

**MARITIME
REPORTER**
AND
ENGINEERING NEWS

MR/EN's annual review of

GREAT SHIPS

12 Containers Across

A unique containership design from Germany maximizes cargo space in a Panamax hull

JAPANESE MARINE TECHNOLOGY

Innovation in shipbuilding and marine equipment helps Japan maintain its stature

FERLISHIP'S CONTRACTS RECORDED • MARINE FINANCIAL REVIEW • RECENT SHIP SALES

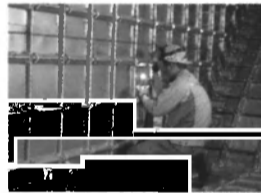
DECEMBER 1996

Samsung is ready to play an active role in LNG market

In August 1996, Korea Gas Corporation (KOGAS) placed an order for a 138,000m³ LNG carrier, further testimony to Samsung Heavy Industries' (SHI) expertise in building highly sophisticated vessels. The next generation tanker from Samsung Koje Shipyard for KOGAS will be built with Technigaz Mark III membrane technology. This method is economically

advantageous from both a shipbuilding and ship operation standpoint. New materials such as polyurethane foam and triplex are employed, providing excellent quality and reliability.

tanker construction market, the company has set up various testing, verification and management systems. By building three mock-up tanks, SHI has perfected its design, production processes, employee training programs, production facilities and machine tool development and application.



(1990), Lloyd's Register (1993), and Korean Register of Shipping (1994).

SHI began to invest in LNG tanker technology in 1986, and in 1990 acquired

technology for constructing two types of membrane cargo containment (Technigaz Mark III and GT 92-2) from Gaz Transport & Technigaz Co. The company has a track record of build quality, and its move into the LNG carrier sector is backed by certificates of quality from Bureau Veritas

SHI has already proven itself to be highly capable in the building of high value-added ships such as FPSO (Floating, Production, Storage and Offloading) tankers and multi-purpose shuttle tankers for international clients. Now, SHI is ready to play an active role in the market for advanced LNG carriers.

During a decade of preparation for entering the LNG



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SAMSUNG

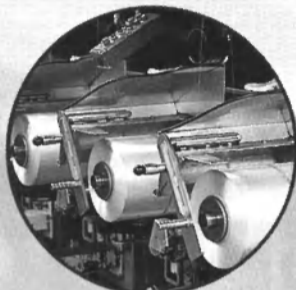
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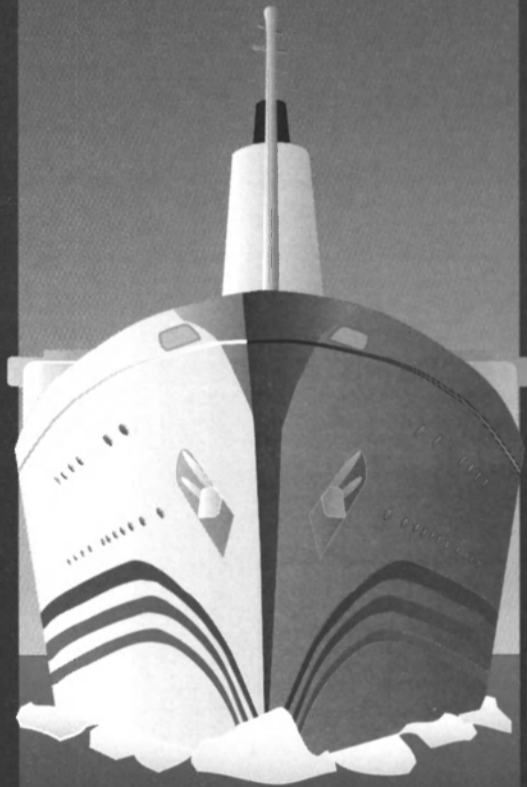
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On The Cover

Pictured on this month's cover is *S.G. Prosperity*, one of *MR/EN's* Great Ships of 1996. Built by Korea's Daewoo Heavy Industries, the 211,320-dwt bulk carrier is powered by a Hanjung MAN B&W 7S70MC main engine which is rated 23,950 bhp at 81.5 rpm. The Great Ships review starts on page 29.

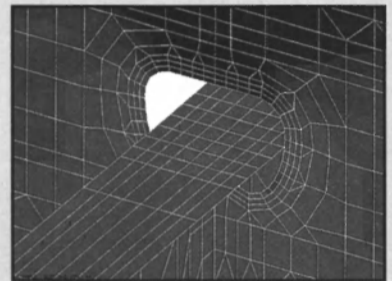
GREAT SHIPS OF 1996

This year's review of outstanding ships includes 18 vessels from some of the world's most prolific builders. The Great Ships section starts on page 29.

JAPANESE MARINE TECHNOLOGY

Shipbuilding and marine product innovation continue to be hallmarks of the Japanese maritime industry. — by Greg Trauthwein, editorial director

PICTURED IS KAWASAKI's apple slot, a new design which eliminates the need for the auxiliary ribs that are fitted to conventional frames.



ALSO IN THIS EDITION

- 10 12 Boxes Wide:** Climb aboard an innovative containership from Germany which can carry 12 containers across in the hull of a Panamax size vessel. — by Graeme MacLennan, international editor
- 18 Is Bigger Better?** The new *Carnival Destiny* — the largest cruise ship in the world at 101,000 gt — cruised into New York recently and Associate Editor Bridget Murphy climbed aboard to report on this technological wonder from Italy.
- 19 EUROPEAN UPDATE** — by Carol Fulford & Andy Smith, contributors
- 24 FAR EAST UPDATE** — by Alan Thorpe, international editor
- 51 MARINE FINANCIAL REVIEW**
- 61 FERLISHIP's Contracts Recorded**

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EDITOR'S NOTE

Our editorial office was once again deluged with applications and information from shipyards around the world which were vying to have their ships included in this year's Great Ships feature. While the ritual of reviewing and processing the applications is at times daunting, it's very satisfying to be associated with a program which is so wildly popular.

This year's gallery of Great Ships includes traditional award recipients, as well as newcomers, including a pair of Croatian-built vessels. The selection also includes many unique vessels, including Germany's largest double hull oil tanker (from Lindenau), as well as the world's largest containership with the most powerful diesel engine (from Odense Steel Shipyard).

This selection of outstanding vessels is laden with containerships, as seven of the 20 ships reviewed are of this type. This does not include an eighth containership, which both literally and figuratively stands alone in this edition. I refer to the new boxship of Bremer Vulkan Compact Class, BV2700C, which allows for the carriage of 12 containers in a Panamax hull. The story on this unique ship, which for all practical purposes is the 21st Great Ship of this edition, is presented on page 10.

For the first time, a conversion project is included in the Great Ships mix, an honor bestowed upon New Orleans-based Avondale for its work on the four tanker rebuild project for AHL. The completion of Captain H.A. Downing represents not only a significant technical feat, but also proves the capability of Avondale's new ship factory to run concurrent commercial and navy orders.

While perusing the Great Ships section, readers will notice that there is not a single Japanese-built ship mentioned. This is not a grievous error, rather a calculated tribute. The decision was made to present a comprehensive review of the entire Japanese Maritime Industry within the context of the Great Ships feature, given the stature of Japanese yards' commercial building prowess. The review, which includes information on several significant ships built in Japan this past year, begins on page 42.

Speaking of great ships (again), Associate Editor Bridget Murphy had the opportunity to board and review the largest cruise ship in the world, Carnival Destiny. The Destiny, as is the tradition with MR/EN, will be fully reviewed in the February 1996 Outstanding Cruise Ships editorial. The preliminary report on the ship starts on page 18.

On a final note, I am sad to report that International Editor Graeme MacLennan, 79, has passed away. Graeme was a maritime industry journalistic stalwart and an expert on marine propulsion. He served in the Royal Navy during WWII, and won the Distinguished Service Cross. Graeme's invaluable insight and perspective -- which he shared freely -- cannot be replaced. He will be sorely missed. His final report covers the innovative containership from Bremer Vulkan begins on page 10.



Gregory R. Trauthwein, editorial director

Please contact me with any comments regarding the publication and/or news leads at:
tel: (212) 477-6700; fax: (212) 254-6271; or e-mail: trauthwein@marinelink.com.



MARITIME REPORTER & ENGINEERING NEWS

Editorial & Executive Offices
118 E. 25th St., NY, NY 10010
Tel: (212) 477-6700; Fax: (212) 254-6271;
e-mail: shippedit@ix.netcom.com

PUBLISHERS

Charles P. O'Malley
John E. O'Malley
John C. O'Malley

Vice President
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Gregory R. Trauthwein
Senior Editor/MarineLink Webmaster
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World Media Network Pty. Ltd., Level 1, 89 York St., Sydney, NSW 2000
Australia, Telephone: +61 2 9299 5677; Fax: +62 2 9299 6178

BENELUX

PAULA TACQ
Maritime Media NL, Boekwettakker 43, 2743 DL Netherlands
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China

ZE WANG
Liaoning Foreign Trade Advertising Corp., 2 Zhongshan Square, Dalian,
China 116002, Telephone: +86 411 2644624; Fax: +86 411 2644606

Eastern Europe

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ALFRED THURNER
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France

MR. DANIEL SOLNICA
Ediconsult Internationale, 25 rue Saulnier 75009 PARIS
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Germany & Switzerland

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Maritime Media, Freiherr v. Stein Str. 24, D-63303 Dreieich, Germany
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Hong Kong/Taiwan

NEWTON CHENG
Winwell Services Ltd., Room 505, Yu Sung Boon Bldg., 107-111 Des
Voux Road, Central Hong Kong
Telephone: +852 2815 0266; Fax: +852 2544 6662

Italy

MR. VITTORIO NEGRONE
Ediconsult Internationale
Piazza Fontane Marose, 3-16123 Genova, Italy
Telephone: +39 10 583684; Fax: +39 10 566578

Japan

MR. TOSHIRO EGUSA
Publinetwork, C-407, 2-22-6, Tsukuda, Chuo-Ku, Tokyo 104 Japan
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Korea

MR. CH PARK
Far East Marketing Ind., Room 1310 Golden Tower Building
191, 2KA, Choonjung-Ro, Seodaemun-Ku, Seoul, Korea
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Twelve Boxes Abreast Within Panamax Beam

By Graeme MacLennan, international editor

The 100-ft. (30.4-m) width of the Panama Canal locks has limited the beam of ships intended for worldwide trading to 105.8 ft. (32.2 m). This constraint was of no consequence to containerships until they grew in capacity to more than 4,000 TEU, with attendant problems of stability and flexibility of loading patterns.

The first long-haul ships designed specifically for liner service were those of Overseas Containers Ltd., which entered the U.K./Australia trade in 1969. The ships were of Panamax beam and stowed containers ten-wide below hatches, with wing tanks and passageways below the weather deck, which carried cabling, water and brine pipe runs for chiller banks between the holds. The vessels had a deep centerline girder and twinned hatches, a pattern which remained unchanged until an eleven-wide configuration with two girders and tripled hatches for 4 + 3 + 4 cells within Panamax beam appeared nearly 10 years later, and a further advance in which there were no girders, but heavier side structure steelwork.

American President Lines (APL), was the first to build ultra-Panamax ships, with five of 4,300 TEU coming from German yards in 1988. Others soon followed for transpacific and Far East/Suez/Europe/U.S. West Coast to East Coast pendulum services.

Many lines are now operating a "same day,

same time" regime in response to demands from industry for "just in time" (JIT) deliveries, and this has put severe pressure on some container terminals which are having to invest heavily in more quayage and cranes to accommodate the latest very long ships.

Inquiries received by Bremer Vulkan shipyard for containerships of maximum capacity within strictly limited overall length led to a reappraisal of finite element calculations undertaken earlier for a twelve-wide coverless hatch project. This showed that the aim could be achieved within Panamax beam by halving the width of the deck in way of the hatch coamings and the wing spaces to 3.6 ft. (1.1 m), and maintaining longitudinal strength by increasing the depth of the ship and the height of the hatch coamings. This allowed an eight-high under-deck stow and clear passage along the side walkways due to the lack of underdeck passages.

A relatively high speed of 23 knots was specified, calling for finer lines forward and aft, the latter necessitating moving the machinery space forward by one hold of two, 40-ft. (12.1-m) bays. The bulbous bow was shortened to reduce the overall length and the rudder fitted with a propulsion efficiency-improving bulb.

The two hatches of the after hold are coverless, and the cell guides were extended to support a five-high stack of boxes above the coamings and an all-around walkway at the level of the third tier. There are 303 power points for reefer boxes. Up to 53 percent of the total stow of 2,754 TEU is carried below main deck level, a high proportion leading to excellent stability; close to 60 degrees in all conditions and low requirement for ballast. Homogeneous stowage allows for 2,070 TEU at 14t/TEU or 2,260 TEU at 11t/TEU, the latter permitting three tiers of loaded containers on deck. Further, 62 percent of the total stow is carried in guides, reducing the time and effort needed for lashing prior to sailing. The overall result is a ship 10 percent shorter than would otherwise be possible for the same capacity.

The first of the Bremer Vulkan Compact Class, BV 2700C, is *Contship Romance*, owned by Conti Caressa Schifffahrts, managed by Niederelbe Schifffahrtsges and employed by its charterers on service from the U.K. and Continent to Australia and New Zealand. There are eleven, 40-ft. bays in the five holds forward and one aft of the superstructure. Hold Nos. 2 through 5 have tripled hatch covers providing



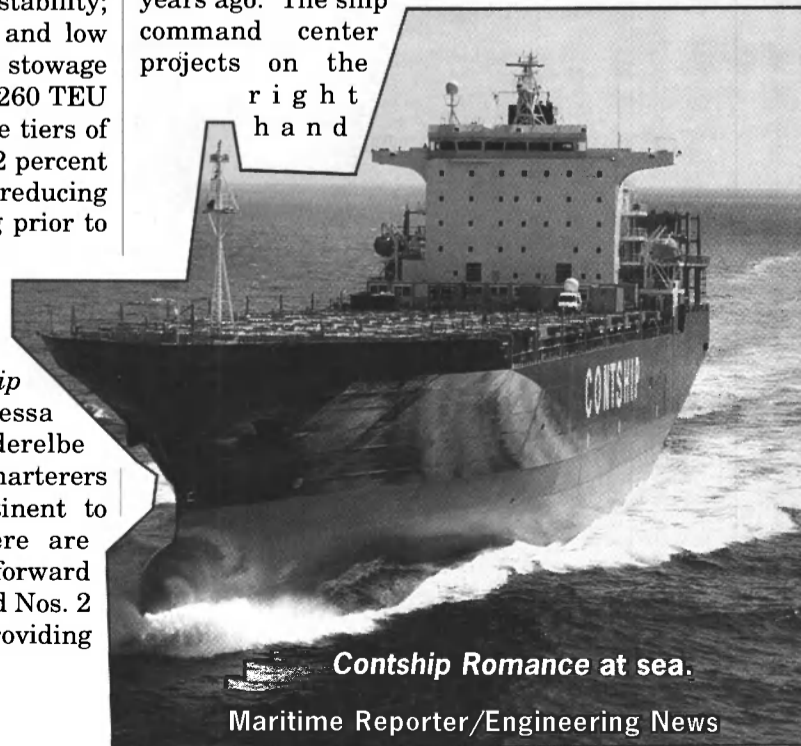
Looking into the No. 10 hatch, immediately aft of the deckhouse.

deck stowage thirteen-wide and from five to three high.

The very compact deckhouse, entirely embracing the engine casing and uptakes, is no longer than a 40-ft. box. It has seven levels above the main deck which embraces the ship's office, 500-kW emergency generator, CO₂ bottle room and air conditioning plant. Located above are the galley, messrooms and dayrooms, and on successive levels, single cabins for crew and officers. The suites for the master and chief engineer, cargo office and library are on the uppermost level. There are berths for a large total complement of 30, including owner, pilot, passengers and Suez Canal crew.

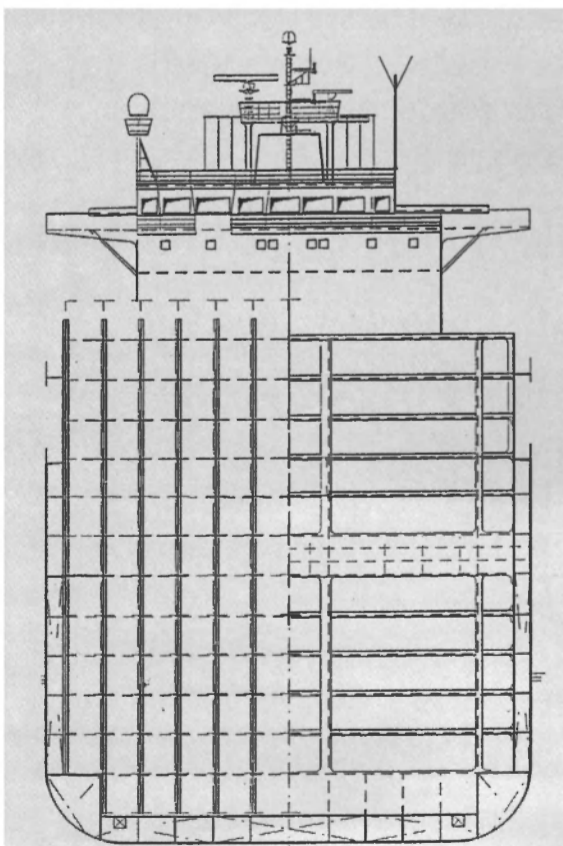
The wheelhouse is offset to starboard and has been laid out in accordance with the German "Ship of the Future" design, to which the leading yards and some owners contributed some years ago. The ship command center projects on the

right
hand



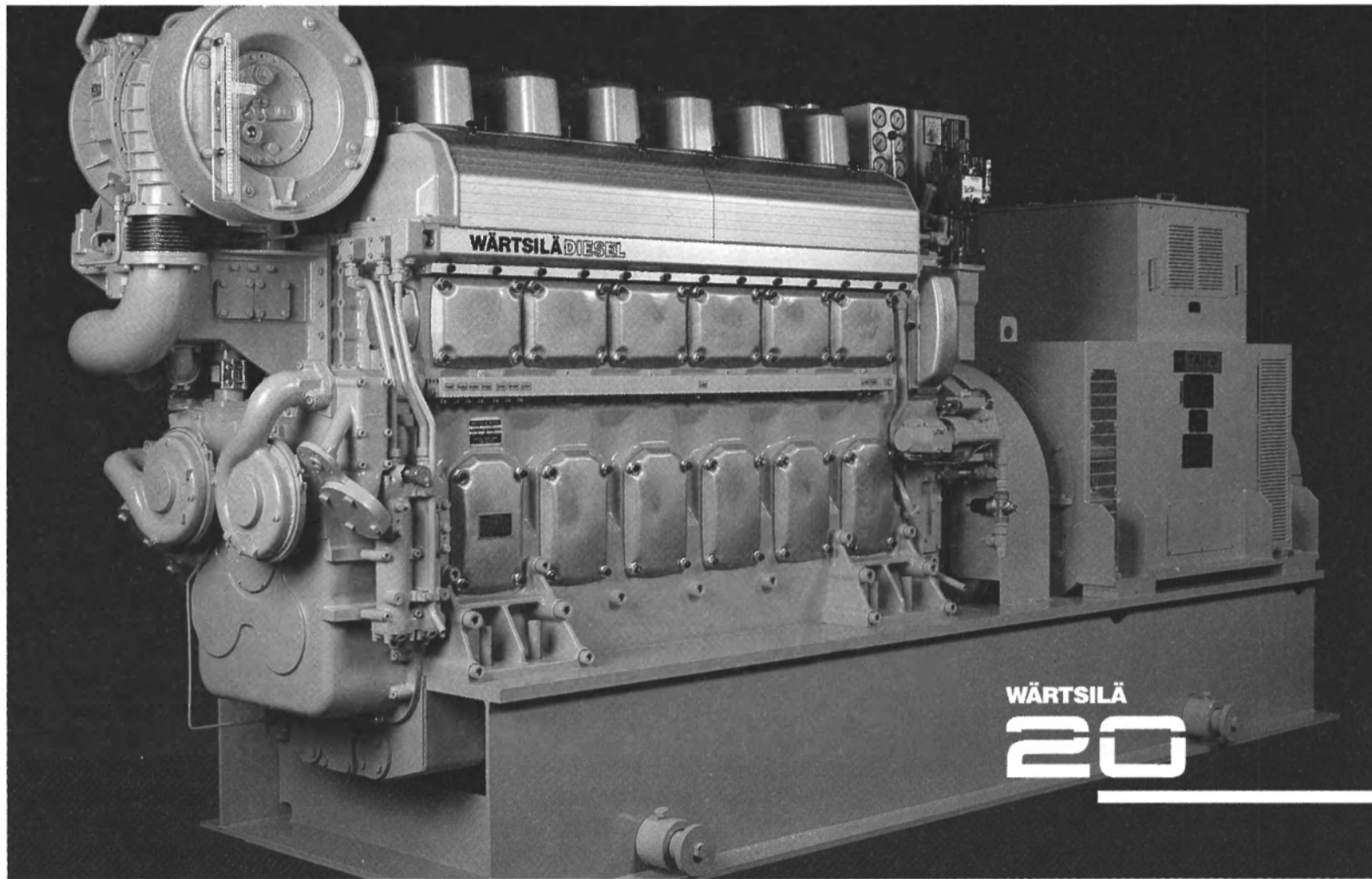
Contship Romance at sea.

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Midships section showing twelve-wide and thirteen-high container stow. Note the 1.1 m wide side shell space.

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side, affording an unrestricted view forward, should deck cranes be fitted later. The wide, U-shaped console carries STN-Atlas 9600 ARPA X and S-band radars, Anschutz gyro compass and autopilot, and remote controls for the DEBEG

GMDSS. The main DEBEG radio console is in the port aft corner of the wheelhouse and the chart table is behind the command center and carries the Trimble NT 200 GPS and DGPS navigators, Loran C and echo sounder.

A Sulzer 6RTA84C engine of 24,300 kW at 102 rpm from Dieselmotoren Vulkan fits comfortably within the short engine room. Close attention was paid to reducing hull vibration arising from machinery and propeller. The engine is fitted with a second order moment compensator at each end, as well as an axial crankshaft vibration damper and hydraulic lateral stays at cylinder head level. It turns a 24.4-ft. (7.45-m) diameter, five-bladed skewed propeller. Experience has shown that these measures have been very effective. The engine exhausts through an HDW composite oil-fired/waste heat boiler and heat from the jacket water is applied to a 25t/day Serck-Como

evaporator. Auxiliary power is provided by three 1,330-kW, 450V generators driven by Wartsila 9L20 engines at 900 rpm. An annex to the switchboard contains a 450V/6kV transformer for supply to the 1,100-kW bowthruster. The electrical power management system ensures that at least two sets are in service before the thruster can be started from the wheelhouse.

The entire plant is highly automated with comprehensive surveillance, alarms and protection, and a network embracing five process and two workstations, above cylinder head level. There are two more; on the bridge and in the ship's office. Temperatures in the reefer boxes are continually monitored, with a print-out on demand.

The BV 2700C is of quite modest capacity — the smallest of the "Compact" family of four sizes, all of Panamax beam and with the same depth, design and freeboard draft, as well as a stretched parallel mid-body. The family consists of BV 3100C, BV 3400C and BV 3700C, with 40-ft. bays in the length and TEU capacities corresponding to their type numbers. The BV 3700C is a 24-knot design, at 772.3 ft. (235.4 m) in overall length.

All of the sizes have an identical after-part module, including the deckhouse. A seven-cylinder engine can be installed within the existing engine room, but engines with eight or more cylinders, as might be required for higher speeds, would require some intrusion into the after hold, with container cells at the sides.

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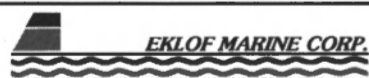


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IDB Mobile Wins Inmarsat Contract

IDB Mobile Communications, Inc. (IDB Mobile) has been awarded an Inmarsat contract to monitor signal levels and operational performance for the organization's recently launched communications satellite. IDB Mobile's Land Earth Station in Staten Island, N.Y., will monitor the new Inmarsat satellite to ensure consistency in signal level and tolerance. The new satellite provides enhanced communications service for the Atlantic Ocean Region East (AORE). The International Maritime Satellite Organization (Inmarsat) is a treaty-based consortium of 79 countries and their designates that share ownership and operation of an orbiting satellite network.

Circle 35 on Reader Service Card

CONTRACTS

PGS Places Newbuild Contract With Norwegian Yard

Petroleum Geo-Services ASA (PGS) announced plans to construct and operate two new seismic survey vessels of the Ramform design. These vessels will be the third and fourth of this design. Construction contracts have been placed with Norwegian shipyard Langsten Slip & Batbyggeri, the same yard that built the first two Ramform vessels. The two new vessels will be delivered in the first half of 1998 and PGS' total investment in these vessels, including seismic equipment, will be approximately \$160 million.

General Dynamics To Acquire Lockheed Martin Assets

General Dynamics and Lockheed Martin have announced a definitive agreement whereby General Dynamics will acquire the assets of two Lockheed Martin business units for \$450 million. The transaction has been approved by the boards of both companies, is subject to regulatory approvals, and is expected to close by the end of the year. This is General Dynamics' third acquisition since September 1995, when the company bought shipbuilder Bath Iron Works, and subsequently Teledyne Vehicle Systems in March 1996.

Circle 25 on Reader Service Card

Raytheon Wins Contract

The U.S. Navy's Space and Naval Systems Command (SPAWAR) has selected Raytheon Electronic Systems (RES) to provide High Data Rate (HDR), multi-band satellite communications terminals on submarines. The basic contract is for \$9.9 million, with options for a second prototype system and services worth a potential \$20 million.

Circle 26 on Reader Service Card

Offshore Systems To Outfit ULS

Offshore Systems has been informed by Upper Lake Shipping Corporation (ULS), St. Catharines, Ontario, that it will outfit the balance of its domestic fleet with Offshore's ECPINS-M21s.

Circle 27 on Reader Service Card

Tenneco Forms Pipeline Partnership

National Fuel Gas Supply Corporation and Tenneco Energy announced their intention to form an equal partnership to develop

the \$200 million Green Canyon Gathering System. The partnership will build, own and operate a 24-in., 153-mi. offshore pipeline to gather and transport natural gas from the Green Canyon, Ewing Bank, Mississippi Canyon, Ship Shoal, Grand Isle and South

Timbalier areas of the Outer Continental Shelf. The companies will also reportedly build a natural gas processing plant at the terminal end of the pipeline in Lafourche Parish, La., that can process 300 million-cu-ft. (MMcf/d) of gas per day.

Oceaneering Awarded Contracts

Oceaneering International, Inc. has been awarded two remotely operated vehicle (ROV) contracts from Texaco Exploration and Production, Inc. to provide long-term drill support services in the Gulf of Mexico. Two new Hydra









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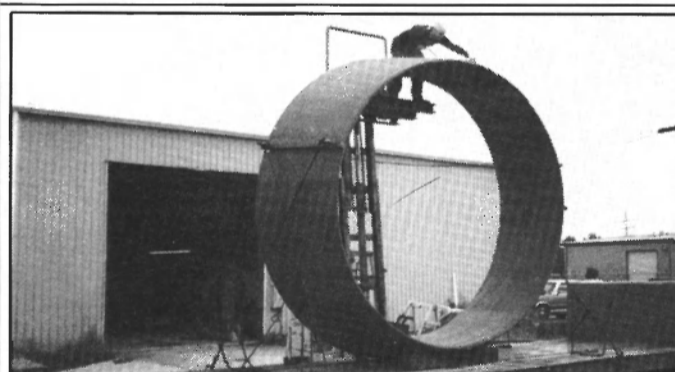
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CONTRACTS

Magnum ROVs will be supplied to the oil company for use onboard semi-submersibles *DF-96* and *Ocean Star*. The first vehicle began a one-year assignment last month to support drilling operations onboard *DR-96* in water

depths to 2,300 ft.

The second vehicle will be mobilized on *Ocean Star* this month to support a three-year drilling program.

For more information
Circle 28 on Reader Service Card

Sperry Wins Stano Contract

Sperry Marine announced a new contract to supply two VISION 2100 Integrated Bridge Systems (IBS) to Stena Lines for two vessels being built at AESA Puerto Real in Spain. The RoPax vessels to be fit-

ted with the company's IBS units are newbuilds 78 and 79.

Circle 29 on Reader Service Card

Ukrainian Yard Chooses FORAN System

A new license for FORAN — a CAD/CAM/CAE system for ship design and production — has been granted to Chernomorsky Sudostroitelni Zavod (Black Sea Shipbuilding Yard) by Sener.

Atlantic Marine Awards

Contract To Gorman Supplier

IMG, Rostock, Germany, has obtained a contract from Atlantic Marine, Inc., Jacksonville, Fla., to supply a micro panel line which includes special gantry for the pressing and welding of stiffeners to the panel. The line is scheduled to be installed in the second quarter of 1997. In addition to panel lines, IMG supplies robotic profile cutting systems, profile bending systems and other specialized shipyard equipment.

Circle 30 on Reader Service Card

CSI Wins Contract To Refurbish Cruise Ship Interior

Custom Ship Interiors, Inc. (CSI) has been awarded a contract to refurbish interior portions of cruise ship *Awani Dream II*, formerly *Cunard Countess*. All work is scheduled to take place while the ship sails from Southwest Marine in Terminal Island, Calif., to Jakarta, Indonesia. Directions in Design will assist in the creation of themed areas, and overall design elements. DeJong & Lebet has been named the naval architecture firm for the effort.

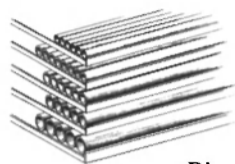
Circle 31 on Reader Service Card

Colie & Associates Performs Work For Celebrity Cruises

James P. Colie & Associates recently carried out its first fabrication and installation project for Celebrity Cruises. Colie's in-house fabrication shop built several display cases, fixtures, and sales counters for installation aboard *Horizon*. A new slat wall and adjustable shelving were also installed as part of the project.

This year, the company also completed a refurbishment of 22 public restrooms on Princess Cruises' *Sky Princess*, as well as in-service work on Holland America's *Ryndam*.

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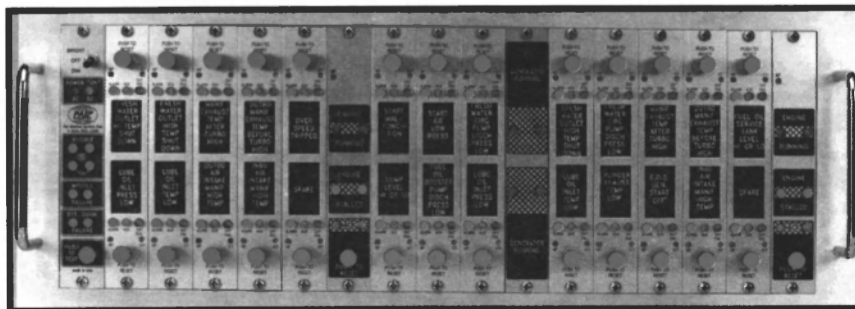
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COMMUNICATIONS UPDATE

AT&T Mobile Launches Marine Services

Global communications giant well positioned to solidify fragmented marketplace

Selecting a single-source communications provider simplified

The ability to communicate — clearly, immediately and dependably — has become paramount to profitable modern-day ocean shipping. The proliferation of Information Technology has infiltrated even conservative shipowners' strategic planning, and the issue of improving overall communication efficiency and effectiveness is on the "front burner" in most every organization.

As shipowners are forced to more thoroughly explore a relatively new area of technology — and evaluate how improved data, voice, and other types of communications

can positively impact the bottom line — the matter is further complicated by the rapidly increasing number of communication service providers and service plans.

AT&T's entrance into the maritime satellite service market should offer reassurance to shipowners, both small and large. AT&T — the world's largest communication services provider — has not only a long history, but a proven ability to deliver comprehensive communications solutions tailored to its customers' needs.

Although AT&T introduced high-frequency radiotelephone service more than 60 years ago, and

has offered shore-to-ship service since 1993, the company was prohibited from offering ship-to-shore service until February 23, 1996, when the Federal Communications Commission granted AT&T's petition to compete in the market. AT&T launched its service just six weeks after the removal of a long-standing federal regulation that barred the company from offering such services.

