WHIRLEYS
The Crosby Group, Inc., P.O. Box 3128, Tulsa OK 74101
Del Gavio Marine Hydraulics Inc., 619 Industrial Rd., Carlstadt, NJ 07072
Liebherr-Werk Nenzing GES.mbh, P.O. Box 10, A-6710 Nenzing, AUSTRIA
Marine Travelift, Inc., 49 E. Yew St., Sturgeon Bay, WI 54235
Morgan Crane Company, Inc., 1300 Normandy Place, Santa Ana, CA 92705
J.D. Neuhaus Hebezeugue GmbH, D-5810 Witten, GERMANY
New England Trawler Equipment Co., 291 Eastern Avenue, Chelsea, MA 02150
Pettibone-Tiffin Corp., 235 Miami St., Tiffin, OH 44883
Reco Crane Co., 5734 Jefferson Highway, New Orleans LA 70181
Zidell Explorations, Inc., 3121 SW Moody Ave., Portland OR 97201

DECK MACHINERY—Cargo Handling Equipment
All Set Marine Lashing AB, P.O. Box 14112, S-161 14 Bromma, SWEDEN
Braden Carco Gearmatic, P.O. Box 547, Broken Arrow, OK 74013
New England Trawler Equipment Co., 291 Eastern Avenue, Chelsea, MA 02150
Markey Machinery Co., Inc., P.O. Box 24788, Seattle, WA 98124 0788
Morgan Crane Company, Inc., 1300 Normandy Place, Santa Ana, CA 92705
McElroy Machine & Mfg. Co., Inc., P.O. Box 4454, Biloxi MS 39535 4454
Seattle Crane & Equipment Co., Inc., 4403 20th Street East, Fife, WA 98424
Skookum/Rope Master,P.O. Box 280,Hubbard, OR 97032
Willem Pot b.v., P. O. Box 29102, 3001 GC Rotterdam, The Netherlands

DECKS
Boatlife, 205 Sweet Hollow Road, Old Bethpage, NY 11804

DECK MACHINERY
New England Trawler Equipment Co., 291 Eastern Avenue, Chelsea, MA 02150

DIESEL ACCESSORIES
Coltec Industries Fairbanks Morse Engine Div. 701 Lawton Ave., Beloit, WI 53511
Diesel America Inc., 5217 River Rd., New Orleans LA 70123
Gearhardt's Inc., P.O. Box 10161, Jefferson, LA 70181
General Thermodynamics Corporation, 210 South Meadow Road, P.O. Box 1105, Plymouth, MA 02360
Giro-Engineering Ltd., 370 Brook Lane, Sarisbury Hampshire, ENGLAND SO3 6ZA
Kiene Diesel Accessories, 325 S. Fairbanks St., P.O. Box 386, Addison IL 60101
Pow-R-Quik, 5518 Mitchelldale, Houston, TX 77092

DIESEL ENGINE—Spare Parts & Repair
Aalborg Ciserv (Miami) Inc., 1539 SW 21st Avenue, Ft. Lauderdale, FL 33312
Caltax Marine Diesel B.V., Frankijkweg 11, 4455 TR Nieuwdorp (Vlissingen Oost), THE NETHERLANDS
Caterpillar, Inc., Engine Div., P.O. Box 610, Mossville, IL 61552-0610
Coltec Industries, Parts & Service Div., 701 Lawton Ave., Beloit, WI 53511
Cummins Engine Company, Mail Code 60011, Box 3005, Columbus, IN 47202-3005
Global Maritime Services, 247 SW 33 Court, Ft. . Lauderdale, FL 33315
Golten Marine Company Inc., 160 Van Brunt Street, Brooklyn, NY 11231
Hatch & Kirk, 5111 Leary Avenue NW, Seattle, WA 98107
Kim Hotstart Mfg Co., E 5724 Broadway Ave, P.O. Box 42, Spokane WA 99210
MAN B&W Diesel GmbH, Stadtbachstrasse 1, D-8900 Augsburg 1, GERMANY
MAN B&W Diesel, 17 State Street, New York, NY 10004
MTU of North America, 10450 Corporate Drive, Houston, TX 77478
Markisches Werk GmbH, P.O. Box 1442, D-5884 Halver 1, GERMANY
Pacific Rim Diesel, 3842 W. Marginal Way SW, Seattle, WA 98106
Paxman Diesels, P.O. Box 8, Paxman Works, Colchester, Essex, CO1 2HW, ENGLAND; Paxman Diesels USA, (A Div. of Ruston Gas Turbines, Inc.), 15950 Park Row, Houston, TX 77084
S.E.M.T. Pielstick, 2 Quai de Seine, Saint Denis, Paris, FRANCE 93203
Sulzer Brothers Inc., 200 Park Ave., New York, N.Y. 10166

