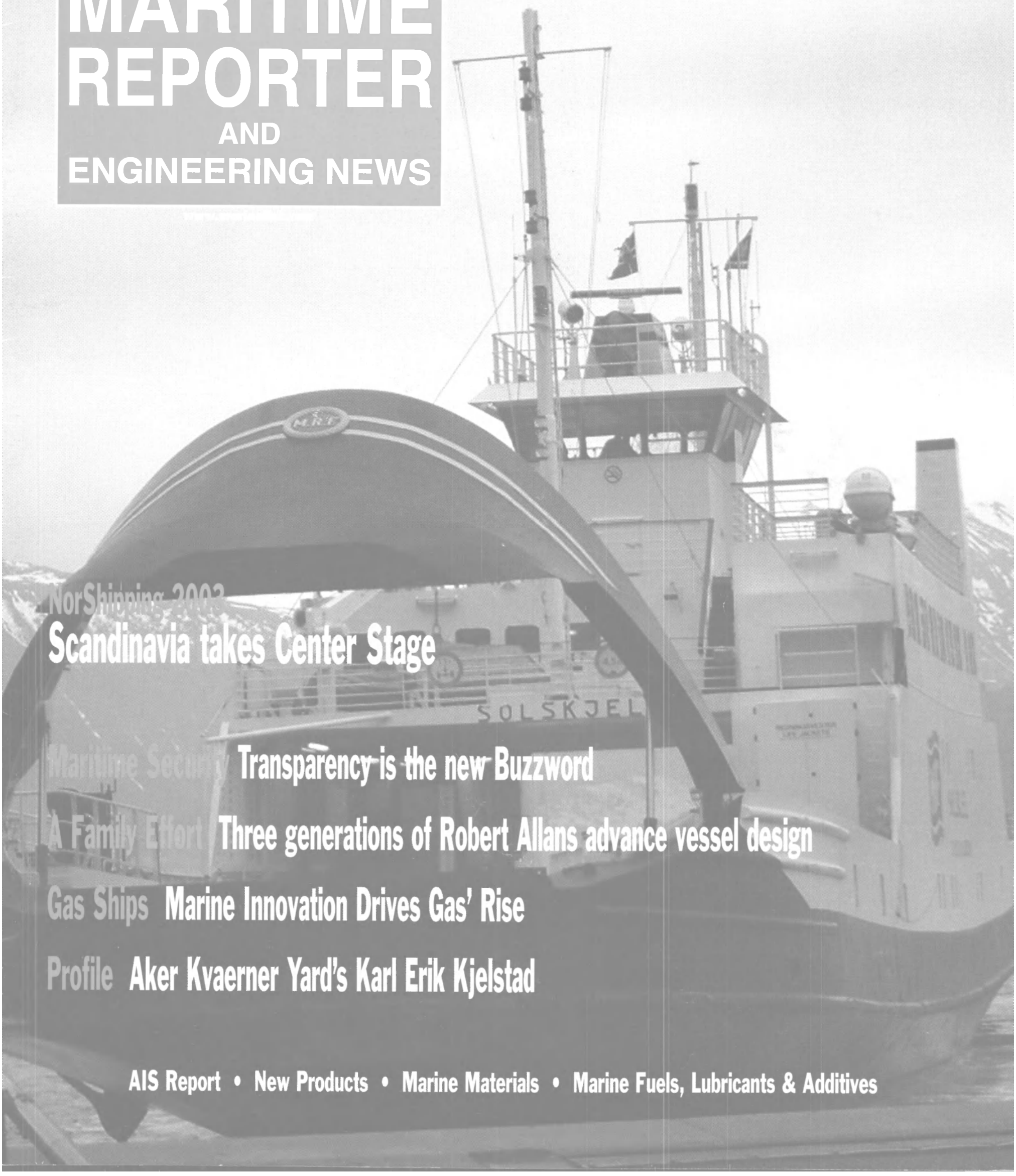
May 2003

MARITIME REPORTER
AND ENGINEERING NEWS



NorShipping 2003
Scandinavia takes Center Stage

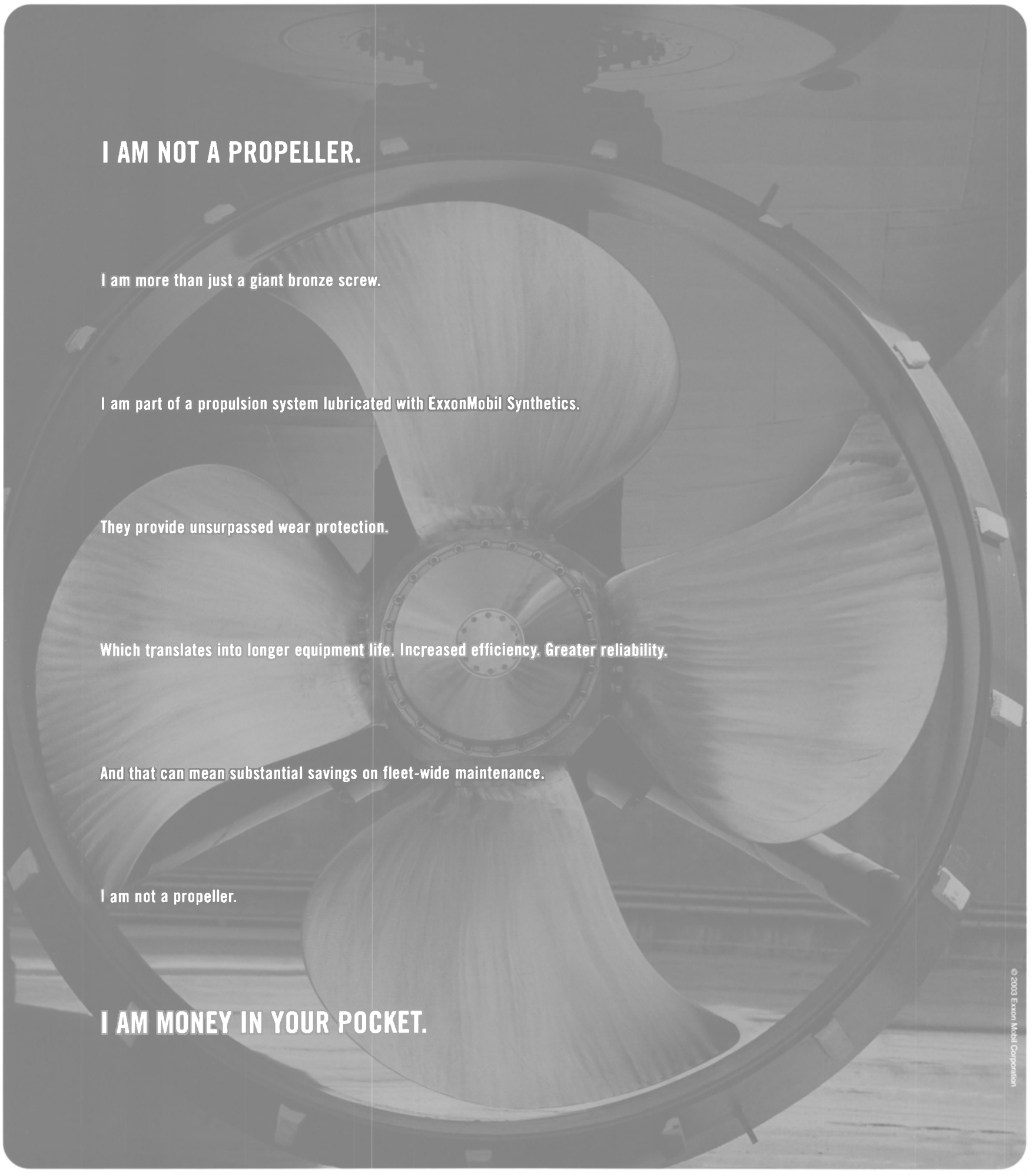
Maritime Security **Transparency is the new Buzzword**

A Family Effort **Three generations of Robert Allans advance vessel design**

Gas Ships **Marine Innovation Drives Gas' Rise**

Profile **Aker Kvaerner Yard's Karl Erik Kjelstad**

AIS Report • New Products • Marine Materials • Marine Fuels, Lubricants & Additives



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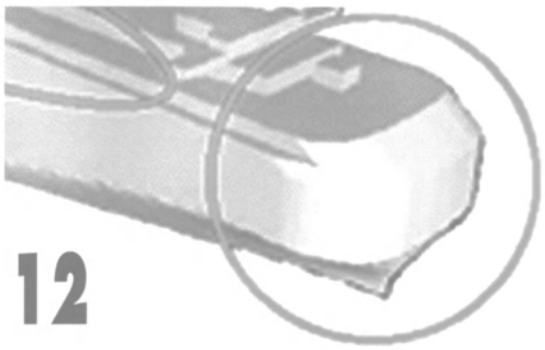

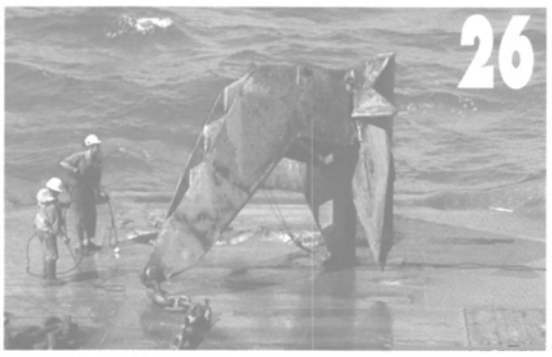

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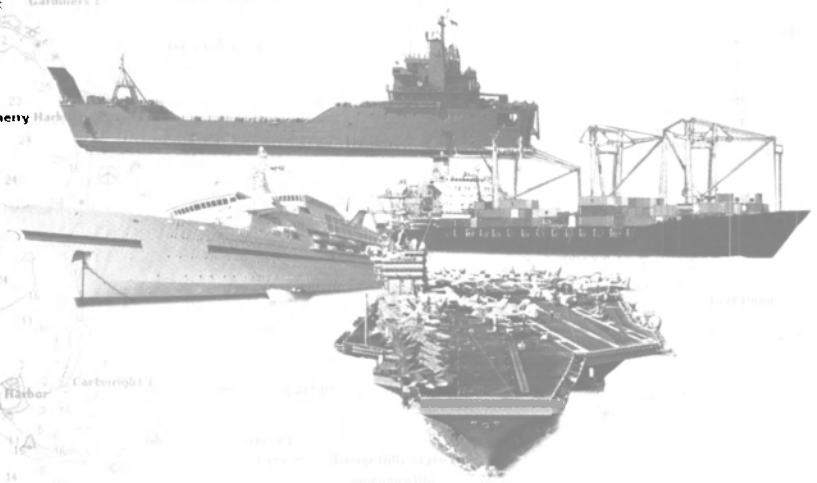

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Circle 213 on Reader Service Card

Editor's Note

Reactive by nature, the marine business is perpetually embarked upon the path of transformation, with new rules and regulations handed down from international, national and regional authorities as to how ships and boats should be equipped and operated.

Tomorrow will be no different.

Whether it is new legislation dictating the timing and form of reporting cargos [*"I'm Looking Through You"* by **Dennis Bryant**, page 18] or the way in which vessels are outfitted [*AIS Update,* page 46], marine companies are increasingly being stretched, forced to consume and digest a veritable smorgasbord of statutes just to stay in business.

Next month in Oslo, the international maritime community gathers in Oslo for the bi-annual NorShipping 2003 Exhibition, one of the world's leading marine events. From around the globe companies will gather to discuss and discover the latest developments which are designed to make the process of designing, building, outfitting and operating vessels more cost efficient.