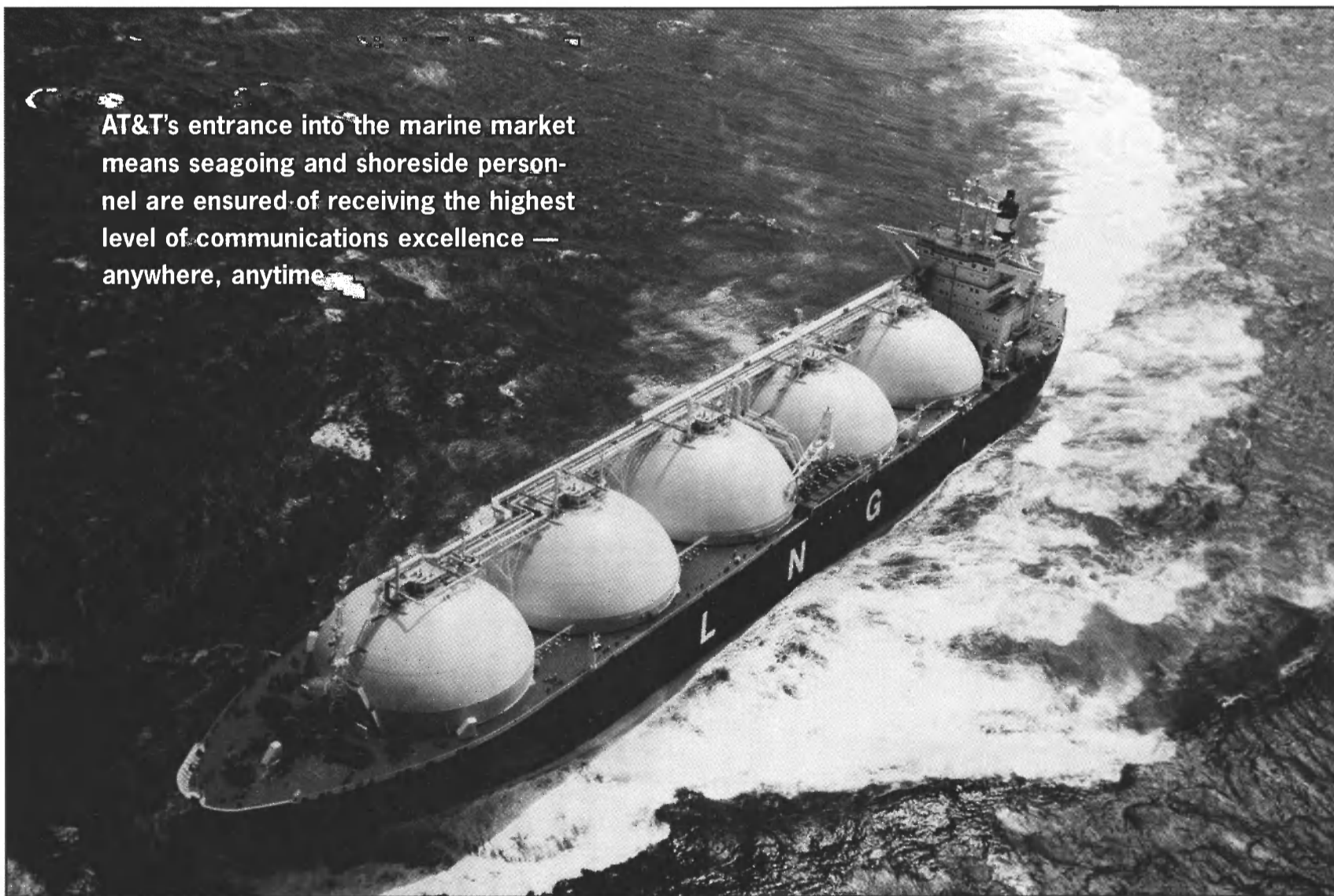
The "Wired" Ship

"Wiring" ships obviously presents unique operational and logistic challenges as opposed to traditional terrestrial communication

setups. The mere fact that a ship is constantly on the move is challenge enough. But these challenges are not impossibilities, and the rapid evolution of technological solutions has led to a seemingly nonstop new offering of satellite communication products and services. Ship-to-shore, shore-to-ship, and ship-to-ship communication is becoming more economical and accessible daily.

AT&T's offering to the maritime community includes direct-dialed, operator-handled, and person-to-person calls and Telex through Inmarsat A, B, and M systems.

AT&T's entrance into the marine market means seagoing and shoreside personnel are ensured of receiving the highest level of communications excellence — anywhere, anytime.



COMMUNICATIONS UPDATE



Whether in the middle of an ocean or the middle of a river, reliable communication is paramount to operational safety and efficiency.

"Now we can offer our customers full two-way mobile satellite service," said Mario Persico, product manager for AT&T's Mobile Satellite Services group. "Our prices are competitive, we'll do our own billing, and the service we will deliver to customers will make our offer very attractive."

The advantages of such seamless communications are illustrated in extreme emergency situations, as well as the mundane situations, such as the daily transfer of voice, fax and data.

Technology is driving the acceptance and implementation of satellite communication services, as equipment and antennas become much smaller and lighter, while allowing for faster transmission times and, ultimately, a reduction in cost-per-minute prices.

Shipowners' and seafarers' communications equipment and service are particularly crucial considering the nature of the ocean shipping business. Secure, reliable communication is the only means to keep a ship at sea from isolation.

The AT&T service was introduced for customers requiring anywhere, anytime global communications between mobile locations not served by land-line telephone service.

Innovative Uses

Keeping a ship in service is the first key to profitability. Today's advanced communications can greatly aid to that end, providing ship personnel an immediate and authoritative link when problems arise. Say, for example, a tanker develops engine problems en route. The master and chief engineer can immediately report the problem to shoreside personnel, and gain insight and technical advice in solving the matter. In a scenario that would require the ship to stop at the nearest repair port, onboard communications could be utilized to prepare spare part and service engineers at the port so the job could start as soon as the ship arrived. The concept of land-based ship management nearly presupposes the existence of fast, effective, and efficient communications. To this end, AT&T has developed an array of products for the maritime industry. (See chart to the right)

Services To Meet Any Need

The maritime industry is demanding, and AT&T offers a comprehensive package of communication plans. Refer to the chart on the right to determine which AT&T plan best fits your company's needs.

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For more information about AT&T Mobile Satellite Services, please call 1-800-392-2067.

AT&T is wherever you are

AT&T Mobile Satellite Services Product Portfolio

High Seas Radiotelephone Service (Manual)

Allows ship-to-shore radiotelephone calling and global access. Three AT&T coast stations. Manual IOC operator call completion. Ship to U.S. and international locations, requiring a marine single-sideband radio.

Usage Cost: \$4.98/min. - 3-minute minimum

High Seas Direct®

(Automatic Radiotelephone Service)

Same as High Seas except handset and modem are required, which are installed into the marine single-sideband radio. Permits radiotelephone calling without the need for operator assistance.

Initial Cost: \$999 (Handset & Modem)

Usage: \$3.50/min. - 1-minute minimum

Shore-to-Ship Inmarsat A, B, M

Permits U.S.-to-ship calling over Inmarsat A, B, M services. Customer dials 011+871, 872, 873, or 874 + customer terminal number to complete the call.

Usage Cost: Standard A is \$9.75/min; Standard B, M are \$5.50/min. Billing in 30-second initial period and 6-second each additional period where available, 1-minute periods where sub-minute billing not available. Discount program available

Ship-to-Shore Inmarsat A, B, M

Permits ship-to-U.S. and ship-to-international calling over Inmarsat A, B, M. Customer dials earth station I.D., call type prefix, and called party number.

Usage Cost: Standard A is \$9.30/min. peak, \$8.50/min. off-peak; Standard B, M is \$5.50/min. peak and off-peak.

Volume discounts inclusive in tariff

Ship-to-Ship Inmarsat A, B, M

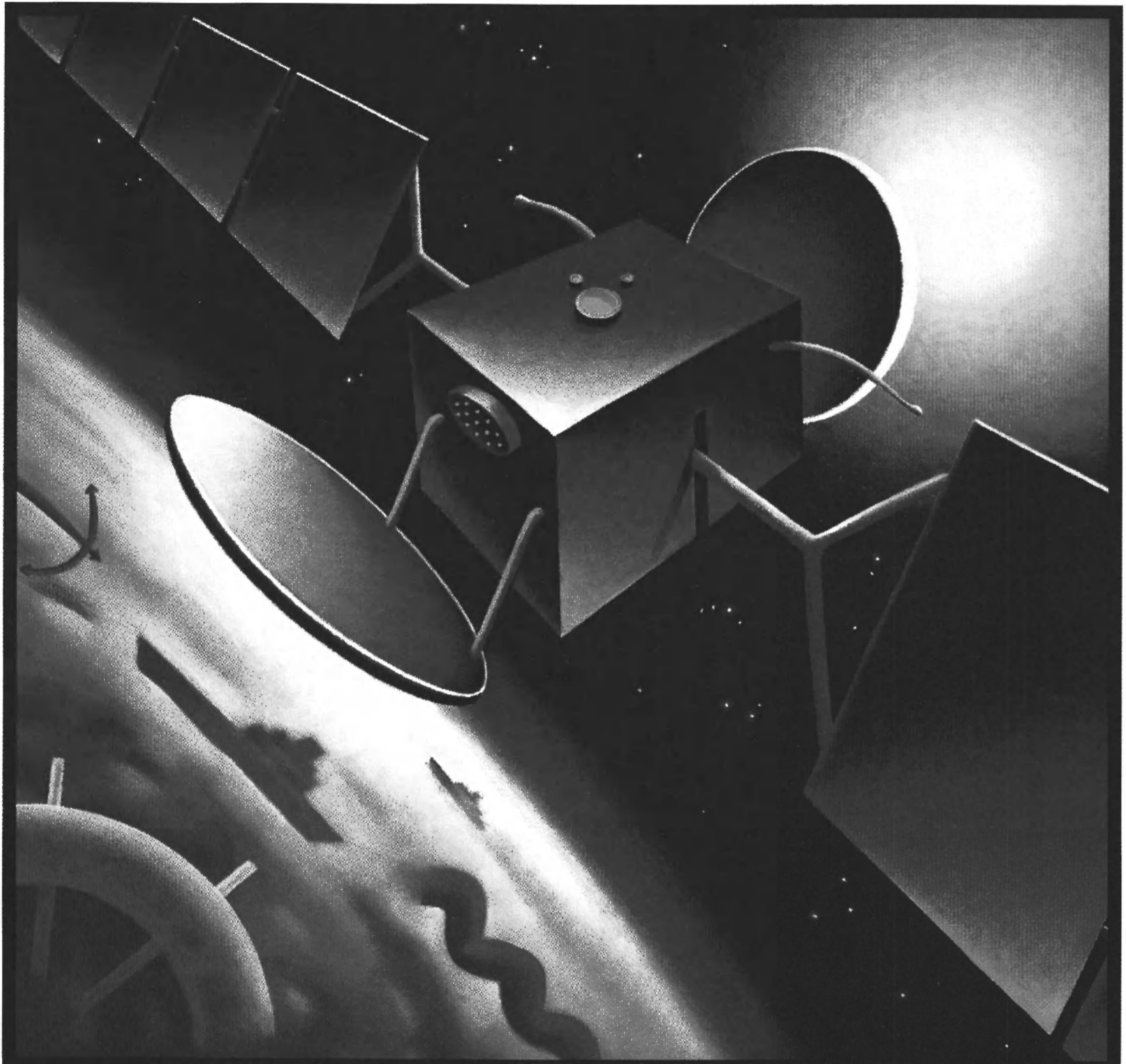
Permits ship-to-ship calling over Inmarsat A, B, M. Call is placed using two satellite links.

Usage Cost: Calls are rated at two times the ship-to-shore rate.

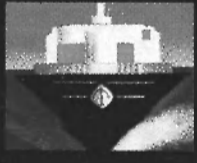
Ship-to-Shore Telex over Inmarsat A, B

Permits telex traffic over Inmarsat A, B.

Usage Cost: Base rates for call terminating in the U.S.: Standard A, \$3.85/min.; Standard B, \$3.50/min. Calls terminating overseas may incur an additional per-minute charge.



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Largest Cruise Ship Ever Built Visits New York

by Bridget Murphy, associate editor

Call it fate, or perhaps just *Destiny*, but the financial future of the cruise sector seems to be directly linked to the construction of bigger and glitzier vessels. Carnival Cruise Lines — no stranger to this profit-enhancing strategy, arguably ranking as the most successful cruise line in operation — is currently in the process of introducing the newest addition to its fleet to the public.

At 101,000 gross tons, *Carnival Destiny* has replaced P&O's *Sun Princess*, which debuted in 1995, as the world's largest passenger ship — an honor which did not go unnoticed by New Yorkers as the ship docked at Pier 88 of the New York Marine Cruise Terminal from November 11 to 13.

Occupying the slip next to USS *Intrepid*, *Destiny* refused to be swallowed up in the shadows of the powerful monument to American maritime history. "We didn't intend to build the biggest ship.

We intended the build the best," quipped Carnival Tour Guide **Roxanne Steele** as she led travel agents, journalists, maritime personnel and other invited guests through what seemed to be a floating city-state.

With the appeal of Las Vegas and the availability of amenities associated with posh Broadway hotels, *Destiny* will predictably be a financial coup for the cruise line as it moves into the fourth quarter of 1996. Starting its inaugural season in late November after visits to Boston and Norfolk, the ship will be deployed from Miami to the eastern and western Caribbean.

While *Destiny's* interior favors the design trend towards busy and modern art, a modest gold-plated plaque mounted on the ship's Promenade or "Destiny Way," attests to Carnival's adherence to another cruise sector trend — Italian vessel construction. *Destiny* was contracted out to

Fincantieri — a trait shared by the two premier vessels that will launch the Disney cruise venture in 1998. The group's Monfalcone yard completed the task on time, and with "innovation and flair," as called for in its corporate mission.

According to Lloyd's Register, which classed *Destiny*, the ship is the first cruise vessel to comply with all of the amendments to the Safety of Life At Sea (SOLAS) Convention of 1992. This includes safer positioning of lifeboats, emergency exit routes with low location lighting and improved structural fire protection standards.

While full smoke detection and automatic sprinkler systems have been installed in all accommodation areas, by Carnival's policy, smoking is permitted in all passenger cabins — a point of contention for a large number of agents touring the ship in New York. Many of these same people, however, were impressed with the ship's generous cabin design, with 60 percent of the staterooms featuring ocean views, and a little more than half of these featuring private balconies large enough for two to sit out on.

The ship's diesel-electric propulsion system, supplied by ABB, employs a central generating arrangement with six ABB generators driven by six Sulzer diesel engines, giving a service speed of 22.5 knots. Two ABB 20 MVA synchronous propulsion motors, driving twin screws and controllable pitch propellers, operate at variable speeds, being supplied through cycloconverters.

Although no new ship orders have been recently confirmed, Carnival has stated that it will base its ordering activity on the success of its products. If the stir created in New York from *Destiny's* visit is any indication of product approval, more orders may be just around the corner.

Carnival Destiny Particulars

Length o.a.	893.03 ft. (272.2 m)
Width	116.4 ft. (35.48 m)
Draft	26.9 ft. (8.2 m)
Weight	101,353 gt
Speed	22.5 kn
Classification	Lloyd's Register @100A
	. Passenger Ship, IWS, LMC, UMS, part HT steel
Passenger capacity	3,360

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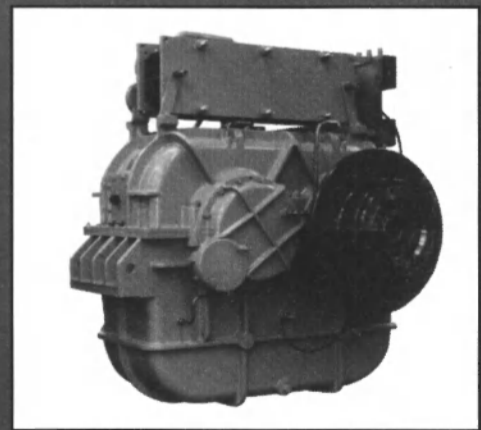
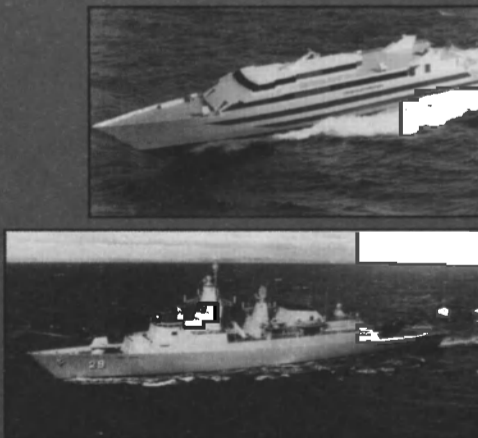


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Circle 215 on Reader Service Card

U.K. Standby Vessels Set For Winter Deployment

by Carol Fulford & Andy Smith,
contributing editors

U.K. stands by its vessels

This winter is expected to bring the positioning of three standby towing vessels at strategic locations around the U.K. for operation by Her Majesty's Coast Guard. This projection follows recommendations made by Lord **Donaldson** in his report on the stranding and loss of *Braer* and the ship's entire crude oil cargo.

Although there has been much discussion and indeed close cooperation between the British and Dutch governments over the question of standby vessels, within the EC, only the U.K. is protected by anchor handling/towing supply (AHTS) ships rather than the dedicated salvage tugs. It is claimed that AHTS has greater operational effectiveness and versatility and is

more economical to operate due to lower manning levels. Specialist salvage crews can be sent out to ships by helicopter if circumstances require.

The latest vessel to enter service in the emergency towing vessel (ETV) role is the 222-ft. (67.7-m), Singapore-built *Far Minara*, introduced to cover the stormy Western Approaches. Howard Smith Salvage, contracted by the British Coast Guard Agency to provide the service, positioned the 12,240-hp vessel at Falmouth in October. Equipped with four Bergen diesels, the vessel is a more powerful version of the 10,000-hp *Far Turbot*, which the company and its Aberdeen-based partner Farstad Shipping operates from Dover, close to the busy sea lanes of the English Channel.

Far Minara, a highly maneuverable vessel with twin CP propellers in nozzles, two bowthrusters and a stern thruster, called at Howard Smith's homeport of Hull earlier this month to take on specialized salvage equipment. The vessel will be under the command of officers who have already gained experience in emergency operations on *Far Turbot*.

John Rutherford, chief executive of Howard Smith,

said: "This additional contract shows the U.K. has found the right combination of established salvage skills and powerful but versatile vessels to fill the ETV role. The last two winters have given the Coast Guard and ourselves valuable experience in various exercises, as well as real emergencies to prove that the AHTS type of vessel meets the requirement."

Howard Smith's salvage manager, Capt. **Mark Hoddinott**, added: "We are fortunate to have been able to get an even more powerful AHTS with 127 tons continuous bollard pull for the planned third ETV station. The extra power and wide area of operation will give us the opportunity to explore even further what these vessels are able to achieve."

Capt. **Hoddinott** also explained to *MR/EN* the primary reasons behind the British government's decision to opt for this type of vessel. "In addition to the obvious essential of abundant bollard pull, an AHTS is incomparably better than the salvage tug in terms of maneuverability — crucial when attempting to get a line onboard a casualty in open sea. The large aft deck offers immense versatility in the subsidiary but important roles such as pollution response and survivor recovery. For example, *Far Turbot* — stationed on the cross channel ferry routes — has a hospital and inside accommodation for 210 survivors and many more on deck," he said. "At Howard Smith we thoroughly agree with the government's policy in this respect." During our discussions with Capt. **Hoddinott**, he advised that *Far*

Minara was at that very moment standing by an incapacitated German coaster in a Force 10 northwesterly 15 miles off Plymouth. Laden with Irish stone, the 3,000-dwt vessel had water in its fuel.

The other standby vessel to take up its operational position is the 12,720-bhp *Portosalvo*, which arrived on station at Stornoway, Isle of Lewis, off the northwest coast of Scotland, on October 3. The vessel will reportedly serve at Stornoway until March 1997. Operated by the CorySmitWijsmuller (CSW) consortium, *Portosalvo*, with a bollard pull of 147 tons, will provide emergency coverage for Northwest Scotland, including the Minches. The British Coast Guard's contract with CSW is a renewal of a similar contract carried out last year, when the vessel employed was 127-ton bollard pull *Smit Lloyd Safe*.

The six months during which *Portosalvo* will be on station are those forecasted with the worst weather, when emergency situations are likely to occur. Although *Portosalvo* is managed by CSW — an Anglo-Dutch consortium of three leading towage and salvage companies, Cory Towage, of the U.K.; Smit Tak, of the Netherlands; and Wijsmuller Salvage, also of the Netherlands — the vessel, like its counterparts to the south and west, is under the operational direction of the British Coast Guard, immediately available to respond to that agency's requirements.

At the time *Portosalvo* took up station the ship was registered in



Pictured in foreground is *Far Turbot*, which cruises the English Channel and is equipped with a hospital and inside accommodations for 210.



British standby vessel *Portosalvo* features a bollard pull of 147 tons.

EUROPEAN UPDATE

Italy, but will reportedly be reflagged under the British 'Red Ensign', an operation scheduled for completion in November. The ship's British crew of 12 includes two cadet/students undertaking the Merchant Navy training course at Lewis Castle College. This prac-

tical experience will complement the education they have received ashore.

The 227 ft. (69.3 m) long *Portosalvo* is powered by four B&W Alpha diesel engines, each developing 3,180 bhp, driving twin CP propellers in Kort nozzles. The

vessel can operate on any combination of engines allowing maximum fuel economy, and with all four engines in use at continuous service rating, achieves a speed of 15.4 knots. Maneuverability is enhanced by two bowthrusters — one of 6.5 tons and one of five tons

— and a five-ton stern thruster. Control of the main engines, steering gear and all thrusters is effected from fixed positions at the forward and aft ends of the wheelhouse, and there is also a portable joystick controller that can be used anywhere on the bridge, and overrides the fixed controls. The tug master is thus able to control operations from the most suitable position for the particular task being undertaken.

Built by Appledore Shipyard as *Wimpey Seahorse*, the vessel is classed by Lloyd's Register and equipped to FiFi1 standards. The vessel's towing equipment includes a Brattvaag three drum waterfall type winch, each drum with a pull of 260 tons and a brake holding power of 400 tons. The main towing drum has a capacity of 1,225 yds. (1,150 m) of wire, 70 mm in diameter.

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Circle 265 on Reader Service Card

Italian yard invests to win six vessel contract

On October 15, the keel for the first of a series of six 5,200-dwt chemical parcel tankers was laid at the Industrie Navali Meccaniche Affini (INMA) yard in La Spezia, Italy. In order to fulfill the contract, placed by Societa Finanziaria Marittima (part of the Stolt Parcel Tankers Group), the state-backed yard has been compelled to invest in new machinery.

Having a length of 315 ft. (96 m), breadth of 53 ft. (16.2 m) and cargo tank capacity of 190,700-cu-ft. (5,400-cu.-m.), this vessel and those to follow are intended primarily for northwest European trade and will be classed for operation in first year ice up to 2 ft. (600 mm) thick. The objectives of the design were to provide cost-effective and environmentally-friendly chemical parcel tanker service, with flexible and reliable cargo arrangements giving efficient and safe handling. Another prime parameter was maintenance of cargo quality during loading, transportation and discharge; all with a machinery and equipment layout that would enable routine maintenance and repair to be carried out with ships in normal service. In addition, the vessels were designed to maintain service speeds of 12.5 knots, and attain 13.5 knots at the design dwt of 4,300 tons (at 19.6-ft. draft), although the maximum dwt

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Circle 267 on Reader Service Card

EUROPEAN UPDATE

at minimum free board is 5,200 tons (21-ft. draft).

To achieve the speed requirements, the vessels will be powered diesel-electrically with each having four generator sets producing total outputs of around 3,600 kW, allowing an anticipated 2,800 kW of shaft power for propulsion purposes. Two variable speed drives, normally operating in unison, will provide a stepless variation from full speed ahead to full speed astern. Exact details of the generators have not yet been released, but according to the yard, the individual units are to be sized to cater, in the most economical manner, to seven designated operating conditions which include full speed and service speed and maneuvering, together with three in port load demands — idle, full cargo pumping and tank washing.

Considerable thought has been given to the cargo arrangements which are designed to accommodate all materials listed in the IMO IBC code, with the exceptions of carbon disul-

phide, hydrogen peroxide and molten sulphur. The vessels will also be equipped to carry any grade of refined petroleum product. Each of the 16 tanks is fitted with its own hydraulically-driven, 200-cu-m/hr. deepwell pump, handling cargo with specific gravities between .7 and 2.2.

All cargo operations, including control of pumps and valves, monitoring of cargo tanks, ballast and stripping, tank cleaning, bilge, fuel, nitrogen, dehumidified air and vapor control will be remotely operated and monitored as part of an integrated system from a dedicated cargo control room. Although a full specification of the bridge fitout has not been announced, the vessels will be classed to a host of DNV and RINA notations including W1 - one person bridge operation in ocean and coastal waters. The vessels will therefore be equipped with integrated bridge systems and main propulsion, 500-kW bowthrusters and rudders, controlled from the central position and bridge wings. All actions will be recorded on an inte-

grated computer. The final selection of electronics is being made to ensure compliance with GMDSS A3 standard. Two sets of combined anchor windlasses/winches will also be capable of being controlled from three positions on the bridge in addition to local operation.

Use of a well-insulated, prefabricated system will provide a high standard of accommodation for 14 passengers in 10 single cabins and two doubles, all equipped with toilet and shower facilities. An additional day room is included in the quarters of captain and chief engineer. The duty mess room for six is augmented by a separate day room/mess for both officers and crew, and a conference room is incorporated at bridge level.

Completion of the first vessel is scheduled for December 1997, followed at four monthly intervals by the next two. The three remaining vessels in the series are subject to an option. In order to meet these delivery requirements INMA has installed a new underwater plasma

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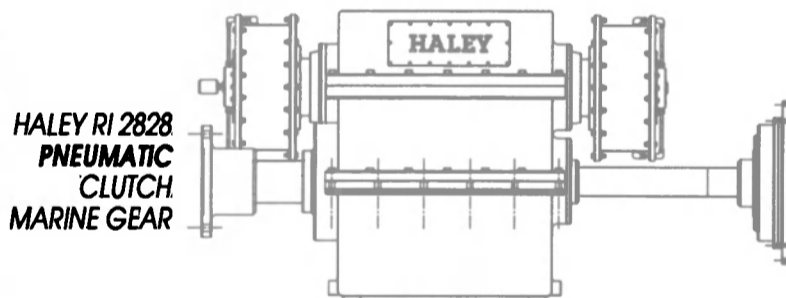
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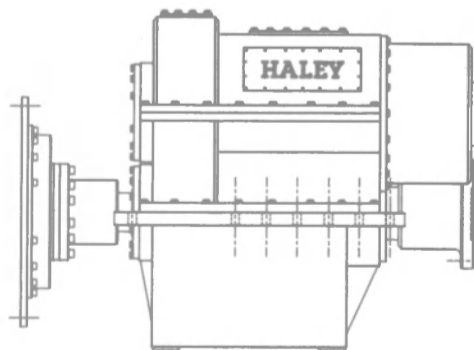
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Circle 249 on Reader Service Card

EUROPEAN UPDATE

cutting line and other covered production facilities on a .7-acre (2,800-sq-m.) area of reclaimed land. Such facilities have already eased the construction of two 339.5-ft. (103.5-m) Aquastrada fast ferries currently building to a Rodriguez design for Corsica Ferries.

This parcel tanker contract is part of a considerable program of fleet renewal by the Stolt-

Nielsen Group which additionally involves yards in Spain, Denmark, France and Japan. The largest of the new vessels will be four (with an option for two more) 22,460-dwt chemical tankers to be built at Astilleros Espanoles' Sestao and Juliana yards in Spain. Double-hulled, these ships will be 533 ft. (162.6 m) long, equipped with 36 stainless steel tanks and

powered by diesel-electric power. Delivery of the first vessel is anticipated for fall 1998.

Orkney accepts flexible ferry

After lengthy controversy, which delayed the project at various stages, the sparsely inhabited Orkney Isles north of Scotland are now being serviced by a brand new ferry, built in southwest Scotland by the Ailsa-Troon yard.

Named *Graemsay*, the 55.7 x 20-ft. (17 x 6.1-m), all-steel vessel has been sized to fit into small ports between Stromness and Hoy (Moness) and Graemsay in Scapa Flow. The ship therefore has a somewhat cut-off appearance, and according to Ailsa-Troon Contracts Director **Tom Jenkins**, "fits like a shoe horn" at its ports of call.

Built to withstand the often poor weather conditions of the region, *Graemsay* will carry passengers, livestock, sand, gravel, bottled gas and fish farm pallets as normal cargo along with farm vehicles and essential food supplies when needed.

A surprisingly spacious forward cabin can accommodate up to 73 passengers who enter and exit via the generously proportioned aft deck. Three bulwark access gates are provided for passengers boarding the ferry from pier steps, while livestock and vehicles are brought aboard via a stern ramp.

Cargo carrying space has been maximized, according to Mr. **Jenkins**, with a 25 percent increase achieved over the original specification. Vessel speed has also been increased to 10.3 knots from earlier lower estimates. Power is derived from twin, 300-hp Mermaid Magnum turbocharged diesels developing 2,500 rpm. These drive FP, 900-mm, full-bladed propellers with 75-mm diameter shaft via Twin Disc MG5091 reverse gears with a ratio of approximately 3:1.

Maneuverability has been enhanced by the installation of a Kort bowthruster.

A Palfinger crane, mounted amidships at wheelhouse level, keeps the deck uncluttered and provides efficient cargo handling when transferring farm materials and cattle boxes directly from the pier. The crane has been carefully mounted so as not to obstruct the view from the wheelhouse which has raked windows forward.

Navigational aids include two Furuno 1931 flush-mounted radars (one at the helm and one in the overhead console), a Furuno FCV 6X7 echo sounder and GP70 Furuno navigator (again flush mounted overhead). Two VHF's, a CB radio and an Ibuki horn have also been incorporated.

Lighting, to cope with dark winter days, has been given high priority. A Seamatz searchlight and five Aqua Signal floodlights have been installed, two forward, two aft and another to cover the crane during loading/unloading operations.



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EUROPEAN UPDATE

Norwegians aid Maltese with RoRo contract

Further details on the three vessel order clinched by Malta Shipbuilding for ferry operator Gozo Channel Line (see *MR/EN* August 1996 European Update), have revealed a substantial Norwegian involvement, particularly on the part of Ulstein Trading.

The double-ended enclosed ferries, destined to replace aging tonnage which provides daily service between the islands of Malta and Gozo, represent a highly valued contract for the yard whose reduced workforce has been involved in

diversification projects such as crane building and container manufacture.

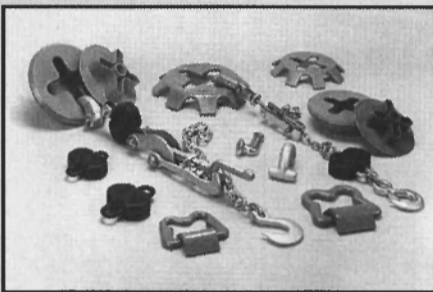
Although being built at the Malta facility, the actual construction process will be performed with a seven-person consulting team from Ulstein. Ulstein is also supplying all materials for the ferries, from steel to curtains, and several subsidiary companies will be contributing to a package of equipment which represents approximately 40 percent of the contract value. The design of the vessels is also Scandinavian — from the drawing board of the Dwinger Marineconsult part of the Carl Bro Group in Denmark. Measuring 262.4 x 59.04 ft. (80 x 18 m) and accommodating 140 cars and 800 pas-

sengers, each ferry will have a diesel-electric plant powering four Ulstein azimuthing thrusters for a 13-knot service speed on the 25-min. crossing. Ulstein Bergen KRGB6 diesels are being employed as generator drives, Ulstein Marine Electronics is supplying switchboards and remote control systems, and Ulstein Bratvaag will be providing the machinery.

Although not tendering such an extensive package, Ulstein liaised with the Maltese yard in the early 1980s, supplying designs and equipment for two UT 704 supply ships built for China.

For more information on Ulstein
Circle 21 on Reader Service Card

Peck & Hale Celebrates 50th Anniversary



Pictured is the Peck & Hale line of deck sockets and chain tiedowns (military and government).

Peck & Hale Inc., a supplier of cargo securing systems for the defense and transportation industries, celebrates its 50th anniversary this month. The company — who focuses primarily on the maritime and defense industries — offers cargo securing systems for general cargo, partial container, fully cellular, RoRo or multi-purpose vessels as well as Adjust-A-Matic wire and high shock chain tiedowns for securing palletized ammunition, vehicles and aircraft on U.S. Navy supply, support and amphibious assault ships.

According to Peck & Hale representatives, the changes in the way containers are carried — vessel sizes and container stack heights — have called for improved lashing systems. The defense buildup of supply support ships has required innovative solutions to securing all types of cargo. The top three issues driving the company's product/service development are: the requirement for cargo securing manuals as outlined in IMO MSC/CIR C.745; the consolidation of mega ports with deliveries to other areas by feeder vessels; and the new containers curing product standards being developed by ISO/TC 104/SC 1/WG2.

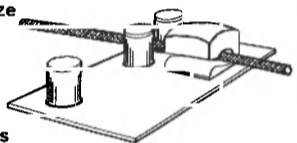
New products at Peck & Hale include the Lock-Matic multi-functional T/L and multi-mode lashing systems. The company expects continued growth in Far East markets, combined with worldwide transportation and delivery options. Peck & Hale introduced its first specialized Adjust-A-Matic cable lashing system in 1946. Today, more than 9,000 commercial and naval ships are reportedly outfitted with Peck & Hale equipment.

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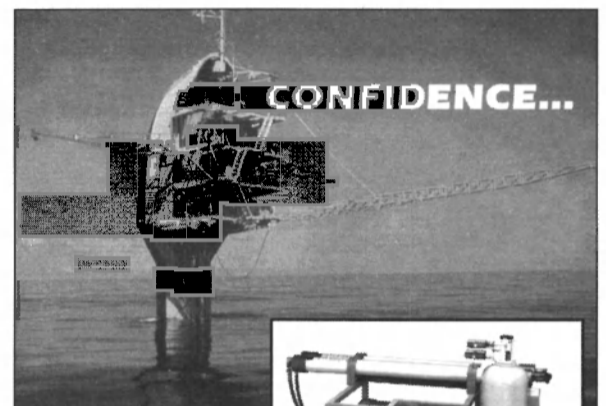
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Circle 231 on Reader Service Card

Tsuneishi Wins Contract To Build 125,000-DWT Shuttle Tanker

by Alan Thorpe, contributing editor



A long awaited decision has been made on the contract to build a 125,000-dwt North Sea shuttle tanker for Stena Umland for a long-term charter to Esso. The contract has been awarded to Tsuneishi Shipbuilding at Numakuma. Meanwhile, Tsuneishi is currently looking at an overseas expansion program involving a shipbuilding yard, Kamaman Heavy Industries, in Malaysia.

The project is a joint venture with Tsuneishi and the Teregganu governments holding 30 percent stakes, with 40 percent owned by local Malaysian shipping interests.

Hong Kong's Orient Overseas Container Line (OOCL) has been busy on the charter market giving contracts to four Panamanian companies for long-term charters on four 1,560-TEU containerships to be built at Japan's Imabari Shipbuilding.