DIVING & SALVAGE
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Muldoon Marine Services, Inc., P.O. Box 3221, Terminal Island, CA 90731
Sea-Side Diving, 28612 Harper Ave., St. Clair Shores, MI 48081

DRY DOCKS-Design
Conrad Industries, 1501 Front Street, P.O. Box 790, Morgan City, LA 70381
Ferrostaal AG, D 4300 Essn, Hohenzollernstrasse 24,GERMANY
Marine Design Services, P.O. Box 928, Bonita CA 92002

ELECTRICAL EQUIPMENT
L. F. Gaubert & Co., Inc., P. O. Box 50500, New Orleans LA 70150
MMC International, 60 Inip Dr, Inwood NY 11696
SPD Technologies, 13500 Roosevelt Blvd., Philadelphia PA 19116
Universal Marine Electric Co., Inc., P.O. Box 266-923, Houston, TX 77027-6923

ELECTRONIC DISPLAY
Scandinavian Micro Systems, P.O. Box 155, N-1411, Kolboton, NORWAY

ELECTRONIC ENCLOSURES
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ELECTRONIC INFORMATION SUPPORT
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ENGINE TEST EQUIPMENT
General Thermodynamics Corp., P.O. Box 1105, 210 S. Meadow Road, Plymouth, MA 02360
Instruments, Computers, & Controls, Inc., 6942 Haven Creek Dr., Katy, TX 77449

EPIRBS
ACR Electronics, Inc., 5757 Ravenswood Rd., P.O. Box 5247, Ft. Lauderdale FL 33310-5247
Alden Electronics, 40 Washington St., Westborough, MA 01581
Litton Special Devices, 750 W. Sprout Road, Springfield, PA 19064
Koden International, 77 Accord Park Drive, Norwell, MA 02061

EQUIPMENT-Marine
Byrne, Rice & Turner, Inc., 1172 Camp St., New Orleans, LA 70130
Gladsky Marine, Garvies Point Rd., Glen Cove, NY 11542
Maritime Power Corp., 200 Henderson Street, Jersey City, NJ 07302
Ovako Steel Inc., P.O. Box 745, Avon, CT 06001

EVAPORATORS
Alfa-Laval Separation, Inc., 955 Mearns Rd., Warminster, PA 18974
Alfa-Laval, Desalt A/S, Stamholmen 93, DK-2650 Hvidore, Copenhagen, DENMARK
Aqua Chem, Water Technologies Div., P.O. Box 421, Milwaukee, WI 53201
Beaird Industries Inc., P.O. Box 31115, Shreveport, LA 71130

FANS-VENTILATORS-BLOWERS
Carling Turbine Blower Co., 10 Nebraska St., P.O. Box 88, Worcester, MA 01613
Jon M. Liss Associates, Inc., 411 Borel Ave., San Mateo, CA 94402

FASTENERS
Jamestown Distributors, 28 Narragansett Ave., P.O. Box 348, Jamestown, RI 02635
Non-Ferrous Bolt & Mfg. Co., 4085 Nevso Dr., Suite C, Las Vegas, NV 98103

FENDERING SYSTEMS/BUOYS-Dock & Vessel
Kahlenberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241
Milligan Marine Supply Inc., 5832 Harvey Wilson, Houston, TX 77020
Rowe Bumpers, Conveyors & Caster Corp., 3501 Detroit Ave., Cleveland, OH 44113
Seaward International, Inc., Clearbrook Industrial Park, P.O. Box 98, Clearbrook, VA 22624
Solidur Plastics Co., 200 Industrial Dr., Delmont, PA 15626
Standard Refrigeration Co., 2050 N. Ruby, Melrose Park, IL 60160
Ultra Poly Inc., 2926 South Steele, Tacoma, WA 98409
Viking Fender Co., 50 Church Street, Sea Bright, NJ 07760

FIBER OPTIC SYSTEMS
AT & T, Cables System/Fiber Optic Div., 111 Madison Avenue, Morristown, NJ 07962