But while change is the constant, the adage "the more things change, the more they stay the same," is similarly apt for the marine business. I personally relish the historical aspect of our business, and receive tremendous satisfaction in discussing the evolution of the business with people in the know. In this edition, I am happy to offer a unique perspective on the evolution of the marine business from **Robert G. Allan**, the third-generation leader of Robert Allan Ltd.

Delivery of the spectacular new fireboat — L.A. Fireboat 2, featured on page 53 — was the impetus for an inquiry e-mail to Mr. Allan, a simple request which quickly mushroomed into a feature on the industry and his company, its heritage and its future, starting on page 50.

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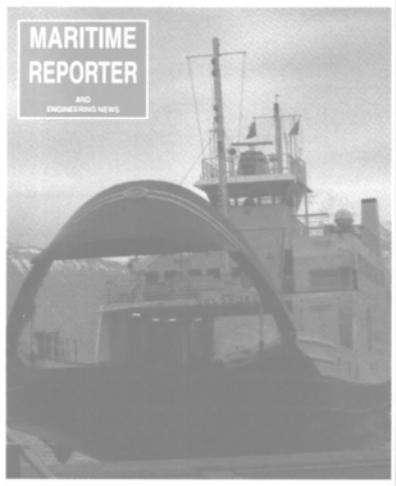
On the Cover



On the Cover: Norwegians have always been closely related to the sea, a factor which has allowed them to become and maintain leadership status in the international marine market. In early June, maritime leaders from around the globe will convene in Oslo for Norshipping 2003. Coverage starts on page 24.

(Photo credit: Greg Trauthwein)

In this edition

Subscriptions: One full year (12 issues) $24.00 in U.S.; outside of U.S. $96.00 including postage and handling. For subscription information, contact: Dale Barnett, fax: (212) 254-6271; e-mail: barnett@marinelink.com

MARITIME REPORTER AND ENGINEERING NEWS

www.marinelink.com

ISSN-0025-3448
USPS-016-750

No. 5 *Vol. 65*

118 East 25th Street, New York, NY 10010
tel: (212) 477-6700; fax: (212) 254-6271

Founder: John J. O'Malley 1905 - 1980
Charles P. O'Malley 1928 - 2000

Maritime Reporter/Engineering News is published monthly by Maritime Activity Reports, Inc. Mailed at Periodicals Postage Rates at Waterbury, CT 06701 and additional mailing offices.

Postmaster send notification (Form 3579) regarding undeliverable magazines to Maritime Reporter/Engineering News, 118 East 25th Street, New York, NY 10010.

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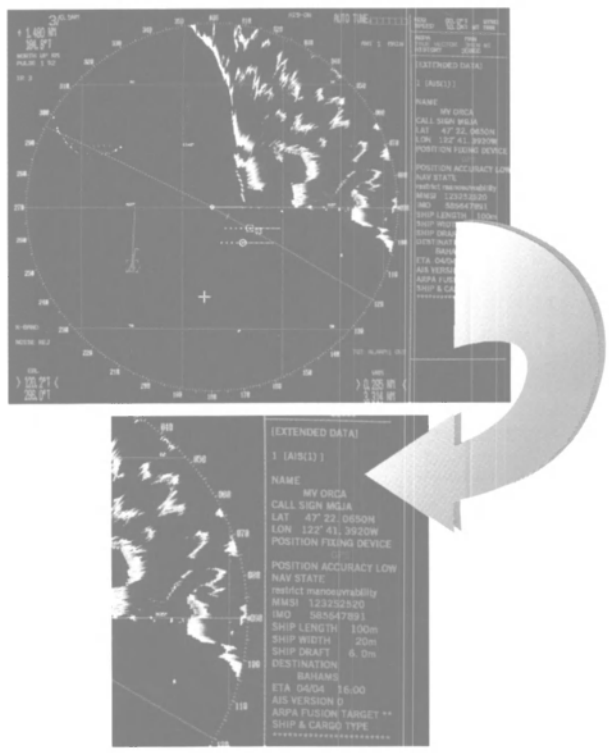

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Austal USA Launches Cloud Nine

Austal USA launched its fifth vessel from its yard in Mobile, Ala., a 135-ft. (41.1m), monohull, on March 31, 2003. This vessel, to be delivered in May to Cloud Nine of New York, is the second dinner cruise yacht built at Austal's shipbuilding facility. The vessel's owner specializes in offering private, luxury dinner cruises for social and corporate groups. It currently operates an 85-ft. (25.9-m), dinner cruise monohull and this new, larger Austal USA vessel, will enable the company to cater to larger corporate groups The vessel will accommodate up to 149 guests and will operate at a service speed of 16 knots. Designed and built by Austal USA to 46 CFR Subchapter T regulations, Cloud Nine is powered by two Cummins KTA 38M0 diesel engines, each rated at 800 bhp. A 120 hp tunnel thruster fitted forward will ensure precise maneuvering.

Circle 46 on Reader Service Card

Navy Commissions Mason

The newest Arleigh Burke class guided-missile destroyer, Mason, was commissioned on April 12, 2003, during a ceremony in Port Canaveral, Fla. The 510-ft. (155.4-m) vessel will be homeported in Norfolk, Va., with a crew of 365 officers. Enlisted personnel Cmdr. **David Gale** of Lebanon, N.Y., will become Mason's first commanding officer.

Guided missile destroyer Mason, built by Bath Iron Works, was commissioned at Port Canaveral, Fla. on April 12, 2003. (Drawing courtesy of **Peter K. Hsu**)

Sponsored by Sen. **Olympia J. Snowe** (R-Me.), during the vessel's commissioning ceremony, Mason is the 21st Arleigh Burke class ship built by Bath Iron Works. The ship has an overall beam of 59 ft. (17.9 m), and a navigational draft of 30 ft. (9.1 m). Four gas-turbine engines power the 9,200-ton ship to speeds in excess of 30 knots.

Mason is the 37th ship of 62 Arleigh Burke class destroyers currently authorized by Congress.

Circle 77 on Reader Service Card

Kvichak Delivers Foil-Assist Catamaran

The first of two foil-assist catamarans built by Kvichak Marine for the United States Army Corps of Engineers (USACE) was delivered to the USACE's Mobile District. The S/V Irvington's mission is to conduct hydrographic surveys in support of dredging and channel maintenance operations. The second vessel, which has a summer delivery, will operate in the New York District. The USACE's Marine Design Center in Philadelphia handled the project management and was instrumental in all design stages of the survey catamaran as well as monitoring the construction details from start to finish. Designed and constructed by Kvichak, the 54-x 20-ft. (16.4 x 6 m) aluminum catamaran incorporates the Hysucat foil design, which is designed to provide the operator with increased fuel efficiency; improved speed and low wake wash. The fully adjustable aft trim foil provides ultimate control for variable loads and sea conditions. Powered by twin Caterpillar 3406E engines rated for 700 bhp at 2,200 rpm, the Irvington has a top speed of 34 knots and a cruising speed of 28 knots. The highlight of the Irvington's on-deck survey package is a Reson multi-beam sonar system.

Circle 42 on Reader Service Card

Virginia Pilots Receive New Boat

Gladding Hearn, Duclos Corporation, has delivered Maryland pilot boat to Virginia Pilot Boat Corporation. It is the Virginia Pilots' sixth Gladding-Hearn launch, but the associations' first of the new Chesapeake class. The new all-aluminum boat measures 52.5 ft. (16 m), with a 17-ft. (5.1 m) beam and a 4.8 ft. (1.5 m) draft, and is powered by twin Detroit Diesel Series 60-D-DEC engines each developing 600 bhp at 2,100 rpm - providing top speeds of 25 knots.

Circle 31 on Reader Service Card

Brostrom's Fleet Grows

The new product tanker Bro Gemini, 7,600 dwt, was delivered, the fifth vessel in the Brostrom fleet delivered from the Dutch shipyard Ferus Smit BV. Another three vessels of the same type are ordered and due for delivery later this year and in 2004.

Bisso Marine Launches Deck Cargo/RoRo Vessel

Bisso Marine heavy lift crews have launched a 150 x 36 x 11 ft. (45.7 x 10.9 x 3.3 m) Deck Cargo/RoRo vessel at Mariner Shipyard in Houma, La. The 375-ton vessel, powered by twin CAT 3412 engines can achieve up to 14 knots. Entech & Associates designed the custom vessel for use in the Caribbean for inter-island transport of freight and equipment.

MITAGS/PMI Company/Ship Security Officer Training Now Available

THE MITAGS/PMI COMPANY/SHIP SECURITY OFFICER PROGRAM is based on International Maritime Organization (IMO) amendments that contain the international ship and port facility security code (ISPS Code) and U.S. Coast Guard NAVIG 10-02.

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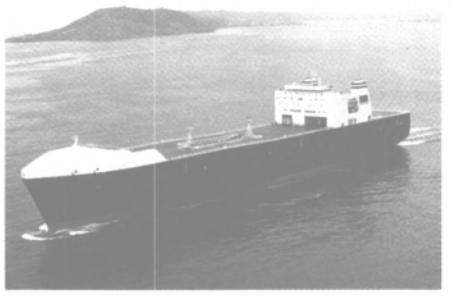
NASSCO Delivers First of ORCA Class

National Steel and Shipbuilding Company, (NASSCO) has delivered the M.V. Midnight Sun to Totem Ocean Trailer Express, Inc. (TOTE). The Midnight Sun is the first commercial dry cargo vessel to be built in the U.S. in 10 years and the first of two new ORCA-class trailerships being built by NASSCO for TOTE's service from Tacoma, Wash., to Anchorage, Alaska. The new vessel, which departed Tacoma, Wash. at 3:00 a.m., April 23. was scheduled to arrive at the Port of Anchorage at approximately 2:00 a.m., April 26. The M.V. Midnight Sun and her sister ship, the M. V. North Star, are 840 x 118-ft. (256 x 35.9-m) RoRo cargo ships capable of carrying highway trailers as large as 53 ft. (16.1 m)

Cargo decks are 360,000 sq. ft. and able to carry up to 600 cargo trailers and 220 autos as well as oversized freight. The ships employ the latest in marine technologies, including twin-screw, diesel-electric propulsion that can achieve a speed of more than 24 knots. The ships' cargo can be loaded and discharged in nine hours, with the speed and efficiency of cargo handling being an important competitive advantage for TOTE.



Above: NASSCO has delivered M.V. Midnight Sun to Totem Ocean Trailer Express (TOTE). The Midnight Sun is the first commercial dry cargo vessel to be built in the United States in 10 years.

The North Star will be christened on June 14, 2003, and will be delivered later this year. Both vessels have received several prestigious awards for their environmentally sensitive features. These awards include the States/British Columbia Oil Spill

Task Force Legacy Award for 2000, the Alaska Department of Environmental Conservation Commissioner's 2000 Pollution Prevention Award, and the U.S. Coast Guard's William M. Benkert Foundation 2002 Environmental Excellence Bronze Award.

Circle 170 on Reader Service Card

First EC Diesel

The first electronically controlled low-speed marine diesel engine built in Japan is currently completing its test program. The engine, which is a Sulzer 6RT-flex58T-B model built under license from Wartsila Corporation by Diesel United Ltd at the Aioi works, will be installed as the main engine in a 105,000 tdw Aframax crude oil tanker. The vessel, which was contracted at Sumitomo Heavy Industries Ltd by Scinicariello Augustea Ship Management SpA, is due for delivery at the end of August 2003.