Japan's Hitachi Zosen has also been busy in the newbuilding market with orders for two woodchip carriers from Japan's NYK Line, a

258,000-dwt VLCC from Mitsui OSK Lines and additional Panamax bulk carriers from Nichimen Corp. Meanwhile, Sasebo Heavy Industries has won contracts for three Panamax bulk carriers — two from Hong Kong's Worldwide Shipping and one from Gowill Co., also based in Hong Kong. Other orders for Panamax bulk carriers have been won by Shin Kurushima Dockyard from Daiichi Chuo Kisen, and by Sumitomo Heavy Industries from Mitsui & Co. In regards to the large tanker market, Mitsubishi Heavy Industries (MHI) has won an order from a consortium of companies including Runciman (U.K.) and Golden Ocean Tankers (Vancouver) for a 305,000-dwt ULCC.

South Korean Business Takes Off

Newbuilding activities in South Korea have taken off during the past two months: Samsung Heavy Industries (SHI) has won a contract from Australia's Woodside Offshore

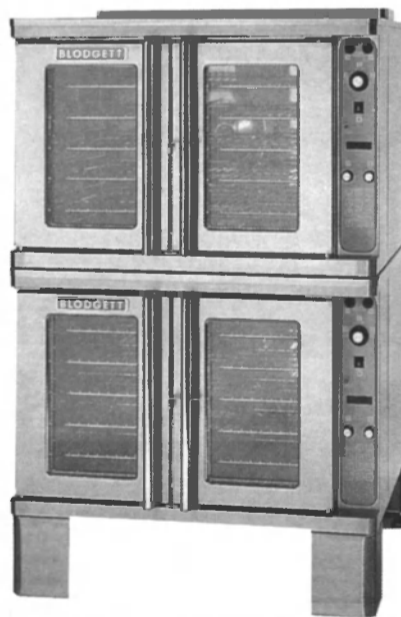
Petroleum to build a FPSO for use in the Timor Sea. The oil storage capacity will be 200,000-cu.-m. This latest offshore order for SHI comes shortly after a contract from Conoco for a double-hulled drillship for delivery during 1998. SHI has also come to a basic agreement with U.S. oil major Chevron for the construction of two VLCCs, which would be the first international order for large tankers won by this shipyard.

Currently, Samsung is building a 308,000-dwt ULCC for Yukong Line; and both Hyundai Heavy Industries (HHI) and Daewoo Heavy Industries (DHI) have won orders from Malaysian International Shipping Corp. (MISC). HHI has an order for two 2,700-TEU vessels, and DHI has won a \$68 million contract to build two 1,200-TEU containerships, both due for delivery in 1998. HHI is also looking to expand its VLCC orderbook with negotiations currently underway with Hyundai

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FAR EAST UPDATE

Merchant Marine for four such ships, and with Kuwait Oil Tanker Co. (KOTC) for two VLCCs.

HHI has increased its orderbook for large containerships with three more 4,300-TEU vessels from Denmark's AP Moller. The yard already has four such vessels on

order. Daedong Shipbuilding has won an order for an additional Panamaxbulk carrier from Four Seasons Overseas to be built at the recently-completed Chinhae Shipyard.

South Korean industrial conglomerate Hanbo Group is consid-

ering investing \$1 billion in a shipbuilding and repair facility in the Philippines. This was announced by the Philippine Board of Investments (BoI), a government agency tasked with promoting the Philippines as an investment side and providing tax incentives to pri-

ority industries. According to Bol's Korean desk officer **Angie Cayas**, Hanbo is in the process of looking for an ideal site for the labor intensive project which is expected to generate 20,000 jobs.

Classification society Germanischer Lloyd (GL) has opened an office in Busan, South Korea. The new office is headed by **Heinz Wagner**, who is GL's principal surveyor in South Korea.

Hopes for new orders by Taiwan's China Ship Building Corp. (CSBC) hang on current negotiations with local boxship owner Yangming Marine for a series of six 4,800 to 5,000-TEU vessels, scheduled for delivery in 1998.

Mainland China's China Ocean Shipping Co. (COSCO) has been busy in the newbuilding market with orders for two Panamax and three 47,500-dwt bulk carriers, all from Hudong Shipyard, Shanghai. Bangkok's Myanmar Shipping has also been active in mainland China with an order for two 12,000-dwt general cargo vessels from Xingang Shipyard, Tianjing. Singapore's Steamers Maritime has increased its order for 746-TEU gear containerships from Jinland Shipyard from four vessels to six.

During the year ending September, Thailand's Unithai has drydocked of 39 vessels for owners from Greece, Japan, Poland, China, Norway, Cyprus, the U.S. and Thailand. Included in this work was the yard's first cargo tank blasting and coatings contract, the re-activation of a Greek OBO from dry bulk to a tanker, and the drydocking of the Royal Thai Navy's largest frigate. Meanwhile, the yard's expansion program continues with the completion of a new 3,500-sq.-m steel fabrication shop, which will be fully operational by the end of this year.

A 5,990-ton lifting capacity synchrolift has been ordered by Indonesia's PT Batamas Jala Nusantara, a division of Sanwa Singapore Agencies.

Since opening a new 984 x 203 x 39-ft. (300 x 62 x 11.9-m) graving dock during March 1995, Guangzhou Wenchong Shipyard, located at Guangzhou near Hong Kong, has successfully moved into the international market. This year the yard has repaired 93 ships, of which only 10 percent were originally built in China. The largest was Zodiac Maritime's 201,227-dwt bulk carrier *Brazil*

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FAR EAST UPDATE

Star, which was in the yard in April. Another highlight has been repair contracts for nearly 20 ships from Greek shipowner Niarchos. Singapore's Star Cruises fleet is expanding with the purchase of *Golden Princess*, which is currently on a long-term charter to P&O Cruises and most recently has been cruising the U.S. West Coast. The vessel will be delivered to Star sometime this month, following its last voyage with P&O. *Golden Princess* will then be refitted, most likely in Singapore, and renamed *SuperStar Capricorn*.

Approximately 200 ships have been drydocked in Singapore Technologies Shipbuilding & Engineering (STS&E) since April 1994. The yard has also seen a 10 percent increase during the first six months of this year, compared with the first six months of 1995.

Singapore-based engineering company Nortrans Engineering Group has won a contract to convert the 1971-built, 70,459-dwt tanker *Cove Endeavour*, which has been laid up in Mobile since March 1995, to a FPSO for use off the Indian coast by Hitech Drilling Services, India — the main contractor to Vaalco Energy India.

Singapore's Singmarine Dockyard and the Black Sea Shipping Co. (Blasco) of Odessa, have settled their dispute over damage to cruise liner *Belorussiya* in 1992. Blasco initially issued a writ against the yard for \$60 million after the 13,251-grt ship toppled over when a floating dock sank with the liner inside it. Sources close to the settlement confirmed an agreement had been reached which was acceptable to both parties. The final sum for Blasco was reportedly somewhat less than the \$60 million claimed.

Due to a shift in the center of its main market, Sweden's Kvaerner Ship's Equipment (KSE) will move its corporate headquarters from Singapore to Oslo. The new headquarters will be headed by **Roar Engang** (president) and his team will include: **Audun Roeneid**, senior vice president, Finance; **Sigurd Gude**, executive vice president, Spares and After Sales Service; and **Sverker Moeller**, executive vice president, Sales & Marketing. Meanwhile, **Terge Gjos** will stay on as vice president, Marketing, in Gothenburg, Sweden, working from KSE's office in Tranby on the outskirts of Oslo.

Madras-based ship repair yard Chokhani International is in the

process of acquiring a floating dock for \$14 million from Israel Shipyards. The reason behind the sale is a lack of ship repair business in Israel and the loss of tender for building patrol boats for the Israeli Navy. For example Zim Israel opts to repair its vessels in

Greece. If the deal goes through, the new dock will complement the yard's existing tow floating docks, the largest measuring 623 x 105 ft. (190 x 32 m) with a lifting capacity of 14,000 tons. Karachi Shipyard & Engineering Works has been asked by a Pakistan Governmental

body to give information on its financial position before a decision on privatization.

Benazir Bhutto, Pakistan's Prime Minister, discussed privatization of KSEW with the Hyundai and Daewoo groups in South Korea.



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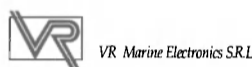
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 **HYUNDAI**
HEAVY INDUSTRIES CO., LTD.

Circle 23E on Reader Service Card



Shipbuilder: ..Samsung Heavy Industries Co.
Ship Name:Berge Hugin
Ship Type:Shuttle Tanker
Owner/Operator: ..Bergesen D.Y. AS/Statoil

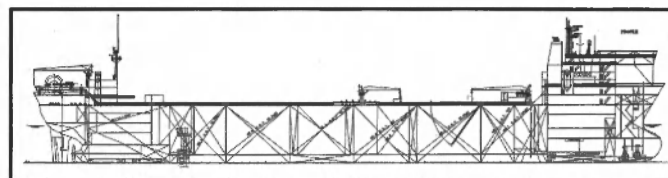
Berge Hugin is the first of two 103,000-dwt self-propelled, multi-purpose shuttle tankers built by Kojie Shipyard of Samsung Heavy Industries Co., Ltd for Statoil. Scheduled to have been delivered to its owner on November 30, 1996, the vessel will go into service in the oil fields of the North Sea.

Compared with most shuttle tankers equipped with the submerged turret loading (STL) system, *Berge Hugin*, by design, is multi-purposeful in that it applies not only the submerged turret loading/production system (STL/STP) for the future installation of produc-

tion, but also the stern loading and discharging system (SLDS) for crude oil loading operation from offshore installations such as subsurface loading stations (UKLOS), floating storage and offloading (FSO) units, floating production storage and offloading (FPSO) units and articulated loading platforms (ALP).

Accommodations such as a navigation bridge and two electric power plant rooms (forward machinery space) are located in the fore part, while a separate compartment (aft machinery space) which includes converter rooms to drive propulsion equipment and cargo/ballast pumps, is located in the aft part. Great emphasis has been placed on ecological aspects as well as on structural and human safety. Such safety features include: fully double-hulled/bottomed designs for all cargo oil tanks as well as for all other oil tanks, including oil sludge tanks; two longitudinal bulkheads inside the cargo tanks to minimize crude oil vaporation during loading operations; a vapor emission control system; gas sampling for ballast tanks; four-stroke engines to reduce NOx emissions; two independent electric power generating plants in separate compartments to reserve redundancy in the event of a power failure; and tin-free paint to protect marine life.

Berge Hugin's electric power generating sys-



tem, which consists of four sets of main diesel generators installed in two completely independent compartments, supplies electricity to major electrically-driven equipment, including a 12,000-kW set of synchronous propulsion motors that drive a single FPP, four sets of cargo oil pumps, and two sets of azimuth thrusters. An integrated automation system (IAS) is designed to function from the wheelhouse. This computerized system is incorporated with the dynamic positioning system, including propulsion motor control and thruster control. To maintain each of the functions when in operation, workstations are arranged in the cargo control station, aft control station and engine room station.

Berge Hugin Main Particulars

Designer: Samsung Heavy Industries Co.
Flag: Norwegian
Classification: DNV
Contract Date: ... November 15, 1994
Float Out Date: July 31, 1996
Delivery Date: ... November 30, 1996
Length o.a.: Apprx. 253 m
Length b.p.: 233 m
Breadth, Molded: 42 m
Depth, Molded To Main Deck: ... 23.2 m
Gross Tonnage: 66,538 tons
Deadweight (Design): Apprx. 95,500 M.T.
Deadweight (Scantling): Apprx. 103,000 M.T.
Draft (Design): 15 m
Draft (Scantling): 15.9 m
Speed, Service: ... Apprx. 13.9 knots
Cargo Capacity: 101,400 cu. m.
Bunkers: 2,800 cu. m.
Water Ballast: 47,500 cu. m.
Fuel Consumption: ... 58 M.T./per day
% Of High Tensile Steel: Apprx. 40 percent

Main Propulsion: ... ABB Cycloconverter
Thrusters: ... (2) Tunnel Bow Thrusters
Generators: ... (4) Diesel Generators, 7,070 hp each
Motor Starters: ABB, KTE
Engine Control(s) Integrated Automation System,
..... Two Engine Control Rooms
Steering Control(s) .Autopilot, Dynamic Positioning System,
..... Propulsion Motor Controller
Shafting: .Single Solid Intermediate And Propeller Shaft,
..... Sleeve Coupling, Wet Keyless Type
Coatings: Self-Polishing A/F For Hull, Tar Free
..... Epoxy For Water Ballast Tanks
VHF radio: JRC
SSB Radio: JRC
Radar: Norcontrol
Compass: Anschutz
GPS: Trimble
Autopilot: Anschutz
Cargo Control System: Simrad
Ballast Control System: Simrad

Shipbuilder:Stocznia
.....Szczecinska
Vessel Name:Engen Rainbow
Vessel Type:Tanker
Owner/Operator:Engen,
..... Unicorn Lines Joint Venture

Engen Rainbow is a B573 tanker that has been adapted for the transportation of chemical cargoes, IMO two and three products and crude oil. The ship's cargo tank compartment is divided into 22 tanks, four equipped for IMO two cargoes. The cargo system, which consists of submerged, hydraulically driven pumps, is designed to ensure ship service flexibility.

Measuring systems of gas concentration in spaces adjacent to cargo

and ballast tanks, remote cargo level and temperature measuring systems, an autonomous cargo high level alarm system as well as pressure measuring in cargo tanks and cargo system pipelines are provided on board the ship. All loading and unloading operations are remotely controlled and monitored from the CCR. The ship is powered by a Sulzer 6RTA52U main engine, with a power output of 8500 kW. On the basis of this design, the shipyard has signed contracts for building the ships for Shell Australia, the owner making the highest requirements regarding cargo transporting safety, environment protection as well as crew safety. Contracts were also signed to build similar ships

for owners from the Republic of South Africa and New Zealand.

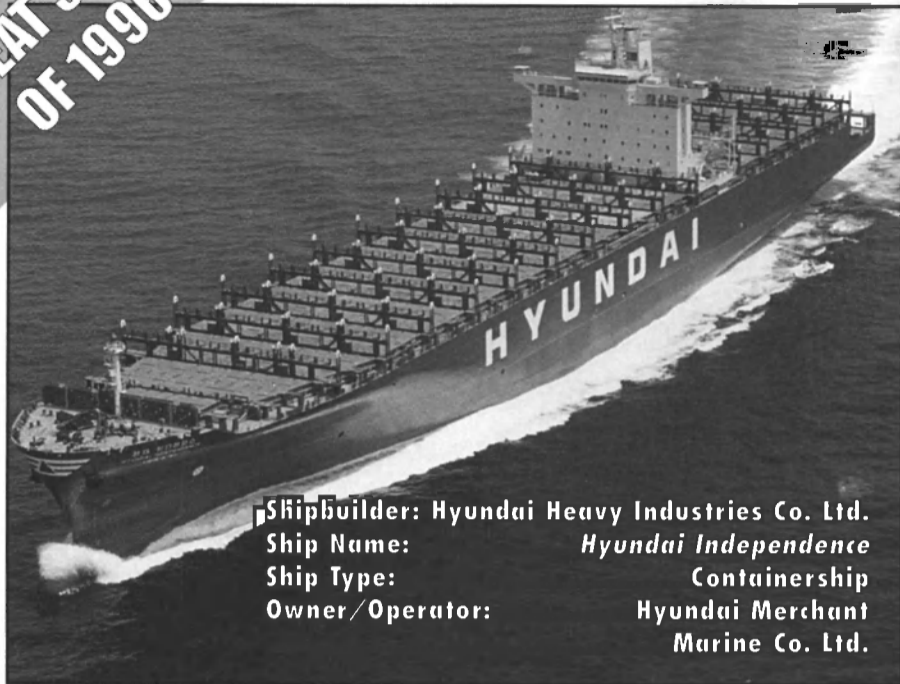
Engen Rainbow Main Particulars

Designer: Stocznia Szczecinska
Flag: St. Vincent and Grenadines
Classification: Lloyd's Register
Contract Date: September 30, 1994
Delivery Date: November 15, 1996
Length o.a.: 183 m
Length b.p.: 172 m
Breadth, Molded: 32.2 m
Depth, Molded To Main Deck: 17.6 m
Gross Tonnage: 28,027 tons
Deadweight (Design): 39,500 tons
Draft (Design): 11 m
Speed, Service: 14.5 knots
Main Propulsion: Sulzer6RTA52U License
Steering Gear: Ulstein Frydenbo A.S.



Bow Thruster: ABB Zamech Ltd.
Boilers: Stocznia Gdanska S.A.
Cargo pumps: Frank Mohn A.S.
Cranes & Windlasses: Towimor

GREAT SHIPS
OF 1996



Shipbuilder: Hyundai Heavy Industries Co. Ltd.
Ship Name: Hyundai Independence
Ship Type: Containership
Owner/Operator: Hyundai Merchant Marine Co. Ltd.

Hyundai Independence is the first in a series of seven identical containerships being built at Hyundai Heavy Industries Co., Ltd. (HHI) for Hyundai Merchant Marine (HMM). The vessel was delivered on May 30, and is currently employed in HMM's Far East-PSW service.

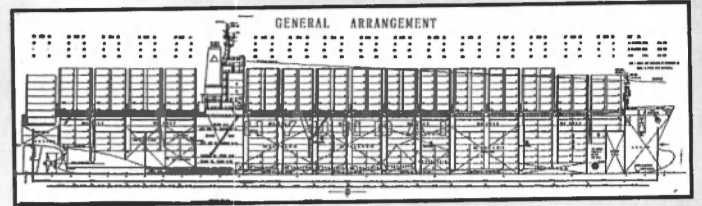
The Hyundai containership features a wider beam for more stability when loading and unloading and is designed to provide superior propulsion efficiency against drafts during the loading process. The vessel has seven holds, five (20-ft. container/22 bay) of which are arranged in front of the engine room and two (20-ft. container/8 bay) are

arranged behind the engine room. Six air changes per hour and water spray nozzles are provided to the No. 2 hold in which dangerous cargoes of SOLAS classes 1 through 9 can be carried.

The vessel is a "girderless" type and can carry the maximum 14 rows in holds and 16 rows on decks of containers. Total TEU capacity for *Hyundai Independence* is 5,551, of which 2,603 TEU is carried in holds and 2,948 TEU on deck.

Pontoon-type hatch covers seal the seven holds. Each hatch cover is made up of three panels, with maximum panel weights kept below 40 tons to suit port cranes. The vessel is

designed to carry 20-ft., 40-ft. and 45-ft., containers. Cargo holds under 1B and 4B hatch are allotted exclusively for 20-ft. container loading by locating slim cell guide. *Hyundai Independence* is powered by a Hyundai-B&W 12K 90MC-C main engine developing 74,520 bhp at 104 rpm which enables it to sail at a service speed of 25.6 knots. Electric power is supplied by four main diesel generators with an output of 1,775 kW at 720 rpm. The Hyundai containership is outfitted with both optimum section profile of rudder and tip-raked propeller to reduce possible cavitation. For durability of outside shell, self-polishing paint ICCP is applied to the vessel, plus an anode system was provided in the water ballast tank.



Hyundai Independence Main Particulars

Designer:	Hyundai Heavy Industries Co., Ltd
Flag:	Panama
Classification:	DNV
Contract Date:	December 6, 1993
Float Out Date:	March 22, 1996
Delivery Date:	May 30, 1996
Length o.a.:	274.6 m
Length b.p.:	263 m
Breadth, Molded:	40 m
Depth, Molded To Main Deck:	24.2 m
Gross Tonnage:	64,054 tons
Lightweight:	22,876 tons
Deadweight (Design):	51,120 tons
Deadweight (Scantling):	68,537 tons
Draft (Design):	12 m
Draft (Scantling):	14 m
Speed, Service:	25.8 kots (at design draft)
Water Ballast:	14,300 cu. m.
% Of High Tensile Steel:	46.6 percent
Main Engines Manufacturer:	Hyundai B&W 12k90MC-C
Propellers:	HHI, FPP
Thrusters:	Kawasaki Heavy Industries Ltd.
Generator Engines:	HHI, B&W Holeyby 4 Sets
Thruster Engines:	Kawasaki Heavy Industries Ltd.
Generators:	HHI
Emergency Generator:	Stamford
Auxiliary Boiler:	Kang Rim
Exh. Gas Economizer:	Kang Rim
Anti-Heeling System:	Framo
Engine Control(s):	Hyundai Electrical Engineering Co. Ltd.
Steering Control(s):	Tong Myung Heavy Ind. Co.
Bearings:	JMT
VHF & SSB Radios, GPS:	JRC
Radar:	Atlas
Autopilot:	TKC
Collision Avoidance:	Atlas
Satnav:	JRC
Lifeboats:	Hyundai-Precision Ind. Co.
Liferafts:	Samgong Industrial Co. Ltd.
Davits:	Samgong Industrial Co. Ltd.
Fire Fighting System:	Namyang
Waste Management System:	Hit-Norcon

Shipbuilder:Odense Steel Shipyard
Ship name:Regina Maersk
Ship type:Containership
Owner/Operator:A.P. Moller/Maersk Line

Odense Steel Shipyard delivered *Regina Maersk*, a 6,000-TEU (including 700 reefer TEU) ship to Maersk Line.

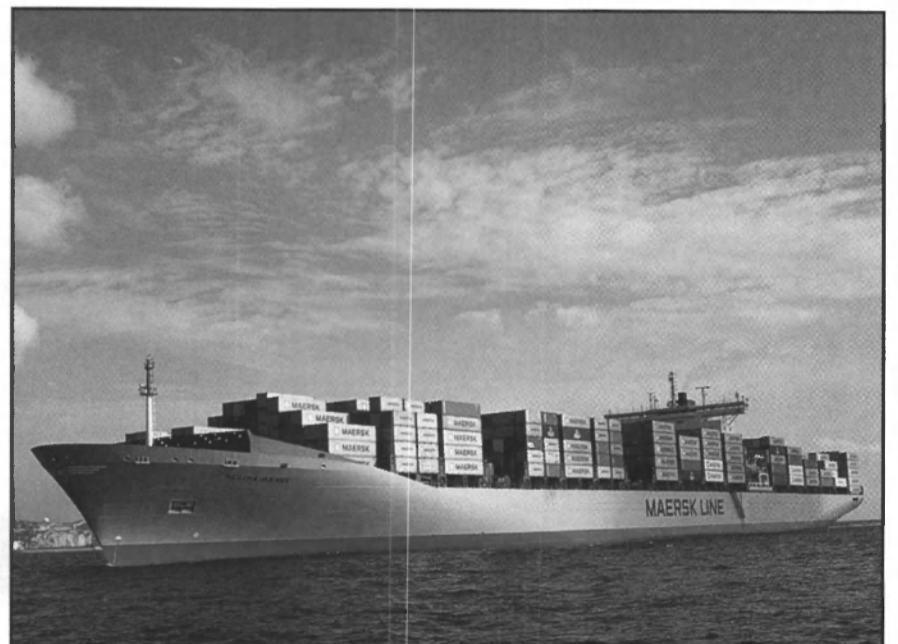
The vessel, originally designed to hold 4,800 TEU, measures 318.2 x 42.8 m, with a deadweight of 65,610 tons. It is powered by a MAN B&W 12K90MC engine, developing 74,640 bhp which powers the vessel to a speed of 25 knots. When delivered in January, the ship boasted the most powerful main engine in the world. The *Regina Maersk's* consumption is 194.5 tons per day at 85 percent MCR. The advanced vessel is automated with the latest in moni-

toring and advanced computer systems, allowing for operation of the world's largest container carrier by a crew of only 15 persons.

The ship features advanced equipment for navigation and communication installed in a one-person operated closed bridge spanning the total breadth of the ship. More than 8,000 data signals continuously monitor the engine rooms and cargo holds using a novel advanced integrated computer system. The central components of the system are installed in the engine control room and can be controlled remotely from the navigation bridge and the cargo control room. Patented lashing bridges make quick and safe lashing of deck containers possible.

Regina Maersk Main Particulars

Length, o.a.:318.2 m



Length, b.p.:302.2 m
Breadth:42.8 m
Depth:24.1 m
Draft:12.2 m
Deadweight:65,610 tons
Main engine:MAN B&W 12K90MC



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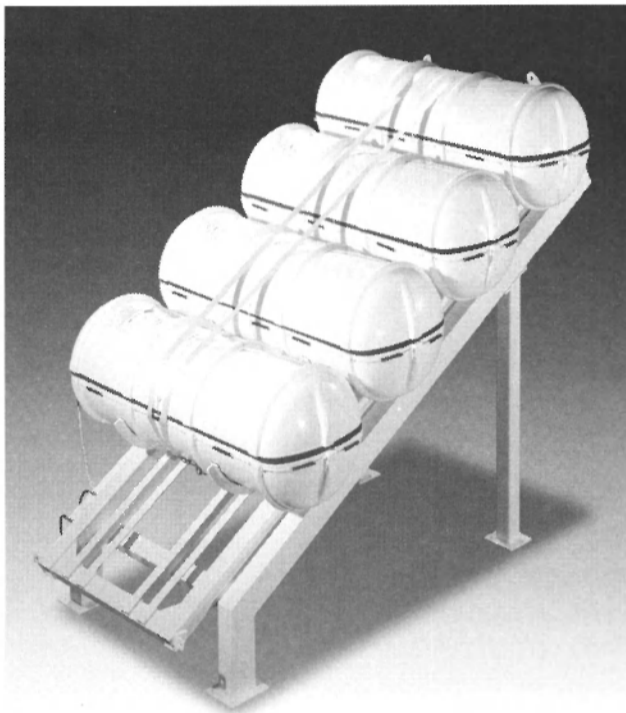
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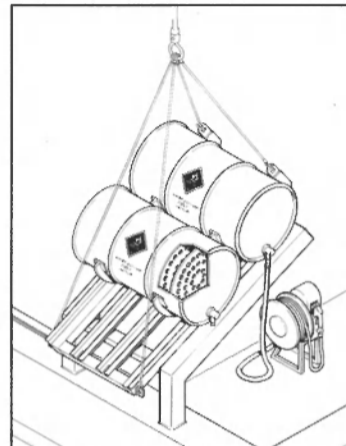
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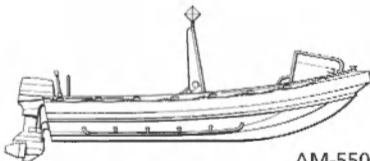
EVAC-U8
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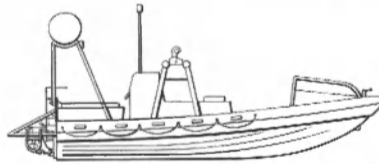
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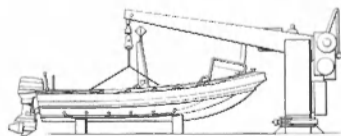


AM-700

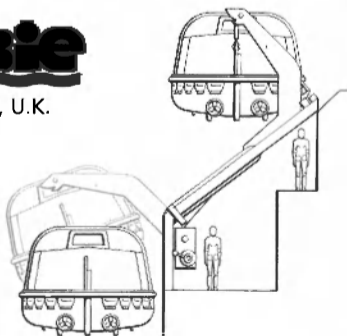
WelinLambie

Brierley Hill, West Midlands, England, U.K.

Davits



Rescue Boat Davit

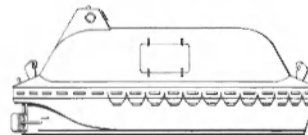


Overhead Gravity Trackway Davit

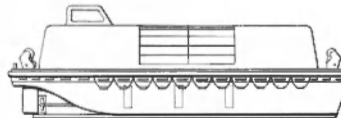


Peterlee, County Durham, England, U.K.

Lifeboats



Phoenix

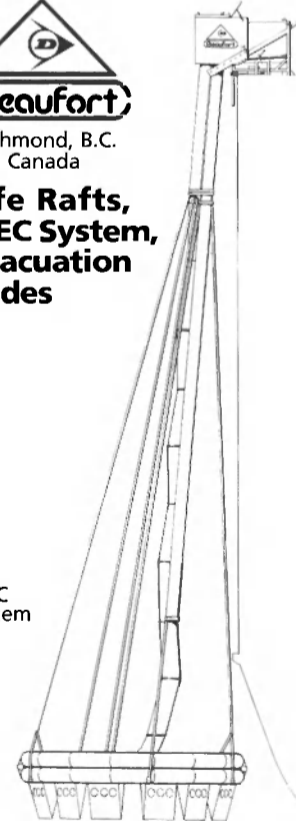


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**GREAT SHIPS
OF 1996**



Shipbuilder: **Astilleros Espanoles**
Ship Name: **Sirius I**
Ship Type: **Product Carrier**
Owner/Operator: **Tomasos Brothers**

The first oil product carrier designed and built in Europe according to Lloyd's Register (LR) ShipRight procedures was recently delivered. *Sirius I* is a 46,500-dwt, double-hulled oil/product carrier built for non-restricted service in world traffic.

It is powered by a 6S50 MC MAN B&W diesel engine rated 11,640 bhp at 127 rpm. This arrangement enables a speed of 14.8 knots, fully loaded at 90 percent MCR.

Built by Astilleros Espanoles for Tomasos Brothers, the vessel measures 182.5 m overall, with a 17.3-m depth, and a 12.3-m scantling draft. Flying the Bahamian flag, the ship is owned by Emerald Star Shipping.

Eight cargo tanks, plus two slop tanks give a total capacity of 53,200-cu.-m. Every cargo and slop tank has its own submerged pump, permitting the cargo to be unloaded in 15 hours. Cargo and slop tanks are coated with a phenolic coating scheme, allowing the ship to carry clean products such as MTBE and pentane.

Sirius I has obtained notation SDA, FDA and CM of LR. ShipRight procedures guarantee that standards of safety, quality and reliability are applied during the design, construction and operating life of a ship's hull. ShipRight comprises eight procedures and the notations it carries in the Register of Ships are proof of both owner and builder commitment to the ongoing care and safety of the ship.

Structural Design Assessment (SDA) is a detailed analysis of a ship's structural response to applied static and dynamic loadings. This mandatory procedure enables the derivation of an optimum distribution of material, and also an appropriate level of scantlings in both primary and secondary structures. It is applied, in addition to the normal plan approval requirement, to the structural arrangement of all new oil tankers over 190 m, and to other ships where the ship type, size and structural configuration demand it.

Fatigue Design Assessment (FDA) is supported by an enhanced direct calculation methodology using several data, i.e. sheer against the reversals to failure, supplemented with large scale models of actual ship structural details. In using FDA, a ship designer or plan approval surveyor can reportedly easily modify the scantlings and arrangements in order to improve the fatigue life.

Construction Monitoring (CM) is to ensure that all recommendations and specifications arising from the SDA and FDA procedures are consolidated and implemented during construction. It is undertaken in addition to the usual surveying tasks carried out during construction and comprises careful controls on the alignment, fit-up and welding of the structural details identified as critical.

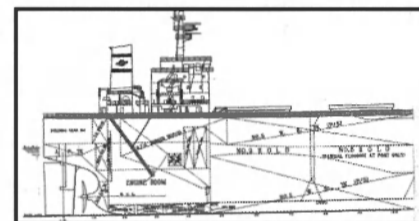
Sirius I Main Particulars

Length, o.a.: 182.5 m
 Depth: 17.3 m
 Draft: 12.25 m
 Flag: Bahamian
 Main Engine: MAN B&W
 Classification: Lloyd's Register
 Total Capacity: 53,200 cu. m.

Shipbuilder: **Daewoo Heavy Industries Ltd**
Ship Name: **SG Prosperity**
Ship Type: **Bulk Carrier**
Owner/Operator: **Ever Fortune Ltd./**
 **Shougang Concord International**

Daewoo Heavy Industries Ltd delivered the 211,320-dwt bulk carrier *SG Prosperity* to Shougang Concord International Transport Ltd. on September 21, 1996. There are two sisterships which are currently under construction. *SG Prosperity* contains nine cargo holds which are strengthened for heavy cargoes and grab discharge. The holds are suitable for loading pattern where Nos. 2, 4, 6 and 8 may be empty, and mainly carrying coal and iron ore.

Five pairs of water ballast tanks interconnected between top side and bottom tanks divided at center line by duct keel are arranged. The portion of high-tensile steel used in construction is approximately 69 percent, with hold frames thickened as per IACS unified requirement with mild steel, and protection within the holds (excluding tank top) comprising two coats of 250 micron bleached tar epoxy. Main propulsion power is provided by a Hanjung B&W 7S70MC main engine with MCR of 23,950 bhp at 81.5 rpm, and NCR of 20,360 bhp at 77.2 rpm (85 percent MCR), which provides a service speed of 14.5 knots. Electrical power is derived from three sets of 680-kW diesel alternators, and steam is supplied from a 2,500 kg/h oil fired auxiliary boiler and a 1,600 kg/h exhaust gas economizer. A Nor-control bridge control system, JRC satellite navigation system and two radars are installed in front center of the wheelhouse. The computer supplied by MECA handles loading calculation. A five-tier deckhouse provides accommodations for a complement of 29 persons.