FUEL ADDITIVES, CONDITIONING
U.S. Borax/Industrial Chemicals, 3075 Wilshire Boulevard, Los Angeles, CA 90010

GALLEY EQUIPMENT
Cospolich Refrigerator Co., 949 Industry Rd., Kenner LA 70062
Gaylord Industries, 10900 S W Avery St, P.O. Box 1149, Tualatin, OR 97062
McElroy Machine & Mfg Co., Inc., P.O. Box 4454, Biloxi MS 39535 4454

GANGWAYS, LADDERS
Coast Marine & Industrial Supply Inc., 398 Jefferson St., San Francisco, CA 94133
Rampmaster Inc., 9825 Osceola Blvd., Vero Beach, FL 32966
Westmont Industries, 10805 Painter Ave., Santa Fe Springs, CA 90670
Wooster Products Inc., 1000 Spruce St., P.O. Box 896, Wooster, OH 44691

HEAT EXCHANGERS
Alfa Laval, Desalt A/S, Stamholmen 93, DK-2650 Hvidovre, Copenhagen, DENMARK
Alfa-Laval Separation Inc., 955 Mearns Rd., Warminster, PA 18974
Beaird Industries Inc., P.O. Box 31115, Shreveport LA 71130

HORNS/WHISTLES
Kahlenberg Bros Co., P.O. Box 358, Two Rivers, WI 54241

HOSE
HBD Industries, Inc., 1801 S. Railroad Street, Salsbury, NC 28145-0948

HYDRAULICS
Aeroquip Corporation, 3000 Strayer, P.O. Box 631, Maumee, OH 43537-0631
Cunningham Marine Hydraulics Co., 201 Harrison St., Hoboken NJ 07030
Del Gavio Marine Hydraulics Inc., 619 Industrial Rd., Carlstadt, NJ 07072

INCINERATORS
Teamtec A/S, P.O. Box 100, N 4912 Gjeving, NORWAY
A/S Vesta, 27 Skudehavnsvej, DK-2100 Copenhagen DENMARK. US Agent: American United Marine, 5 Broadway, Rte 1, Saugus, MA 01906

INSULATION
Soundcoat Company, 1 Burt Drive, Deer Park, NY 11729

JOINER—Watertight Door—Paneling—Ceiling System—Decking
Cupples Products, 2650 S. Hanley Rd., St. Louis, MO 63144
GEC-Marconi Electronic Systems Corp., 550 S. Fulton Ave., Mt. Vernon, NJ 10550
IMAC AB, Berga Alle 1, S-252 55 Helsingborg, SWEDEN
U.S. Rep: Hopeman Brothers, Inc., P.O. Box 820, Waynesboro, VA 22980
Jamestown Metal Marine Sales, Inc., 4710 Northwest Second Avenue, Boca Raton, FL 33431
Marine Accommodations Inc., 8535-3 Baymeadows Road, Suite 140, Jacksonville, FL 32256
Maritime Services Corp., 3457 Guignard Drive, Hood River, OR 97031
Walz & Krenzer Inc., 1390 Mt. Read Blvd., Rochester NY 14606

KEEL COOLERS
R.W. Fernstrum & Co., 1716 Eleventh Ave., Menominee, MI 49858
Kahlenberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241
The Walter Machine Co., Inc., 84-98 Cambridge Avenue, Jersey City, NJ 07307

LEGAL SERVICES
John Jozwick, c/o Bryan, Schiffrin & McMonagle, First & Cedar Bldg., Ste 350, 2701 First Ave., Seattle, WA 98121

LIFEBOATS/RAFTS
Zodiac of North America, P.O. Box 400, Stevensville, MD 21666
Willard Marine Co., Inc., 1250 N. Grove St., Anaheim, CA 92806

LIGHTING EQUIPMENT—Lamps, Fixtures, Searchlights
ACR Electronics, Inc., 5757 Ravenswood Rd., P.O. Box 5247, Ft. Lauderdale, FL 33310-5247
Archway Marine Lighting, 4501 Swan Ave., St. Louis, MO 63110
Carlisle & Finch, 4562 W. Mitchell Ave., Cincinnati OH 45232
The L.C. Doane Co., P.O. Box 975, Essex, CT 06426
Nautilus Equipment Ltd., P.O. Box 66, Station M, Halifax, Nova Scotia B3J 2L4, CANADA
Phoenix Products, 6161 N 64th St., Milwaukee WI 53218