The Sulzer 6RT-flex58T-B has a maximum continuous power output of 12,750 kW (17,340 bhp) at 105 rpm. Developed by Wartsila Corporation, Sulzer RT-flex engines are the first low-speed engines to have electronically controlled common-rail systems for fuel injection and valve actuation.

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Aerodynamic Garage Ships

By David Tinsley

With tall, slab sides encasing a multi-deck configuration, the pure car/truck carrier (PCTC) has a characteristically high windage factor, influencing course-keeping, maneuvering and fuel usage. A new series of PCTCs at the top end of the capacity range denotes a particular endeavor by Japanese shipbuilders to raise design performance through close attention to the aerodynamic properties of such vessels. Recently delivered into the long-haul vehicle trade patterns maintained by Mitsui OSK Lines (MOL), the 57,000-gt Courageous Ace embodies a refined form intended to lessen wind resistance and enhance fuel efficiency. Courageous Ace can load

by David Tinsley,
technical editor

6,400 automobiles of 'standard' size throughout its 13 cargo decks, and is the first of a trio from Minami Nippon Shipbuilding's Oita yard. Another three vessels of the series are in hand at Shin Kurushima Dockyard.

The design has been developed in conjunction with Universal Shipbuilding Corp., and is claimed to yield operating benefits, such as a higher service speed for a given power, while lessening the environmental impact through reduced emissions of carbon dioxide, and oxides of nitrogen (NOx) and sulfur (SOx) per unit load.

MOL's corporate principles emphasize "safe operation and environmental protection," based on the company's environmental management system, which has led to ISO 14001 certification. The philosophy permeates the newbuild program, and the consideration given to the energy implications of aerodynamic form in Courageous Ace sets the pattern for future investments in vehicle carriers.

Since the cargo decks in a PCTC extend right forward, encompassing the entire length of the hull, the vessel's elevated bow has been aerodynamically rounded and beveled along the bow line to help reduce pressure from head winds. In addition, wind channels have been created along the sides of the vessel at the top of the uppermost garage deck, so as to help counter windage and better maintain a straight course. Test results pointed to an approximate 20 percent reduction in aerodynamic pressure at the bow in winds of 15-m /sec., thereby promising an improvement of about four-percent in fuel efficiency. By reducing leeway, the design is expected to raise fuel efficiency by approximately six

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percent, averaging all wind directions at 15-m/sec. The combined effect of the design enhancements are said to offer a speed increase, relative to power, of up to one knot, depending on wind direction.

Courageous Ace is also equipped with Propeller Boss Cap Fins (PBCF), a device developed by MOL to enhance propeller efficiency by four- to five-percent, with resulting gains in efficiency. The vessel is powered by an eight-cylinder Mitsubishi UEC60LS two-stroke diesel, rated at 14,160-kW, for a speed of 20-knots at 30 ft. (9.1-m) design draft. Speed in ballast is 21.1-knots.

In keeping with the needs of the trade, MOL's latest fleet entrant has the flexibility to carry so-called 'high-and-heavy' cargo, by virtue of the adoption of two, hoistable car decks. The arrangements enable construction equipment, agricultural vehicles, railcars, buses and other than autos to be loaded on Nos 5 and 7 decks, with the associated moveable decks in the stowed position. Capacity intake using the full height of these two decks equates to 182 dump trucks of 27 tons, plus 5,300 autos of standard unit size 15 x 5 ft. (4.5 x 1.7-m) accommodated elsewhere throughout the ship on the fixed car decks.

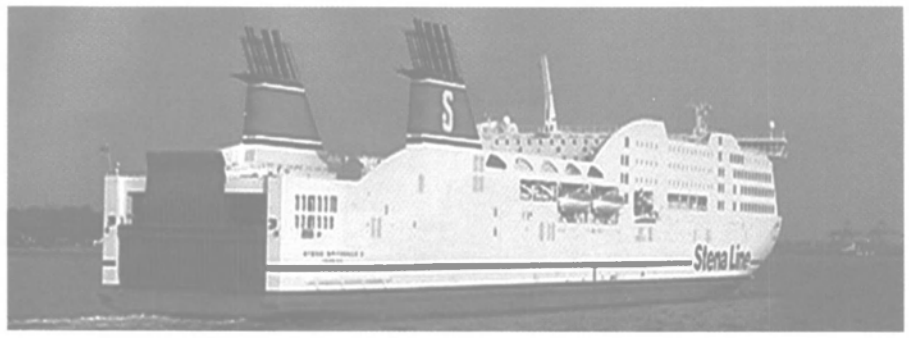
Above: The new 57,000-gt PCTC built for Mitsui OSK Lines by Minami Nippon Shipbuilding. **Left**: Image model of the PCTC, which depicts areas designed for less wind pressure resistance.

RoPax Milestone

A new arrival in the North Sea has provided Hyundai Heavy Industries, the world's largest shipbuilder, with its debut reference in the RoPax market, approximately 25 years on from the South Korean yard's construction of the operationally acclaimed Searunner RoRo trailership series. As the first of

Investment in Design

two Stena Seamaster-class newbuilds, the 43,500-gt Stena Britannica has been phased into the long-established ferry route linking the U.K. east coast port of Harwich with the Hook of Holland, at the seaward end of Rotterdam's New Waterway. Commercially significant in realizing a 20 percent advance in freight intake and 50 percent increase in capacity relative to the modern, IZAR-built RoPax of the same name which she has superseded, Stena Britannica also



New Hyundai-built RoPax ferry Stena Britannica, recently introduced to southern North Sea service. (Note that the name the vessel carries, Stena Britannica II, was only temporary - now Stena Britannica).

denotes an industrial milestone for Hyundai, as the latter's first large passenger vessel. The 22-knot, drive-through design provides unobstructed standing for 3,400-lane m of freight vehicles and units on four decks, with extra flexibility conferred by a lightweight, hoistable car deck dimensioned for 120 autos. The standard and quality of finish of the passenger spaces and cabin accommodation, along with the yard's convincing contractual performance, give a solid foundation to Hyundai's drive to raise its profile in the passenger vessel market.

Alstom to Equip Platform Supply Vessels

Alstom has been awarded a $20 million order to supply equipment for 10 new platform supply vessels, which are being built at Bender Shipbuilding & Repair Co. The Mobile Ala. shipyard awarded Alstom the contract to design, install and commission the fully integrated AC electrical propulsion and control systems for the 210-ft. (64-m) support vessels, which will be based in the Gulf of Mexico.

Communication is Common Ground

At the Communications & IT in Shipping (CITIS) conference at Inmarsat's Headquarters in London, Telaurus Communications emphasized the importance of communication in the recently passed ISPS Code to a group of delegates largely unaware of its ramifications. A survey of the group showed that 78 percent of those attending knew little of the implications of the legislation. With the compliance date only 16 months away, the conference was left in no doubt regarding the urgency of the issues. The Telaurus presentation identified five aspects of the legislation where communication was vital to its implementation and effectiveness. Those areas were Crew Calling, Security Planning, Training, AIS & other surveillance technologies and Crisis and Emergency Response. Telaurus' senior vice president of Sales and Marketing, **Trevor Whitworth,** told the conference that the contrasting attitudes of owner/operators towards Crew Calling placed this issue in contention.

Safe Boats Wins 700-Boat, $145-M Contract

The Coast Guard will purchase up to 700 new Defender Class Response Boats from SAFE Boats International of Port Orchard, Wash. The new Defender Class boats, which will be used in homeland security missions, will replace nearly 300 non-standard shore based boats and provide a standardized platform for the Coast Guard's new Maritime Safety and Security Teams (MSST's) which were established as a result of the September 11 terrorist attacks. The Coast Guard selected SAFE Boats International to manufacture the boats after a two-phased process. Three vendors were selected from written proposals to produce a prototype of their design. The total value of the contract is $145 million. Each boat will cost approximately $180,000. The 25-ft. (7.6-m) Response Boats, "add valuable capability to the Coast Guard as well as being more efficient in terms of training and costs," said Capt. **James Maes**, Acting Chief, Officer of Boat Forces. The boats have increased maneuverability and are capable of speeds in excess of 40 knots (46 mph) with twin outboard engines. The full cabin provides crew protection from the elements and is equipped with a state of the art navigation system, heater, shock mitigating seats and a communication system capable of communicating with other Federal, State and Local Homeland Security partners. The boat is also designed to be transportable by road or by C-130 aircraft." Delivery of the first boat is expected in July 2003 and will continue to arrive at Coast Guard units at a minimum of two per week. The Coast Guard will purchase up to 700 boats as needed over the next seven years and represents the largest single acquisition of identical response craft ever purchased by the Coast Guard.

The Coast Guard's new 25-ft. boats are part of the "Defender Class" boats that will replace nearly 300 non-standard shore based boats and provide a standardized platform for the Coast Guard's new Maritime Safety and Security Teams (MSST's) which were established as a result of the Sept. 11 terrorist attacks. *(USCG Photo/**Mike Hvozda**)*

Circle 19 on Reader Service Card

Barge Industry Security Plan Approved

The American Waterways Operators' (AWO) Model Vessel Security Plan for the American tugboat, towboat and barge industry has been approved by the U.S. Coast Guard. The Model Plan was developed in close consultation with the U.S. Coast Guard and the U.S. Army Corps of Engineers by a special AWO Security Working Group, and serves as a template for company-specific procedures to prevent terrorism in the categories of Awareness, Training, Personnel Practices, Planning, and Emergency Response. The Plan lists both required and suggested actions to take, depending on the threat level, with regard to physical security, communications, and cargo. In addition, a Plan appendix categorizes nearly 100 hazardous cargoes to identify those that could be used as weapons of mass destruction.

"I'm Looking Through You"

By Dennis L. Bryant,
senior maritime counsel,
Holland & Knight, Washington, D.C.

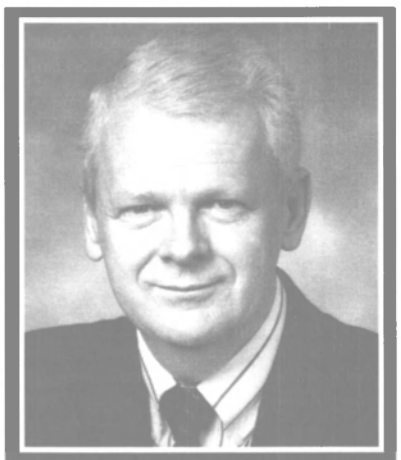
The federal government has concluded that one means of enhancing maritime security is by making maritime activity transparent. The theory is that if the federal government can look through or behind all maritime transactions, it can determine if any of them have ties to terrorists and take appropriate action before the threat manifests itself.

The problem is that many of the participants in maritime activities value the current opaqueness of most maritime transactions, generally for legitimate commercial reasons. If your competitor knows early-on what you are doing, he or she can more successfully compete against you. One of the problems with providing information to the government is that the government sometimes cannot (or will not) keep the information confidential. Thus, there is a natural tension between the government's desire for detailed information and the commercial sector's preference for opaqueness. The U.S. drive for transparency is being waged on several fronts. It involves cargo, ships, and persons on the ships.