SG Prosperity Main Particulars

Classification: DNV
 Length o.a.: 312 m
 Length b.p.: 300 m
 Breadth, Molded: 50 m
 Depth, Molded To Main Deck: 25.3 m
 Gross Tonnage: 108,083 tons
 Displacement: 236,770 tons
 Lightweight: 25,450 tons
 Deadweight (Design): 207,084 tons
 Deadweight (Scantling): 211,320 tons
 Draft (Design): 18 m
 Draft (Scantling): 18.3 m
 Speed, Service: 14.5 knots
 Fuel Consumption: 60.6 tons
 Main Engine: Hanjung MAN B&W
 Auxiliary Engines: Hyundai Heavy Ind.
 Propellers: Hyundai Heavy Ind. Co. Ltd,
 Fixed Pitch, NiAlBr
 Emergency Generator: Samsung
 Heavy Ind. Co. Ltd
 Motor Starters: HHI
 Engine Control(s): Norcontrol

Steering Control(s): Dong Myung Heavy Ind.
 Deck Machinery: Kocks, Electro-Hydraulic
 Shafting: Daewoo
 Bearings: JMT
 Coatings: Dongju-Hempel
 VHF Radio: JRC
 Radar: JRC
 Compass: Magnetic; John Lilley &
 Gillie; Gyro; Tokimec
 GPS: JRC
 Autopilot: Tokimec
 Satnav: JRC
 Pumps: Naniwa
 Heat Exchangers: Daewoo
 Air Conditioning: Hi-Pres
 Lifeboats: Hyundai Precision & Ind.
 Liferafts: Viking Lifesaving Equipment
 Davits: Dongwoo Mach. & Engineering Co. Ltd.
 Fire Fighting System: Namyang
 Waste Management System: Kang Kim Ind. Co.
 Ballast Control System: Samsung Co. Ltd.
 Computers: Loading Computer

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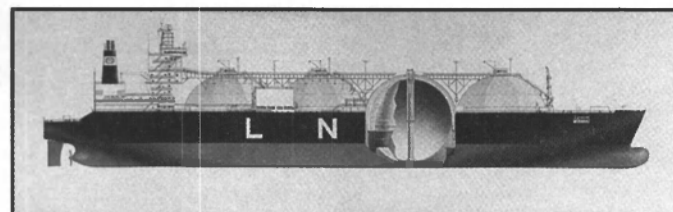
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Mubaraz Main Particulars

Length, o.a.:	290 m
Length, b.p.:	275 m
Breadth:	48.1 m
Draft, design:	11.3 m
Deadweight (summer):	72,950 tons
Paints:	International
Steel Plates:	Rautarukki, Finland
Aluminium Material For Lgn Tanks:	Alcoa
Tank Insulation:	Panel System, Panels Of Polystyrene, Stud-Bolt Fixed;
	Kaefar Eristystekniikka Oy
Insulation Of Cargo Piping:	Kaefar Eristystekniikka Oy
Cargo & Machinery Control:	Lyngso Marine
Steering Gear:	Brown Brothers
Chains:	Chain Cable For Anchors
Anchors:	Two Hall-Type Anchors; ABB
Deck Machinery:	Norwinch
Reversible Geared Steam Turbines:	Mitsubishi Heavy Industries Ltd.; High Pressure Turbine And Low Pressure Turbine With Internal Astern Turbine Main Condenser, Reduction Gear, Thrust Bearing Mcr 29600 Kw 85 Rpm
Auxiliary Condenser:	Senior Thermal Engineering Ltd.
Boilers:	Mitsubishi Heavy Industries
Stand-By Diesel Generator:	Wartsila Vasa Br32d
Turbine Generators:	Mitsubishi Heavy Industries
Propeller:	Lips BV
Steam Piping:	Power-Piping
Cargo Pumps:	Ebara International Corporation
Spray Pumps:	Ebara International Corporation
High-Duty Compressor:	Atlas Copco
High-Duty Heater:	Kvaerner Ship Equipment A/S
Shell And Tube Type Heat Exchanger:	Kvaerner Ship Equipment A/S
Cargo Valves:	Westad
Lifeboats:	Nor-Safe
Liferafts:	Viking
Electric Cables:	Nokia
Integrated Navigation And Control System:	Sperry Marine
Autopilot:	Sperry Marine
Radars:	Sperry 3400 M Rascar Superscan ARPA
Gyro Compass:	Sperry Mk-37 Digital Gyro Compasses
Magnetic Compass:	Cassen & Plath Magnetic Compass
Rate Of Turn Indicator:	Sperry Marine
Speed Indicators:	Sperry Marine
Wind Indicator:	Sperry Marine/Malling Control Mk 879
	Wind Station
Radio Navigators:	Phillips Decca Navigator
Satellite Navigators:	Magnavox Mx200 DGPS
Echo Sounders:	Skipper

sium and manganese alloyed aluminium, 4.9 - 4.9 percent Mg. 4 - 1 percent Mn. The stainless steel construction

Shipbuilder:Kvaerner Masa-Yards
Ship Name:Mubaraz
Ship Type:LNG Carrier
Owner/Operator:ADNOC

Mubaraz is the first liquefied natural gas carrier in a series of four 135,000-cu.-m. ships ordered by Abu Dhabi National Oil Company (ADNOC), United Arab Emirates. The ship and its sisters are from by Kvaerner Masa-Yards' Turku New Shipyard.

Kvaerner Masa-Yards has systematically carried out development work on LNG carrier design and construction, and has developed a new generation of LNG carriers for the growing LNG transportation market.

This series of LNG carriers is the first 135,000 cu. m. capacity with only four spherical cargo tanks. The LNG cargo containment system is based on the spherical tank devised by Kvaerner Moss Technology. The cargo tanks, where the liquefied gas is transported at atmospheric pressure, are made of thick aluminium plates forming an unstiffened shell of spherical shape. Each aluminium sphere is supported through an "equator profile" by a cylindrical support skirt.

The cylindrical skirt which consists of zones of aluminium, stainless steel and steel connects the tank structure to the ship's hull. Tanks are therefore only marginally exposed to hull deflection. The quality of the aluminium is 5038 and its composition is magne-

sium and manganese alloyed aluminium, 4.9 - 4.9 percent Mg. 4 - 1 percent Mn. The stainless steel construction reportedly has good insulating properties that ensure minimum heat transmission from the hull into the tank structure and cargo. The insulation attached to the outside of the sphere consists of panels of polystyrene layers sheathed with a tight aluminum foil that serves as a secondary barrier around the cargo tanks. The insulation is attached to the tank surface with a small gap in between, providing continuous monitoring of possible gas leakage with the aid of pure nitrogen gas blown over the tank surface, which also keeps the insulation dry to avoid ice formation. It also reportedly reduces the risk of fire by maintaining an incombustible atmosphere around the tank shell.

During a laden voyage, a controlled amount of LNG cargo is boiled off naturally, keeping the temperature and pressure of the cargo stable. This "boil-off" gas is burned in steam boilers, and depending on sea conditions, it provides most, if not all of the energy for the propulsion machinery.

The Mubaraz offers a number of new design features focused on reducing ship operating costs, while improving fuel economy, seakeeping performance and maneuverability. To that extent, the ship's hull form is a new slender, low resistance type. Its tanks are built under the certificated requirements of the Quality Assurance Scheme for Hull Construction of Lloyd's Register of Shipping. In addition, by having only four spherical cargo tanks, ship construction costs are reduced and cargo operations are simplified.



Shipbuilder:3. Maj.
Ship Name:Jadroplov Pride
Ship Type:Containership
Owner/Operator:Scorpi Maritime
nc./Jadroplov

In August, 3. MAJ (Rijeka, Croatia) delivered the 31,400-dwt containership *Jadroplov Pride*. The vessel, which measures 201.5 x 32.2 x 18.7 m, is classed by Bureau Veritas (BV) to Ice class BV 1A, which enables the ship to travel North Seas routes.

The vessel is powered by a propulsion package

which includes a Sulzer 6RTA72 diesel engine, a Lips FP propeller and a Lips CPP bowthruster. The vessel's trial speed was 19.7 knots at 85 percent MCR and design draft.

Jadroplov Pride is capable of carrying a total of 2,324 TEU (1,018 in the holds and 1,306 on deck). The vessel offers a number of design features, including:

- High flexibility in container stowage, due to 20-ft. container guides in hatches 1, 2, 9 and side hatch 3; as well as 40-ft. container guides in hatches 3, 4, 5, 6, 7 and 8, which, alternatively, can accommodate two 20-ft. containers instead. The stowage capacity includes 168 refrigerated slots;

- Improved maneuverability provided by a Schilling rudder, which has a rudder torque maximum of 65 percent. This reduces the need of vessel positioning by tugs;
- An economical and fuel-saving propulsion provided by a fuel-saving main engine and carefully designed ship hull form; and
- A fully automated engine room (BV OUT PORT class notation), plus an integrated navigation system on the bridge.

The ship is designed so that it has minimized lashing needs. This was achieved by careful design of the container stowage arrangement and container guides.

The ship's integrated navigation system is comprised of many of today's latest systems, including Kelvin Hughes ARPA Nucleus 6000 radars; Raytheon Anschutz compass; Magnavox GPS and SP Radio VHF and SSB radios.

Deck Machinery: Aquamaster-Rauma
Coatings: Hempel
VHF Radio: SP Radio
SSB Radio: SP Radio, Sailor
..... Compact 2000 Radio Console
Radar: Kelvin Hughes Ltd.
Compass: Raytheon Anschutz-Standard
..... 20 Gyro Compass
GPS: Magnavox Mx 200, Differential
Autopilot: Raytheon Anschutz, Nautopilot D
Pumps: Iron Pump (Centrif. Pumps)

Pumps: Allweiler (Screw Pumps)
Pumps: MPD (Screw Pumps)
Heat Exchangers: Alfa Laval
Air Conditioning: Klima-Hi Pres
Lifeboats: Greben
Davits: Greben-Sph
Fire Fighting System: Thorn Security Ltd.
Desalination Equipment: Alfa Laval Nirex
Ballast Control System: Amri Hydraulic Actuators,
..... Norcontrol Datachief 2000
Computers: Norcontrol

Jadroplov Pride Main Particulars

Designer: 3. Maj
Flag: Croatia
Classification: .Bureau Veritas/Croatian Register Of
..... Shipping
Contract Date: April 27, 1995
Float Out Date: May 19, 1995
Delivery Date: August 29, 1996
Length, o.a.: 201.5 m
Length, b.p.: 189 m
Breadth, Molded: 32.24 m
Depth, Molded To Main Deck: 18.7 m
Gross Tonnage: 29,768 tons
Displacement: 48,567 tons
Lightweight: 12,953 tons
Deadweight (Design): 31,400 tons
Deadweight (Scantling): 35,614 tons
Draft (Design): 11 m
Draft (Scantling): 11.8 m
Speed, Service: 19.7 Knots
Complement: 30
Cargo Capacity: 2,324 TEU
..... (1,018 TEU in holds/
..... 1,306 TEU on deck)
Bunkers: 3,333.1 cu. m. (HFO)
Fuel Consumption: 56.3 tons
..... (Main Engine At 85% MCR)
Main Engine: 3.Maj - Sulzer G RTA 72
..... (22,358 hp at 94 rpm)
Auxiliary Engines: Wartsila 8 L 20
Propellers: Lips FPP
Thrusters: Lips CPP Bowthruster
Thruster Engines: Koncar Gajbz
Generators: Leroy Somer
Anti-Heeling System: Frank Mohn
Engine Control(s): ABB, Fahm-200
Steering Control(s): Porsgrunn Steering Gear,
..... Schilling Rudder



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INNOVATIVE CONVERSION

Shipbuilders: Avondale Industries
Ship Name: *Captain H.A. Downing*
Ship Type: Tanker
Owner/Operator: AHL Shipping

Though all other Great Ships mentioned in this edition are newly constructed, *Captain H.A. Downing* from Avondale deserves recognition as a unique project and accomplishment. The ship is the first of four AHL tankers being built as double-hulled ships with the addition of a new 510-ft. (155.4-m) long double-hulled forebody constructed by Avondale.

The new forebody is joined to the renovated and modified existing stern section, where the engines, crew quarters and bridge are located — to complete the conversion into a modern, environmentally sound, double-hulled product carrier, and the first commercial, self-propelled double-hulled tanker built in the U.S. to conform with OPA 90 and the Jones Act.

The ship uses a steam-powered central hydraulic system to drive deepwell cargo pumps and deck machinery. It features a new accommodations house and an onboard vapor recovery and inert gas system. Meeting USCG Type II requirements, the design, pumps and coatings systems are capable of transporting a wide range of products from Grade A petroleum to xylene.

Overall the ship measures 207 x 27.4-m, with a design deadweight of 39,431 metric tons. A 13,600-hp cross compound steam turbine main engine drives the vessel to a service speed of 15.5 knots. The vessel is outfitted with an array of the latest equipment, which can be reviewed in detail on the accompanying Main Particulars list. One of the more unique aspects of this four-ship project is that it is being run through a yard which has relied completely on Navy business for many years. Subassemblies and modules for an LSD 52 and Fast Sealift Ship moved side-by-side with the 38,000-dwt AHL forebody through the covered factory, through the same blast and paint facility, and along the same path over the Mississippi River levee to their



respective erection ways.

"To accomplish this, every department of our shipyard had to adapt to the accelerated schedule, reduced complexity, and highly streamlined requirements of the commercial job," said **Ron McAlear**, Avondale's vice president of Advanced Programs and Marketing. Avondale and AHL formed a Tiger Team with the U.S. Coast Guard to obtain early approval on a number of design documents that can typically delay a program. According to **Mr. McAlear**, the Navy understands that commercial programs offer innovation as well as a prudent revenue supplement for the U.S. shipbuilding base. Avondale's 36,074-cu.-m. covered factory for modular construction was designed with the synchronization challenges of Navy and commercial work in mind. Construction is now progressing on the remaining three ships in the AHL program.

The second double-hulled forebody was launched on September 25, and the new ship is to be christened *Anasazi*. The double-hulled forebody for the third ship, which will be named *New River*, is also presently under construction at Avondale. A keel laying ceremony was held on October 2, for the fourth ship, which will be named *The Monseigneur*. The double-hulled product carriers will transport refined products and chemicals.

Captain H.A. Downing Main Particulars

Designer:	Avondale Industries, Inc.
Flag:	U.S.
Classification:	ABS
Contract Date:	May 12, 1995
Float Out Date:	July 31, 1996
Delivery Date:	October 3, 1996
Length o.a.:	207 m
Length b.p.:	198.8 m
Breadth, Molded:	27.4 m
Depth, Molded:	16.4 m
Gross Tonnage:	24,846.2 M.T.
Displacement:	49,270 M.T.
Lightweight:	9,797 M.T.
Deadweight (Design):	39,431 M.T.
Deadweight (Scantling):	40,017.4 M.T.
Draft (Design):	10.97 m
Draft (Scantling):	11.2 m
Speed (Service):	15.5 knots
Cargo Capacity:	42,000 cu. m.
Bunkers:	2,070 cu. m.
Water Ballast:	18,900 M.T.
Fuel Consumption:	60 tons/day
Percent of High Tensile Steel:	80
Main Engine Manufacturer:	Bethlehem Steel
Main Engine Type:	Cross Compound Steam Turbine, 13,600 hp
Propellers:	Bethlehem Steel
Generator engines:	General Electric
Generators:	GE 500 kW, 450 VOLT AC
Emergency Generator:	Steward & Stevenson 8V-92TA, 250 kW, radiator cooled diesel
Motor Starters:	GE
Reduction Gear(s):	Falk, double reduction
Steering Control(s):	American Engineering, electric-hydraulic
Deck Machinery:	Aquamaster and Techrane
Shafting:	Bethlehem Steel
Bearings:	Bethlehem Steel
Coatings:	Ameron Jotun-Valspar
VHF Radio:	Sperry Marine GMOS system
SSB Radio:	Sperry GMOS system
Radar:	Sperry Rascar VT
Compass:	Sperry MK 37 digital
GPS:	Sperry NT 200 GPS PN 80926-00
Autopilot:	Sperry
SatNav:	Trimble
Pumps:	Framo Cargo Pumps, ITT foam pump, Leistritz SV, scrubber and DK seal pump
Heat Exchangers:	Bethlehem Steel, C.H. Wheeler, Cochrane
Air Conditioning:	Carrier
Lifeboats:	Harding-Watercraft 6.5 M MKV, Saab engine
Liferafts:	Viking 6 DK
Fire Fighting System:	Herbert Hiller
Desalination Equipment:	(2) Bethlehem Steel, single-stage, 10,000 GPD
Cargo Control System:	Framo
Ballast Control System:	Scana Skarpenord level control
Computers:	Scana Skarpenord
Stern Tube Seal:	John Crane
Cathodic Protection:	Wilson Walton
Inert Gas System:	Permea

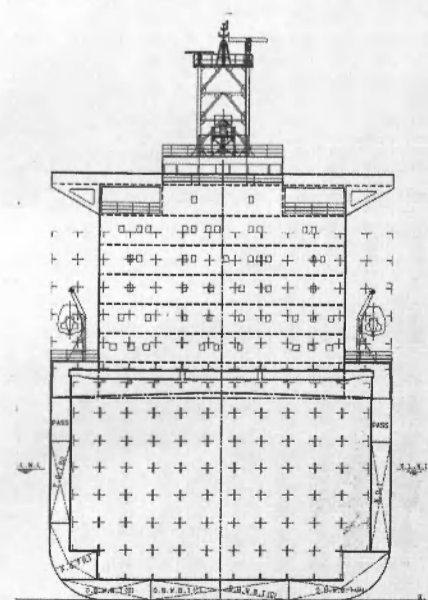
Shipbuilder: Halla Engineering & Heavy Industries Ltd.
Ship Name: *Hanjin Zenoa*
Ship Type: Containership

Halla Engineering & Heavy Industries Ltd. has delivered *Hanjin Zenoa*, the third in a series of 2,500-TEU containerships. The double skin vessel measures 210.5 x 32.3 m, with a 1.9 space between steel skins. The 30,280-gt vessel is powered by a Hyundai B&W 8K80MC-C engine which develops 34,040 bhp at 104 rpm and drives a NiAlBr Hyundai-make CP, 7.3-m propeller. The ship has a service speed of 22 knots, and main engine consump-

tion is 90.08 tons/day. *Hanjin Zenoa* is classed by Germanischer Lloyd to GL+100AS Container Ship + MC, AUT, 1W. The ship is equipped to carry 1,100 TEU in the hold (7 tiers, 11 across) and 1,400 TEU on deck (5 tiers, 13 across on Kvaerner hatches). There are also 215 reefer plugs.

Hanjin Zenoa Main Particulars

Length, o.a.:	210.5 m
Length, b.p.:	190 m
Breadth, Molded:	32.3 m
Width Of Double Skin:	1.9 m
Draft (Design):	11 m
Draft (Scantling):	12.2 m
Depth, Molded To Main Deck:	19 m
Gross Tonnage:	30,280 tons
Deadweight:	29,800 tons
Deadweight (scantling):	36,100 tons



GREAT SHIPS
OF 1996

Shipbuilder:Lindenou GmbH
Ship Name:Sea Devil
Ship Type:Tanker
Owner/Operator:Partenreederei

The largest double hull tanker in Germany was built and delivered by Lindenau GmbH in 1996. The 32,250-dwt *Sea Devil* (newbuilding No. S 240) was ordered by Partenreederei c/o Carl Buttner, Bremen. The ship is an ecologically beneficial, innovative design from Lindenau, belonging to the shipbuilder's Tanker Class 2000 series.

The newbuilding is the largest ship ever designed and built by Lindenau, and the development, design and construction are touted as proud achievements for the medium-sized shipyard. The newbuilding is equipped with a double bottom with side hull for all cargo and all fuel tanks. The double hull is three times more resistant to collision than a single hull tanker, therefore the ship will receive the class notation COLL 3 for all cargo tanks. Subsequently, insurance companies have rewarded this with a reduction of premiums.

The shipbuilder installed volume bulkheads between each cargo tank. This allows fast unloading and faster washing of cargo tanks. It also provides a double separation of the cargo tanks. The 178.2-m long ship will also receive the Finnish/Swedish Ice Class 1B.

Driven by a MAN 6L 58/64 main engine (developing 8,340 kW at 428 rpm) the ship is propelled by a variable pitch, NIAIBr four-blade propeller to 14.7 knots. The vessel also features three Yanmar auxiliary generator sets, one emergency diesel generator, one bowthruster, and one balanced, semi-spade rudder.

Designed for the transport of crude oil and oil products, the ship features seven cargo tanks and two slop tanks. All cargo tanks are coated with Camkote MX, and all cargo pipes, cargo pumps, fittings in the cargo tanks and cargo valves are made of stainless steel. The cargo system aboard *Sea Devil* is comprised of: seven heat exchangers for cargo heating (at about 900 kW each); two heaters for tank washing (at about 3,000 kW each); one screw-pump for tank washing and COW (at about 188 cu. m./hr. 12 bar); seven fixed tank washing machines for cargo tanks (at about 47 cu. m./hr.); two fixed tank washing machines for slop tanks (at about 15 cu. m./hr.); and one oil-fired inert gas generator.

The cargo pump system is remotely controlled and comprised of: nine hydraulically driven deepwell pumps; one portable hydraulic driven deepwell pump; and five electrically driven hydraulic main powerpacks.

The maximum simultaneous discharge capacity is about 3,000-cu.-m./hr. with four cargo pumps running. There is one loading computer, online, connected to cargo tank radar with an overflow alarm system.

Special features aboard *Sea Devil* include: remote draft indication system with four measuring points; CO₂ firefighting system for machinery and ballast pump room; and foam firefighting equipment on deck. Navigation systems are of the latest type and include Atlas ARPA S-band, Atlas ARPA X-band, Atlas DCS ECDIS and Atlas Trackpilot. The electronics package is complemented with a gyro compass and autopilot from Anschütz Standard and wireless equipment according to GMDSS A3 with Satcom C, Satcom B, echosounder, speedlog, weatherfax, DGPS, GPS, Navtex and VHF radio.



Sea Devil Main Particulars

Length, o.a.:	178.2 m	Gross Tonnage:	Apprx. 22,000 tons
Length, b.p.:	168 m	Cargo Tank Capacity (100%):	Apprx. 38,600 cu. m.
Breadth, Molded:	28 m	Deadweight At Design Draft:	Apprx. 32,250 tons
Depth, Molded	16.8 m	Speed:	14.7 knots (undet trial conditions, at design
Draft:	11 m	..... draft and a Main Engine Output Of 6,600 kW	
Deadweight:	32,250 tons	Main Engine:	MAN 6 L 58/64, 8,340 kW At 428 rpm
Cargo Capacity:	38,600-cu.-m.	Fuel Oil:	Apprx. 850 cu. m.
Main Engine Output	8,340 kW	Diesel Oil:	Apprx. 400 cu. m.
Speed	14.7 knots	Lubricating Oil:	Apprx. 80 cu. m.
Class: (100 A 5 E2 Oil Tanker ESP COLL 2 (MC E2 AUT, INERT		Freshwater:	Apprx. 150 cu. m.
Flag:	German	Radars:	1 ARPA S-Band, 1 ARPA X-Band

Shipbuilder:Flender Werft
Ship Name:Nedlloyd Amazonas
Ship Type:Containership

Lübeck-based Flender Werft delivered MV *Santa Giovanna* to its owner Claus-Peter Offen. On the same day, the ship commenced a three-year charter service with its charter name MV *Nedlloyd Amazonas* for Nedlloyd Lines.

Nedlloyd Amazonas is the 16th ship out of a successful series of containerships developed by Flender Werft, and the 10th one built for Messrs. Claus Peter Offen. This series comprises various ship sizes having a stowing capacity of 1,200 to 3,500 20-ft. containers and was developed on the basis of Flender's experience in the construction of containerships for international shipowners such as A.P. Möller, P&O, OCL and Hapag



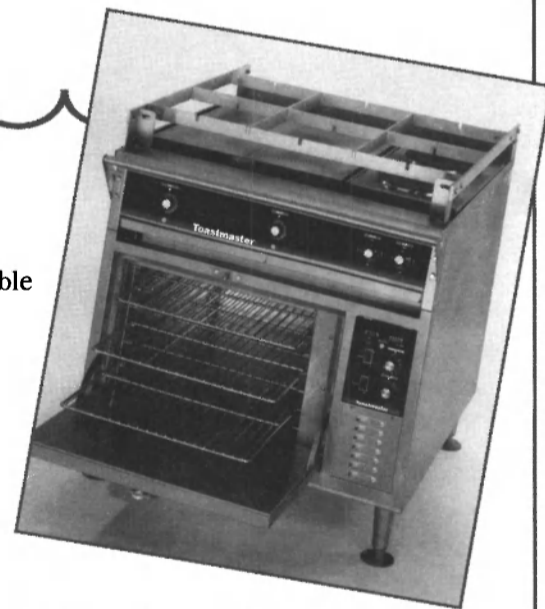
Lloyd.

The *Nedlloyd Amazonas*, which is ship type Flender 2000T, is an extension of the Flender 1800 type vessel, which has been sailing for Messrs. Claus Peter Offen on the seas all over the world. In comparison to the Flender type ship FW 1800, *Nedlloyd Amazonas* can stow 140 TEU containers more while keeping the same ship length, e.g. totally 2,061 TEU container of which 42 percent are transported in fixed 40-ft. cell guides in the cargo holds. On deck, there are 150 electrical connections provided for the transportation of reefer containers.

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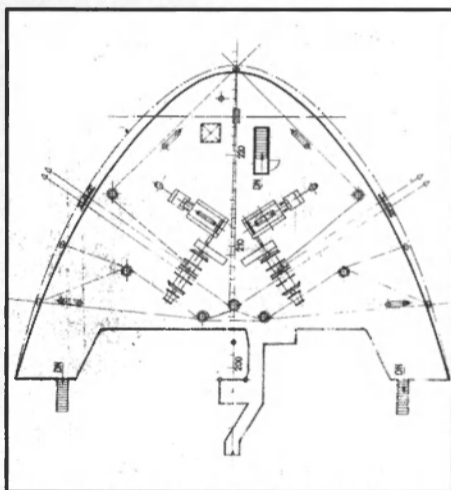
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Shipbuilder:Shipyard Trogir
Vessel Name:Trogir
Ship Type: Double Hull Oil Tanker
Owner/Operator:Trogir
.Shipping Ltd.

Trogir is the first in a series of 12 double hull, 39,990-dwt oil tankers designed and contracted by shipyard Trogir and built for sub-



siaries of Novorossiysk Shipping Company of Novorossiysk during 1995 and 1996 by Shipyard Trogir. Part of the series was built by Croatian yards Split, Uljanik and 3.Maj. Shipyard Trogir has been working for the last 10 years on the double hull designs of this ship size. Originally, the design was based on a full breadth cargo tank concept. However, this was foregone in the favor of a longitudinal centerline bulkhead concept, as the latter was found to be advantageous in terms of steel savings and unlimited loading/unloading sequence, regardless of the number of partly filled cargo or ballast tanks. The cargo tank area is divided into 10 cargo tanks, two slop tanks and 10 ballast tanks with smooth inner hull arranged to IMO and OPA 90 requirements.

The cargo system is designed to handle five segregations simulta-

(Continued on page 69)

Shipbuilder: . . .Samsung Vessel
Name:Eagle Boston
Vessel Type: . .Crude Oil Tanker
Owner/Operator:NOL

Eagle Boston is the first of four 99,300-dwt shallow draft, crude oil tankers for Neptune Orient Lines Ltd. (NOL) of Singapore, from Samsung Heavy Industries Co., Ltd. The vessel and its sisterships are designed to carry crude oil to shallow water ports such as Linden, N.J., where the maximum draft is 11.15 m. Compared to similar vessels of this class, the characteristics of the hull form are an unusually shallow draft and wide beam with the high ratio of 3.96 (breadth/draft). Offering a shallow draft in a full form ship with wide beam presents several technical problems, including maneuvering performance and propulsive performance. In order to

meet IMO guidelines for maneuverability, Samsung focused its attention on the maneuvering performances without sacrificing speed performance during the hull form design stage.

Extensive tanks tests were conducted with alternative hull forms. The final hull form selected has proven to offer great maneuverability in both mock-up tests and at sea trials. Three different grades of cargo can be handled simultaneously, using three steam turbine driven cargo oil pumps of 2,500 cu. m./h each. The main engine is a Samsung-built MAN B&W 6S60MC which develops 16,680 bhp at 105 rpm. The engine drives a FPP, allowing the vessel to achieve a service speed of 14.4 knots. The integrated control and alarm monitoring system (ICMS) is designed to be operated from the wheelhouse.

Eagle Boston Main Particulars

Classification:DNV, +1a1, "Tanker For Oil", Eo
Length o.a.:253 m
Length b.p.:242 m
Breadth, Molded:44.2 m
Depth, Molded To Main Deck:19.2 m
Gross Tonnage:57,456 tons
Deadweight (Scantling):99,300 M.T.
Draft (Design):11.15 m
Speed, Service:14.35 knots
Main Engine:Samsung B&W 6S60MC
Propellers:Single 4 Blade FPP
Engine Control(S):Integrated Automation
.System, One Engine Control Room
VHF, SSB Radios, Radar:JRC
Compass:Tokimec
GPS:JRC



Shipbuilder:Daewoo Heavy Industries
Ship Name:Astro Sirius
Ship Type:Aframax Tanker
Owner/Operator:Kristen Navigation Inc.

Astro Sirius — an Aframax tanker built for Kristen Navigation, Inc. — is one of two vessels built by Daewoo Heavy Industries to be honored as a Great Ship this year. Designed by Daewoo for a Greek owner, the Astro Sirius is the third in a five-ship order for Kristen. The ship is one of a series which uses a new structural design philosophy aimed at producing stronger, safer ships, which comply with all of the latest international safety and environmental regulations.

The 248-m, 53,074-gt ship is powered to a service speed of 15.2 knots by a Hyundai B&W 5S70MC engine, which delivers 19,100 bhp at 91 rpm. Four-blade, 8,000-mm diameter propellers are driven via a 610-mm diameter shaft. Engine controls are from Norcontrol, and fuel consumption is 52.18 ton/day.

Structurally, the Guide for Dynamic Based Design and Evaluation of Tanker Structures of

the ABS classification have been applied. About 60 percent of the construction is high-tensile grade steel. To ensure long-term stability, a hull stress monitoring system from BMT is installed. This system incorporates four deck strain gauges and a bow accelerometer for checking actual bending movement and bow motion.

Electronics onboard include an array of equipment from JRC (VHF and SSB radios, radar, GPS and Satcom-C); and a Tokimec autopilot.

Two-stripe coating with pure epoxy has been applied to cargo and slop tanks (and to the outfitings in the tanks) allowing the vessel to carry crude oil and oil products, and to minimize free edges and to eliminate blind spots. Inexa bulb plates are used in ballast tanks of the cargo areas to improve the quality of the protective coatings.

Astro Sirius has a cargo space divided into six tanks by transverse bulkheads and slop tanks aft, with one longitudinal bulkhead forming



port and starboard. These are handled using three Shinko electrifugal steam turbine driven 2,500 cu. m./hr. pumps for segregation. Side ballast tanks are combined with double bottom ballast tanks.

Astro Sirius Main Particulars

Flag:Greece
Classification:ABS

(Continued on page 41)

Hanjin, Korea's pioneering shipyard, makes headway with the delivery of its 5,300 TEU Full Container Carrier



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Circle 236 on Reader Service Card

Hanjin London Main Particulars

Designer: Hanjin Heavy Industries
 Flag: Korea
 Contract Date: April 26, 1994
 Float Out Date: December 29, 1995
 Delivery Date: March 15, 1996
 Length o.a.: 279 m
 Length b.p.: 265 m
 Breadth, Molded: 40.3 m
 Depth, Molded To Main Deck: 24.1 m
 Gross Tonnage: 66,687 tons
 Displacement: 93,129.9 tons
 Lightweight: 25,831.9 tons
 Deadweight (Design): 49,389 tons
 Deadweight (Scantling): 67,298 tons
 Draft (Design): 12 m (molded)
 Draft (Scantling): 14 m (molded)
 Speed, Service: 26.3 k (85% MCR
 engine output)
 Water Ballast: 15,331 cu. m.
 Fuel Consumption: main 212.4 t/day; auxiliaries 6 t/day
 % Of High Tensile Steel: 64.3 percent
 Main Engine: KHIC B&W 12K 90MC-C
 (Mark VI) 74,520 PS x 104 rpm
 Propellers: FPP
 Cranes: Dongnam/Luffing
 Bow thrusters: Kawasaki



Shipbuilder: Hanjin Heavy Industries Co., Ltd.
Ship Name: Hanjin London
Ship Type: Containership
Owner/Operator: Hanjin Shipping

Hanjin Heavy Industries' *Hanjin London* is the first of an order for five sister vessels each with a 5,302-TEU capacity, on a Post-Panamax beam, allowing for a maximum of 14 rows/9 tiers of containers to be carried in hold and 16 rows/6 tiers on deck. The vessel has eight holds (six positioned forward of the tall superstructure and engine room) contained within a double skin hull. The cell-guide systems are arranged for 40-ft. containers, but can accommodate twin 20-ft. containers in the bottom five tiers

throughout. They are also designed so that some holds can easily be converted to suit 45-ft. containers. High-cube containers can be accommodated in every hold, and dangerous cargoes can be carried in holds Nos. 1 through 6 and all deck spaces (except one bay), in accordance with 1981 amendment to SOLAS 1974. The ship has 400 reefer slots. It is powered by a B&W 12K90MC-C (MARK VI) main engine, manufactured by KHIC, which develops 74,520 PS at 104 rpm. This engine drives a five-blade, 8.35-m diameter NiAlBr FPP, made by Hyundai, driving the ship to a service speed of about 26 knots at NCR, with 15 percent sea margin. Electrical power is supplied by four Wartsila/Heeco diesel-alter-

(Continued on page 69)

Shipbuilder:IVI-Industrias Verolme-Ishibras S.A.
Ship Name:N.M. Frota Santos
Ship Type:Containership
Owner/Operator: Frota Oceanica Brasileira S.A.

Industrias Verolme-Ishibras' *Frota Santos* is the second of a series of two ships to be built for Frota Oceanica Brasileira by IVI-Verolme shipyard, and was designed to attend the specific requirements of the trades between northern Brazil and the Far East. The ship dimensions, especially its length and draft, were selected to attend the restrictions of the ports of northern Brazil, including those in the Amazon River. To operate efficiently in this trade, the ship has the capability to carry a mix of containerized and non-containerized cargoes.