LINE BLINDS
Stacey/Fetterolf, P.O. Box 103, Skippack, PA 19474

LOGISTICS
VL Logistics Consultants, Inc., 3420 Bienville Blvd., Ocean Springs MS 39564
QED, 4646 N. Witchduck Road, Virginia Beach, VA 23455

MACHINERY MAINTENANCE, REPAIR, OVERHAUL, AND TESTING
Del Gavio, 619 Industrial Rd., Carlstadt, NJ 07072
Global Maritime Services, 247 SW 33 Court, Ft. Lauderdale, FL 33315
Golten Marine Company Inc., 160 Van Brunt Street, Brooklyn, NY 11231
New England Trawler Equipment Co., 291 Eastern Avenue, Chelsea, MA 02150

MACHINING—On Site Repair
Global Maritime Services, 247 SW 33 Court, Ft. Lauderdale, FL 33315

MARINE ACCOMMODATIONS
Hopeman Brothers, P.O. Box 820, 435 Essex Ave., Waynesboro, VA 22980
Jamestown Metal Marine Sales, Inc., 4710 Northwest Second Avenue, Boca Raton, FL 33431
Marine Accommodations Inc., 8535-3 Baymeadows Road, Suite 140, Jacksonville, FL 32256

MARINE FURNITURE
Jamestown Metal Marine Sales, Inc., 4710 Northwest Second Avenue, Boca Raton, FL 33431
Marine Accommodations Inc., 8535-3 Baymeadows Road, Suite 140, Jacksonville, FL 32256
Wilson & Hayes, 1601 Eastlake Avenue, East, Seattle, WA 98102

METAL PRODUCTS
Harrington Metal Fabrication, P.O. Box 410, 6720 M 89, Fennville, MI 49408
Williams & Co., 901 Pennsylvania Ave., Pittsburgh, PA 15233-1495

NAVAL ARCHITECTS, MARINE ENGINEERS, SURVEYORS
Advanced Marine Enterprises, Inc., 1725 Jefferson Davis Hwy., Arlington, VA 22202
Aero Nav Laboratories, Inc., 14-29 112 St., College Point, NY 11356
Artec Offshore Corp., 578 Enterprise St., Escondido, CA 92025
B.C. Research, 3650 Wesbrook Mall, Vancouver, B.C. CANADA V6S 2L2
CDI Marine Co., 9487 Regency Square Blvd., Suite 500, Jacksonville, FL 32225
CT Marine, 18 Church Street, Georgetown, CT 06829
Childs Engineering Corp., Box 333, Medfield, MA 02052
Crandall Dry Dock Engrs., Inc., 21 Pottery Lane, Dedham, MA 02026
Crane Consultants, 15301 First Ave S., Seattle WA 98148
C.R. Cushing, 18 Vesey St., New York, NY 10007
Arthur D. Darden, 3200 Ridgelake Dr., Suite 403, Metairie LA 70002
Design Associates Inc., 14360 Chef Menteur Highway, New Orleans, LA 70129
Designers & Planners, 2611 Jefferson-Davis Hwy, Ste. 3000, Arlington, VA 22202
Diversified Technologies, 812 Live Oak Dr., Chesapeake VA 23320
Encon Management & Engineering Consultant Services, P.O. Box 7760, Beaumont,