Cargo

Under the Advance Vessel Cargo Declaration regulation (better known as the 24-hour rule), carriers are required to notify U.S. Customs at least 24 hours prior to loading cargo in a foreign port if the cargo is to be carried to the United States. Among the information that must be provided to Customs are: the numbers and quantities of each packing unit; the foreign port at which the cargo was loaded; a precise description of the cargo (such as the Harmonized Tariff Schedule number to the six-digit level) and the weight thereof; the shipper's complete name and address; the consignee's complete name and address; the internationally recognized hazardous material code (if applicable); the container number; and the seal number. Most of that information is required by law to be made available to the public upon request. An importer or consignee may request confidential treatment of its name and address, and the name and address of the shipper. Until the 24-hour rule came into effect on December 2, 2002, the cargo declaration information was more limited and was not presented to Customs until the cargo actually arrived in the United States ("landed"). Expanding the information requirements and having it presented much earlier in the importation process made that information more commercially valuable.

Reacting to numerous protests that the 24-hour rule would result in the compromise of commercially sensitive information, Customs issued a proposal to make it easier for consignees and importers to seek and obtain confidential treatment of some of the information. In the meantime, it issued a fact sheet reminding consignees and importers how to obtain confidential treatment of certain information under the current regulation.



Dennis L. Bryant, Senior Maritime Counsel at the law firm of Holland & Knight, Washington, D.C., is a contributing editor of *MR/EN.*

Ship

Prior to the events of September 11, 2001, the U.S. Coast Guard required ships coming to the United States to submit basic information regarding the ship 24 hours before arrival. Immediately after the terrorist attacks, the information requirement was significantly expanded and the information was required to be submitted at least 96 hours prior to arrival.

Masters are now required to submit detailed information relating to the ship, the ports recently visited, the ports in the United States to be visited (including the names of the specific receiving facility), the name and telephone number of a 24-hour point of contact, a general description of the cargo and specific details regarding certain dangerous cargo, detailed information regarding all persons on board, the operational condition of all navigational equipment required to be carried, and information regarding the ship's safety management system. The information requirement is so sufficiently demanding that the Coast Guard estimates it will cost ship owners and operators as a whole approximately $6.7 million annually to gather and provide the information on a timely basis.

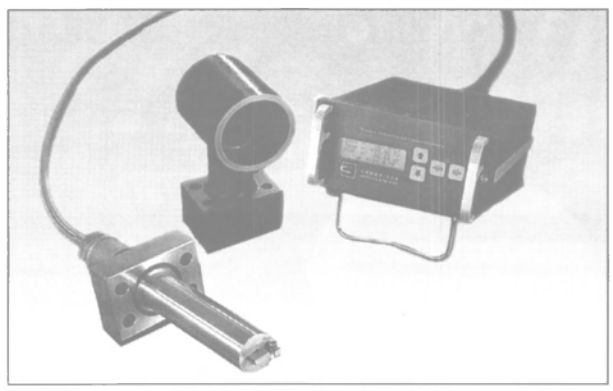
Crew and Other Persons on Board

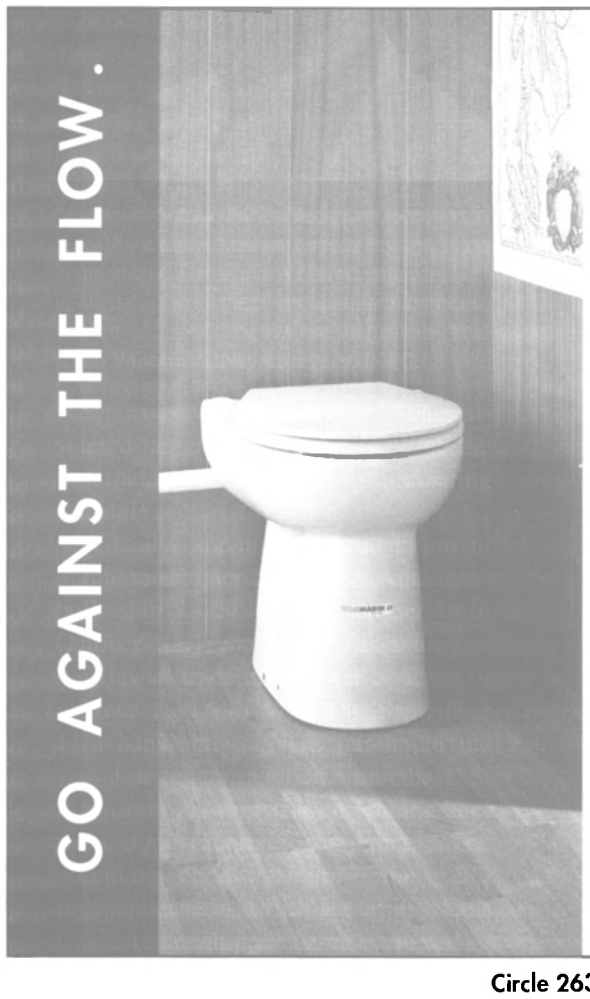
Almost the only information not required to be reported to the U.S. Coast Guard concerning persons on vessels arriving in U.S. ports is the maiden name of the person's mother. The individual's full name, date of birth, nationality, passport number (mariner document number is acceptable if the individual is a crewmember), position or duties on the ship (if the individual is a crewmember), and the port or place where the individual embarked must all be reported to the Coast Guard in the advance notice of arrival. The Coast Guard shares this personnel information with the Immigration Service and with the intelligence community. If persons reported to be on board raise suspicion, the Coast Guard and possibly other agencies conduct a more detailed examination when the ship enters U.S. waters. If, during a routine boarding, discrepancies are found between persons reported to be aboard and persons actually on board, the ship will be delayed until the matter is fully resolved.

Recently, a ship coming to the United States reported in its routine advance notice of arrival that the master and the chief engineer were of Iraqi nationality. The Coast Guard detained the ship shortly after it entered U.S. waters. The ship was held until the operator provided a new master and chief engineer of another nationality. A ship is deemed to be under the control of the master, chief mate, and chief engineer. A ship with a master and chief engineer of Iraqi nationality was considered to present an unacceptable security threat to the United States.

International Efforts

The United States attempted to get approval through the International





Maritime Organization (IMO) for a requirement that flag administrations gather information regarding the true and beneficial owners of ships registered in that country, rather than just the owner of record. The concern was that terrorist organizations, such as al Qaeda, might own ships through cover organizations. The ships could then be used for a variety of illegitimate purposes, including smuggling weapons and terrorists in and out of countries and carrying weapons of mass destruction into vital ports for detonation. This particular effort to enhance transparency on the international level was not adopted, but other efforts have succeeded.

A new international requirement was adopted for flag administrations to prepare and issue Continuous Synopsis Records for each ship in its registry that engages in international trade. The Record will contain, among other things, the name of the flag state; the date of registration; the ship's identification number and name; the port of registration; the names and addresses of the registered owners, registered bareboat charterers, and operating company; and the name of the classification society for the ship. The Record is to be updated regularly so that it provides a continuous history of the ownership and operation of the ship. While not as extensive as the United States originally wanted, the Continuous Synopsis Record will provide a greatly expanded database for port state control officials once it comes into effect on July 1, 2004.

Ships will also be required to permanently mark their identification number in a visible place on the hull and on a major bulkhead. This will provide yet another means for coastal states and port states to readily identify vessels in their vicinity. It should also make it easier to track down vessels that violate pollution or other laws. At the request of the United States, the dates by which ships are to install and operate automatic identification system (AIS) equipment have been advanced. The technology was originally developed for navigational use, but during the re-evaluation of security issues following the terrorist attacks it was realized that AIS could be used to better identify ships as they came into range of shore installations. Efforts are now being made to develop a version of AIS that utilizes satellite communications, so that ships can be tracked worldwide, not just in coastal waters (using current AIS technology).

Summary

While it is unclear how successful these U.S. efforts have been in identifying and rooting out terrorists, it is very clear that the information demands placed on the maritime and related industries are high. As noted above, the cost of just the expanded advance notice of arrival requirement is almost $7 million per year, according to government estimates. The cost in loss of a competitive edge has not been computed, and is probably incalculable, but may prove to be quite high. On the other hand, if the loss of transparency leads terrorists to forego use of the maritime sector as an avenue for their activities, the high price may be worth it. Only time will tell.

Munson Delivers 48-Ft. Packcat

Nikolski Fisherman's Association recently took delivery of this 48-ft. (14.6-m) welded aluminum PACKCAT landing craft designed and built by the

William E. Munson Company of Mount Vernon, Wash.

The vessel is designed to transport 20-ft. (6-m) shipping containers to and from Dutch Harbor to the remote island of Nikolski — 110 miles west in the Aleutian chain. Nikolski Fisherman's Association will use the specialized vessel to transport the containers loaded with construction materials to build their new fishing lodge, as well as for general purpose cargo hauling to and from Dutch.

The craft's 10-ft. (3-m) wide bow door and 34-in. long open cargo deck are outfitted with heavy duty deck rollers for offloading containers on the beach with a backhoe. Twin Mercruiser 7.3L 270 hp diesels with Bravo 2 sterndrives provide a top speed of 35 mph. Additional outfitting includes a 7 x 7 ft. (2.1 m) wheelhouse elevated for maximum visibility, diesel cabin heater, Yamaha 2600 gen set, Furuno 16 radar with interfaced GPS, davit with 12V winch and bow anchor pulpit.

Circle 35 on Reader Service Card

Moose Boats Wins U.S. Park Police Contract

Moose Boats was awarded a contract to deliver a boat for the U.S. Park Police, New York Field Office. The Moose Boats Model 320C is a replacement boat, and it will be used to patrol the Statue of Liberty, Search and Rescue for the JFK Airport, and for Emergency Response for the New York Harbor.

The 34.5 ft. (10.5-m) all-aluminum boat is a jet powered catamaran featuring twin Cummins 370-hp turbo diesels driving Hamilton 292 water jets.

"Last June we visited the MACC in Norfolk, Va., to look for a replacement boat, and we stopped by to look at the Moose Boats," said Sgt. **Grant Arthur,** U.S. Park Police. "After viewing their models and information in the booth, we set out in the harbor for a demo ride. When we returned to the dock, we knew this was the boat for us."

Arthur continued: "We were looking for a boat that would have the ability to provide a speedy response time, to safely land on shore, and get into shallow waters with ease."

Circle 48 on Reader Service Card

Damen Offers Disaster Prevention Vessels

At the beginning of 2000, Damen Shipyards was awarded the contract for the design and construction of five Disaster Prevention Vessels for the Rotterdam Port Authorities. With four of these specialized vessels designed for use inshore in the Rotterdam Port area, the fifth vessel (and slightly larger) of the series will be used in the offshore approach area of the Port of Rotterdam. The vessels were specially formatted for fire fighting, oil pollution prevention, patrol and inspection operations.

Normally, the vessel will operate with a crew of three, but if disaster should occur, the vessel can take up to eight persons aboard. Classed by LR with the descriptive note "Specially strengthened for navigating in RIZA code R conditions," the vessel meets the requirements of the Netherlands Shipping Inspectorate, such as the ADNR regulations for vessels coming alongside vessels carrying dangerous goods while loading and unloading. The hull is of a round bilge design strengthened by a combined longitudinal and transverse framing system. In the design process special attention has been paid to minimize sound levels and minimization of the generation of waves. Also, the ability to execute patrol activities at very low speeds for prolonged periods of time was an important factor in the design of the vessels. The wheelhouse has been designed to act as a command center in the event of Disaster Prevention Operations. Its large front, side, aft and sky windows provide maximum visibility. Controls have been divided over two controls, one forward and one aft with the forward console comprised of three sections (port, center, starboard) in which the various controls, navigation and communication equipment and fire fighting control equipment are placed.