The ship was designed mainly as a containership and several features that ease the operations with non-containerized cargoes have been incorporated. The cargo space has four holds, each covered by hydraulically operated folding-type hatch covers on the

(Continued on page 69)

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Manufacturing

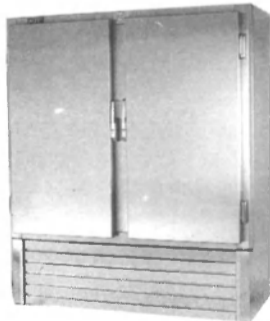
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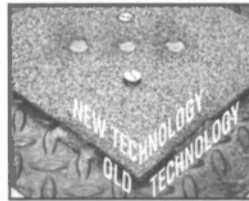
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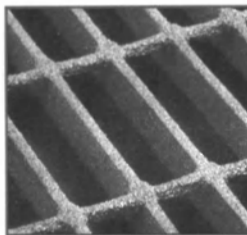
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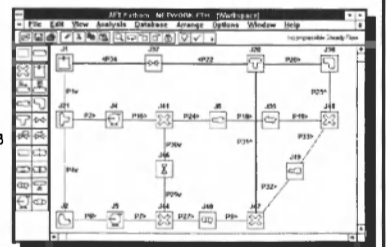
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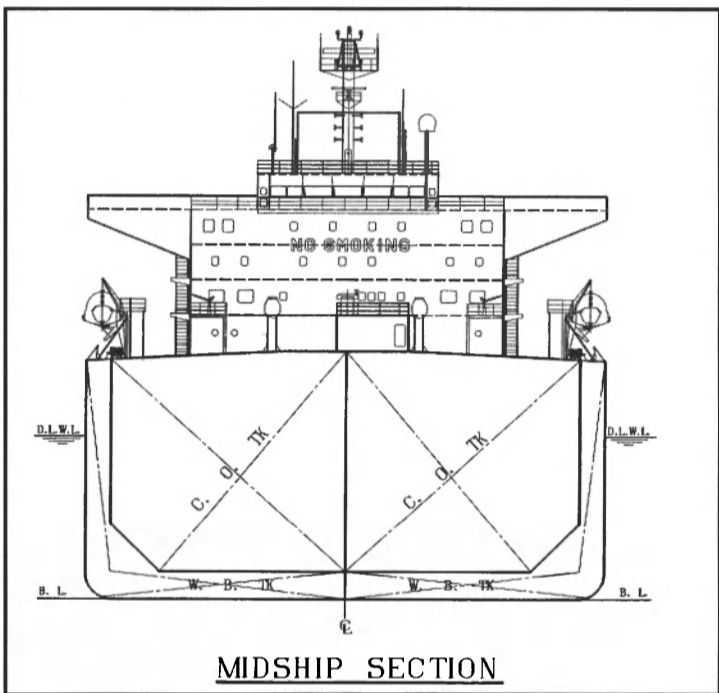
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Circle 247 on Reader Service Card

(Astro Sirius continued from page 38)

Contract Date: Sept. 22, 1994
 Float Out Date: March 30, 1996
 Delivery Date: May 30, 1996
 Length o.a.: 248 m
 Length b.p.: 238 m
 Breadth, Molded: 43 m
 Depth, Molded: 19.8 m
 Gross Tonnage: 53,074 tons
 Displacement: 115,789 tons
 Lightweight: 16,984 tons
 Deadweight (Design) 98,805 tons
 Deadweight (Scantling): 98,805 tons
 Draft (Design): 13.5 m
 Draft (Scantling): 13.5 m
 Speed, Service: 15.2 knots
 Complement: 30 persons
 Cargo Capacity: 114,383 cu. m.
 Bunkers: 3,151 cu. m.
 Water Ballast: 42,071 cu. m.
 Fuel Consumption: 52.18 ton/day

Main Engines: Hyundai B&W 5s70mc
 Auxiliary Engines: Yanmar
 Generator Engines: Yanmar
 Generators: Taiyo
 Emergency Generator: Ssangyong-Stamford 150kva, 1 set
 Motor Starters: K.T. Electric
 Engine Control(s): Norcontrol (Autochief-4)
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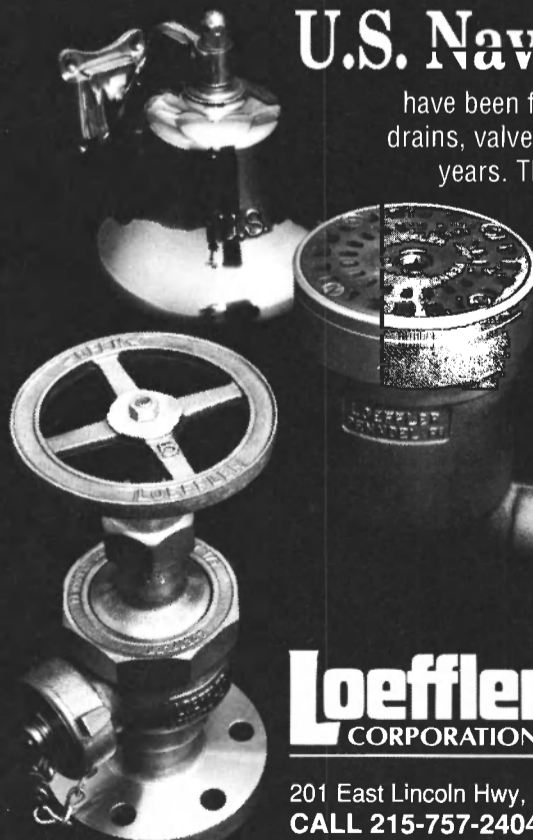
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41

Keeping A Step Ahead

Japan maintains its commercial shipbuilding edge using experience, technology

By Greg Trauthwein, editorial director

Numbers don't lie.

The Japanese shipbuilding industry is having another solid year, as evidenced by the most recent statistics released from the Japan Ship Centre. From the time period between April and September 1996, new orders totaled nearly 5.8 million gt, a 24.5 percent increase over the same period the last year.

Despite fierce international competition, escalating labor costs and currency concerns, the Japanese maritime industry is maintaining its edge as the top builder of commercial ships in the world.

The following pages highlight many of the companies which have made, and intend to keep, Japan near the top of the commercial shipbuilding heap for some time to come. This section also houses the Great Ships of '96 from Japan.

Ship Machinery Production Up

According to the Japanese Marine Equipment Association (JSMEA), ship machinery and equipment manufactured in Japan in 1995 totaled ¥819 billion, up ¥7.1 billion from 1994. Marine internal combustion engines alone accounted for 31.5 percent of that total (¥257.8 billion). (See chart to the right).

In looking at the number of internal combustion engines produced, large diesel engines (over 10,000 PS in per-unit power output) registered a 6.2 percent decline, while medium-sized diesel engines (1,000 to 10,000 PS output) registered a 5.6 percent decline. The production of small diesel engines (lower than 1,000 PS) also slightly decreased, while the production of outboard motors increased 11.7 percent. On the export front, a total of ¥142.8 billion in Japanese equipment was manufactured for use outside of Japan, roughly the same amount of the pre-

vious year. The annual total of exports, which held a 17.4 percent share of overall output, registered a decline for the fifth straight year.

In looking at all of the products exported, only three categories constituted 85 percent of the total: marine internal combustion engines (¥71.9 billion, 50.4 percent of total export value); parts and accessories (¥27.3 billion, 19.1 percent); and nautical equipment (¥22.6 billion, 15.8 percent).

By destination, Asia accounted for 39.3 percent of purchases of equipment from Japan (¥56.1 billion), followed by North America (¥37.1 billion, 26 percent), and Europe (¥35.1 billion, 24.6 percent). Notably, these three regions alone held a combined share of 90 percent in the total value of ship machinery and equipment exported from Japan. Other significant buyers of Japanese equipment included: South America (¥5.1 billion); Oceania (¥4 billion); Africa (¥2.8 billion); and the Middle East (¥2.3 billion).

The Shipbuilders

Any conversation about Japanese shipbuilding starts with Mitsubishi Heavy Industries (MHI), the largest shipbuilder in the country. According to MHI's annual report, total ship sales for 1995 totaled nearly \$2.6 billion, while ship repair and conversion activity accounted for \$395 million. These numbers were not significantly more than the previous year. However, the company did suffer a higher than 25 percent slump in the steel structures and products category, a drop which resulted in a decline of 9.1 percent for the Shipbuilding and Steel Structures Group as a whole.

During the year, MHI has won a number of impressive orders, including orders for a series of ten 4,173-TEU boxships from Taiwan's Evergreen Corp., two 4,369-TEU ships from Singapore's Neptune Orient Lines (NOL), and two 4,900-TEU vessels from Orient Overseas Lines (OOCL).

Ship Machinery Production in 1995

Equipment	Value (Mil ¥)	Share (%)
• Marine internal combustion engines.....	257,817	31.5
• Parts and accessories	188,523	23
• Outfitting	114,541	14
• Marine auxiliary machinery.....	79,587	9.7
• Nautical equipment.....	65,467	8

Source: JSMEA

GREAT SHIP OF 1996

Shipbuilder.....Mitsui Engineering & Shipbuilding
Ship Owner.....H Corporation
Ship Type.....Ore/Bulk Carrier
Ship Name.....Cape Olive
DWT.....169,963



Touting the 169,963-dwt *Cape Olive* as a "state-of-the-art highly rationalized vessel embodying commitment to labor saving and energy conservation," Mitsui Engineering & Shipbuilding delivered the ship to H Corporation on July 30.

The *Cape Olive* is a flush decker with the main engine and navigation bridge arranged aft. The ship features:

- A cargo space divided into nine holds having nine large hatches, each provided with side-rolling type hatch covers, opening from the middle towards the sides.

The handling of these requires little human labor;

- A slimmed superstructure to reduce air resistance;
- Unmanned operation of the engine room, with the M0 notation of NK;
- An ultra-long stroke, fuel efficient Mitsui MAN B&W 7S70MC (Mark-V)

diesel main engine ; and

- GMDSS installation.

For more information on Mitsui
Circle 6 on Reader Service Card

Cape Olive Main Particulars

Length (o.a.).....	290 m
Length (b.p.).....	278 m
Breadth (mld.).....	46 m
Depth (mld.).....	23.3 m
Draft (mld.).....	17.2 m
GT.....	85,663
Cargo capacity.....	183,354 cu. m.
Main engine.....Mitsui MAN B&W 7S70MC (Mark-V) diesel	
Output.....	24,060 at 91 rpm
Speed.....	17.5 knots
Crew.....	30
Classification.....	NK
Flag.....	Panama

GREAT SHIP OF 1996

Shipbuilder **Sumitomo Heavy Industries**
 Ship Owner **Mobil**
 Ship Type **VLCC**
 Ship Name **Raven**



Double-hulled VLCC *Raven* underwent sea trials prior to its delivery in June to Mobil Shipping and Transportation Company. The 280,000-dwt supertanker was built by Sumitomo Heavy Industries, Ltd.'s Oppama shipyard in Oppama, Japan. *Raven* will be Mobil's second double-hulled VLCC.

Also built at the Oppama Shipyard, the vessel follows sister vessel *Eagle*, delivered in 1993. *Raven* meets the latest requirements for double hull tankers, new MARPOL regulations adopted at IMO MEPC 32, and OPA 90 requirements.

The hull structure was designed using ABS Dynamic Load Approach (DLA) and advanced fatigue analysis to achieve the highest degree of structural reliability. DLA is a design method used to improve structural reliability by analyzing dynamic structural strength under a wide range of load conditions.

Other features include: tin-free anti-fouling paint for underwater hull protection; light-colored modi-

fied epoxy coatings system with back-up anodes in water ballast tanks to simplify maintenance; stages and ladders in the double hull spaces for easy maintenance and inspection; fail-safe major valves on cargo oil piping to prevent oil spills during cargo handling; and an energy-saving turbo generator system.

For more information on Sumitomo
 Circle 7 on Reader Service Card

Raven Main Particulars

Length (o.a.):	332 m
Length (b.p.):	317 m
Breadth (mld.):	58 m
Draft, design:	20.7 m
GT:	160,348 tons
Deadweight (design):	279,658 tons
Deadweight (scantling):	301,653 tons
Cargo capacity:	349,524 cu. m.
Main Engine:	Diesel United Sulzer RTA84M
Classification:	ABS

Evergreen Marine Transport is reportedly set to sign a deal with MHI in January for the construction of an additional eight 4,948-TEU containerships.

MHI maintains its position at the

forefront of marine research and development, with participation in such projects as the Techno-Superliner (with fellow shipbuilder Mitsui Engineering & Shipbuilding and the TSL Assoc.), which won the

Society of Naval Architects of Japan (SNAJ) Ship of the Year honors. The company continues research in many different facets, including investigation of: a super high-speed hydrofoil catamaran; a modern

Daihatsu Develops New Engine

The DK-26 has been added to Daihatsu's DK engine series, and was developed as a prime mover for marine propulsion, as well as electricity generation on board vessels and in stationary power-plant situations. To date, 18 engines — for use as marine generator engines and propulsion engines — are on order for delivery through March 1997.

When designing the DK-26 (which joins the DK-20, 200mm bore x 300mm stroke; and the DK-28, 280mm bore x 390mm stroke) the company sought to: enhance reliability and durability; reduce maintenance costs; maximize operational economy; and create an engine which is light, compact and environmentally friendly.

The DK-26 (260 mm bore x 380mm stroke) was designed with a large stroke/bore ratio (1.46), and reportedly has a better profile in the combustion chamber as well as a higher compression ratio. Subsequently, stable combustion over the entire load range on heavy oil is achieved without sacrificing NOx emission and fuel oil consumption. As the DK series from Daihatsu develops, the manufacturer said that the DL series engines will soon be phased out. Current plans for the DK series include the introduction of a model even larger than the DK-28. The DK-26 incorporates many market driven design features, including:

- The engine frame is provided with deep mounting foot with "I" contoured section so that rubber elements for resilient mount can be attached directly to the mounting foot. The frame rigidity is strengthened by two side bolts.
- The crankshaft employs R-R forging to offer a larger pin and journal diameter around which thicker, adequate oil film is formed without fillet recess against crank webs. Pins and journals are induction hardened for anti-wear, which reportedly make them effective for long, maintenance-free operation.
- The cylinder head is made of vernicular cast iron characterized

by both high heat transmissibility and high mechanical strength. The cylinder head is clamped to the engine frame by four hydraulically tightened bolts.

- The cylinder liner is made of wear-resistant cast iron. It is also provided with a "protect ring" on its upper inside, to keep wear, as well as lube oil consumption, to a minimum.

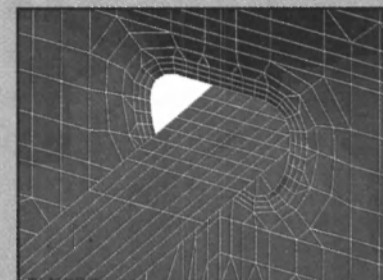
Fuel injection gears are reportedly of robust design and play an important role in the engine performance. The fuel injection pump, with a built-in tappet and roller, can be regularly operated at around 1,500 kg/sq. cm. with the employment of a closed-type plunger barrel. The injection pump is connected to the nozzle holder through a stamp forged injection block with drilled passage rather than conventional injection pipe. Block with drill passage design can be beneficial by: eliminating cracks due to crease; and easy assembly and disassembly.

For more information from Daihatsu
 Circle 4 on Reader Service Card

6 DK-26 Main Particulars

Length	3,350mm
Width	1,180mm
Height	2,508mm
Total dry mass	14,700 (w/o flywheel)
Cylinder bore	260mm
Piston stroke	380mm
MCR	1,681 kW (2,200 PS)
Engine speed	720/750
Mean piston speed	9.12/9.5
Bmep	22.72 kgf/sq. cm./21.81 kgf/sq. cm.
Power ratio	207.2
Max. pressure	160 kgf/sq. cm.
FO consumption	185 g/kWh

INNOVATIVE MARINE PRODUCTS



Kawasaki has developed the apple slot, an apple-shaped opening at joints between the frame and the girders. The new design eliminates the need for the auxiliary ribs that are fitted to conventional frames.

Circle 10 on Reader Service Card

Mitsubishi Heavy Industries Ltd.

(MHI) has started the development of a new engine type in its UE series, type UEC43LS II. The UE engine is Japan's only domestically developed, large-sized, low-speed diesel engine. The new engine will be designed as a main engine for a variety of ships, including but not limited to medium and small size tankers, and 22,000 to 26,000-dwt bulk carriers. The engine will be available with from four to eight cylinders, in a power range from 5,720 PS (four cylinders) to 11,400 PS (eight cylinders).

Main Particulars of UEC43LS II

Cylinder bore	430 mm
Piston stroke	1,500 mm
Max. output	1,430 PS/cylinder
Engine speed	160 rpm
Fuel consumption	127 g/PSH

Circle 3 on Reader Service Card

MHI delivered

Ever Ultra, the first of five U-class containerships being built by MHI for Evergreen. At 5,300-TEU, the ship is the largest containership classed by the ABS. The 69,000-gt vessel measures 879 ft. (268 m) long.

Circle 12 on Reader Service Card



Japanese Marine Technology

cruise ship; a mid-deck tanker; an advanced ship operation support system; a contra-rotating propeller; marine growth prevention by electroconductive paint; water and sea-cleaning systems; and a deep sea, remote-controlled vehi-

cle.

During the year MHI delivered *Ever Ultra*, the first of five U-class containerhips being built by MHI for Evergreen. At 5,300-TEU, the ship is the largest containerhip classed by the American Bureau of

Shipping (ABS). The 69,000-gt vessel measures 879 ft. (268 m) long.

While Mitsubishi is the largest, it certainly is not the only quality builder of ships in Japan.

Ishikawajima-Harima Heavy Industries Co. Ltd. (IHI) delivered

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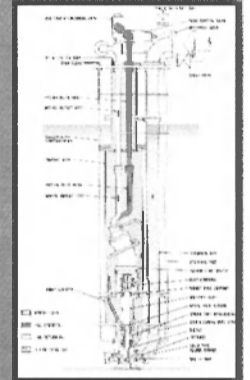
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INNOVATIVE MARINE PRODUCTS

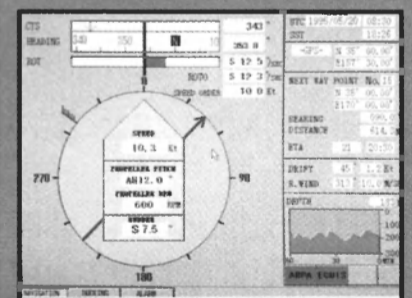
The **KHS** from **Shinko** and **Kawasaki** is a hydraulically driven submerged cargo pump system. The pump's casing is made of stainless steel or bronze, and features vertically split construction so the mechanical seal can be replaced without lifting the pump. The impeller is made of stainless steel or phosphor bronze precision casting, designed to improve the suction performance. A double type mechanical seal is provided where the shaft is passing through the bearing house and cofferdam. Since the pump handles a variety of products and chemicals, its teflon bellows type mechanical seal prevents corrosion and wear, and is non-spark adopted.



Circle 14 on Reader Service Card

After years of manufacturing deck equipment, Fukushima has developed the Emergency Towing Arrangement (ETA). The ETA is capable of towing large ships or tankers involved in accidents or lost in hurricanes. Fukushima's ETA has been recognized and certified by societies such as ABS, DNV and NK.

Circle 16 on Reader Service Card



Japanese Radio Co.'s Integrated Bridge System (IBS) promotes safe and economical sailing by providing centralized information management. A typical configuration integrates: radar/ARPA; conning display; ECDIS; an integrated radio communication system (IRCS); night vision; and an engine monitoring package. Pictured is a conning display, which is a comprehensive display of the ship's conditions such as position, course, speed, rudder angle, rate of turn, rpm, wind and drift.

Circle 15 on Reader Service Card

Japanese Marine Technology

a pair of technically advanced, 17,300-gt cruising ferries — *Suzuran* and *Suisen* — to Shin Nihonkai Ferry Co. in May.

The Ultra-High Speed Cruising Ferries can run up to 29.4 knots, allowing IHI to claim honors for the world's fastest diesel-powered mono-hull large car ferries. Measuring 199.4 m long with a 25-m breadth, the 507-passenger ships can attain a top speed of 31.4 knots powered by DU-SEMT Pielstick 18PC4 main diesel engines, at 37,330 kW.

These vessels are particularly important to IHI, because technically, they are positioned (in terms of performance) between conventional ferries and the Super Slender Twin Hull (SSTH) vessels currently under development at IHI. The new ferries were designed with many performance criteria in mind, particularly: iteration between optimization of fine hull form and stability; reduction of wave-making resistance with an improved bow shape; enhancement of propulsive efficiency with an improved

stern shape; increase in main engine power; and improvement of the performance of high-power controllable pitch propellers.

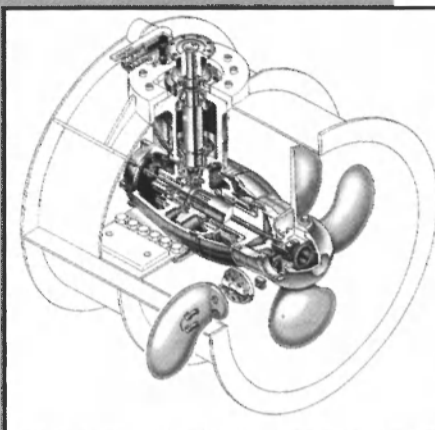
Elastic support is used to suppress engine bed vibration. The structural arrangement is planned to adequately prevent resonance of the natural frequency with the blade frequency and to sufficiently reduce the vibration response to the fluctuating propeller pressure.

Great ships from IHI are the direct result of a dedication to advancing technology, a tenant of the yard since Ishikawajima Shipyard was founded in 1853. One area of particular interest is advanced bonding technology, and IHI's research and development is moving forward to help develop more labor-saving, automated and efficient welding techniques. IHI is also actively working on high energy-density electron beam welding, laser welding, and welding and bonding in special environments.

P&O Containers has signed an agreement with IHI to build what will reportedly be two of

INNOVATIVE MARINE PRODUCTS

Hanshin Diesel Works provides a wide variety of propulsion solutions, including state-of-the-art side thrusters. Controlling the side thrusters in combination with a CP propeller and a high-performance rudder, Hanshin says,

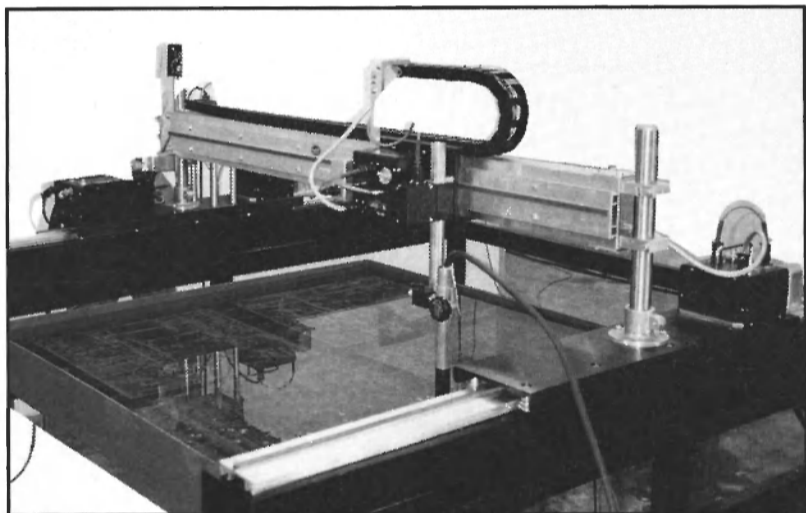


allows ships to be operated and maneuvered by a single pilot using a joystick control. Hanshin's side thrusters enable thrust to either side of a ship to be freely controlled from zero to maximum thrust by simply operating a pitch dial control in the ship's wheelhouse.

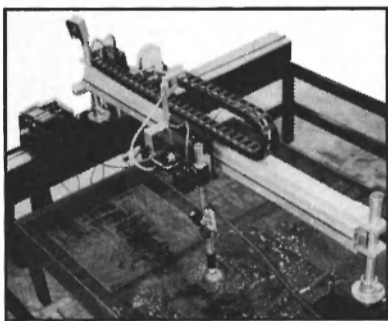
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Circle 214 on Reader Service Card

JAPAN: Paving the Road of Technology

Q&A With *Hiroaki Itabashi* of JSMEA

Hiroaki Itabashi, managing director, Japanese Marine Equipment Association (JSMEA), offered his organization's views on the present and future business of Japanese ship equipment suppliers.

MR/EN: What will your organization focus on to aid/improve Japanese export sales? (What are your planned activities/strategies to boost business?)

HI: Our operational policies are as follows: Promotion of technological development; promotion of cost reduction; improvement in enterprise potential; maximization of business resources; and establishment of an autonomous market.

MR/EN: What are the top business factors inside Japan that will hurt the maritime export business?

HI: With respect to marine industry products alone, yen appreciation and dollar depreciation exert a large influence. The major marine industrial nations include Scandinavia, Britain and Germany. With few exceptions, such as the German mark, their currencies are even more depreciated. Consequently, marine equipment of these nations has become relatively less expensive in the dollar base. Given the appreciation of the yen, Japanese shipyards have been actively procuring foreign marine equipment. Since prices of foreign marine equipment are compared with Japanese prices in these dealings, the prices of Japanese equipment are, in many cases, irrelevantly determined to production costs. This lowers domestic marine equipment prices and ultimately reduces profitability. The resulting lowered enterprise profitability discourages receipt of orders. The business foundation risks becoming further weakened.

MR/EN: What are the top business factors outside Japan that will make the maritime business more challenging/difficult?

HI: The yen appreciation and dollar depreciation.

MR/EN: What are the basic tenants of Japanese shipbuilders which, in your opinion, have made them respected commercial shipbuilders?

HI: The development of the Japanese marine industry has depended upon thorough production and management technology, and upon flexible, highly sensitive customer service. In addition to enhancing productivity by upgrading the production technology and the system, Japanese marine industry workers are united in their efforts at quality and inventory control, which has lowered production costs and improved product quality. Meanwhile, the Japanese marine industry has established a close working relationship with the Japanese shipyard industry by providing full technical support and flexible service allowing for specification changes. These efforts together have resulted in worldwide esteem for the Japanese shipbuilding and marine industries.

The Double-Hull VLCC *Ohminesan*



The *Ohminesan* is the fourth double-hull VLCC built by Hitachi Zosen.

This new vessel is double-sided and double-bottomed, and has a deadweight of 258,000 tons. The high-quality double-hull tankers from Hitachi Zosen are exceptionally easy to operate and maintain thanks to careful design and highly automated and integrated construction. Hitachi Zosen has an abundance of technology and experience in the construction of VLCCs.

Hitachi Zosen's Ariake Works is one of the most modern and automated in the world. The works features a FCuB single-side welder that is 2.5 times faster than conventional automated welders, NC cutting machines, proprietary 20-electrode line welders and portable NC welding robots (HIROBO).

For double-hull VLCCs with efficient and user-friendly automated operation, advanced design and the highest quality, contact Hitachi Zosen, and judge for yourself.

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Japanese Marine Technology

GREAT SHIP OF 1996

Shipbuilder ----- **Hitachi Zosen**
 Ship Owner ----- **Golden Bayshore Corp.**
 Ship Type ----- **VLCC**
 Ship Name ----- **Navix Astral**



Navix Astral from Hitachi Zosen is a 259,987-dwt, 1,062.6-ft. (323.9-m) long VLCC delivered to Golden Bayshore Corp.

Navix Astral, a 259,987-dwt VLCC, has been completed at the Ariake Works of Hitachi Zosen. This tanker, under Panamanian registry, was delivered to the owner — Golden Bayshore Corporation — in March. The features of the vessel include: Super Stream Duct, a nozzle developed by Hitachi Zosen, located in front of the propeller and fitted with a large bulbous bow

below the fore waterline; a low-speed, long-stroke, static-pressure supercharged engine; cargo oil and ballast tanks with remote-control level gauges, for oil monitoring in the cargo control room; and wheelhouse operation of the main engine through a microcomputer-equipped remote-control system. In addition, Hitachi Zosen has completed *Far Eastern Auspice*, a 72,171-dwt bulk carrier, at its Maizuru Works. This is the 80th Hitachi Panamax and the second vessel of the Hitachi Panamax Optima class in which several improvements have been made to the original version. These include a larger propeller, as well as increased tonnage and cargo capacity.

For more information on Hitachi Zosen
 Circle 8 on Reader Service Card

Navix Astral Main Particulars

Length (o.a.)	-----	323.9 m
Breadth	-----	56.6 m
Depth	-----	28.6 m
DWT	-----	259,987 metric tons
Main engine	-----	Hitachi Zosen MAN B&W 6S80MC
Speed	-----	14.8 knots
Classification	-----	LR

World-Class Ariake Works Gets Even Better

Hitachi Zosen's Ariake Works is a shipyard with world-class productivity rates. The Works is also a leader in the CIM network systems for shipbuilding, in which automatic cutting and welding robots are operated with increased accuracy using data from Hitachi Zosen's original three-dimensional CAD system, HICADEC. This automation contributes to the improved productivity. The value of the program is illustrated by the fact that nearly 95 percent of total welding length can be completed on the ground and a double hull VLCC can be built in 82 or 83 blocks. A welding robot for curved sections and painting robot, the first such robots in the world, are now under development.

Ariake Works has a backlog of shipbuilding orders that includes six VLCCs and three LPG carriers. In addition, Ariake Works received an order for a FPSO, reportedly the largest type of marine structure in the world, as of November 15, 1996. The Works will be operating at full capacity until the end of 1998. The new Ariake Machinery Works will be completed at the same site in October of next year for the manufacturing of such products as prime movers, and press machines for automobile production.

the world's largest containerships. The new ships will each have a capacity of 6,674 TEU, greater than any containership currently in service, and each will be driven by one of the most powerful marine diesel engines ever built. When the vessels are delivered in 1998, it is expected that they will join the Grand Alliance operation between Europe and the Far East.

IHI and Sumitomo Heavy Industries Ltd. were said to have hatched a plan to exchange shipbuilding design data online to help significantly reduce the costs associated with the design of VLCCs. The costs of designing this type of ship (at 200,000 tons or more) is estimated to constitute from seven to eight percent of overall costs. IHI has reportedly set up 40 terminals running the Ajisai CAD system at its shipyard; while Sumitomo apparently has introduced an upgraded version of Ajisai at its yard in Kanagawa Prefecture, and planned to apply the system in building two supertankers in November.

Sumitomo Heavy Industries deliv-

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Japanese Marine Technology

ered several interesting ships during the year, one of which is the double-hulled VLCC *Raven*. The *Raven*, a 280,000-dwt supertanker for Mobil Shipping and Transportation, was built in the company's Oppama shipyard, and

is the second double hull VLCC for Mobil.

Mitsui Shipbuilding (MES), with major newbuilding operations at both its Tamano Works and Chiba Works, recently delivered the 169,963-dwt *Cape Olive*, which is

featured on page 42. The ship features many of the latest in labor-saving, operational enhancing and safety devices.

Mitsui, which develops and builds nearly any type of commercial ship, also has expertise in


other related construction projects. Its consortium with Keppel Integrated Engineering Ltd. of Singapore recently received an order for 28 large overhead bridge cranes for container handling from the Port of Singapore Authority (PSA).

The cranes will be installed at the new container terminal now under construction in the Pasir Panjang area of the Port of Singapore. The cranes feature a state-of-the-art operation control system which allows operation by remote control, and an electric anti-sway device to cope with rapid traversing acceleration. The units are reportedly the first overhead bridge cranes with such systems installed in the world. To further enhance efficiency, the PSA is planning to use automated guided vehicles for transferring containers in the yard. The order is scheduled for completion and delivery by January 1999. The consortium between MES and Keppel had previously received orders for 16 large overhead bridge cranes from PSA, together with incidental quay and foundation work contracts.


Japan's Hitachi Zosen has won a contract from Norway's Tentech to build the hull of what will reportedly be the world's largest ever Floating Production Storage Offloading Terminal (FPSO). The vessel will have a crude oil processing capacity of 200,000 bpd, a crude storage capacity of 900,000 bbls, and a gas handling capacity of over 15 mcm/d. The unit will operate on Statoil's Asgard Field in the Norwegian sector of the North Sea. The consortium which won the contract from Statoil consists of ABB, Aker and Maritime Tentech. When the hull is completed in Japan, it will be towed to Aker's yard at Stord, Norway, for completion prior to hook-up.

Kawasaki Heavy Industries (KHI) has two plants: the Kobe Works, where high-value-added vessels are developed and built; and the Sakaide Works, which is equipped with one of the world's largest and most automated facilities for building versatile, large-sized vessels.


The company sees the demand for double-hulled VLCCs increasing in the coming years, and KHI has developed a new technology called "apple slot," which is designed to eliminate the need for the auxiliary ribs that are fitted to



Tanker Jupiter, Bay City, Michigan



Crane Barge BOS 400, Capetown, South Africa

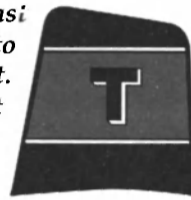


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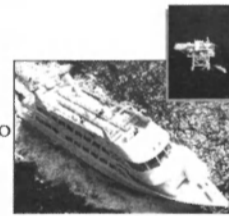
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conventional frames. KHI is a leader in next-generation technology development, and is a leading company in the team developing the hydrofoil-type cargo hybrid ship for the Techno-Superliner ultra high speed ship project.

(Please see this month's Far East Update [page 24] from International Editor **Alan Thorpe** for more recent developments in the Japanese maritime industry).

John Crane Marine Names Canadian Rep

John Crane Marine (JCM) has appointed **Bill Wilkat** as its Canadian representative for all marine sealing products, including propulsion shaft seals, pump seals, packing and accessories. With 18 years of experience in both the design and sales of mechanical sealing products, Mr. **Wilkat** supports JCM'S Total On Board Sealing customer service program.