TX 77706
GHM Inc. (Industrial Measurement Consultants), P.O. Box 1836, Newport News, VA 23601
Gibbs & Cox, Inc., 50 West 23rd Street, New York, NY 10010
The Glosten Associates Inc., 600 Mutual Life Bldg., 605 First Ave., Seattle, WA 98104
Morris Guralnick Associates, Inc., 130 Sutter Street, Suite 400, San Francisco, CA 94104
C. Raymond Hunt Associates, 69 Long Wharf, Boston MA 02110
Hydrocomp, Inc., 45 James Farm-Lee, P.O. Box 865, Durham, NH 03824
JJH Inc., No. 4 Executive Campus, Culbert Blvd. & Route 70, P.O. Box 5031, Cherry Hill, NJ 08034
R.D. Jacobs & Associates, 11405 Main St., Roscoe, IL 61073
James S. Krogen, 1515 NW 7th St., Suite 124, Miami FL 33125
Rodney E. Lay & Associates, 13891 Atlantic Blvd., Jacksonville, FL 32225
Alan C. McClure Associates, Inc., 2600 South Gessner, Houston, TX 77063
John V. McCollum, Inc., 1199 Long Point Road, Mt. Pleasant, SC 29464
McElroy Machine & Mfg Co., Inc., P.O. Box 4454, Biloxi, MS 39535-4454
John J. McMullen Associates, Inc., 1 World Trade Center, Suite 3000, New York, NY 10048
MacPherson Maritime Services, 141 Jefferson Ave., Westfield NJ 07090
Fendall Marbury, P.O. Box 2321, Annapolis, MD 21401
Marine Design & Operations, Inc., 226 Chestnut St., Roselle Park, NJ 07204
Marine Management Systems Inc., 102 Hamilton Ave., Stamford CT 06902
Marine Power Associates, 1010 Turquois St., Ste 217, San Diego, CA 92109
Maritech, 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
Olsen Marine Surveyors Co., P.O. Box 283, Port Jefferson, NY 11777
Omega Marine Engineering Systems, Inc., 11757 Katy Freeway, Ste 1100, Houston TX 77079
QED Systems Inc., 4646 Witchduck Rd., Virginia Beach, VA 23455
Donald J. Quigley, Inc., P.O. Box 515 Richboro, PA 18954
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 975, Barnegat Light, NJ 08006; 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. Stearn, 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

Anschutz & Company, One Madison St., East Rutherford, NJ 07073
AT&T, High Seas Dept., 412 Kemble Ave., Room C380, Morristown, NJ 07960
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
IDB Aero-Nautical Communications, 15245 Shady Grove Road, Rockville, MD 20850
Kelvin Hughes Ltd., New North Rd., Hainault, Ilford, Essex 1G6 2UR ENGLAND
Kenwood USA Corp., Marine Products Div., 2201 E. Dominquez St., Long Beach, CA 90810
Mackay Communications, 441 US Highway #1, P.O. Box 331, Elizabeth NJ 07207
Marine Electric RPD, Inc., 50 Carol St., P.O. Box 1135, Clifton, NJ 07014-1135
Megapulse, Inc., 8 Preston Court, Bedford MA 01730-2380
Mobile Telesystems, Inc., 300 Professional Drive, Gaithersburg, MD 20879
Naval Electronics, 5417 Jetview Circle, Tampa FL 33634
Norwegian Telecom, P.O. Box 6701, Oslo 1, NORWAY
Novatech, 820 Cormorant St., Victoria, BC V8W 1R1, CANADA
Robertson Marine Systems, 3000 Kingman Street, Suite, 207, Metairie, LA 70006
SPD Technologies, 13500 Roosevelt Blvd., Philadelphia, PA 19116
Simrad, 19210 33rd Avenue West, Lynwood, WA 98036
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
Summer Equipment Ltd., 24 West 4th Ave., Vancouver V5Y 1G3, CANADA
Trimble Navigation, 585 North Mary Avenue, P.O. Box 3642, Sunnyvale, CA 94086
Waterway Communications System, Inc. 453 E. Park PL, Jeffersonville, IN 47130

OIL—Marine—Additives

Exxon Company International, 200 Park Ave., Bldg 222, Room A279, Florham Park, NJ 07932, P.O. Box 4706, Houston, TX 77210-4706
Mobil Oil Corporation, 3225 Gallows Road, Fairfax, VA 22037-0001
Shell Oil, P.O. Box 2463, Houston, TX 77252
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, 3240 North Broadway, St. Louis, MO 63147
MMC International, 60 Inip Dr, Inwood NY 11696

PAINT—COATING—CORROSION CONTROL

Ameron, 201 N. Berry St., Brea, CA 92622
The Arnessen Corp., Corrosion Dynamics Division, 1100 Walmut Street, Rosell, NJ 07203
Enviro Coatings, Inc., 4560 Belt Line Rd., Suite 300, Dallas, TX 75244
Esgard, Inc., P.O. Drawer 2698, Lafayette, LA 70502
GlobalTech, 9801 Westheimer St., Ste. 202, Houston, TX 77042
Jamestown Distributors, 28 Narragansett Ave., P.O. Box 348, Jamestown, RI 02635
Hempel Coatings, Foot of Curie Avenue, Wallington, NJ 07057
Melvin Pierce Marine Coating, Inc., P.O. Box 93, Semmes, AL 36575
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
Lokring, 396 Hatch Drive, Foster City, CA 94404
Stanley G. Flagg Co., 1020 W. High St., Stowe, PA 19464
Thaxton, Inc., 25 Leonburg Rd., Mars, PA 16406-8401