The vessel is fitted with two Lips controllable pitch propellers each driven by a resiliently mounted Caterpillar 3412E TA (electronic) engine via a Reintjes LAF 562 reduction gearbox. Auxiliary power is generated by two (naturally aspirated) Caterpillar 3304 B engines, each developing 63 kVa, and a hydraulically driven (200 kW) bowthruster is capable of generating a side thrust of max. 2.2 ton.

Forward of the (propulsion) engine room a pump room is situated, in which two fire fighting sets are fitted comprised of Caterpillar 3406 engines driving 900 cu. m. Nijhuis FiFi pumps at 13 bar each. The FiFi lines are connected to four hydraulically remote controlled monitors, two of which are fitted in front of the wheelhouse and are rated 450 cu. m/hr. each. In addition, the vessel's anchoring DP system may be activated during fire fighting operations for station keeping. The fire-fighting monitors, fire-fighting connections are provided at the fore and aft deck fitted in heated enclosures.

A high level of automation can be found on board, such as a Praxis automation technology system comprising four TFT screens on the bridge for remote control of all major systems.

Main Particulars - Disaster Prevention Vessels

Owner	Rotterdam Port Authority
Builder	Damen Shipyards, Gorinchem, The Netherlands
Length , (o.a.)	94 ft. (28.8 m)
Breadth	27 ft. (8.2 m)
Depth	12 ft. (3.8 m)
Draft, aft	8 ft. (2.5 m)
Air draft	
29.5 ft. (9 m)	
Crew	3
Propulsion power	
2x 485 kW at 1,800 rpm	
Bollard pull	15 ton
Speed	13.3 knots
Navigation	Simrad Robertson
Radar system	Litton RR 2175
Autopilot system	Zeeland type Eco 500 combi pilot
DP system	Simrad Robertson
Tank capacities	
Fuel oil	14.4 cu. m.
Fresh water	3 cu. m.
Foam	9.5 cu. m.
Grey water	1.9 cu. m.
Black water	1.7 cu. m.

Circle 94 on Reader Service Card

NCL Acquires S/S United States

Furthering its commitment to its U.S.-flag cruise ship initiative, Norwegian Cruise Line (NCL) has purchased the S/S United States, one of the country's most venerable ships built in the glory days of trans-Atlantic sea travel. NCL will convert the vessel to a state-of-the art, modern cruise ship and add it to NCL's planned U.S. flagged fleet.

Widely considered to be the greatest superliner ever built in this country, the S/S United States was engineered to be faster, safer and more technologically advanced than anything else afloat when it was christened. To this day, its Atlantic crossing record has never been matched and it remains the holder of the fabled Blue Riband.

Knowing that S/S United States faced an uncertain future, NCL moved swiftly to purchase the vessel. NCL is now evaluating options for use of the ship under U.S. flag and determining the extent of renovations needed to convert it to a state-of-the-art, modern cruise ship. The ship is expected to offer mainland U.S. itineraries where cruise products are not currently available. The refurbishment of the hull and superstructure will be done at U.S. shipyards with the outfitting completed overseas. Conversions such as this are not foreign to NCL, as the company transformed the North Atlantic liner, S/S France, into cruising's first Caribbean megaship, S/S Norway.

The announcement follows NCL's recent commitment to begin a U.S. flag operation in Hawaii. A new federal law will allow NCL to complete the stalled Project America as a U.S. flagged and U.S. manned operation for inter-island Hawaii cruise service. NCL purchased the partially completed first Project America ship and substantial materials and related components for the second Project America ship from Northrop Grumman Ship Systems (NGSS) in September 2002. The legislative initiative was designed to recover the U.S. investment in Project America, generating hundreds of millions of dollars in economic activity and tax receipts, and creating more than 20,000 U.S. jobs.

On its maiden voyage, S/S United States set an unbroken record by crossing the North Atlantic Ocean in three days, 10 hours and 42 minutes. Its service speed exceeded 35 knots and the vessel was rumored to be capable of 50 knots. Designed by **William Francis Gibbs,** the ship is the longest passenger vessel ever built in the United States. At 991 ft., (302 m) the vessel, which was constructed at what was then known as Newport News Shipbuilding, was considered an engineering marvel at the time, and held a near perfect operating schedule.

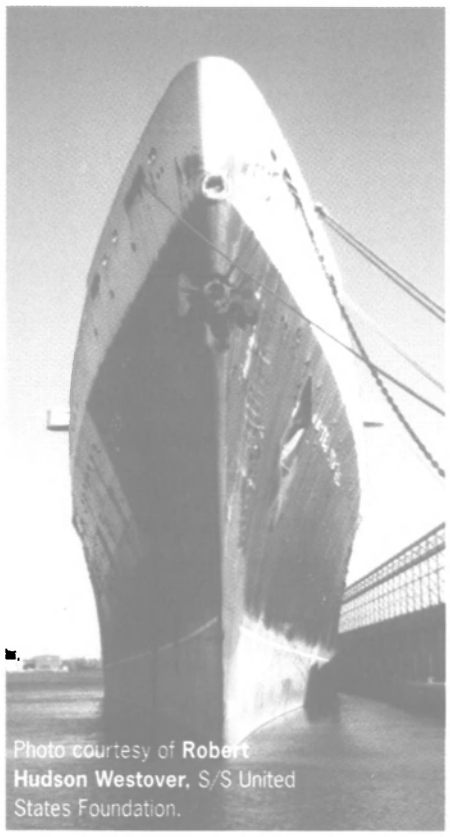
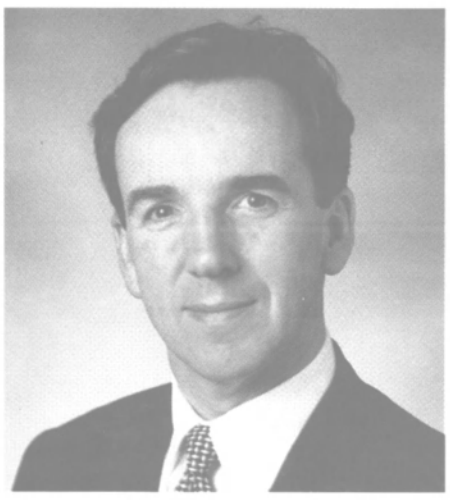


Photo courtesy of **Robert Hudson Westover**, S/S United States Foundation.



"When we discovered this American icon was in jeopardy, we saw a unique opportunity and acted immediately. The ship is a classic, she was built in America and is eligible to operate in domestic service under existing law and regulation," said **Colin Veitch**, NCL's president and CEO.

NCL also announced its intentions to purchase another classic — American-built ship — S/S Independence. Until October 2001, the vessel was sailing in the Hawaii trade until it was a victim of its owner's (AMCV'S) post-September 11th bankruptcy. NCL purchased the vessel at federal auction from the U.S. Maritime Administration saving her from almost certain scrapping. The potential addition of the S/S Independence as a fifth vessel in NCL's U.S. flag operation is being evaluated.

Farstad Shipping Goes Big

Farstad Shipping ASA is a valued Norwegian owner/operator of offshore supply vessels, well regarded for its innovative approach but reliance on conservative values in relation to safety of ships and crew.

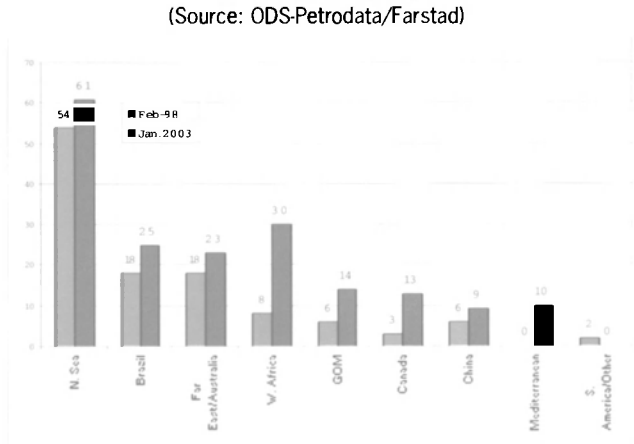
The company, which has steadily built its fleet and reputation in the offshore sector since exiting the tanker business in 1973, has a decidedly neutral take on the future, though. "There is a lot of uncertainty right now, about how the industry will move forward," said **Torstein L. Stavseng**, Farstad's CFO. "We are entering a period where there is a lot of overtonnage, which will require us to push into new fields. More than likely, some of the small players will disappear into the larger ones."

While the crystal ball may seem a bit cloudy, Farstad has proven in the past to be an astute evaluator of companies and markets in the past. It acquired the Seafourth fleet in 1989, just as the market was starting to pick up steam, established International Offshore Services (IOS) in 1997 in an Australian joint venture with P&O, and established Brazil Offshore Services in 1995.

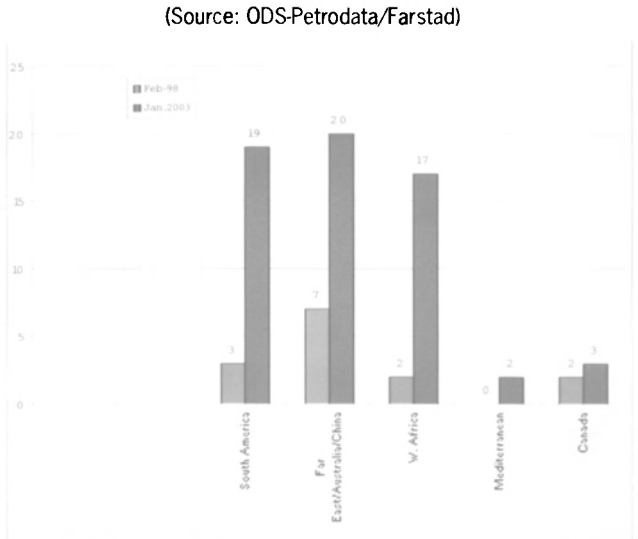
The organization has a market capitalization of more than $200 million and a newbuild orderbook of approximately $170 million. Including the vessels under construction (four Platform Supply Vessels and six Anchor Handling Tug Supply vessels), the Farstad controlled fleet is 53.

Though future demand is uncertain, Farstad's strategy is not. The company is firmly focused on owning and operating large PSVs and AHTS', in excess of 2,000 dwt for the former and units in excess of 10,000 bhp for the latter. In evaluating its prospects, it sees the move to deeper water for E&P to be the most vibrant.

AHTS>10,000 bhp
(Worldwide, sorted by Region)
(Source: ODS-Petrodata/Farstad)



PSV>2,000 dwt
(Worldwide, sorted by Region)
(Source: ODS-Petrodata/Farstad)



Frontline Continues to Blaze a Path

Managing Director **Ola Lorentzon** (left), and CFO **Tom E. Jebsen** at Frontline's Oslo office.

Plenty of companies talk the talk. Frontline also walks the walk.

A large, young, double hull fleet, which is a market trend setter is an apt desire for most any company that carries oil from point A to B. Frontline, has sped from zero to 60 at record pace.

Hatched in 1996 over frustration stemming from carrying cargo based on oil major's terms, Frontline sought to become a lightning rod for consolidation, changing the very foundation of how the tanker business was traditionally run.

Before Frontline was conceived, the tanker market was fragmented, to say the least. Of the 450 VLCCs 10 years ago, Frontline CFO, **Tom E. Jebsen**, estimates that 100 vessels were owned by one-vessel operations. Today, that picture is simplified, with approximately 70 owners total. Frontline started in the mid 1990s with six ships, but rapidly grew to its fleet of 69 VLCC and Suezmax ships today (40 VLCCs plus one newbuild, 21 Suezmax and eight Suezmax OBOs). The company controls a cumulative 17.2 million dwt, and its fleet, 71 percent of which is double-hulled, averages just 6.8 years old.