The company also named **Richard Panikiewsky** as commercial sales representative in the Northeast regional U.S. He was formerly a project manager with General Dynamics' Electric Boat Division.

CONMACO Appoints New President

Craig W. Smith has been promoted to the presidency of CONMACO, a New Orleans-based heavy equipment company supplying the marine and construction industry. Mr. **Smith** has served in the capacity of vice president in charge of Administration since 1991. He is now responsible for all national and international sales and operations.



IMarE Makes Unique Appointment

For the first time in its 107-year history, the Institute of Marine Engineers (IMarE) has appointed a president from outside the U.K. **Alan H. Taylor**, an Australian marine engineer and current president of the Institute's Australia/New Zealand division, will assume the prestigious office for a one-year period beginning in March 1998. Mr. **Taylor** became an IMarE member in the 1960s

while in Hong Kong, and soon after held the position of Honorary Secretary of the HK Branch. He is currently Environmental manager of BHP Transport in Melbourne, and in the past has reportedly been involved in the construction of more than 30 ships, including the largest Australian bulk carrier, as well as the first bulk carrier regis-

tered to the country.

Elliott Bay Strengthens Engineering Services

Elliott Bay Design Group (EBDG), a naval architectural firm located in Seattle, has strengthened its mechanical and electrical

engineering services in the past few years, and recently named **Brian King**, chief marine engineer, to lead its engineering team.

Projects performed by the department include a propulsion selection study and subsequent contract design for an Alaska Marine Highway ferry. This project covered engines, reduction gears,

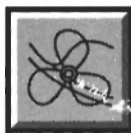
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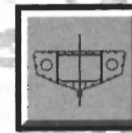
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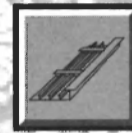


ShipCAM & NC-Pyros

from Albacore Research Ltd.

ShipCAM4: Fairing, lofting, surface/surface intersection, filleting between two surfaces and shell expansion for developable and compound curvature surfaces for ship construction and repair.

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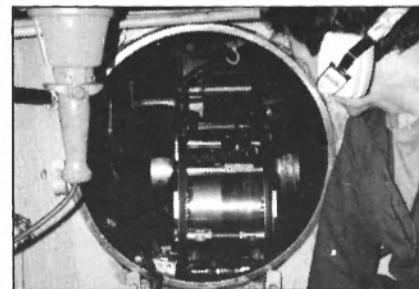
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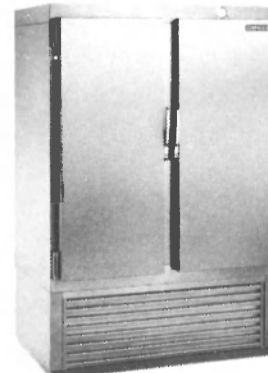
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shafting, steering, foundations, exhaust system, generators and stabilization system. Another recent project involved thruster modifications for D7-Class containerships for Sea-Land Service, Inc. Recent customers in the areas of hydraulic system design, shipboard fluid systems and HVAC systems include: the University of

Connecticut; AT&T; Crowley Marine Services; Hvide Marine Inc.; and NOAA.

Hollaway Joins Thrustmaster

The management of Thrustmaster of Texas, Inc. announced that **Dave Hollaway** has joined its team of marine

propulsion professionals as Applications engineer. He will work closely with company President **Joe R. Bekker** in the design and configuration of hydraulic marine propulsion units, and is responsible for proposal management. Mr. **Hollaway** was previously with the Institute for Applied Marine Research.

Hvide Marine Promotes Two Employees

Hvide Marine Inc., Fort Lauderdale, Fla., announced that **Leo T. Carey** will serve as vice president of Ship Management, after a promotion from his former capacity as director of Operations for the company's chemical and petroleum tanker fleet. In addition, **Christopher D. Strong** was appointed treasurer, and will retain his former title of director of Finance, in which capacity he has served since 1994. He played a key role in Hvide's initial public offering in August.

Evergreen Transfers Responsibility For Shipping

Taiwan's Evergreen Group will reportedly transfer responsibility for its Far East/South Africa/South America service from Uniglory Marine Corp. to Evergreen Marine Corp. Some changes in service are anticipated, and will be announced in the near future. Uniglory will cease to manage pricing with the sailing of *Petralia* from Keelung on December 31. Operation of this weekly service will become Evergreen's responsibility beginning with the sailing of 1,810-TEU *Ever Living* from Keelung on January 6, 1997. The combined Evergreen/Uniglory fleet stands at 82 vessels, with vessels on order bringing the total to 108.

New Marine Consultancy Sprouts In New Orleans

Anchor Marine Ltd., a new marine consulting and manufacturer's representation company, has been formed in New Orleans



by **Charlie Hall**, a 34-year veteran of the shipbuilding, repair and maritime industries. Prior to establishing his own firm, he managed ship repair and conversion sales, and was sales administrator for the Trinity Marine Group. Mr. **Hall** has also worked for Avondale Shipyards in this capacity and has experience as owner/manager of a marine supply company, in international chartering for two offshore fleet operators, and in shipbuilding and repair project management.

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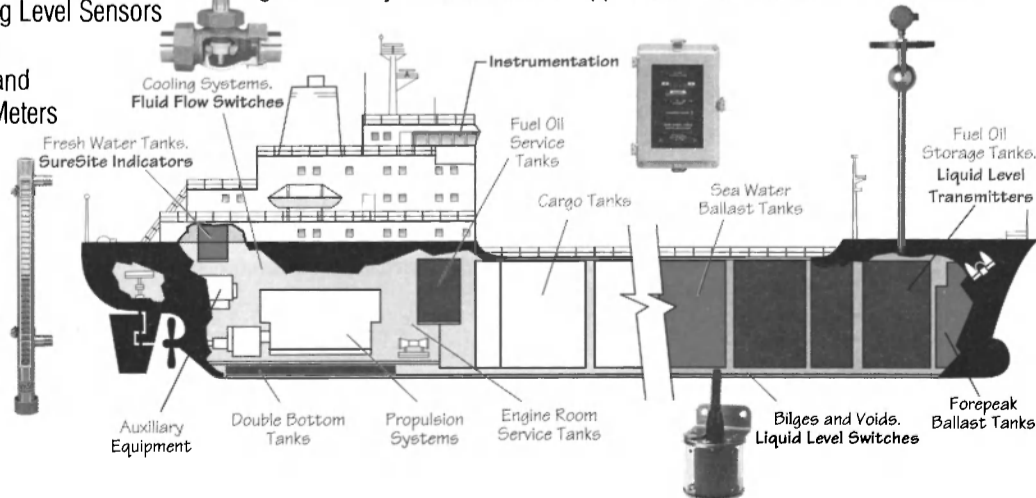
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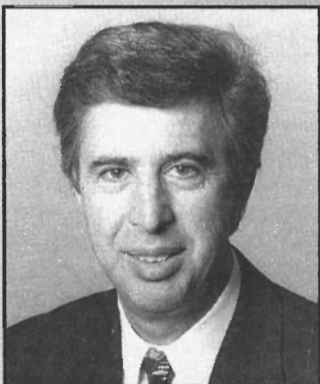
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"There is a surge in new vessel construction..."

Q&A With Stephen Serepca of The CIT Group

For MR/EN's Marine Financial Annual, **Stephen Serepca**, senior vice president of The CIT Group/Capital Equipment Financing, Inc., was recruited for a discussion centered on the market conditions in the maritime sector, including the state of current loan activity.



Prior to joining CIT, Mr. Serepca worked for a marine container leasing company for 19 years, and also served as an employee of Trans World Airlines, in the carrier's cargo marketing and cargo containerized traffic development departments.

MR/EN: As the aging fleet and new oil pollution and safety requirements necessitate the construction of new ships, it seems logical to conclude that the maritime sector's borrowing activity would be in the midst of a surge. How would you classify current borrowing activity?

SS: There is a surge in new vessel construction, especially in the dry bulk, containership and cruise sectors of the industry. Current borrowing activity is brisk.

MR/EN: Do you agree that lending institutions are increasingly eager to reverse the tight lending practices that pervaded the maritime industry in the last decade? Are they perhaps trying to win back the industry's trust and business?

SS: Lending institutions are all too eager to lend to the industry. The number of institutions financing has more than doubled since 1992.

MR/EN: Many analysts have advised shipowners to be wary of easy loans, explaining that the availability of funds may lead to a market glut, with newbuild overcapacity and a shortage of work. When a shipowner comes to CIT to explore financing options for new vessels, what market indicators do you examine to determine if the proposed newbuilds would be successfully utilized and able to generate enough funds to repay the loan?

SS: When CIT evaluates providing financing for owners acquiring new or existing vessels, CIT evaluates the collateral and the financial condition of the owner. The vessels' current and future values are estimated based on their characteristics and the dynamics of the market sector in which they operate. The financials of the borrower are analyzed as well as their position in the market, and their ability to generate sufficient cash flow from operations service debt.

MR/EN: In addition to market conditions, what are the top

(Continued on page 52)

Drewry Releases Shipping Finance Report

In its latest report, *Shipping Finance: A High Risk, Low Return Business?*, Drewry Shipping Consultants demonstrates the limited potential for newbuild investment at current freight rates and construction prices. The report emphasizes that only shipowners who are willing to buy at the bottom of the market, trade in a rising freight market and sell before the market peaks, reap serious financial profits out of the newbuilding market.

Further, the report states that while there is currently not a shortage of financial institutions willing to fund fleet expansion or replacement, "frequently these institutions take a short term view of the industry, which is often in conflict with the borrower's longer term horizon." Drewry also explains that an increasingly complex range of financial tools are aimed at the shipbuilding industry, including securitization, private placements and IPOs.

On a good note, the report analyzes positive investment potential for second-hand acquisitions, and advises that the Handysize dry bulk sector offers the best investment opportunities due to its trading flexibility. Very Large Crude Carriers (VLCCs) are highlighted in the category of negative investment opportunities.

The report also analyzes the performance of more than 250 shipping companies listed on the world stock exchanges.

For more information on the Drewry report
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New Lease, Financing Options Opened By Congress

Recent changes in U.S. vessel documenting laws present new opportunities for shipowners, operators, and financial institutions both in the U.S. and overseas. The FY 1997 Coast Guard Authorization Act broadened the sources of capital for U.S. vessels by creating new lease financing options, including a limited cross-border leasing provision, and by removing a number of prior impediments to financing such vessels.

The full impact of certain provisions, such as the apparent new ability of vessels owned by section 883-1 ("Bowaters") corporations to engage in unrestricted coastwise commerce, may, however, not be certain until after the U.S. Coast Guard (USCG) issues implementing regulations.

Within Congress at least, the underlying motivation for virtually all changes made was the members' desire to encourage modernization and revitalization of the maritime industry in the U.S., on its shipbuilding and shipowning and operating sides, by eliminating restrictions on vessel ownership and financing to enable U.S. shipowners to take increased advantage of modern methods of vessel financing and to encourage the flow of investment capital into the U.S. fleet.

This report surveys key changes made and identifies areas where such change presents opportunities (or

risks) for those involved with the financing or operation of U.S. documented vessels.

Changes to U.S. law governing the documentation and financing of vessels or otherwise intended to encourage investment in such vessels made by Pub.L. 104-324 include:

Allowing a vessel owned by a documentation act citizen corporation (i.e., one having no limitation on foreign stock ownership), which is related to a financing entity, to engage in coastwise trades through a demise charter to a U.S. citizen qualified to operate a coastwise vessel (i.e., one who meets the 75 percent U.S. citizen stock ownership test in section 2 of the Shipping Act, 1916, as amended (the "Shipping Act"))(vessel lease financing);

Permitting cross-border leasing by allowing a vessel that is owned by an ownership trust having a non-U.S. citizen beneficiary to obtain a registry endorsement for operation in U.S. foreign commerce based on charter to a U.S. citizen qualified under section 2 of

(Continued on page 53)

MARINE FINANCIAL ANNUAL

(Serepca Q+A Cont. from pg. 51)
three criteria used by CIT to determine investor loan eligibility?

SS: In addition to market condi-

tions, among the important criteria used by CIT to determine loan eligibility include remarkability of assets, size of substance of the borrower, the borrower's profitabil-

ity, leverage and cash flow coverage of debt service, as well as the borrower's past performance in down cycles, and reputation in the market.

MR/EN: The offshore market is in the midst of a long-awaited boom, and the need for FPSO conversions, new offshore supply vessels, workboats and other exploration and production equipment seems to be on the rise. Have you made note of increased borrowing activity in this area of operations? How long do you think it will be before loan activity in this area reaches the saturation point?

SS: Regarding loan activity in the capital FPSO area, as these type of assets are specialized and not readily remarkable, lending will be based more on relationships and the credit ratings of prospective borrowers rather than the more traditional asset-based lending that takes place in other sectors of the maritime industry.

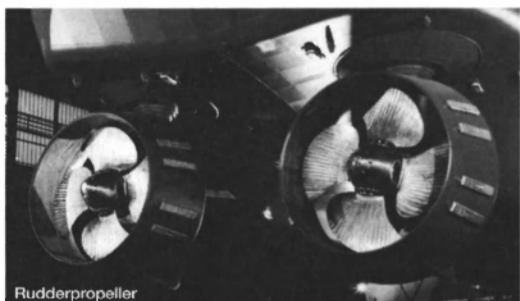
Editor's Note: On October 19, The CIT Group Holdings Inc., a U.S. commercial and consumer lending organization owned 80 percent by The Dai-Ichi Kangyo Bank, Ltd. and 20 percent by The Chase Manhattan Corp., reported net income of \$65.1 million for the third quarter ended Sept. 30, 1996 — an 11.3 percent increase from the \$58.5 million reported for the third quarter of 1995. Net income for the nine months ended Sept. 30, 1996 was a record at \$197.3 million, 17.6 percent higher than the \$167.8 million of 1995. The improvements resulted from strong operating revenues including increased portfolio spreads, partially offset by increased operating expenses.

GL Classification Orderbook Bulges

The biggest orderbook in its 129-year history was recently announced by Germanischer Lloyd (GL), the classification society charged with classifying 527 new vessels, totaling 5.54 million grt. Most of the vessels to be classed are large containerships, feeder containerships, chemical and liquid carriers and fast passenger and freight ferries.

"Such extraordinary growth is a real challenge, and we have taken a number of steps to meet it," said Rainer Schoendube, a member of GL's executive board. "This includes moves to accelerate the approval and ships' plans, an expansion of our surveyor force and field staff, and the opening of new inspection offices."

Producing Thrust



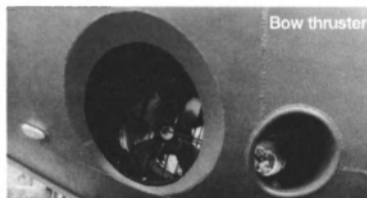
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(Continued from page 51)

the Shipping Act (although subject to limitations as to participation in the newly-enacted Maritime Security Program) ('cross border financing');

- Authorizing foreign sale and transfer approval for a non-U.S. documented vessel prior to it becoming documented under U.S. law;
- **Eliminating restrictions on who may be a mortgagee for a U.S.-documented vessel, which, in turn, eliminates both the need to establish a Westhampton Trust to be able to obtain foreign source financing and the need for Secretarial approval for use of a foreign mortgagee; and,**
- Expressly recognizing the availability of extra-judicial remedies to enforce preferred ship mortgages.

(NOTE: The following are intended only to provide a general introduction to each of the above to permit the reader to gain an appreciation for the magnitude of the change and its potential application or impact for vessel financing institutions, shipowners and operators.)

Vessel Lease Financing/Section 883-1 Owned Vessels

Section 12106 of title 46, U.S. Code (Coastwise Endorsements), now permits coastwise endorsement of a vessel eligible for documentation under section 12102(a) of title 46 (i.e., one that is owned by a 'documentation act citizen' whose stock may be 100 percent foreign-

owned if a corporation), provided: (i) the owner, a parent, or another subsidiary of that same parent is engaged primarily in leasing or other financial transactions; and (ii) the vessel is demise chartered to and operated by a U.S. citizen eligible to engage in the coastwise trades under section 2 of the Shipping Act (i.e., 75 percent U.S. citizen owned and controlled). This change eliminates the U.S. citizen stock ownership requirements previously applied to the owner of a vessel seeking coastwise endorsement while maintaining the same degree of U.S. citizen control over the vessel itself as under prior law through the demise charter requirement. Thus, a U.S. bank or other financing institution is no longer required to establish its own corporate U.S.-citizen ownership to finance a vessel in the coastwise trades (thereby eliminating the premium often associated with such ownership). Provided vessel title rests with a U.S. owner as defined by section 12102(a) (in the case of a corporation, one having a U.S.-citizen chief executive, chairman and board majority), that financing institution may itself now be located outside the U.S. A potential further application of this new leasing provision arises for a vessel operating in the coastwise trades under the narrow 'Bowaters' authority of section 883-1 of title 46 or a foreign-owned corporation that otherwise would be required to qualify under that provision to operate in coastwise trades. By meeting the requirements of this provision (e.g.,

related to a financing entity even if that entity played no role in the financing of the vessel in question) such a corporation may now alternatively qualify for a coastwise endorsement under this provision. As a result, such corporations can avoid the requirements of section

(Continued on page 54)

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(Continued from page 53)

883-1 (e.g., 90 percent U.S. employees, 75 percent U.S.-origin raw materials) and any restrictions on the use of owned vessels in coastwise common or contract carriage (provided demise chartered to a qualified coastwise operator).

In either case, key issues for the

financing institution and for the vessel owner will include ensuring that the demise charterer qualifies under section 2 of the 1916 Act and that the charter itself includes no impermissible control over the vessel or its operations.

Cross Border Financing

Section 12102 of title 46, U.S. Code (Vessels Eligible for Documentation), now permits U.S. documentation under a registry endorsement only for a vessel owned by a trust having a non-U.S. citizen beneficiary, provided: all

trustees are U.S. citizens; the trust restricts control by any non-citizen; and the vessel is demise chartered to a U.S. citizen qualified to engage in foreign trades under section 2 of the Shipping Act. Whereas under prior law and Coast Guard interpretation 'all members' of a trust, including beneficiaries, had been required to be U.S. citizens for a vessel to be eligible for documentation, this change conforms to the long-standing practice of the U.S. aviation industry respecting such ownership trusts.

Notably, however, a vessel owned in this manner qualifies for the new Maritime Security Program (the recently enacted successor to the soon to expire operating differential subsidy program) only under specified circumstances keyed primarily to existing vessels and operators eligible for that program. Such a limitation appears to reduce the utility of this financing mechanism, particularly for the liner side of the U.S. fleet.

Prior Approval For Foreign Transfers

The Secretary of Transportation may now provide investors in vessels not yet documented under U.S. law advance approval for the foreign sale and transfer a vessel prior to its documentation under U.S. law. This change is intended to assure such investors that their asset could not be forced to remain under U.S. flag under different economic circumstances than those that existed when the vessel was so documented. Because the provision granting such authority simply specifies the timing of the approval required under section 9(c) of the 1916 Act, such approval may be subject to such conditions as the Secretary may require as under prior law.

Although the subsection making this change is included under the heading of 'Cross-Border Financing' and is discussed in legislative history solely in those terms (e.g., to allow foreign transfer upon default of the charter), as enacted it applies to any transfer into U.S. registry, irrespective of whether linked to an ownership trust.

Lifting Restrictions On Mortgagees

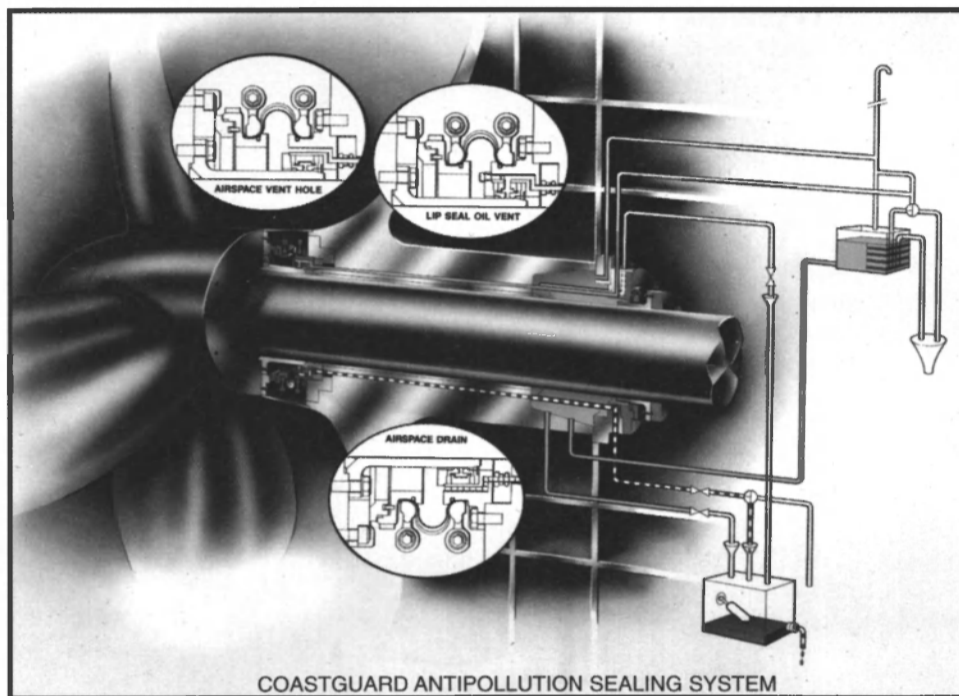
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a preferred mortgage covering a U.S. documented vessel, Pub.L. 104-324 opens the opportunity to seek financing worldwide without need for approval by the Secretary. As a consequence, both the provision providing for establishment of 'Westhampton Trusts' to obtain similar financing and all references thereto or to mortgages generally under section 9(c) of the 1916 Act (transfers requiring Secretary approval) have been repealed or eliminated as no longer required.

Extrajudicial Remedies Upon Default of Preferred Mortgages

In an effort to resolve conflicting case law and uncertainties regarding the use of extra-judicial remedies, Congress expressly permitted their use in addition to judicial remedies of an in rem action against the vessel or a civil action in personam against the mortgagor. This change corrects the situation that has existed since 1985 as a result of the decision in *Bank of America National Trust and Savings Assoc. v Fogle*, 637 F.Supp. 305 (N.D. Cal. 1985) (holding that the in rem remedy provided by statute indicated a Congressional intent to preclude such "self help"), where a mortgagee was forced to seek judicial relief even though repossession and sale could have been accomplished without court involvement (particularly where a recreational vessel was involved). The new provision does, however, raise some additional questions, particularly regarding the ability of a second or third mortgagee to foreclose on vessel assets without knowledge of the first preferred mortgagee.

Vessel Financing Practices Of Other Countries

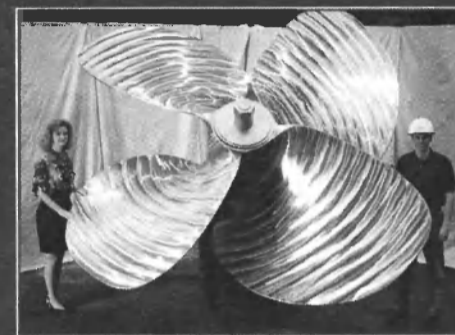
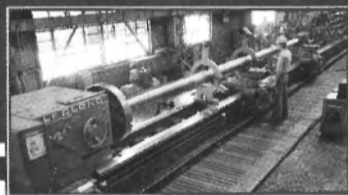
Section 1113(f) of Pub.L. 104-324 further tasks the Secretary of Transportation with studying and reporting on the methods for leasing, demise chartering, and financing of vessels operating in the coastal trades of other countries and whether the laws of those other countries provide reciprocity for U.S. banks, leasing companies, and other financial institutions with respect to the rights granted foreign institutions in the preceding changes. This report is required to be submitted to Congress by October 1997, so the changes discussed above may only be the first wave of change to U.S. laws in these areas.

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Intertanko: Middle East Oil Export To Remain Steady

According to Intertanko's monthly market report for October 1996, Middle East oil export is expected

to remain steady, and VLCCs will continue to compete with Suezmax tankers in the Atlantic.

Intertanko also reported that the International Monetary Fund (IMF) has forecast low world inflation of two to three percent, a stable long-term interest rate of four percent and accelerating growth of world GDP to above four percent.

Part of the explanation for the positive trends is the sharp rebound in activity in the transition economies in eastern Europe and the former Soviet Union.

Intertanko also reported that at the annual ship finance seminar arranged by the Norwegian Shipping Academy in Oslo, modest views on the industry's future abil-

ity to attract external investors' capital were expressed. The market report further states that outside of Norway, the stock-listed shipping companies have generated a far too low return on equity compared with other industries, even after taking into account the shipping industry's risk/return profile.



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Tidewater Naval Architects Awarded Technical Service Contracts

Tidewater Naval Architects, Inc., headquartered in Portsmouth, Va., has been awarded two significant technical services contracts by the Keelung Harbor Bureau of Taiwan. These contracts represent a breakthrough in technical support between a U.S.-based marine engineering firm and the Republic of China. Tidewater will provide the design, supervision and shipyard engineering for one self-propelled dredge, two self-propelled barges and one self-propelled floating crane for Keelung Harbor, in Northern Taiwan.

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Mikkelsen Appointed New Deputy Chief For Ulstein Group

Bård Mikkelsen has been appointed deputy chief executive of Norway's Ulstein group, with the formal title of president at the Ulstein Industrier subsidiary. Currently president of Norwegian domestic airline Widerøe's Flyveselskap and chief executive of the Widerøe Group, Mr. Mikkelsen will join Ulstein next February.

The present chief executive, Idar Ulstein, will remain in office but will transfer responsibility for day-to-day operational management of the Group to his new deputy.

Mr. Mikkelsen will also replace Mr. Ulstein as chairman of Ulstein Verft, Ulstein Propeller, Ulstein Bergen and Ulstein Brattvaag, and will head the cor-

a preferred mortgage covering a U.S. documented vessel, Pub.L. 104-324 opens the opportunity to seek financing worldwide without need for approval by the Secretary. As a consequence, both the provision providing for establishment of 'Westhampton Trusts' to obtain similar financing and all references thereto or to mortgages generally under section 9(c) of the 1916 Act (transfers requiring Secretary approval) have been repealed or eliminated as no longer required.

Extrajudicial Remedies Upon Default of Preferred Mortgages

In an effort to resolve conflicting case law and uncertainties regarding the use of extra-judicial remedies, Congress expressly permitted their use in addition to judicial remedies of an in rem action against the vessel or a civil action in personam against the mortgagor. This change corrects the situation that has existed since 1985 as a result of the decision in *Bank of America National Trust and Savings Assoc. v Fogle*, 637 F.Supp. 305 (N.D. Cal. 1985) (holding that the in rem remedy provided by statute indicated a Congressional intent to preclude such "self help"), where a mortgagee was forced to seek judicial relief even though repossession and sale could have been accomplished without court involvement (particularly where a recreational vessel was involved). The new provision does, however, raise some additional questions, particularly regarding the ability of a second or third mortgagee to foreclose on vessel assets without knowledge of the first preferred mortgagee.

Vessel Financing Practices Of Other Countries

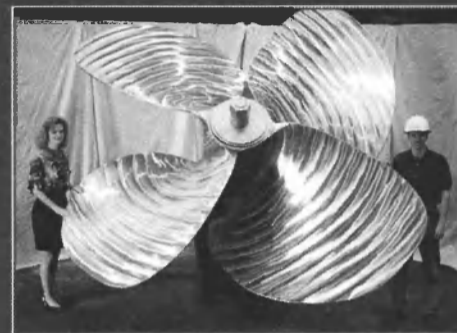
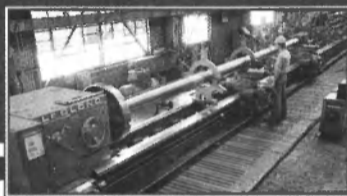
Section 1113(f) of Pub.L. 104-324 further tasks the Secretary of Transportation with studying and reporting on the methods for leasing, demise chartering, and financing of vessels operating in the coastal trades of other countries and whether the laws of those other countries provide reciprocity for U.S. banks, leasing companies, and other financial institutions with respect to the rights granted foreign institutions in the preceding changes. This report is required to be submitted to Congress by October 1997, so the changes discussed above may only be the first wave of change to U.S. laws in these areas.

For more information on these laws
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ny's Energy Services business segment.'

Intertanko: Middle East Oil Export To Remain Steady

According to Intertanko's monthly market report for October 1996, Middle East oil export is expected

to remain steady, and VLCCs will continue to compete with Suezmax tankers in the Atlantic.

Intertanko also reported that the International Monetary Fund (IMF) has forecast low world inflation of two to three percent, a stable long-term interest rate of four percent and accelerating growth of world GDP to above four percent.

Part of the explanation for the positive trends is the sharp rebound in activity in the transition economies in eastern Europe and the former Soviet Union.

Intertanko also reported that at the annual ship finance seminar arranged by the Norwegian Shipping Academy in Oslo, modest views on the industry's future abil-

ity to attract external investors' capital were expressed. The market report further states that outside of Norway, the stock-listed shipping companies have generated a far too low return on equity compared with other industries, even after taking into account the shipping industry's risk/return profile.



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Mr. Mikkelsen will also replace Mr. Ulstein as chairman of Ulstein Verft, Ulstein Propeller, Ulstein Bergen and Ulstein Brattvaag, and will head the cor-

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porate management team. He is due to step up to the chief executive's post when the Ulstein Group receives a listing on the Oslo stock exchange within a year or two.

Stolt Comex Awarded \$68 M Contract From Brazilian Interest

Stolt Comex Seaway SA has been awarded a four-year contract from Brazilian state oil company Petrobras for diving and ROV support services using *Seaway Harrier*. The contract is valued at \$68 million and will commence in May. The contract calls for IMR work and pipeline tie-ins on the Campos Basin oil field which will require diving services to a depth of 1,033 ft. (315 m), the provision of a work class ROV operating to a depth of 4,921 ft. (1,500 m), and an observation ROV working down to 1,968 ft. (600 m). The Campos Basin oil field, one of the world's largest oil fields and located in the deepest water depths to date for oil production, has identified recoverable reserves of 12 billion barrels of oil. This contract follows a three-year award by Petrobras for *Seaway Osprey* — val-

ued at \$67 million, which commenced in September of this year — to lay flexible flow-lines and flowline bundles in water depths up to 1,476 ft. (450 m) and to provide diving support up to 1,050 ft. (320 m).

TDI Enters Into Contract

Texas Drydock, Inc. (TDI) has entered into a contract with Arabian Drilling Company (ADC) of Dammam, Saudi Arabia, for the design and construction of a new-generation, multi-purpose, self-propelled jackup service vessel for operation in the Arabian Gulf. This vessel, which measures 150 x 108 x 15 ft. (46 x 33 x 4.6 m) with three 228-ft. (70-m) triangular truss legs and 40-person quarters, has a design speed of six knots and jacks 5 ft. (1.5 m) per min.

Maritime Tentech Appoints Broker

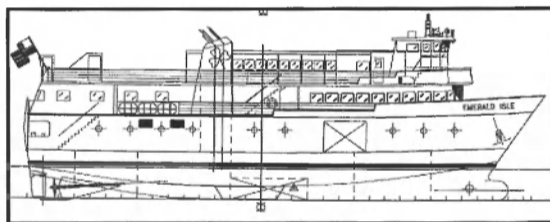
Maritime Tentech AS has appointed Johan G. Olsen Shipbrokers AS as its exclusive broker for the marketing of its drilling vessel. Based on the Tentech

design, this vessel is a further development of Maritime Tentech's FPSO technology. Seven such vessels are either in operation or under construction. The double hull vessel is developed for deepwater, either in D.P. mode or turret mooring, or a combination thereof, with a complete drilling system. The storage tanks and piping are an integral part of the hull, enabling the vessel to be easily and economically upgraded to facilitate EWT, storage and production.

Washburn & Doughty To Build Ferry For Michigan Transportation Authority

Washburn & Doughty Shipyard of East Boothbay, Maine, has signed a contract with the Beaver Island Transportation Authority Board to build *Emerald Isle* — a steel, twin screw, passenger/vehicle ferry. The vessel is the 10th ferry to be built by Washburn & Doughty. *Emerald Isle* will run between Charlevoix and Beaver Island, Mich., replacing *Beaver Island* which traversed that same route for 34 years. Powered by two Caterpillar 3512 engines, each producing 1,500 hp, *Emerald Isle* is scheduled to travel at 14 knots. Maneuvering will be enhanced by a 200-hp American Trac series bowthruster, which is directly driven by a Caterpillar 3116 engine. Capable of carrying 300 passengers and 20 vehicles, *Emerald Isle* will afford its customers easy access by means of a hydraulically operated stern ramp and 11-in. sideports equipped with roll-up doors. *Emerald Isle* will meet U.S. Coast Guard K rules for Great Lakes winter service and will be extremely heavily plated to withstand the rigors of Lake Michigan. Designed by Timothy Graul Marine Design of Sturgeon Bay, Wis., the vessel will be launched in May 1997 and delivered to Washburn & Doughty in August 1997.