PORT SERVICES

Port of Iberia, P.O. Box 897, New Iberia LA 70561
Port of Portland, 5555 N. Channel Ave., Portland, OR 97217

PROPULSION EQUIPMENT—Bowthrusters, Diesel Engines, Gears, Propellers, Shafts, Turbines

Avondale Industries, Harvey Quick Repair, P.O. Box 116, Harvey, LA 70058
American Air Filter, P.O. Box 35690, Louisville, KY 40432
ASEA Brown Boveri, 1460 Livingston Avenue, N. Brunswick, NJ 08902
ASEA Brown Boveri (Stromberg), P.O. Box 185, 00381 Helsinki, FINLAND
Argo International, 140 Franklin Street, New York, NY 10013
Aquamaster-Rauma Ltd., Box 220, SF-26101, Rauma, FINLAND
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
Caterpillar, 100 NE Adams Street, Peoria, IL 61629-2320
Cincinnati Gear Co., 5657 Wooster Pike, Cincinnati, OH 45227
Coltec Industries (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 Divisio—GMT, Bagnoli della Rosandra 334, Trieste, ITALY
GE Marine & Industrial, 1 Neumann Way N-158, Cincinnati OH 45215
GE Naval & Drive Turbine Systems, 166 Boulder Dr., Fitchburg MA 01420
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, 17 State St., 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 GERMANY
MKW Power Systems, 301 S. Church St., Rocky Mount, NC 27801
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
Nylands Marine Service A/S, P.O. Box 130, N-4818 Faervik, NORWAY
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
Textron Lycoming, 550 Main St., Stratford, CT 06497
Ulstein International, A/S, N-6065 Ulsteinvik, NORWAY
J. M. Voith GmbH, Marine Division, Postfach 1940, D-7920, Heidenheim/Brenz, GERMANY U.S. Rep: Voith Schneider America Inc., 121 Susquehanna Ave., Great Neck, NY 11021
Oy Wartsila Ab, Vasa and Abo Divisions, P.O. Box 244, SF65100 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

PUMP—Repair—Drives

Coffin Turbo Pump, Inc., 326 S. Dean Street, Englewood, NJ 07631
Del Gavio, 619 Industrial Rd., Carldstadt, NJ 07072
Golten Marine Company Inc., 160 Van Brunt Street, Brooklyn, NY 11231
Houser Marine, Lario Division, 1713 S McKenzie St., Foley AL 36535
Jim's Pump Repair, 48-55 36th St., Long Island City NY 11101
Leistritz Corporation, 165 Chestnut Street, Allendale, NJ 97401
Megator Corporation, 562 Alpha Drive, Pittsburgh, PA 15238
Vita Motivator, 99 W Hawthorne Ave., Suite 622, Valley Stream NY 11580
Wilden Pump & Engineering Co., 22069 Van Burren St., P.O. Box 845, Colton, CA 92324

REMOTE VALVE OPERATORS

Elliott Manufacturing, P. O. Box 773, Binghamton, NY 13902
S. S. White Technologies, Inc., 151 Old New Brusnwick Road, Piscataway, NJ 08854
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
Columbian Rope Corp., P.O. Box 270, Guntown, MS 38849
Dupont, Montgomery 403, 1011 Centre Road, Wilmington, DE 19805

SANITATION DEVICE—Pollution Control

Jered Brown Brothers, 56 South Squirrel Rd., Auburn Hills, MI 48326
Byrne, Rice & Turner, Inc., 1172 Camp Street, New Orleans, LA 70130
Envirovac Inc., 1260 Turret Dr., Rockford, IL 61111
Fast Systems, 3240 North Broadway, St. Louis, MO 63147
Microphor, Inc., 452 E. Hill Rd., P.O. Box 1460, Willits, CA 95490
Novatech, 820 Cormorant St., Victoria BC V8W 1R1, CANADA
Red Fox Environmental Services, Inc., P.O. Box 53809, Lafayette, LA 70505-3809
Research Products/Blankenship (Incinolet), 2639 Andjon, Dallas, TX 75220