Frontline's strategy centers on the inherent purchasing power of operating a large versus a small fleet, and the realizing cost savings through the outsourcing of operations such as ship management. Despite it acquisitive past, and the current (at the time of MR/EN's visit to Frontline's Oslo office in mid-March 2003) VLCC dayrate of $100,000, the company is currently holding steady, as it digests how world events, including the war in Iraq, the strike in Venezuela, and the effects of the Prestige sinking on scrapping rates, will effect the market. In particular, it notes the current world fleet and newbuild orderbook:

	VLCC	ULCC	Suezmax
Feb 14, 2002	**433**	**25**	**285**
On Order (2001-2006)	**76**	**1**	**63**

Noting that the company commands a 10 percent market share in two major segments, Jebsen said: "I think (right now) we are big enough, but he did admit that, "at any time, we are looking" at a couple of companies to buy."

It's position as consolidator is not the only factor that sets Frontline apart. Despite strong ties to the Norwegian home market, the company is based in Bermuda. "Any shipowner should leave any 'normal' European tax scheme," Jebsen said, noting that Bermuda's tax-free environment was essential to Frontline competing against Greek and Singapore ship owners.

— Greg Trauthwein

Solid Roots to Withstand Future Storms

In true Norwegian fashion, the Norwegian Shipowners' Association does not shy from the fact that its power base is shrinking. But, the organization does not concede defeat, and is a powerful lobbyist in helping to rouse political and industry support for measures that could help right the ship. In short, the number of ships and capacity of ships controlled from Norway is dropping, nearly three percent and six percent, respectively, in just 12 months. The Norwegian owned foreign-going fleet was considerably reduced in 2002, dropping from 1,718 ships at 48.7 million dwt to 1,670 ships at 45.9 million dwt. A reduction of 48 ships and 2.8 million dwt is the most significant decline in the Norwegian controlled foreign-going fleet since 1993. The offshore fleet represents 21 percent of the foreign-going fleets' total value, while tankers and dry cargo vessels represent 18 percent. Chemical tankers represent 15 percent of the fleet and bulkships 10 percent. Gas carriers and passenger vessels totals approximately seven to eight percent. The Norwegian fleet is still third largest in the world. At the beginning of 2003, Norwegian shipowners held orders for 113 newbuildings, $6 billion, an increase of $1.8 billion compared to the previous year. Measured in contracts, Norway still holds the top spot as a shipbuilding nation, with 29 contracts. According to **Marianne Lie**, Director General, Norwegian Shipowners' Association, the problems facing the Norwegian industry are mainly political, and tax based. Specifically, she noted, the European Union has been much more aggressive in recent years of establishing favorable tax breaks to lure shipping companies in, an effort not duplicated in Norway largely because the country's head economist does not favor specialized schemes for specific interests. "In spite of significant competitive challenges, Norwegian shipping still holds its importance and position," said president **Terje Andersen**, Norwegian Shipowners' Association. "Our goal is for Norway to be an attractive country for setting up high quality and capital intensive shipping and offshore activities, where the maritime industry has a potential for growth based on a competitive maritime policy and access to global markets," Andersen says.

Marianne Lie,
Director General, NSA

The Best of Both Worlds

Oslo-based Aker Kvaerner Yards is irony in action. It serves an ancient industry dominated by older generation, yet is led by a fresh faced young executive. It prospers in a capital and equipment intensive market, yet is helping to re-define some of these relationships via the Internet. The organization is the largest shipbuilding consortium in Europe, yet good prospects for growth lie in smaller, compact yards.

— by Greg Trauthwein

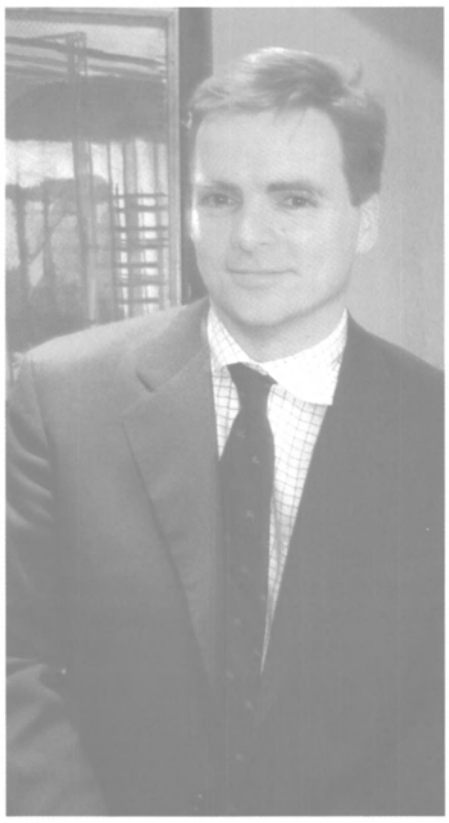
Upon first meeting the new leader of Aker Kvaerner Yards, the initial thought is "Good God, this guy is successful at a young age!"

Once the cover of the book is read, though, it is increasingly easy to see why **Karl Erik Kjelstad**, 36, was tapped to lead one of the top shipbuilding consortiums in the world. Aker Kvaerner Yards is a collection of 16 yards and approximately 16,500 employees that generates an annual turnover of nearly $3 billion.

Kjelstad, officially named to the post of President and CEO on February 4, 2003, has occupied these positions in an acting capacity since early January 2002 when the previous incumbent, **Leif-Arne Langøy**, left to become president and CEO of Aker RGI.

To set the stage, Aker Kvaerner Yards is a management company owned 50/50 by Aker Kvaerner and Aker RGI Holding AS. It functions as the group management for the 16 yards variously owned by Aker Kvaerner and Aker RGI. They are highly specialized, with a range of deliveries, which includes cruiseships, containerships, RoRo vessels and offshore service vessels, as well as traditional and fast ferries.

Aker Kvaerner Yards also acts as the management for the shipbuilding activities of Aker Kvaerner. The wholly owned Aker Kvaerner yards in the group are Kvaerner Masa-Yards in Finland, and Kvaerner Philadelphia. Aker Kvaerner also owns 40 percent of two German yards, Aker MTW and Kvaerner Warnow.



Karl Erik Kjelstad, President & CEO, Aker Kvaerner Yards. Kjelstad graduated from the Norwegian Institute of Technology (now the Norwegian University of Science and Technology) in 1992. In the last 11 years he has held a number of leading positions in the maritime industry - with Aker Yards since 1998, and Aker Kvaerner Yards since the company was established in February 2002.

A Clear, But Not an Easy Path

The strategy to profitability at Aker Kvaerner Yards lies in the diversity of its talents and the breadth of its reach. The company — which enjoys an approximate 20 percent return on capital — is in the business of building high-value niche vessels. With 16 yards, it can target most niches, helping to effectively smooth out some of the cycles inherent in the marine business. The problem today: there are few if any strong markets, according to Kjelstad, a situation he sees improving in the 2004/2005 timeframe. It can be sure that top business schools are not modeling business success today as that of an equipment and capital-intensive venture in Norway. Norwegians, generally very forthcoming with on-target self-analysis, make no secret of the fact that soaring costs in Norway, including labor, is driving business out of the country.

Kjelstad said the there are no firm acquisition offers on the table now, but if the company were to expand again, it would possibly cast its eyes to the Far East, where it currently has no presence.

Despite this, there is an inherent experience and base of knowledge — that cannot be reproduced within a generation — that keeps the customers coming back. Diversified international companies such as Aker Kvaerner Yards are now trying to strike a delicate balance that integrates the financial benefits outside the country with the technical expertise inside.

A perfect example of this is the company's shipyard in Romania, Aker Tulcea.

Acquired by Aker Yards in 2001, the shipyard has been utilized liberally to build hulls for the new wave of massive offshore vessels, sending them to the Norwegian facilities for final outfitting and delivery.

Another good example of investment outside the country is the company's venture in Brazil, Promar.

Promar was acquired, initially, to win new orders for offshore vessels from U.S. giant Tidewater. Now that the operation is integrated into the company fold and running, it is seen as a potential model of efficiency. "What we want to do in Brazil is to take the Norwegian model and incorporate our plan ... a small compact yard with no heavy lifts," said Kjelstad.

The Philadelphia Shipyard is another sign of the company's strategy towards expanding markets, albeit much different from the previous two examples. The Philadelphia shipyard — which occupies more than 114 acres of the former Philadelphia Naval Shipyard — is currently building three containerships, (two of them ordered and one on spec) with the first due for delivery to Matson Navigation in early June. While the containership market is interesting, the real target for this yard will be the Jones Act tanker fleet, though Kjelstad admits that he hopes to avoid building tankers on spec.

Another big ship building unit is in Finland, with the pair of Kvaerner Masa-Yards, in Turku and Helsinki, as

www.syx.com

Aker Yards is a 32 percent owner of a new shipyard exchange system — www.syx.com — which is a synergized procurement system designed to streamline and reduce the costs of procuring goods and services for ships. Touted as a global online sourcing and selling tool, it has been in use since early 2002. The company would not put an exact dollar figure on the amount saved to date, but does admit that this, coupled with the buying power of 16 shipyards around the globe, go a long way in ensuring that the company receives the most favorable pricing.

The company also is experimenting with an accounting system whereby suppliers get paid when the shipyard gets paid, based on the fact that most shipyards receive the majority of their money (up to 80 percent) when the vessel is actually delivered. "More subcontracting, more turnkey solutions, lower overhead costs and lower materials cost," is how **Karl Erik Kjelstad**, President & CEO Aker Kvaerner Yards, succinctly summed up his company's strategy for future profitability.

well as Aker Finnyards. Kvaerner Masa-Yards needs no introduction, as the company is a prolific builder of some of the world's most outstanding cruise ships, and has been profiled in these pages on many occasions. The company recently signed a $329 million deal with Color Line AS, the largest ferry operator in Norway, for the construction of a 74,600-gt, 2,800-passenger cruise ferry. To be classed by DNV, the 735 x 115 ft. (224 x 35 m) ship is scheduled for delivery in December 2004, and was a much-needed boost for the yard. While Kjelstad admits that the cruise market is a bit depressed at the moment, he is quick to remind that a cruise ship has not been ordered in about 18 months — since September 11, 2001— which could indicate that once ordering resumes, it could do so in earnest.

Kjelstad said the there are no firm acquisition offers on the table now, but if the company were to expand again, it would possibly cast its eyes to the Far East, where it currently has no presence.

Home Field Advantage

While the company is busy expanding around the globe, it is not forgetting its roots, and is in the midst of many yard improvement projects in Norway that are designed to enhance efficiency and output.

For example, an approximate $20 million is being invested in Langsten shipyard, primarily in the form of a new covered building facility, capable of accommodating two supply vessels inside and one for final outfitting. It is scheduled to be complete in June 2003. Langsten currently employs 420 and has a capacity up to 30,000 dwt.

The company is due any day to announce its plan for Tangen Werft, as it is working with local officials and unions to determine the future course of profitability.

Kronodoc Oy and ShipyardXchange AS (SYX) Join Forces

Kronodoc Oy and ShipyardXchange have collaborated to create a project solution for the shipbuilding industry, which includes developing a prototype, conducting a pilot, and developing a project collaboration portal to complement the current SYX offering to the marine industry.