For more information on Washburn & Doughty
Circle 18 on Reader Service Card



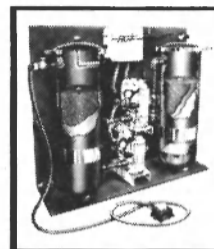
Emerald Isle particulars

Length o.a.	130 ft. (40 m)
Beam	38.8 ft. (12 m)
Passenger capacity	300 persons
Automobile capacity	20
Main engines	(2) Caterpillar 3512B electronic
Reduction gears	ZF mod. BW750
Bowthruster engine	Caterpillar 3116 205 bhp
Bowthruster	American Trac series

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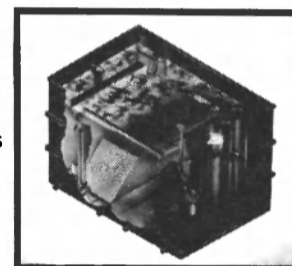
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**PMC Adds To Line of Alarm
And Monitoring Products**

Prime Mover Controls (PMC) of

Vancouver, Canada, has added the 8110 Tank Level Monitor to its line of alarm and monitoring products. This unit is specifically designed to

meet the tank level indication and alarm requirements for marine applications. Suitability to the marine environment is provided by two different scan rate options — slow scan to smooth the effects of sloshing liquids due to vessel motion

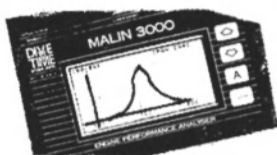
and fast scan for rapid level indication. Corrections for the irregularly shaped tanks found in marine applications are performed using tank shape tables. These tables can be manually entered or created by using one of two automated calibration methods.

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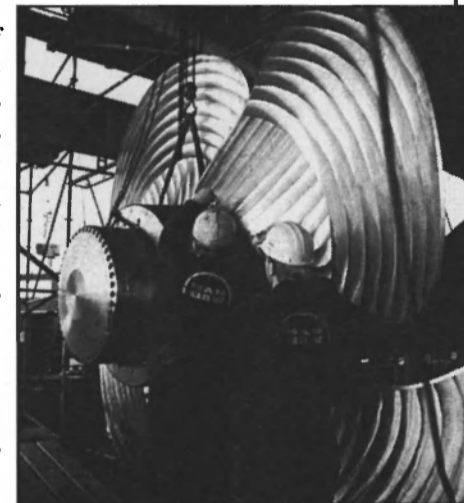
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MAN B&W Launches New Prop System

MAN B&W Diesel AS, Alpha Diesel has launched its new VBS-type CP propeller system optimizing the coverage of the range of VB and VBS propellers with diameters up to 23 ft. (7 m) and outputs up to 15,000 kW. The VB series — with hub diameters from 480 to 640 mm — features the propeller blade pitch setting by a hydraulic servo motor integrated in the Alpha reduction gearbox. The VBS series — with hub diameters from 740 to 1,680 mm — features the propeller blade pitch setting by a hydraulic servo motor integrated in the propeller hub. With the introduction of VBS 1180, 1380 and 1560, improved propeller coverage is offered to match all cylinder numbers of L40/54, L48/60 and L58/64 four-stroke engines and the two-stroke engine range up to S60MC-C.



For more information on MAN B&W
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**Dockwise Moves TLP
Ram Powell**

Dockwise N.V., operator of a fleet of semi-submersible heavy-lift vessels, has been awarded its second contract from Shell for the sea transport of a 370-ft. (113-m) wide tension leg platform (TLP) from the Belleli construction yard in Taranto, Italy, to the Aker Gulf Marine yard in the Gulf of Mexico, where completion and outfitting of the TLP will take place. The load-out operation was carried out in four steps. The hull was first skidded from the construction quay onto two barges, moored stern to the quay. The barges were towed to Mar Grande bay, off Taranto, where the floating hull was discharged by means of the float-off method. Subsequently, the TLP was loaded by a float-on operation onto *Mighty Servant 2*.



The diagonal setting of the 14,500-ton *Ram Powell* TLP on the 131.2 ft. (40 m) wide *Mighty Servant 2* reportedly increased the width of the transport to 370 ft. This resulted in a protrusion of 120 ft. (36.5 m) on each side of the heavy-lift vessel.

Dockwise N.V. operates a fleet of 15 semi-submersible heavy-lift vessels. Nine vessels focus on the oil, gas and petrochemical industry, and three on the fully erected container crane and dredging material markets. Three of the vessels are fully operational in specialized fields, of which, two are in the subsea cable laying market and one is involved in luxury yacht transportation.

Principal Contracts Recorded, October 1996

Orders are listed alphabetically, by vessel type. Publisher is not responsible for errors or omissions. For additional information on this, or other ship market information, contact: FERLISHIP, Paseo De San Francisco De Sales, 8, 28003 Madrid, Spain, tel: +341 441 4138; fax: +341 441 4138.

Owner/ Operator	Country (Owner)	Shipyard	Country (Shipyard)	Ship Type	No.	DWT	Delivery Date	Price \$M
ROVDE SHIPPING	NORWAY	FOSEN MEK VERKSTEDER	NORWAY	AHTS	1	—	1998	—
SEA TRUCK SHIPPING	NORWAY	SOVIKNES VAERFT	NORWAY	AHTS	1	—	12/98	—
SEACOR MARINE	U.S.	HALTER MARINE INC.	U.S.	AHTS	—	—	—	—
SEACOR MARINE	U.S.	TRINITY MARINE GROUP	U.S.	AHTS	1	—	10/97	—
SIMON MOKSTER SHIPPING	NORWAY	AUKRA INDUSTRIER	NORWAY	AHTS	1	—	1998	—
FARSTAD SHIPPING	NORWAY	LANGSTEN	NORWAY	AHTS	1	—	1998	—
ANDHIKA GROUP	SINGAPORE	TSUNEISHI	JAPAN	BULK CARRIER	3	—	1999	72
BRITISH STEEL	U.K.	HYUNDAI	KOREA	BULK CARRIER	1	—	1998	49
CHOWGULE SS	INDIA	BORNEO SHIPPING	—	BULK CARRIER	1	—	1997	—
COSCO	CHINA	HUDONG SHIPYARD	CHINA	BULK CARRIER	3	—	—	—
COSCO	CHINA	SANOYAS CORP.	JAPAN	BULK CARRIER	2	—	—	40.7
SHOWA LINE	JAPAN	TSUNEISHI	JAPAN	BULK CARRIER	1	—	1997	27.5
MARITIME CREDIT CORP.	JAPAN	HITACHI ZOSEN	JAPAN	CAR FERRY	1	—	1998	—
EKTANK AB	SWEDEN	JIANGNAN	CHINA	CHEMICAL	1	—	—	24
J & W SHIPPING	SWITZERLAND	SHIN YOUNG	KOREA	CHEMICAL	2	—	12/97	—
UNITED TANKERS	SWEDEN	FACTORIAS VULCANO	SPAIN	CHEMICAL	1	—	1998	—
UNITED TANKERS	SWEDEN	FACT. VULCANO	SPAIN	CHEMICAL	1	—	1998	—
N.Y.K. (NIPPON YUSEN KAISHA)	JAPAN	HITACHI ZOSEN	JAPAN	CHIP CARRIER	1	—	1998	24
N.Y.K. (NIPPON YUSEN KAISHA)	JAPAN	HITACHI ZOSEN	JAPAN	CHIP CARRIER	1	—	1998	25
COSCO/NISSHO Iwai	CHINA	IMABARI SHIPBUILDING	JAPAN	CONTAINER	1	—	1998	29
EGON OLDENDORFF	GERMANY	FLENSBURGER	GERMANY	CONTAINER	6	—	1998	162
ERNST JACOB	GERMANY	FLENDER WERFT	GERMANY	CONTAINER	2	—	—	—
EVERGREEN	TAIWAN	MITSUBISHI H.I.	JAPAN	CONTAINER	8	—	1999	—
MISC	MALAYSIA	HYUNDAI	KOREA	CONTAINER	2	—	1998	—
MISC	MALAYSIA	DAEWOO	KOREA	CONTAINER	2	—	1998	78
MISC	MALAYSIA	DAEWOO	KOREA	CONTAINER	2	—	10/98	—
MIITSUI BUSAN	JAPAN	IMABARI SHIPBUILDING	JAPAN	CONTAINER	1	—	7/97	30
NAKATA/MIITSUI	JAPAN	IMABARI SHIPBUILDING	JAPAN	CONTAINER	1	—	7/97	30
NISSSEN KAIUN/MIITSUI	JAPAN	IMABARI SHIPBUILDING	JAPAN	CONTAINER	1	—	7/97	30
OOCL	HONG KONG	IMABARI SHIPBUILDING	JAPAN	CONTAINER	4	—	1997	120
P & O CONTAINERS	U.K.	ISHIKAWAJIMA HARIMA H.I.	JAPAN	CONTAINER	2	—	—	—
PACIFIC INTERNATIONAL LINES	SINGAPORE	KANASASHI CO.	JAPAN	CONTAINER	2	—	11/97	48
RCL	SINGAPORE	KYOKUYO ZOSEN	JAPAN	CONTAINER	2	—	—	—
TOKEI KAIUN/MIITSUI	JAPAN	IMABARI SHIPBUILDING	JAPAN	CONTAINER	—	—	7/97	30
UNKNOWN	PANAMA	IMABARI SHIPBUILDING	JAPAN	CONTAINER	4	—	1997	—
WAN HAI LINES	TAIWAN	SHIN KURUSHIMA	JAPAN	CONTAINER	2	—	9/98	46
WAN HAI LINES	TAIWAN	SHIN KOCHI JUKO	JAPAN	CONTAINER	2	—	1998	—
COMPAGNIE DES ILES DU PONANT	FRANCE	LEROUX ET LOTZ	FRANCE	CRUISE SHIP	1	—	1998	—
BJARNE SKEIE	NORWAY	DALIAN SHIPYARD	CHINA	DEEPWATER SEMISUBM.	1	—	—	36
CHUN KYUNG LINE	KOREA	DAE SUN	KOREA	CONTAINER	1	—	9/97	—
TOR LINE (DFDS GROUP)	SWEDEN	FINCANTIERI	ITALY	FERRY	1	—	1998	—
CONSERVAS GARAVILLA	SPAIN	ASTILLEROS MURUETA	SPAIN	FISHING	1	—	1997	—
NUUK	GREENLAND	UMOE STERKODER	NORWAY	FISHING	1	—	7/97	—
POLAR SEAFOOD TRAWL	GREENLAND	UMOE STERKODER	NORWAY	FISHING	1	—	7/97	—
BRIESE SCHIFFAHRTS	GERMANY	VOLHARDING	NETHERLANDS	GENERAL CARGO	1	—	1997	—
HEINRICH JUNGERHANS	GERMANY	XINGANG SHIPYARD	CHINA	GENERAL CARGO	2	—	1998	—
HINSCH	GERMANY	VOLHARDING	NETHERLANDS	GENERAL CARGO	1	—	1997	—
WAGENBORG SHIPPING BY	NETHERLANDS	BODEWES VOLHARDING	NETHERLANDS	GENERAL CARGO	2	—	1997	—
WAGENBORG SHIPPING BY	NETHERLANDS	FERUS SMIT	NETHERLANDS	GENERAL CARGO	3	—	1998	—
WAGENBORG SHIPPING BY	NETHERLANDS	FERUS SMIT	NETHERLANDS	GENERAL CARGO	2	—	1998	—
MAMMOET SHIPPING	NETHERLANDS	VARIOUS YARDS	NETHERLANDS	HEAVY-LIFT CARGO	4	—	9/98	—
ROYAL AUSTRALIAN NAVY	AUSTRALIA	NQEA AUSTRALIA	AUSTRALIA	HYDROGRAPHIC	2	—	98/99	—
ROWAN COMPANIES	U.S.	LETOURNEAU	U.S.	JACK-UP	2	—	1998	320
CISPA GAS TRASPOTI	ITALY	CANTIERE NAVALE DI PESARO	ITALY	CHEMICAL	1	—	10/97	—
SONDERBORG	DENMARK	SVENDBORG	DENMARK	LIVESTOCK CARRIER	1	—	3/97	—
SCHLUTER	GERMANY	KROEGERWERFT	GERMANY	MULTI-PURPOSE	1	—	1998	—
ARIES MARINE	U.S.	HALTER MARINE INC.	U.S.	OFFSHORE SUPPLY	1	—	1997	—
MRF	NORWAY	ZAMACONA	SPAIN	PASSENGER/CARGO	1	—	1997	16
JAPAN CRUISE LINE	JAPAN	ISHIKAWAJIMA HARIMA H.I. (IHI)	JAPAN	PASSENGER/CRUISE	1	—	5/98	—
NEGROS NAVIGATION	PHILIPPINES	KVAERNER FJELLSTRAND SING.	SINGAPORE	PASSENGER/FERRY	1	—	1997	6
OFOTENS	NORWAY	KVAERNER FJELLSTRAND	SINGAPORE	PASSENGER/FERRY	1	—	1997	—
WEISSE FLOTTE	GERMANY	KVAERNER FJELLSTRAND	SINGAPORE	PASSENGER/FERRY	1	—	1997	—
CALEDONIAN MACBRAYNE	U.K.	APPLEDORE SHIPBUILDERS	U.K.	PASSENGER/RoRo	1	—	4/98	23.5
GOZO CHANNEL COMPANY	MALTA	MALTA SHIPBUILDING	MALTA	PASSENGER/RoRo	3	—	98/99	135
HONG KONG RESORT	HONG KONG	MARINTEKNIK SING.	SINGAPORE	PASSENGER/RoRo	1	—	1997	—
HONG KONG RESORT	HONG KONG	MARINTEKNIK SING.	SINGAPORE	PASSENGER/RoRo	1	—	1997	—
GERMAN NAVY	GERMANY	FLENSBURGER	GERMANY	SUPPLY	1	—	—	203.3
ASIAN ETERNAL SHIPPING	SINGAPORE	PAN-UNITED SHIPYARD	SINGAPORE	TANKER	1	—	1998	—
CHEVRON	U.S.	SAMSUNG	KOREA	TANKER	2	—	98/99	174
ICB SHIPPING	SWEDEN	DAEWOO	KOREA	TANKER	1	—	1998	—
LABROY MARINE	SINGAPORE	PAN-UNITED SHIPYARD	SINGAPORE	TANKER	1	—	1998	—
SEATANKERS MANAGEMENT	CYPRUS	HYUNDAI HEAVY INDUSTRIES (HHI)	KOREA	TANKER	1	—	1998	51.5
LUNDQVIST REDERIENNA	FINLAND	DAEWOO	KOREA	TANKER	1	—	3/98	41
SCINICARIELLO	ITALY	—	JAPAN	TANKER	2	—	1998	84
TAIYO OIL	JAPAN	IMABARI SHIPBUILDING	JAPAN	TANKER	1	—	5/97	47
COASTAL TANKERS LTD. (CTL)	NEW ZEALAND	SZCZECIN SHIPYARD	POLAND	TANKER	1	—	11/98	37
COASTAL TANKERS LTD. SHIPPING	NEW ZEALAND	STOCZNIA	POLAND	TANKER	1	—	10/98	—
STRENSTRAM	—	JIANGNAN	CHINA	TANKER	1	—	1999	21
WW MARPETROL	SPAIN	UNION NAVAL DE LEVANTE	SPAIN	TANKER	2	—	1998	56
FREDRIKSEN	CYPRUS	HYUNDAI HEAVY INDUSTRIES (HHI)	KOREA	TANKER	1	—	1998	51
IMPRESA FRATELLI BARRETTA	ITALY	CANTIERE NAV. TOMMASI.	ITALY	TUG	2	—	1997	14.4
K-LINE	JAPAN	HITACHI ZOSEN	JAPAN	WOOD CHIP BULK	1	—	1998	—
MIITSUI O.S.K. LINES (MOL)	JAPAN	IMABARI SHIPBUILDING	JAPAN	WOOD CHIP BULK	1	—	1997	—

Intertanko Claim Against Washington State Dismissed

A federal judge has thrown out a lawsuit challenging Washington state's oil spill prevention law, rejecting Intertanko's contentions that the state had overstepped its authority. U.S. District Judge **John Coughenour** concluded that the strict state law and regulations are not preempted by federal law, do not violate the Constitution and do not conflict with international agreements.

"We're disappointed, obviously, in the result," said a member of Intertanko's counsel team.

The state law requires oil vessels and onshore oil facilities to prepare and submit both spill response and

spill prevention plans. State officials say the strict rules are particularly important because Congress has approved exports of Alaskan crude, meaning tanker traffic in Washington could increase significantly.

Oceaneering Purchases Diamond Offshore Rig

Oceaneering International has purchased semi-submersible drilling rig *Ocean Zephyr II* from Diamond Offshore, Inc. The company will market the rig for conversion to a floating production system (FPS), and may also offer it as a multi-service vessel (MSV) to support construction and intervention operations, including

workovers on subsea production facilities. The lower hull of the rig measures 221 x 201 ft. (67.3 x 61.2 m) and supports a watertight upper hull measuring 180 x 150 ft. (54.8 x 45.7 m) with a depth of 14 ft. (4.2 m).

Service Marine Completes Conversion Project

Service Marine Industries, Inc. completed a vessel conversion project for Halliburton Energy Services, Inc. The conversion of 174 x 52-ft. (53 x 15.8-m), self-propelled, unmanned oil spill recovery vessel (OSRV) *CGA-200* included significant modifications to the service capabilities of the specialty barge, such as: addition of crew

living quarters; removal and replacement of existing oil spill containment and recovery equipment; addition of new port and starboard storage areas; and closing in of the existing stern ramp. HVAC modifications were installed and potable water tanks were enlarged. The work was completed under ABS' rules and the ABS Maltese Cross A1 Oil Tank Barge classification was preserved, with additional certification for manned operation.

Circle 36 on Reader Service Card

Austal Confirms Second Ferry Order From Japan

Austal Ships has announced that a contract has been signed with Japan's Kumamoto Ferry — a new subsidiary of Kyushu Sanko — for a 30-m (98.4-ft.) high speed passenger catamaran. This is the yard's second high speed ferry contract from Japan. Kumamoto agreed to let Austal subcontract vessel construction to Image Marine Group, another Western Australian builder, due to demands on Austal's yard capacity. Image worked closely with Austal to secure the contract in the face of stiff competition from Japan. Finance for the vessel is being supplied by Maritime Credit Corp. of Japan. Austal Ships was supported in its finance application by Kambara Marine Development and Shipbuilding Co. based in Hiroshima prefecture.

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Laser Plot Announces ARCS Compatibility

Laser Plot has announced that its ChartNav INS+ electronic chart systems (ECS) now complies with the U.K. Hydrographic Office commercially released version of the ARCS database, version 2.0. The company has been participating in ongoing development of the ARCS product in conjunction with the Hydrographic Office and the Royal National Lifeboat Institute, which has more than 50 ChartNav systems installed. "ChartNav electronic chart systems now have the capability to use raster and vector chart databases from the U.S., Britain and Canada," said Laser Plot President **Richard Gregory**. ChartNav systems use ARCS (U.K.), RNCI (U.S.), NDI (Canada) and other government chart data in the Sea-D database. Features such as depth contours, radar data and data logging can be layered over the ARCS data, allowing flexibility for route planning and track histories.

Maritime Reporter/Engineering News

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

Emerald Creek Garnet, 2615 North Fourth Street, Coer d'Alene, ID 83814
Ervin Industries, Inc., 3893 Research Park Drive, Ann Arbor, MI 48106-1668

ACOUSTICS

Predict/DLI, 253 Winslow Way West, Bainbridge Island, WA 98110
BBN Acoustic Technologies, 70 Faucett St., Cambridge, MA 02138

ADHESIVES

Life Industries, Corp., 2061 Bridge View Dr., N. Charleston, SC 29405

AIR CONDITIONING AND REFRIGERATION - Repair & Installation

ABB Faklt Marine, Box 1043, S 43621 ASKIM SWEDEN
Adrick Marine, 1410 Central Ave., Farmingdale, NY 11735
Carrier Transicold, P.O. Box 4805, Syracuse, NY 13221

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SELCO 353 A Ashbury Commons Dr., Atlanta, GA 30338

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Munson Mfg., 780 Pearle Jensen Way, La Conner WA 98257
Worskoff, Inc., 10824 Bothell Hwy S E., Bothell, WA 98012-6869

ASBESTOS ABATEMENT

Chemplex Environmental, 3405 Highway 33, Neptune, NJ 07753

AUCTIONEERS

MACI Auctioneers, 2334 Willis Rd., Richmond, VA 23230

AUTOPILOT SYSTEMS

ComNav Marine, 1915 Stainsburg Ave., Vancouver, B.C. CANADA

BALLAST

Mineral Research & Recovery Inc., 4620 South Coach Dr., Tucson, AZ 85714
Redland Genstar Inc., Executive Plaza IV, Hunt Valley, MD 21081-1091

BARGE REPAIR - CONSTRUCTION

Mobro Marine, Inc., 4652 Phillips Hwy, P.O. Box 47080, FL 32247

BASKET STRAINERS

Beard 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
Blöhm & Voss Industrie GmbH, P.O. Box 100720, D-2000 Hamburg 1, GERMANY
U.S.A. Reps: Simplex-Turmaric, Inc., P.O. Box 168, Little Neck, NY 11363p, -0168
Kahlerberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241
Orion Corp., 1111 Cedar Creek Rd., Grafton, WY 83024
Apollo Engineering Plastics, 2535 Prairie Rd., Eugene, OR 97402
Thoron Bearings Inc., 3225 Malvern, Burlington, Ont., CANADA L7M 1A6
Vasco Plastics, P.O. Box 40647, Cleveland 2029 SOUTH AFRICA

BILOE OIL/FUEL ABSORBER

Northstar Marine, 84 Wall Street, Farmingdale, NY 11735

BILOE SYSTEMS

Nelson Div., Exhaust & Filtration Sys., Hwy. 51 West, P.O. Box 428, Stoughton, WI 53589

BOAT SHAPING

Western Branch Metals, Inc., 2401 Wesley St., Portsmouth, VA 23707

BOILERS

Clarke Chapman Canada, 1075 North Service Rd. West, Oakville, Ontario CANADA

BOW THRUSTERS

Van Dusen & Meyer, Inc., 50 Parrott Dr., Shelton, CT 06484 0558

BRIDGE WIPERS

In-Mar Systems, Yellowstone Street, Kenner, LA 70064

BROKERS

151 Maritime Services, 34062 El Encanto B, Dana Pt. CA 92629
Captain Astad Company, Inc., P.O. Box 350486, Ft. Lauderdale, FL 33335
Jack Faulkner, 2415 Caddy Lane, P.O. Box 371, Flatsomoor 1, 60422
Mowbray's Tug & Barge Sales Corp., 35 De Hart St., Morristown NJ 07960

BULKHEAD SEAL/PANELS

Blöhm & Voss Industrie GmbH, P.O. Box 100720, D-2000 Hamburg 1, GERMANY
Panel Specialists, Inc./Thermax, 3115 Range Rd., Temple, TX 76501
U.S.A. Reps: Simplex-Turmaric, Inc., P.O. Box 168, Little Neck, NY 11363-0168

CABLE TRANSIT SYSTEMS

O-Z Gedney & Nelson Firestop, P.O. Box 726, Tulsa, OK 74101-0726

CAD/CAM SYSTEMS

Albacore Research, 3080 Uplands Rd., Victoria, B.C. CANADA V8R 6B4
All Alpha Int'l., Inc., P.O. Box 458985, Cincinnati, OH 45249
Autoship Systems Corp., #403, 611 Alexander St., Vancouver, BC, CANADA V6A1E
Creative Systems, Inc., P.O. Box 1910, Port Townsend, WA 98368
IMSA 20 Ridgely Ave., Annapolis, MD 21401
Kokkum Computer Systems AB, P.O. Box 50555, S. 202 15 Malmo SWEDEN
Scientific Marine Services, Inc., 101 State Pl., Suite F, Escondido, CA 92029
TIMSCO, P.O. Box 91380, Mobile, AL 36651

CARGO MONITORING & CONTROL SYSTEM

Radio-Holland USA, 8943 Gulf Freeway, Houston, TX 77017

CELLULAR TELEPHONE SERVICE

Cellnet, 400 Main St., Stamford, CT 06901

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Waleman Supply Co., P.O. Box 596, Wilmington, CA 90748

CHEMICALS

Ashland Chemical/Drew Ameroid Marine, One Drew Plaza, Bozton, NJ 07005
Unisevice Americas, 57174 Hardin Rd., Shidell, LA 70461
Unitor Ship Service Inc., 2375 West Esther Street, Long Beach, CA 90813
Waleman Supply Co., P.O. Box 596, Wilmington, CA 90748

CLAMPING - Pipe, Tubes, Hose

ZSI, 12748 Richfield Ct., Livonia, MI 48150

CLASSIFICATION SOCIETY

American Bureau of Shipping, 2 World Trade Center, 106th Fl, New York, NY 10048
Det Norske Veritas, 70 Grand Ave., Haverdodge, N.J. 07861

CLUTCHES

Haley Clutch and Coupling Corp., 1820 Hwy. 1 North, Greenville, MS 38702

COAMING WELDER

Bug-O-Systems 3003 W. Carson St., Pittsburgh, PA 15204

COATINGS / COATINGS PROTECTION

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Royal Chemical Corp., 2705 Concord Rd., Belle Chasse, LA 70037

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Chand Corporation, 157 Hwy 654, Mathews, LA 70375
Creative Systems, Inc., P.O. Box 1910, Port Townsend, WA 98368
IMSA 20 Ridgely Ave., Annapolis, MD 21401
Marine Management System, 470 West Ave., Stamford, CT 06902
Micronautics, P.O. Box 1017, Rockport, ME 04856
Plankowor Software, P.O. Box 536, Ladyard, CT 06339
Senar, C/Severo Ochoa, 4 Parque Tecnologico de Madrid, 28760 Tres Cantos - Madrid SPAIN

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CONSOLE/GMDSS

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CONTROL SYSTEM - Monitoring

Engine Monitor, Inc., 179 Hickory Ave. Harahan, LA 70123
GEC ALSTHOM Diesels Inc., 10801 Kemppow Drive, Suite 1, Houston, TX 77043 1412
Ian-Conrad Bergan, 3409 Gulf Breeze Pkwy, Gulf Breeze, FL 32561
IMO Industries, Gems Sensors Division, One Cowles Rd., Plainville CT 06062
MMC International, 60 Inip Dr., Inwood NY 11696
Robertson Marine Systems, 3000 Kingman St., Suite 207, Metairie, LA 70006
Scientific Marine Services, Inc., 101 State Pl., Suite F, Escondido, CA 92029

CONTROL SYSTEM - Steering

Engine Monitor, Inc., 179 Hickory Avenue Harahan, LA 70123
Kokcum Sonics, Inc., 819 Veterans Blvd., Suite 201, Kenner, LA 70068

CONTROL VALVES

Leslie Controls, 12501 Telecom Dr., Tampa, FL 33637

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COUPLINGS

American Vulkan, P.O. Drawer 673, Winter Haven, FL 33882
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Haley Clutch and Coupling Corp., 1820 Hwy. 1 North, Greenville, MS 38702
Mapoco Products, 90 Forest Avenue, P.O. Box 382, Locust Valley, NY 11550
Tylok International, 1061 East 260th Street, Euclid, OH 44132

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CRANES

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New England Trawler Equipment Co., 291 Eastern Avenue, Chelsea, MA 02150
Smith Berger Marine Inc., 516 South Chicago Street, Seattle, WA 98108

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New England Trawler Equipment Co., 291 Eastern Avenue, Chelsea, MA 02150
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DIESEL ACCESSORIES

Kiene Diesel Accessories, 325 S. Fairbanks St., P.O. Box 386, Addison, IL 60101
Plymouth, MA 02360

DIESEL ENGINE ANALYZER

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DIESEL ENGINE - Spare Parts & Repair

Alaska Diesel, 4420 14th Ave., NW, Seattle, WA 98107
Caterpillar, Inc., Engine Div., P.O. Box 610, Mossville, IL 61552-0610
Cummins Engine Co., 4500 Leeds Ave., Ste. 301, Charleston, SC 29405-8521
Cummins Mid-South, Inc., 110 E. Airline Highway, Kenner, LA 70062
John Deere, John Deere Rd., Moline, IL 61265
DMI Northcoo Co., P.O. Box 2100, Norfolk, VA 23501-2100
GE Transportation Systems, 2901 East Lake Rd., Erie, PA 16531-0001
GEC ALSTHOM Diesels Inc., 10801 Kemppow Drive, Suite 1, Houston, TX 77043-1412
Gottens Worldwide, 160 Van Brunt St., Brooklyn, NY 11231
GTC Chemical Services, Inc., 8920 Lawndale Suite A, Houston, TX 77012
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GE Transportation Systems, 2901 East Lake Rd., Erie, PA 16531-0001
GEC ALSTHOM Diesels Inc., 10801 Kemppow Drive, Suite 1, Houston, TX 770

MARINE GEAR

Cincinnati Gear Co., 5657 Wooster Pike, Cincinnati, OH 45227
The Falk Corp., PO Box 492, Milwaukee, WI 53201-0492
Haley Marine Gears, Inc., P.O. Box 689, Greenville, MS 38702
Marine Gears, P.O. Box 689, Greenville, MS 38701

MARINE INSURANCE

John G. Alden, 1300 SE 17th St., Fort Lauderdale, FL 33316

MARINE INTERIORS

Insulations, Inc., Rt. 5, 12360 Leisure Road, Baton Rouge, LA 70807
Jamestown Metal Marine Sales, 4710 Northwest Second Ave., Boca Raton, FL 33431
Johnson Construction Specialties, Inc., 3420 Rusk P.O. Box 1360 Houston Texas 77251
Maritime Services Corp., 3457 Guignard Drive, Hood River, OR 97031

MARINE PUMPS

Gilkes Inc., P.O. Box 628, Seabrook, TX 77586

MARINE SURPLUS SALES

Defense Reutilization & Marketing Service, 2163 Airways Blvd., Memphis, TN 38114

MARINE ARTWORK

Sarba Art Studio, 6 Ridge Drive, Old Saybrook, CT 06475

MOTOR PROTECTION EQUIPMENT

Marine Safe Electronics, 37 Staffer Dr., Concord, Ontario L4K 2X2

NAVAL ARCHITECTS, MARINE ENGINEERS, SURVEYORS

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Bay Engineering, 253 N. First Ave., Sturgeon Bay, WI 54235
Donald L. Blount, 2550 Elstern Ave., Ste. K, Norfolk, VA 23513
C. Baxter & Associates, P.O. Box 9006, Mobile, AL 36609
CDI Marine Co., 4040 Woodcock Dr., Suite 200, Jacksonville, FL 32207
Chids Engineering Corp., Box 333, Medfield, MA 02052
Crandall Dry Dock Engrs., Inc., P.O. Box 505804, Chelsea, MA 02150
Crane Consultants, 15301 First Ave S., Seattle, WA 98148
C.T. Cushing, 18 Vesey St., New York, NY 10007
CR Marine, 56 Crooked Trail, Rowayton, CT 06853
Cunningham & Walker, 1762 Providence Hollow Lane, Jacksonville, FL 32223
Arthur D. Darden, 3200 Ridgeland Dr., Suite 403, Metairie, LA 70002
Dajong & Lebel, Inc., 1734 Emerson Street, Jacksonville, FL 32207
Design Associates Inc., 14360 Chef Merteux Highway, New Orleans, LA 70129
Designers & Planners, 2120 Washington Blvd., Ste. 200, Arlington, VA 22204
Elliott Bay Design Group, 5301 Shisholee Ave. N.W., Ste. 200, Seattle, WA 98107
Enron Mgmt & Engineering Consultant Services, P.O. Box 7760, Beaumont, TX 77706
GHM Inc. (Ind. Measurement Consultants), P.O. Box 1836, Newport News, VA 23601
Gibbs & Cox, Inc., 50 West 3rd St., New York, NY 10010
John W. Gilbert & Assoc., Inc., 199 State St., Boston, MA 02109
The Glosten Assoc., Inc., 600 Mutual Life Bldg., 605 First Ave., Seattle, WA 98104
Gufo Peta & Assoc., 720 3rd Ave., Ste. 1200, Seattle, WA 98104
Morris Guarinck Associates, Inc., 130 Sutter St., Ste. 400, San Francisco, CA 94104
C. Raymond Hunt Associates, 89 Long Wharf, Boston, MA 02110
Hydrocomp, Inc., 202 C Packets Court, Williamsburg, VA 23165
IHSA 20 Ridgely Ave., Annapolis, MD 21401
J.H. Inc., 3412 Progress Dr., Bensalem, PA 19020
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Rodney E. Lay & Associates, 13891 Atlantic Blvd., Jacksonville, FL 32225
MCA Engineers, Inc., 2960 Airway Ave., AA-103, Costa Mesa, CA 92626
Alan C. McClure Associates, Inc., 2600 South Gessner, Houston, TX 77063
McElroy Machine & Mfg Co., Inc., P.O. Box 4454, Biloxi, MS 39535-4454
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Fendall Marbury, P.O. Box 2321, Annapolis, MD 21401
Marine Design & Operations, Inc., 225 E. 1st Ave., Roselle, NJ 07068
Marine Management Systems Inc., 102 Hamilton Ave., Stamford, CT 06902
Marine Power Associates, 1010 Tuquoise St., Ste 217, San Diego, CA 92109
Maritech, Seacoff, 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
Naval Designs, Inc. 2101 S. Andrews Ave., Suite 202, Ft. Lauderdale FL 33316
Ocean Motions Co., P.O. Box 130, 49 Shore Drive, Barrington, RI 02806-0130
Olsen Marine Surveyors Co., P.O. Box 283, Fort Jefferson, NY 11777
M. Rosenblatt & Son, Inc., 350 Broadway, New York, NY 10013 and 620 Fulton St., Ste. 301, San Francisco, CA 94107
Sargent & Herkes, 225 Baronne St., Suite 1405, New Orleans, LA 70112
Scientific Marine Services, Inc., 101 State Pl., Suite F, Escondido, CA 92029
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, Bamegat Light, NH 08006; 2001 N. Beauregard Street, Alexandria, VA 22311; 50 Vashell Way, Orlinda, CA 94563
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R.A. Steam, Inc., 253 N. 1st Ave., Sturgeon Bay, WI 54235
A.K. Suda & Ass., 3004 19th St., Metairie, LA 70002-4989
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KWH Industries, Inc., 110 Enterprise Center, Middletown, RI 02842-5268
Mackay Communications, 300 Columbus Circle, Edison, NJ 08837
Hegron Marine Consultants, 640 Bond Street, Elizabeth, NJ 07201
Offshore Systems Ltd., 107-930 West 1st St., North Vancouver, B.C. V7P-3M4 CANADA
Radio-Holland USA, 8943 Gulf Freeway, Houston, TX 77017
Scandinavian Micro Systems P.O. Box 155, N-1411, Kolbotn, NORWAY
Sea, Inc., 7030 220th S.W., Mountlake Terrace, WA 98043
Simrad, 19210 33rd Avenue West, Lynnwood, WA 98036
Simrad Robertson, 10801 Hammerly, Suite 100, Houston, TX 77043-1923
Sperry Marine Inc., 1070 Seminoe Trail, Charlottesville VA 22901
Standard Communications, P.O. Box 92151, Los Angeles, CA 90009
Trimble Navigation, 585 North Mary Avenue, P.O. Box 3642, Sunnyvale, CA 94086
Waterway Communications System, Inc. 453 E. Park Pl., Jeffersonville, IN 47130