SCALE MODELS

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

SCUTTLES/MANHOLES

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

SHIPBUILDING EQUIPMENT

NEI Syncrolift, 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.,P.O. Box 3202, Mobile, AL 36652
Atlantic Marine, Inc., 8500 Heckscher Dr., Jacksonville, FL 32226
Avondale Industries Inc., P.O. Box 50280, New Orleans LA 70150
Bender Shipbuilding & Repair, 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
Chris-Marine AB, P.O. Box 9025, S-2000 39, Malmo, SWEDEN
Conrad Industries, 1501 Front Street, P.O. Box 790, Morgan City, LA 70381
Curacao Drydock (USA), Inc., P.O. Box 3012, Curacao, Netherlands Antilles
Equitable Shipyards Inc., Trinity Marine Group, Box 29266, New Orleans LA 70189
Fincantieri SpA Cantieri Navali Italiani, Via Cipro 11, 16129 Genoa ITALY
Freeport Shipbuilding, P.O. Box 417, Freeport, FL 32439
Galveston Shipbuilding, 6800 Port Industrial Boulevard, P.O. Box 2660, Galveston, TX 77553
Gulf Craft, Inc., 3904 Highway 182, Patterson, LA 70392
Halter International, 7412 Lakeshore Drive, New Orleans, LA 70124
Hitachi Zosen, Hitachi Shipbuilding & Engineering Co., 1-1-1 Hitotsubashi, Chiyoda-ku Tokyo 100, JAPAN
In-Place Machining Co., 1929 N. Buffum Street, Milwaukee, WI 53212-3793
Institute for International Research, 437 Madison Ave., N.Y., N.Y. 10022
Jacksonville, Shipyards, 750 E. Bay St., Jacksonville, FL 32202
Jeffboat, Inc., P.O. Box 610, Jeffersonville IN 47130
Kvaerner Fjellstrand, N-5632 Omastrand, NORWAY
Lisnave, Apartado 2138, 1103 Lisbon, Codex 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
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
Nichols Brothers Boat Builders, 5400 South Cameron Road, Freeland, WA 98249
Norconsult Engineering Co., Inc., P.O. Box 529, 5785 Plantation Rd., Theodore, AL 36582
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
Quality Shipyards, Inc. (Zapata), 3201 Earhart Dr., P.O. Box 1817, Houma, LA 70361
Thomas Marine, 37 Bransford Street, Patchogue, NY 11772
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
Steiner Shipyard, Inc., P.O. Box 742, Bayou la Batre, AL 36509
Swath Ocean, 979 G Street, Chula Vista, CA 92011
3 Maj Associates Shipbuilding Industry, P. O. Box 117, 51001 Rijeka YUGOSLAVIA
Textron Marine Systems, 6600 Plaza Drive, New Orleans, LA 70127-2584
Trinity Marine Group, Box 3029, Gulfport, MS 39505-3029
Union Dry Dock & Repair, P.O. Box M1539, Hoboken, NJ 07030
Zidell 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

Houston Marine Training Services, 1600 20th Street, Kenner, LA 70062
Marine Safety International, Marine Air Terminal, LaGuardia Airport, NY 11371

SILENCERS

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

STABILIZERS

Naiad Stabilizers, Van Dusen & Meyer Inc., P.O. Box 558, Shelton, CT 06484

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

Parkway/Imperial, 241 Raritan Street, South Amboy, NJ 08879
Schat Watercraft, P.O. Box 465, Ft 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 LEVELING INDICATORS

Ian-Conrad Bergan, 3409 Gulf Breeze Parkway, Gulf Breeze, FL 32561
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, 7800 Govern's Dr., SW, Huntsville, AL 35807

TOOLS

Derbyshire Machine & Tool, Belfield Ave. & Wister St., Philadelphia, PA 19144-1788
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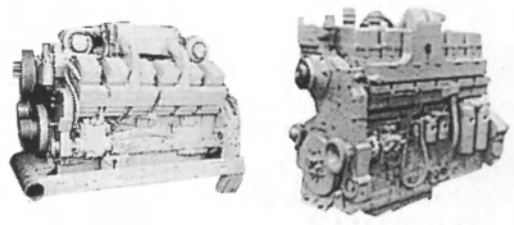

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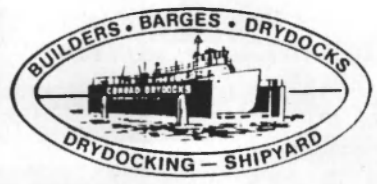