The portal will be based on Kronodoc's technology and collaboration functionality. A pilot team comprised of Langsten shipyard (Norway), Skipsteknisk ship design consultants (Norway) and Braila shipyard (Romania) has tested Kronodoc in an actual project since November 2002. In this pilot, Kronodoc is used to support the exchange and approval of design drawings between Braila (supplying the hull); Langsten (outfitting the ship); and Skipsteknisk (responsible for the design).

Circle 90 on Reader Service Card

Tribon Solutions releases Tribon.com 6.0

Tribon.com recently released its newest version, 6.0, for easier attainment of information. The new layout presents the relevant product information in a clear and user-friendly overview on the screen making it easy for ship designers to search and find suppliers' product information. Some of the new features are: a new presentation

Tribon

An air-cooled air compressor from Sperre Industri AS presented on the new product presentation page. A subset of available attributes can be seen. The 3-D volume of the compressor is displayed in a separate window. The 3-D volume can easily be rotated in real time.

of search results based on product types, a more intuitive product presentation page, easily accessible search tips and help for the Browse Search and Free Search functions, modified system menu to provide a better overview and quicker access to pages and functions and general layout is improved to give a better overview.

Circle 86 on Reader Service Card

Transas At Nor-Shipping 2003

Located at **booth number C3:08** at the Nor-Shipping exhibition, Transas' display will be comprised of three sectors: onboard navigation systems and equipment, maritime simulators and shore-based applications, including VTS, maritime security, and fleet and ship management.

The focus of the 'navigation sector' will be the new-generation 3000 line of products, including the Navi-Sailor 3000 ECDIS and ECS; the Navi-Fisher 3000 electronic chart system specifically adopted for fishing vessels; the Navi-Radar 3000 PC-based radar system with advanced ARPA and Chart facilities, and Navi-Conning 3000, a handy navigation tool. The new Transas UAIS transponder MT-1 will also feature strongly on the stand. Navi-Sailor 3000 systems connected with UAIS transponders will be displayed in the interactive operation mode. The highlight of the 'simulation sector' will be a virtual bridge network system based on the Transas full mission ship handling simulator Navi-Trainer Professional 4000, incorporating Navi-Sailor, Navi-Radar and Navi-Conning. Among other simulators to be showcased is the Engine Room simulator, LCH simulator and GMDSS simulator TGS-4100 with new modern hardware. The 'shore-based applications area' of Transas' display will show the company's latest developments for maritime safety. Visitors will see the Navi-Guard system, the new solution for port and coastal security; the Fleet View 3.0 monitoring system and PISCES, the next-generation Potential Incident Simulation, Control & Evaluation System.

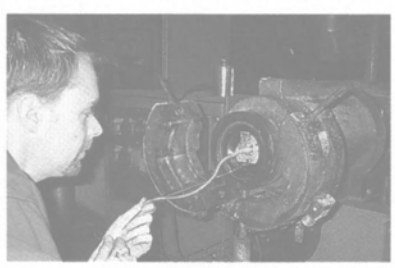
Becker Marine Systems

Since taking over the Schilling-Rudder product line, Becker Marine Systems has extended its product range, which it plans to present at this year's Nor-Shipping. Since the acquisition, Becker has come to be known as one of the largest producers of high-performance rudders. This is reflected in its twisted rudder, which lowers operating and maintenance costs on high-speed ships by reducing or avoiding cavitation. Included in the product range is the newly developed, automated materials handling system, which ensures efficient and safe handling of provisions and materials on RoPax ferries, cruisers and marine vessels. At the exhibition, the company will focus on the various options of deploying its globally established Becker rudder types, steering gear and Kort nozzles for ships of all sizes, such as platform supply vessels, cruisers, anchor handling tug supply vessels, fishing boats and oil/chemical tankers.

Circle 92 on Reader Service Card

Fixturlaser AB

Developing Advanced Machine Alignment Systems



Fixturlaser AB, Molndal, Sweden, has developed a new and highly accurate system for positioning and aligning machines and production line installations.

The new Fixturlaser Level is a laser based "one-man-level" system, which meets high mechanical and accuracy leveling requirements. The one-man-level makes a helping hand redundant, since the system consists of a self leveling, scanning laser transmitter and a high resolution receiver.

Circle 87 on Reader Service Card

MP: Eying Patrol Potential

By Greg Trauthwein

Sitting in scenic Alesund, Norway, Maritime Partners, which sells a wide variety of rescue and patrol craft, has the advantage of geography in more ways than one. Aesthetically, Alesund could be considered one of the most beautiful places in the world, with German-influenced architecture set on the rugged, fjord-laden Norwegian west coast. Aesthetics aside, Maritime Partners sits in the middle of a cradle of Norwegian maritime technology, allowing it to tap an enviable base of experience while enjoying the benefits of international operations.

Maritime Partners, started in 1994, has an annual turnover of $20 million and delivered 70 vessels in 2002. In 1999 it acquired well-known brands such as Alusafe, Seabear and Weedo, positioning it to prosper in the years to come, particularly with the acceleration of fast, versatile craft for maritime security operations. The company designs and builds boats ranging from 16 to 82 ft. (5 to 25 m), and is an aluminum specialist. The vessels are largely of a standard design with modifications to meet a specific customer's needs, but custom build options are also available. Most offer a diesel/waterjet configuration, and the designs, according to **Arne K. Dybvik**, sales manager, are flexible enough to allow a range of different manufacturer configurations, with Volvo/Kamewa, Yanmar/Hamilton and Caterpillar/Castoldi combinations accounting for a majority of the orders. The patrol craft market seems a natural extension for the company, and while the bulk of recent deliveries have been for commercial companies, **Peder R. Myklebust**, the company's managing director, admitted that interest is growing quickly. In mid-March, in fact, the company had plans to travel to the U.S. soon to explore the possibility of working with a U.S. company to build Maritime Partner designs, he said. A recent delivery for the Norwegian Home Defense highlights the possibilities. The Alusafe 1300 Mk II is a multi-purpose defense vessel with a 280-n.m. range and a top speed of more than 40 knots. The boat sleeps four and is outfitted with a complement of electronics to full military specification. *Maritime Reporter* had the opportunity to jump aboard SHV 104 Kvitsoy for a ride which fully confirmed the company claims, as the boat — powered by a pair of 450-hp Volvo Penta's driving Kamewa K28 waterjets - featured excellent acceleration and maneuverability. Kvitsoy is the first of three vessels for the Norwegian Home Guard.

Peder R. Myklebust, Maritime Partners' managing director, plans to visit the U.S. soon to explore a partnership with a boatbuilder to construct the company's designs.

LEFT: While the patrol craft market is enticing new business, the open type rescue boats is the company's "bread and butter", accounting for 50 deliveries in 2002, according to Arne K. Dybvik, sales manager. The MP 741 Springer, pictured, is a solid example of a vessel of this type.
RIGHT: The Alusafe 1300 Mk II is a multi-purpose defense vessel with a 280-n.m. range and a top speed of more than 40 knots.

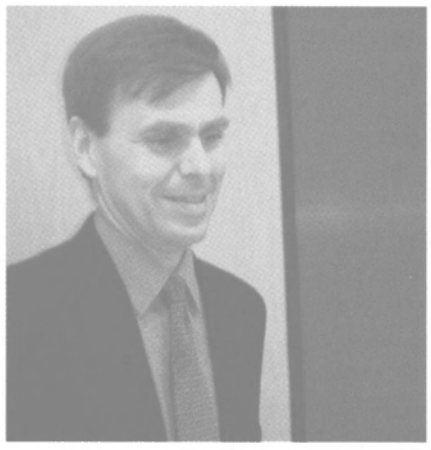
While the patrol craft market is enticing new business, the open type rescue boats is the company's "bread and butter," accounting for 50 deliveries in 2002, said Dybvik. The MP 741 Springer, pictured left, is a solid example of a vessel of this type. Late last year the company logged a breakthrough order, as Langsten Shipyard (part of the Aker Group) together with the ship owner placed an order with Maritime Partner for Daughter Craft, Fast Rescue Craft and a tug to hold offshore oil booms. This state-of-the-art stand-by vessel is chartered to Statoil for the Haltenbanken Area to perform stand-by duty for the offshore installations there. It will be on station 365 days a year and need well proven, reliable equipment to maintain operational readiness at all times. That Maritime Partners is chosen as supplier for this newbuilding gives a stamp of quality to the products. Simon Mokster is one of the pioneers in the stand-by service in the North Sea. The equipment chosen is one MP-1111 WJ FRDC, a waterjet driven daughter craft, one MP-741 Springer fast rescue boat and one Weedo 710 Tug. The FRDC is a highly specified version of the MP-1111 & 1211 family, which have been delivered in several versions since 1995.

Circle 99 on Reader Service Card

DNV Maritime: Changing of the Guard

Rapid-fire change is the only thing that stays the same in today's increasingly regulation-heavy, litigious maritime industry. Norway's Det Norske Veritas is there to help smooth out the curves.

It is no overstatement to say that the marine business is undergoing one of the most dramatic wholesale changes in a generation. With political pressure mounting from disasters such as Prestige and security concerns heightened due to the threat of terrorism, no stone has been left unturned.



Tor Svensen is the newly appointed chief operating officer of DNV Maritime.

Classification societies in particular are under increasing pressure to perform, as they are often the first ones in the eye of the maelstrom of public opinion when an accident occurs.

Norway's Det Norske Veritas is one of the world's leading classification societies. Although fourth on the list of the world's largest class societies (classing 16 percent of the world's fleet, or 93.3 million grt), the organization is highly regarded for its technical expertise and commitment to environmental issues.

Recently Tor Svensen took over the helm of DNV, and while he has no immediate plans to change its current strategy, he wants to increase the global credibility of classification societies, particularly that of DNV.

At face value, it is worthy to note that less than half of DNV's overall business, (44 percent to be precise), is from the maritime industry, with certification, offshore work and consulting making up the other 50-plus percent. But Norway's deep cultural affinity for the sea and the unique relationship of the Norwegian cluster help ensure that DNV is on the cutting edge of the business. DNV classes more than 70 percent of the Norwegian fleet, but this is a shrinking business as owners move headquarters to more economically friendly environs. While the home offshore market is stagnant, the company continues to grow its offshore operations through expansion, recently opening a 10-person office in Angola to service this burgeoning region.

Svensen emphasizes that the organization's strategy and commitment to quality, performance and service remain competitive factors for increased global activity. "There is no doubt that there is political pressure, stemming from a series of major maritime disasters including the Prestige sinking, to tighten regulations and means of enforcement.

Unless we take care, this trend may change the relationship between Class and the international bodies. We need to re-inforce the role of class to regain confidence. This will remain an important task for DNV and for all of IACS."

Bad Ships = Bad Business

Talk around the world, whether in the offices of DNV or the recent conferences at the Intertanko Tanker Convention, centers on the "elimination of substandard ships." While it could be argued that much of such talk in the past has been idle chatter, DNV seems poised to step up and help lead the way, accepting the responsibility of its unique role and its determination above all to eradicate sub-standard ships.

Towards this end, DNV is engaged in several projects aimed at harmonizing Class rules. Through IACS, the principles for establishing common scantlings are being developed. A smaller group of IACS members, consisting of Lloyd's Register, American Bureau of Shipping and DNV, is harmonizing the structural requirements for tankers. More common rules will prevent competition on basic safety standards.

The new head of maritime believes DNV is likely to become a more diversified company over the next decade, providing a wider portfolio of services. In turn, this will demand an ability to implement changes, swiftly, effectively and with precision.