NOISE CONTROL

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NOZZLE SYSTEM

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Rice Propellers, Av Rios Espinoza 868, Mazatlan, MEXICO 82180

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OIL TANK CLEANING

Bain Industries Australia, Pty. Ltd., 21 Bearing Rd., Seven Hills, NSW 2147 AUSTRALIA

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U.S.A. Reps: Simplex-Turner Inc., P.O. Box 168, Little Neck, NY 11363-0168
Fast Systems, 3240 North Broadway, St. Louis, MO 63147
Hamworthy Marine Inc., 1129 Hospital Dr. Ste 3C, Stockbridge, GA 30281
MMC International, 60 Inip Dr., Inwood NY 11956
National Fluid Separators, 827 Hanley Industrial Ct., St. Louis, MO 63144
Nelson Industries, Highway 51 West, Sloughon, WI 53589

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Corrosal, Inc., 1045 12th Ave. NW, FSA, Issaquah, WA 98027
Devco Coatings 4000 Dupont Circle, Louisville, KY 40207
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Ferro Corp., 1301 North Flora St., Plymouth, IN 46563
Jamestown Distrib., 28 Narragansett Ave., P.O. Box 348, Jamestown, RI 02835

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Product Research Service, Inc. 229 Hwy 23, PO Box 158, Belle Chasse, LA 70037
Royal Chemical, 2705 Concord Road, Belle Chasse, LA 70037
Sigma Coatings, 8879 Market St., Houston, TX 77029, 330 Rover Rd., Harvey, LA 70059, 1100 Adams St., Hoboken, NJ 07030
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Rolsa SP Propellers SA, P.O. Box 251, Via Silva 5, 6828 Balema, SWITZERLAND
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ABB Drive Inc., P.O. Box 372, Milwaukee, WI 53201-0372, USA
ABB Industry Oy, P.O. Box 185, 00081 Helsinki, FINLAND
ABB TURBOCHARGER, INC., 1460 Livingston Avenue, Newark, NJ 08102
Aquamaster-Raumta Ltd., Box 220, SF-26101, Rauma, FINLAND
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Markstrosch Werk, P.O. Box 1442, D-5848 Halver GERMANY
MAN B&W Diesel, 17 State St., New York, NY 10004
MAN B&W Diesel AS, Østervej 2, DK-4960 Holby, DENMARK
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Kvaerner Masa-Yards Oy, Box 132, SF-00151, Helsinki, FINLAND
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Lindenau GmbH, Segersacker 10, Postfach 9093 D-2300 Kiel, Friedr. Schott GERMANY
McDemott Shipbuilding, Inc., 160 James Dr. East, St. Rose, LA 70087
Motor Service AB, Box 2115, 144 04 Rominge, SWEDEN
Murson Hammerhead, 780 Pearle Jensen Way, La Conner WA 98257
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Peterson Builders, Inc., 101 Pennsylvania Ave., Sturgeon Bay, WI 54235-0650
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Samsung Heavy Ind., 25, 1-Ka, Bongrae-dong, Chungku, Seoul, Korea
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SeaFab, P.O. Box 1651, 4111 Cedar St., Pascagoula, MS 39567
Service Marine Industries, P.O. Box 9006, Morgan City LA 70381
Shipgarden Shipyard, 621 Paik Plaza Dr., Dept 21, LaCrosse WI 54601
Skene Shipyard, Inc., P.O. Box 742, Bayou La Batre, AL 36508
Swath Ocean, 875 G Street, Chula Vista, CA 92011
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Mackay Communications, 2721 Discovery Dr., Raleigh N.C. 27664-1851
Maritime Cellular Network, 560 Village Blvd., W. Palm Beach, FL 33409
Norwegian Telecom, Postboks 6701 St. Olavs Plass, Oslo, Norway
PTT Telecom, Station 12, P.O. Box 30150-2500, JD The Hague, NETHERLANDS
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Scientific Atlanta, Inc., 1650 International Court, Norcross, GA 30093
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Telstra Mobile Satellite & Radio Services, 79 St. Hillers Rd., Auburn NSW 2144, AUSTRALIA
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Kobelco Marine Engineering Co., 6F Tatsunuma Bldg., 3-19, Yaeasu 1-chome, Chuo-ku, Tokyo, 105 JAPAN
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Tumbul, Inc., 3818 134th St. NE, Marysville, WA 98271

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American Bureau of Shipping, 2 World Trade Center, 106th Fl., New York, NY 10048

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Bender Shipbuilding & Repair, P.O. Box 42, Mobile AL 36601
Bisco Marine Co., P.O. Box 4113, New Orleans, LA 70178
Bolinger Lodiport & Larose, P.O. Box 250, Lodiport, LA 70374-0250
Caribco, P.O. Box 1147 Port Of Spain, Trinidad, W.I.
Chris-Marine AB, P.O. Box 9025, S-2000 39, Malmö, SWEDEN
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SeaFab, P.O. Box 1651, 4111 Cedar St., Pascagoula, MS 39567
Service Marine Industries, P.O. Box 9006, Morgan City LA 70381
Shipgarden Shipyard, 621 Paik Plaza Dr., Dept 21, LaCrosse WI 54601
Skene Shipyard, Inc., P.O. Box 742, Bayou La Batre, AL 36508
Swath Ocean, 875 G Street, Chula Vista, CA 92011
Westport Shipyard, P.O. Box 308, Westport, WA 98595
Willard Marine, Inc., 1250 N. Grove St., Anaheim, CA 92806
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ALBACORE RESEARCH	CAD/CAM SYSTEMS & SOFTWARE	282
ALLIED SIGNAL	ROPES & FIBERS	200
AMERICAN MOBILE SATELLITE CORP.	SATELLITE	201
AMERICAN SHIPYARD	SHIPBUILDING	281
APPLIED FLOW TECHNOLOGY	COMPUTER SOFTWARE	202
AQUAMASTER-RAMA	PROPELLERS	203
A/S DAN-BUNKERING LTD.	BUNKERING	204
ASTILLEROS-ESPANOLAS	SHIPBUILDING	205
ATLANTIC MARINE (JACKSONVILLE)	SHIPBUILDING	206
AT&T MARITIME SERVICES	COMMUNICATIONS	207
BLODGETT SHIPBOARD	SHIP PARTS/ACCESSORIES	217
BLOHM & VOSS SIMPLEX-TURMAR	SIMPLEX COMPACT 2000	209
BLOUNT MARINE	BOAT BUILDER	211
BOLLINGER LOCKPORT	SHIPYARD	210
BRANTON INDUSTRIES	JOINERS	212
BRUNVOLL A/S	THRUSTERS	213
BUG-O-SYSTEMS INC.	COAMING WELDER	214
CINCINNATI GEAR	MARINE GEARS	215
COLORADO SCHOOL OF MINES	ADVANCED MATERIALS FOR MARINE CONSTRUCTION	216
COMMERCIAL PRODUCTS	SHIP PARTS/ACCESSORIES	218
CONNECTICUT MARITIME ASSOCIATION	TRADE SHOW	219
COSPOLICH REFRIGERATION	REFRIGERATION	220
JOHN CRANE MARINE USA	SEALS	221
CUSTOM NOZZLE	CUSTOM NOZZLE	222
CUSTOM SHIP INTERIORS	JOINER CONTRACTORS	223
DAIHATSU DIESEL (USA) INC.	DIESEL ENGINES	224
DATREX, INC.	LOW LOCATION LIGHTING SYSTEM	225
DON JON MARINE	SPILL RESPONSE	226
ELLIOT MFG.	VALVE CONTROL SYSTEMS	227
ENVIRO RESPONSE PRODUCTS	FUEL DECONTAMINATION	229
ENVIRONMENTAL SOLUTIONS INTERNATIONAL	DECONTAMINATED FUEL	228
FCS, INC.	TANK GUARDING SYSTEM	293
FERRO CORP.	LIQUID COATINGS	231
GEORGE FISHER PIPE TOOLS	PIPE CUTTERS	290
G. J. WORTLEBOER	ANCHORS/CHAINS	277
GIBBS & COXA	NAVAL ARCHITECTS	234
L.F. GAUBERT	ELECTRICAL CABLE	233
GRACO, INC.	FLUID HAND EQUIPMENT	288
HALTER MARINE GROUP, INC.	SHIPBUILDING	235
HANJIN HEAVY IND.	SHIPYARD	236
HERMONT MARINE	DIESEL ENGINE ANALYZER	285
HITACHI ZOSEN CORP.	SHIPBUILDING	237
H.O. BOSTROM	SEATING	289
HYUNDAI HEAVY INDUSTRIES CO., LTD.	SHIPYARD	238
IMOGEN SENSORS DIVISION	SENSORS	239
IMSA	SOFTWARE	240
IN-PLACE MACHINING	CRANKSHAFT REPAIR	241
INTERNATIONAL MARINE	EQUIPMENT	279
ISHIKAWAJIMA HARIMA HEAVY INDUSTRIES	SHIPBUILDING AND OFFSHORE	287
ITW PHILADELPHIA RESINS	CHOCKFAST COATINGS	242
JAMESTOWN METAL MARINE	INTERIORS	243
JEAMAR WINCHES	WINCHES	244
J.W. FISHERS MFG.	UNDERWATER METAL DETECTORS	232
KVAERNER MASA MARINE INC.	NAVAL ARCHITECTS	245
LANG MANUFACTURING	GALLEY EQUIPMENT	246
LEEYAC SHIPYARDS	SHIPYARD	247
LOEFFLER CORP.	VALVES-BELLS	248
MARINE GEARS	MARINE GEARS	249
MARINE TRAVELIFT	CRANES/HOISTS	250
MGH INTERNATIONAL	LIFESAIVING EQUIPMENT	261
MOTOR SERVICES HUGO STAMP INC.	DIESEL ENGINES SPARE PARTS	252
NORWEGIAN MARITIME EQUIPMENT	OFFSHORE EQUIPMENT	253
OFFSHORE MARINE LABS	REVERSE OSMOSIS WATER SYSTEM	254
OVERSEAS EXHIBITION SERVICES	TRADE SHOW	255
OWENS MANUFACTURING	SANITATION	292
PAN AMERICAN	NAVAL LIGHT PANELS	291
PTI TELECOM	SATELLITE COMMUNICATIONS	256
PUGET SOUND ROPE	ROPES	257
RGF MARINE	ENVIRONMENTAL PRODUCTS	258
RTF MFG.	REFRIGERATION	259
SAMSUNG HEAVY INDUSTRIES	SHIPBUILDING	278
SCHOITEL-WERFT	PROPULSION	260
SEMCO MARINE INC.	ELECTRICAL SERVICE & SPARE PARTS	261
KARL SENNER	MARINE GEARS/CONTROLS	262
SERVICE VALVE & FITTINGS	VALVES & FITTINGS	286
SLIPNOT SAFETY FLOORING	SAFETY FLOORING	263
SPURS MARINE	CUTTERS	264
STORK-KWANT	CONTROLS	265
TELECOM ITALIA	MARITIME COMMUNICATION	266
THRUSTMASTER OF TEXAS	JET BOW THRUSTER	267
TITAN MARITIME INDUSTRIES	MARINE SALVAGE	268
TOASTMASTER	MARINE RANGE	269
U.S. SPARES	SPARE PARTS	270
URITHANE PRODUCTS	RUBBER FENDERING	280
VIOLET DOCK PORT	BERTHING FACILITIES	271
WALLACE COAST MACHINING	MACHINERY	272
WASSER	HIGH TECH COATINGS	294
WATERMAN SUPPLY CO.	MARINE EQUIPMENT	275
WARTSILA DIESEL OY	DIESEL ENGINES	273
WASHBURN DOUGHTY	BOAT BUILDER	284
WASHINGTON CHAIN	CHAINS	274
WESTERN MACHINE WORKS	HYDRAULIC TOW PINS	276

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A. Total no. copies printed (Net press run)	33,296	32,673
B. Paid Circulation		
1. Sales through dealers and carriers, street vendors counter sale	30,251	30,138
2. Mail subscriptions	0	0
C. Total paid and/or Requested Circulation	30,251	30,138
D. Free Distribution (including samples) by mail, carrier or other means.	2,745	2,235
E. Total Distribution (sum of C and D)	32,996	32,373
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I certify that the statements made by me above are correct and complete.
(Signed) Dale L. Barnett, Circulation Manager

Kvaerner Delivers Grandeur Of The Seas To Royal Caribbean

Finland's Kvaerner Masa-Yards' Helsinki New Shipyard has delivered M/S *Grandeur of the Seas* to Royal Caribbean Cruises, Ltd. (RCCL). At a length of 915 ft. (279.1 m), a gross tonnage of 74,140, and a passenger capacity of 2,400, the ship is the biggest cruise liner in the RCCL fleet. The vessel has a diesel-electric AC-AC power plant machinery with electric propulsion motors. The total onboard power developed is 50,400 kW (68,500 hp). *Grandeur* will begin year-round service to the eastern Caribbean from Miami on December 14. Sistership *Enchantment of the Seas* is due to be delivered by Kvaerner in July 1997. In addition to the cruise ship delivery, the naming ceremony for the third of four LNG carriers for Abu Dhabi National Oil Co. recently took place at Kvaerner's Turku New Shipyard. *Al Hamra*, a sistership to *Mubaraz* and *Mraweh*, will be delivered to its owners in January.

For more information on Kvaerner Masa-Yards
Circle 39 on Reader Service Card

Grandeur of the Seas Main Particulars

Length, o.a.	915 ft. (279.1 m)
Width, o.a.	121.3 ft. (37 m)
Classification society	DNV
Main engines	(4) MAN B&W 12V 48/60
Propulsion motors	(2) 17,000 kW, Cegelec AC motors
Bowthrusters	(2) 1,750 kW

Meyer Werft Delivers Newbuild Galaxy To Celebrity Cruises

Meyer Werft Shipyard in Papenburg, Germany, delivered *Galaxy* to Celebrity Cruises.

Galaxy is the largest passenger ship built in Germany, and is slightly longer than sistership *Century*, delivered in 1995. The third ship in the series, *Mercury*, is being completed in the yard's covered building dock and is scheduled for delivery in 1997.

The ship is propelled by four, non-reversible, four-stroke MAN B&W L48/60 engines, with an output of 2 x 9,450 kW and 2 x 6,300 kW at 500 rpm.

Each pair of engines transmits its power via a gearbox to a propeller shaft. Electrical power is supplied by four auxiliary diesel generator sets, MAN B&W type 6L40/54, as well as two shaft generators driven by a gearbox PTO.

For more information on Meyer Werft
Circle 40 on Reader Service Card

Galaxy Main Particulars

Length, o.a.	866 ft. (263.9 m)
Width	105.6 ft. (32.2 m)
DWT	6,500
Tonnage	77,713 gt
Propulsive power	53,556 hp
Speed	21.5 kn
Passenger capacity	1,896
Classification	LR @ 100 A 1 "Passenger Ship" IWC, LMC, UMS

Recent Ship Sales

This report, compiled by Shipping Intelligence, Inc., a New York maritime consulting firm, tracks sale prices of secondhand bulk carriers and tankers. For more information, call tel: (212) 997-0966.

Date Reported	Vessel Name	Vessel Type	DWT	Year Built	Sale Price (M)
10/28/96	Dongnama Pohang	Bulker	19,408	78	\$2.8
11/11/96	First Marine	Bulker	22,531	79	\$4
10/21/96	Akragas	Bulker	23,539	78	\$4.8
10/21/96	Ocean Wave	Bulker	23,790	83	\$7.9
11/4/96	Flora	Bulker	24,022	81	\$4.9
11/4/96	Beta Luck	Bulker	24,517	76	\$3.7
10/28/96	Flying Hawk	Bulker	24,835	84	\$8
10/28/96	Rio Cervos	Bulker	26,602	74	\$1.5
10/28/96	Laserbeam	Bulker	26,637	74	\$2.3
11/11/96	New Venus	Bulker	26,914	86	\$9.5
11/11/96	Thalia	Bulker	30,694	76	\$3.4
10/21/96	Adjarja	Bulker	31,923	73	\$1.6
11/11/96	Sea Muse	Bulker	36,122	76	\$3.5
10/28/96	Oriental Spring	Bulker	37,000	86	\$12
10/28/96	World Aretus	Bulker	37,472	77	\$2.5
11/11/96	Iloilo Victory	Bulker	38,323	80	\$5.5
10/21/96	Yasuko Venture	Bulker	38,623	85	\$9.8
10/28/96	Sanko Grace	Bulker	42,842	85	\$12.8
11/4/96	Barba Thanassis	Bulker	69,123	77	\$3.5
11/4/96	Raijin Maru	Bulker	70,653	86	\$12
10/28/96	Global Epoch	Bulker	71,119	81	\$6
11/11/96	More Tirreno	Bulker	81,880	76	\$3
10/28/96	Capocripta	Tanker	10,029	71	\$1.2
11/4/96	Wawasan Setia	Tanker	29,755	91	\$17.2
10/21/96	Nordholm	Tanker	29,999	91	\$22
11/4/94	Ranger	Tanker	35,663	76	\$2.8
10/21/96	Sinora	Tanker	36,827	80	\$11.8
10/21/96	Pacific Pride	Tanker	36,834	80	\$11.8
10/28/96	Port Blanc	Tanker	37,800	75	\$4.5
10/21/96	Asia Prosperity	Tanker	46,500	96	\$33
10/28/96	Amazon Glory	Tanker	256,715	74	\$11.8

U.S. Contractors To Support Egyptian Spill Prevention Center

On November 13, the Arab Academy for Science & Technology in Alexandria, Egypt, awarded a \$21-million contract to Ship Analytics to complete the second phase of an Oil Spill Crisis Management

and Shipboard Spill Prevention Training & Simulation Center. Ship Analytics is a consortium whose member include Evans & Sutherland, Lockheed Martin, Digitran, Sperry Marine, Digital Equipment Corp. and the University of Connecticut.

The program is designed to deliver U.S.

technology to support the privatized efforts of the Egyptian university's scientists and engineers in protection of the environment, and in order to export Egyptian expertise throughout the Middle East. The equipment is housed in the Integrated Simulators Complex at the university, a 10,000-sq.-m.

facility which provides training for merchant mariners from Egypt, Africa and the Middle East.

Scana Acquires Scandinavian Drilling

Scana Industrier ASA has reached a final agreement with the owners of IOS Desco to acquire 100 percent of the shares in the company. Scana will pay NOK29 million for the shares in the company, which is reportedly one of Scandinavia's largest supply and service companies for drilling and pressure control equipment for the petroleum industry.

Hvide Marine To Acquire Five Vessels

Hvide Marine Inc. announced the addition of five offshore supply vessels (OSVs) to its growing offshore energy supply fleet. The vessels will reportedly be refurbished and reconfigured and lengthened in some cases before expected entry into service during the first quarter of 1997. The vessels will be operated and marketed through Hvide's offshore subsidiary, Seabulk Offshore Ltd. The total price of the acquisitions is \$19.7 million, and the total investment will be \$26.1 million.

Two of the supply boats are ice-strengthened vessels and will be increased to 225 ft. (68.5 m) for deepwater service. The remaining three vessels, one 180-ft. (54.8-m) supply boat and two 195-ft. (59.4-m) anchor handling/towing supply boats, are being purchased from Seacor Holdings, Inc.

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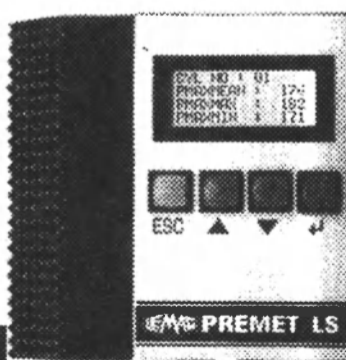
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GREAT SHIPS OF 1996

(Frota Santos continued from page 40)

main deck. The hatch covers of hold No. 1 have a length for one 40-ft. container.

The tank top can support loads up to 9.5 t/sq.-m. to allow the carriage of some heavy cargoes such as steel products, the tween deck hatch panels can support loads up to 2.6 t/m². Another feature of the design is the option of removing the tween-deck hatch panels and install fixed or removable cell guides if required by an increase in the quantity of containers to be carried in the trade. The hatch covers and the main deck can support loads up to 2.6 t/sq. m.

Due to the lack of port facilities in the Amazon region, the ship is equipped with three cranes, each with a capacity of 40t SWL with an outreach of 30 m. An automatic anti-heeling equipment was installed to automatically correct the heel of ship when loading/unloading heavy cargoes.

Since the ship operates in rivers with sand banks and narrow passages, good maneuverability is required. To fulfill this requirement a large rudder and a controllable pitch propeller were installed. A sophisticated machinery automation system was installed for control and monitoring of the machinery and reefer containers by a computer network with terminals installed in differ-

ent places in the engine room and accommodations. The ship is certified by ABS for "One-man bridge operation."

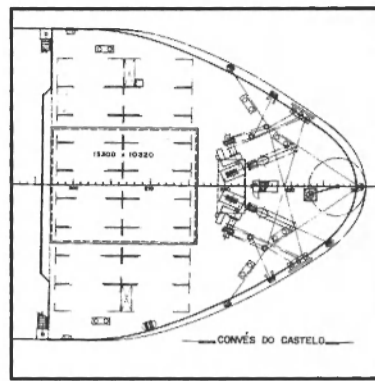
The ship operates at a service speed of 18 knots at design draft with power delivered from a MAN-B&W 5S 60 MC main engine.

Three MAN-BW/Siemens diesel alternators sets are installed, each one rated at 610 kW. Steam is produced by an oil-fired and an exhaust gas boiler. Special care was taken in the design of the fuel oil systems to allow the use of high viscosity heavy fuel oils in the main engine and auxiliary engines and recommendations of "CIMAC" have been followed, like the installation of two pairs of settling/services tanks, high viscosity fuel oil purifiers and heating systems. The central cooling system use double-speed pumps controlled by microprocessors.

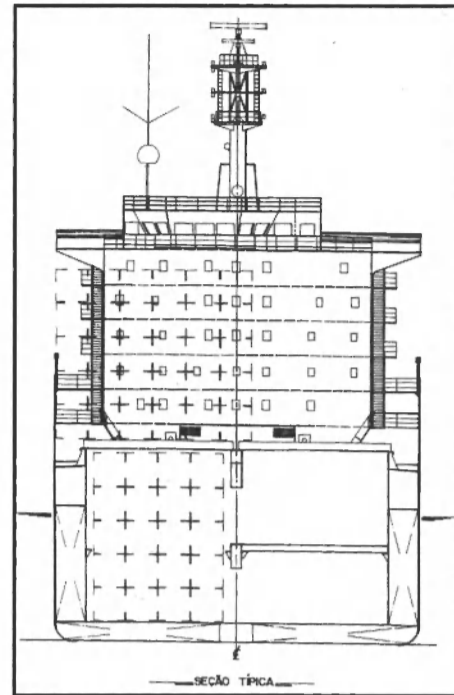
Special care was taken to avoid pollution and the ship is equipped with sewage system, incinerator, special stern tube sealings, and the heavy fuel oil deep tanks are protected on ship side and bottom by a double skin and double bottom.

Frota Santos Main Particulars

Designer: . . . Projemr-Estudios E Projectos De Engenharia S.A.
Flag: Brazil
Classification: ABS
Contract Date: July 21, 1992



Float Out Date:	January 27, 1995
Delivery Date:	August 12, 1996
Length o.a.:	168.3 m
Length b.p.:	158.3 m
Breadth, Molded:	27.9 m
Depth, Molded To Main Deck:	13.5 m
Gross Tonnage:	15,509 tons
Displacement:	27,645 tons
Lightweight:	8,015 tons
Deadweight (Design):	13,200 tons
Deadweight (Scantling):	19,630 tons
Draft (Design):	.8 m
Draft (Scantling):	9.9 m
Speed, Service:	18 knots
Water Ballast:	6,400 cu. m.
Fuel Consumption:	34.5 tons
% Of High Tensile Steel:	13 percent
Main Engines: MAN B&W Diesel, 5560 MC, 12,950 bhp X 105 rpm	
Auxiliary Engines:	3 X MAN B&W
Propellers:	.CPP; MAN B&W Alpha Diesel
Generator Engines:	3 X Hynday-Siemens
Generators:	.Hynday-Siemens
Anti-Heeling System:	.Hoppe
Engine Control(s):	.Geamar
Steering Control(s):	.Hatapla-Teleram



Deck Machinery:	.Krupp
Shafting:	.MAN B&W Alpha Diesel
Bearings:	.Renk
Coatings:	.International Paints
Radar:	.Sperry Marine
Compass, GPS, Autopilot, Collision Avoidance:	.Sperry Marine
Pumps:	.Hamworthy
Heat Exchangers:	.Alfa Laval
Air Conditioning:	.Sabroe
Liferafts:	.Viking
Fire Fighting System:	.Autronica
Desalination Equipment:	.Alfa Laval
Ballast Control System:	.H. Dewers
Computers On The Ship:	.Searco Computer System
Incinerator:	.Kvaerner-Golar

(Hanjin London continued from page 40)

nator sets each rated at 2,300 kW (two sets) and 1,500 kW (two sets). The ship is outfitted with a 2,000-kW bowthruster, as well. For the tank level and draft gauge, remote reading electric resistance type level gauges are equipped for each water ballast and peak tank, and the level is displayed on the IMCS CRT. The fresh water generator is from Alfa Laval, and is capable of producing 30 ton/day. The bilge separator with 10 ton/hr. is applied in compliance with MEPC 60 (33) regulation.

The waste oil incinerator, with 800,000 Kcal/hr. as per new IMO rule Annex V Appendix II, is newly developed by Kangrim and installed to meet environmental requirements.

(Trogir continued from page 38)

neously, with a total discharging capacity of 4,000 cu. m./h. Each tank is provided with a submerged hydraulically driven pump, and each pair of tanks forming one segregation. Heating is provided by means of heating coils. The inert gas system and vapor emissions control system are configured to U.S. requirements.

The vessel is powered by a MAN B&W ULJANIK 6S50MC main engine developing 8310kW at 123 rpm, enabling trial speed of 15.1 knots at 90 percent load.

Trogir Main Particulars

Flag	. . . . . Malta
Classification:	. . . . . Lloyd's Register
Contract Date:	. . . . . March 28, 1993
Delivery Date:	. . . . . June 1, 1995
Length o.a.:	. . . . . 180.6 m
Length b.p.:	. . . . . 173.5 m
Breadth, Molded:	. . . . . 31.9 m
Design Draft:	. . . . . 10 m
Summer Draft:	. . . . . 11 m
Deadweight At Design Draft:	. . . . . 35,697 M.T.
Deadweight At Summer Draft:	. . . . . 40,727 M.T.
Trial Speed At Design Draft And 7,480 kW:	. . . . . 15.1 knots
Number Of Cargo Tanks Incl. 2 Slop Tanks:	. . . . . 12
Cargo Tanks Capacity (100% Full):	. . . . . 51,316 cu. m.

Classification: L.R. (100 A1 Oil And Chemical Tanker (Double Hull, Caustic Soda Only), Spm (Lmc, Ums, Igs, Cow, Pl, Sbt Max, Filling Height With Caustic Soda 67% Of Depth S.G. =1.53

Main Engine: MAN B&W-Uljanik 6S50MC
Generator Sets: New Sulzer Diesel
Fire Detection System: Autronica
Steering Gear: Vulcan-Dibo Frydenbo
Air Conditioning Plant: Carrier
Cargo Pumps: Framo
Pump Material: Stainless Steel
Radar Level Gauging System: Autronica
SATCOM: ABB Saturn (Inmarsat A)
SATCOM: Standard Radio (Inmarsat C)
Gyro Compass: Anschütz Nautopilot
Radars: Kelvin Hughes
Echosounder: Skipper
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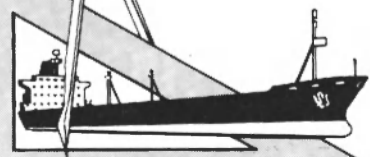
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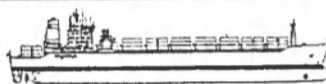
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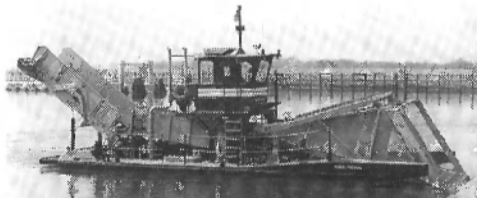
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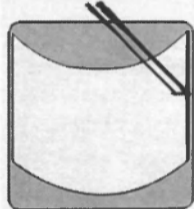
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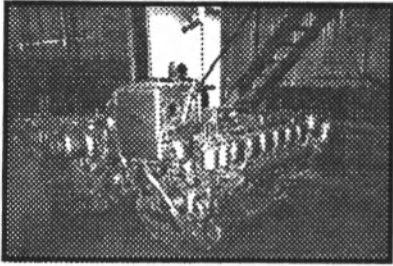
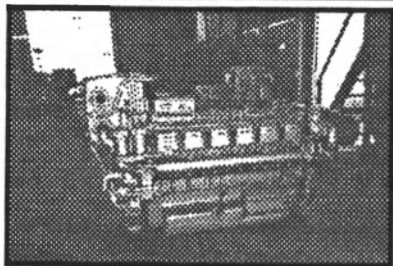
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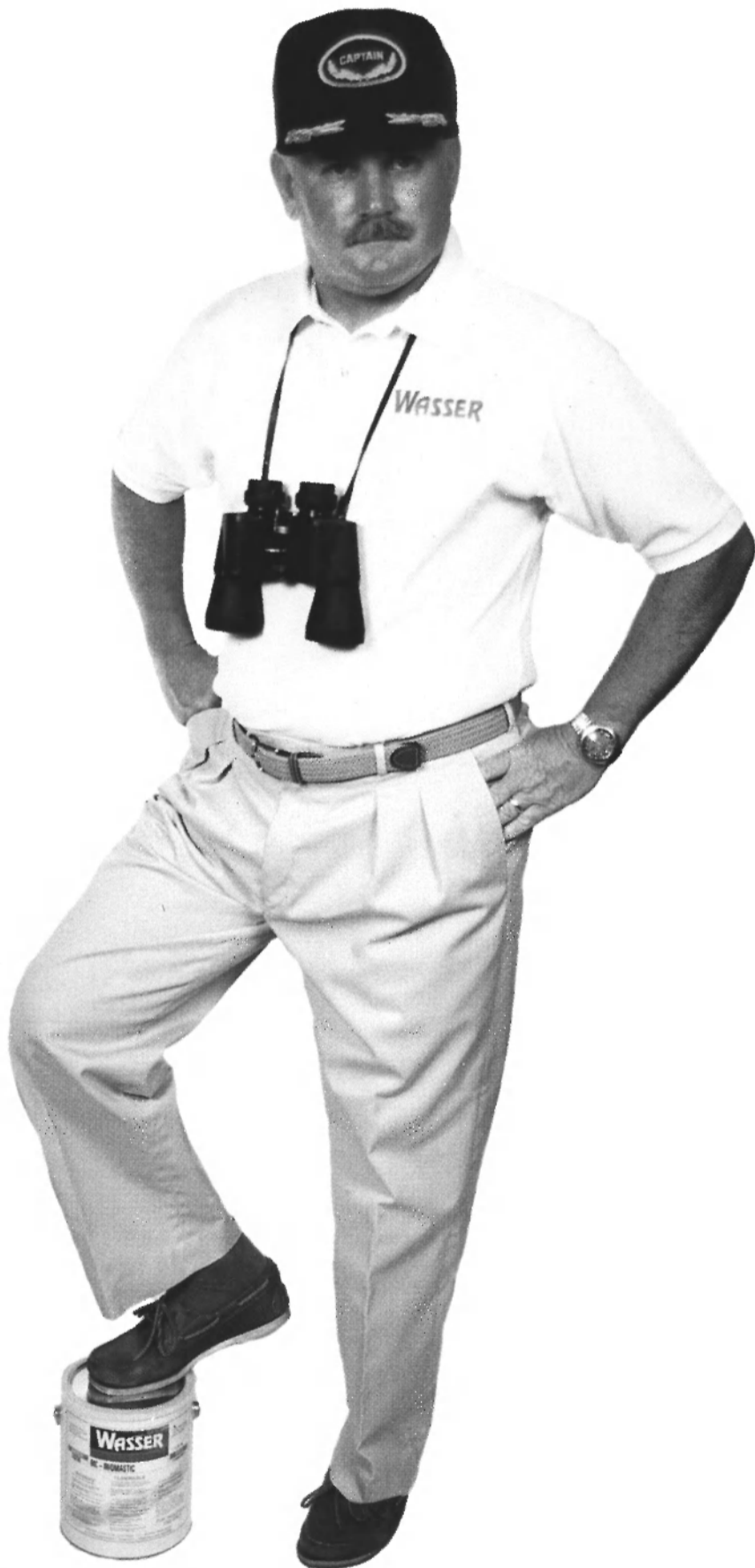
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