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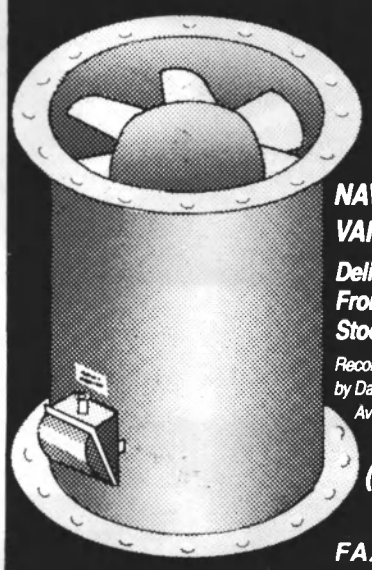

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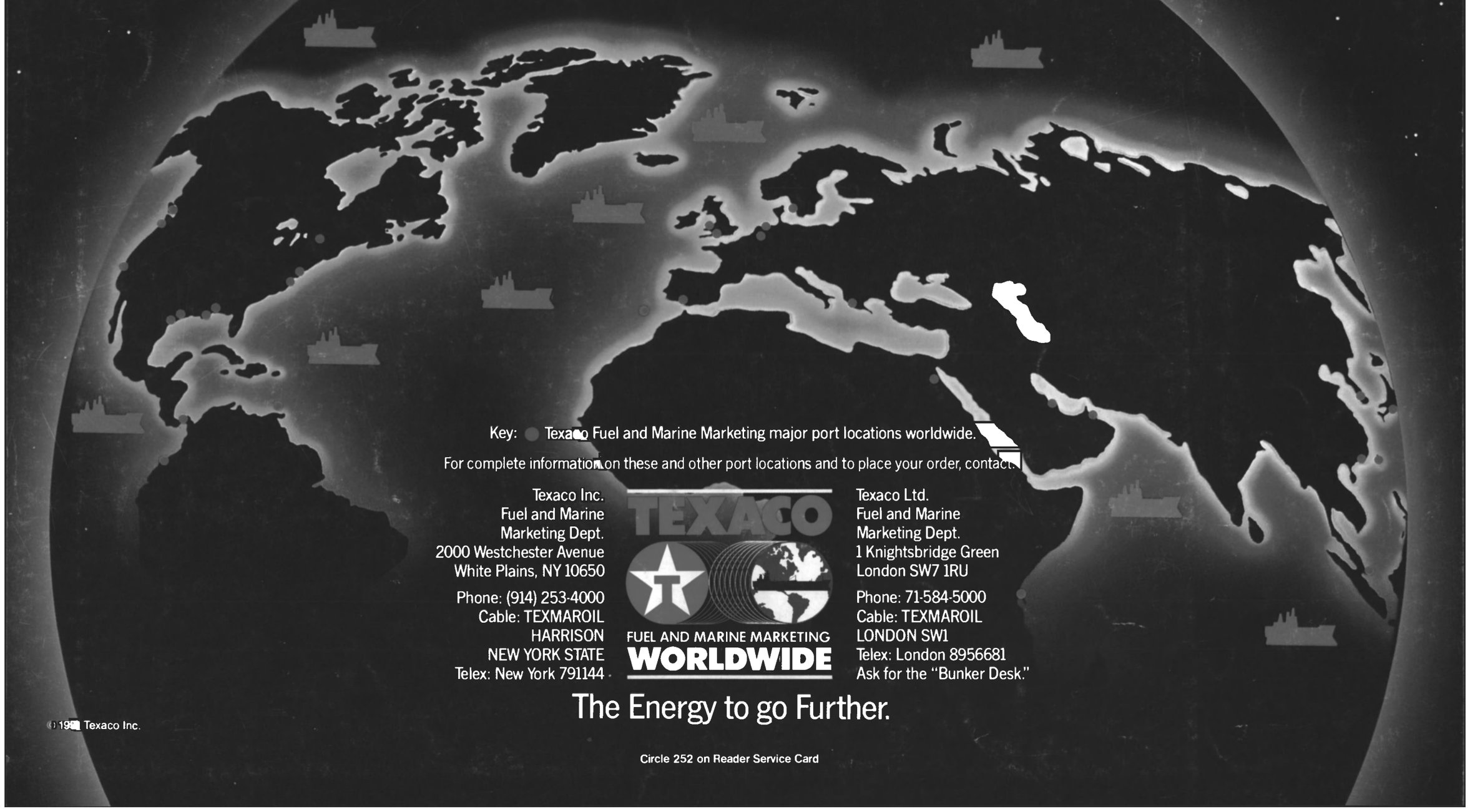

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