"Prolonged decision-making can undermine Class quality, performance, service, and market positions," he says, adding "DNV's greatest advantages lie in the field of technology — where it has held a leading position for several decades — and its global presence, which includes strong units in Asia and the Americas."

The ability to see the whole picture in an international perspective is partly why Svensen is now heading DNV's Maritime business unit. Educated as a naval architect, he has extensive experience in research, engineering and ship design.

Since 1993 he has worked his way up through DNV's system — from section manager in advisory services — to regional manager for South East Asia in 1996, and finally as Technical Director. The job in Singapore, in particular, was where he earned his stripes: in an extremely competitive climate, DNV made some significant market inroads during Svensen's period.

Security is the Word

DNV, like most every other organization serving the maritime market, is busy finding the angle to penetrate the fast-growing maritime security demand. July 1, 2004 is the date circled on calendars around the globe, as this is when the ISPS (International Ship & Port Facility Security) Code is set to enter force, commanding "certification" for a mind numbing estimate of 40,000 ships and up to 10,000 port facilities. This, combined with the patchwork of national and regional regulations, means that vessel owners and facility operators will, more than ever, depend on organizations such as classification societies to help them consume, digest and live up to the new rules. To that end, DNV is currently training more than 100 surveyors to help customers meet the deadline.

Circle 96 on Reader Service Card

Small Tankers, Huge Market Potential

Rolls-Royce has introduced an innovative "pulling tanker" design to fill a need in the small (3,000 to 16,000 dwt) tanker niche, a niche which the company suspects will have to be filled with 1,000 vessels worldwide in the coming five years. In fact, there are strong indications that an order from a not yet-named owner is coming soon, possibly announced before or during this year's Nor-Shipping event in Oslo in early June, according to company officials.

The heart of the concept — which was started about 1.5 years ago, as pressure mounted on owners in the wake of Erika — are twin Ulstein Aquamaster Azipull thrusters with pulling propellers, in a compact arrangement using simple mechanical transmission from a pair of medium speed diesel engines, that can also supply the electrical services and cargo pump loads. The concept carries on the trend towards minimized engine room spaces and maximized, flexible cargo space arrangements, allowing owners to maximize profitability, said **Gunnar Nyland,** Rolls-Royce corporate research. In this case, Rolls-Royce claims that the power configuration allows for an additional five to seven percent more cargo space than would usually be offered in a ship of this size range.

The rudder effect of the Azipull thruster and the high side force it can generate in relation to helm angle is designed to allow the hull advantages to be retained while adding the benefits of azimuth thrusters for maneuvering.

Rolls-Royce carried out a full program of CFD analysis combined with tank testing to ensure that the NVC-Design vessels meet course stability requirements, while reaping the benefit of the new hull design. The design features two totally separate engines and propulsion systems. However, Rolls-Royce is confident that the combination of quality ownership and legislative pressure from around the globe will make its highly redundant vessel attractive and economical in the long haul. Also, the enhanced maneuverability effectively eliminates the need for tug assistance.

Circle 97 on Reader Service Card

Scandinavian Cruise Ships Feature RR Propulsion

Rolls-Royce's Kamewa Ulstein propeller systems will be featured on three separate cruise routes in the Scandinavian market. For each ship, the Rolls-Royce propeller system includes the shafting, hydraulic pitch setting system, digital electronic controls and the operator stations on the bridge. Birka Line has ordered the system for its cruise vessel being built at Aker Finnyards. The 580-ft. (177-m) vessel will have a twin screw propulsion system with Kamewa Ulstein Ice Class 1A Super propellers, turned by main engines to give a maximum speed of about 21 knots. Each 15-ft. (4.6-m) diameter stainless steel four-blade propeller will transmit up to 11,400 kW, and there are strict requirements to minimize pressure pulses to cut noise and vibration. The system will also be featured on a 73,500-gt cruise ferry being built for Color Line, and a 40,000-ton, 636-ft. (194-m) vessel being built for Tallink by Aker Finnyards.

Circle 210 on Reader Service Card

Circle 221 on Reader Service Card

Knutsen OAS Shipping Leads Gas Shipping Charge

Knutsen OAS Shipping of Haugesund, Norway, is no stranger to international shipping circles, with roots back to 1896 when the founder of the Knutsen company bought his first vessel. Today, the company operates one of the most sophisticated and modern fleets of purpose-built shuttle tankers, chemical carriers and product tankers in the world, and is presently operating the largest fleet of purpose-built DP class shuttle tankers in the world.

The company has adhered to a hands-on strategy, based on the development of total projects from design to operation. The strategy has, throughout the last 10 years, been implemented with a program of 20 newbuildings worth more than $1 billion.

Naturally, this hands-on approach puts the company in a position as a leading developer of advanced technologies to enhance ship safety and efficiency, particularly evident in the area of gas ships. In 2001 Knutsen OAS Shipping launched a new method for transporting gas at sea, the Pressurized Natural Gas, or PNG Carrier.

Under development for three years now, an order for a PNG carrier is not yet signed, but progress is being made as the company is working with DNV for class approval, while simultaneously conducting talks with yards and customers regarding a contract to build the innovative vessel.

The new system requires "top notch" pipeline welding and inspection technology, and to this end the company has received unparalleled support from EuroPipe in Germany with development of the containment system. While **Per Lothe,** project director, Knutsen OAS Shipping was loathe to share per ship pricing information, he did admit that the PNG carrier would cost more than an LNG carrier today or greater than $160 million.

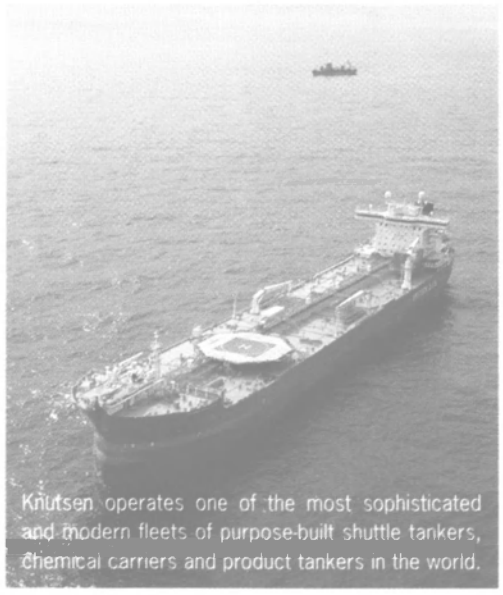
KVOC

The environmental push from Knutsen OAS Shipping could emanate in part from the pristine environment from which the company hails. Dubbed KVOC, or the Knutsen Volatile Organic Compounds System, it is a system for the reduction of VOC emissions from tankers during loading and unloading. This emission is not only an environmental hazard, but a loss of product and profitability as well. Knutsen has developed the system for two years and installed it aboard its own vessel for full scale testing. The company expects a payback, as the world increasingly tightens standards in regards to emissions, a move, which will eventually force owners to adopt or develop similar systems. The company will market the system to other shuttle tanker operators, and Lothe priced a refit cost in the area of $2 million. While the price may seem steep to traditionally tight shipping companies, Lothe estimates that the system payback, via cargo saved, could be fully realized by a VLCC in little more than a year.

Small Ships, Big Market?

Knutsen OAS Shipping has acted on the perceived potential for an exceptionally small LNG tanker intended to boost the coastal gas supply infrastructure. The company is also building a new 1,100 cu. m. LNG carrier for operation along the west coast of Norway, according to Lothe. He notes that the small LNG market is an "interesting new area," and that the ships cost an estimated $13 to $14 million to build.

The vessel is distinguished not only by its modest cargo containment volume of 1,100-cu. m., but also by its planned installation of



Knutsen operates one of the most sophisticated and modern fleets of purpose-built shuttle tankers, chemical carriers and product tankers in the world.

a bi-fuel powering plant to permit operation mainly on LNG, in the form of cargo boil-off, with diesel oil as back-up.

Dubbed the 'Kyoto Tanker' due to the environmental benefits of its propulsion system, the tanker will feature four gensets to provide energy to the 900-kW frequency-controlled electric motors serving two azimuth propulsion thrusters. During normal service conditions, it is anticipated that cargo boil-off will be sufficient for propulsion needs, engaging the two 900 kW gensets driven by gas engines. Back-up and booster capacity will be available through a second pair of gensets of 640-kW output, using diesel prime movers. Construction has been entrusted to Scheepswerf Bijlsma, a shareholder in the Groningen-based sales, marketing and design engineering firm Conoship International.

Circle 174 on Reader Service Card

Under development for three years now, an order for a PNG carrier is not yet signed, but progress is being made.

Schottel To Present New Products in Oslo

Known as an international group of companies with a worldwide sales network, Schottel GmbH & Co. KG houses its main facility in Spay — on the River Rhine in Germany. Besides azimuthing propulsion systems and maneuvering devices, Schottel also supplies conventional propulsion packages with a power rating of up to 30 MW for vessels of all kinds and sizes.

The company will be displaying, at this year's Nor-Shipping, current Schottel range of products and services, particularly: Rudderpropellers (SRP) up to 6,000 kW; Twin-Propellers (STP) up to 3,500 kW; Navigators (NAV) up to 1,000 kW; Podded Drives (SEP and SSP) up to 20 MW; Pump-Jets (SPJ) up to 3,500 kW, Transverse Thrusters (STT) up to 3,400 kW; and controllable-pitch propeller plants (SCP) up to 30,000 kW, including shafting, rudder systems, and remote control devices, as well as tailor-made steering and control systems.

Circle 191 on Reader Service Card

Saab Rosemount: Excellence in Marine Engineering

SAAB ROSEMOUNT

In terms of marine technology, Saab Rosemount offers more than just stand-alone systems. An integral part of the company's product design is to ensure seamless integration between the group's systems. This is why each subsidiary of the Saab Rosemount Marine Group is dedicated to focused development of its respective spearhead technologies.

The onboard systems offered by the Saab Rosemount Marine Group are developed, designed and produced in Scandinavia — based on the innovative engineering and requirements of the marine market. With four market leaders working as one, Saab Rosemount, SF-Control, Scanjet Marine and MEP Marine, the group's solutions support customers from system design and product advice — to installation, consultation and operational services.

Not only are these systems crucial for ship safety, efficiency and productivity, but in effect, also provide long-term commitments, and local support and expertise through the sales and service companies covering the global marine market.

Circle 93 on Reader Service Card

Nor-Shipping 2003: Bigger Than Ever

When Nor-Shipping 2003 opens its doors on June 3 to the 19th shipping trade fair, nearly 1,400 exhibitors with close to 6,000 individuals representing more than 30 nations, will dominate the large new exhibition and congress center in Lillestrøm, which is just outside the city center

The predecessor to the Nor-Shipping trade fair - an exhibition called Dekk og Dørk (Deck and Engine Room) — was held for the first time in the beginning of the 1960's, organized by Norwegian Industrial Fairs (now Norway Trade Fairs) in cooperation with the trade magazine, *Skip*. The first two exhibitions were entirely national, focusing more on the Norwegian sailor and his work place onboard rather than the international market.

The international potential for a Norwegian shipping exhibition was recognized by a Norwegian ship owner and magazine publisher, Per Selvig. He contacted then-Secretary General of Norwegian Industrial Fairs, Edv. Mowinckel-Larsen, suggesting a broader and more international focus for the next maritime exhibition, organized with the support of Selvig's magazine

Norwegian Shipping News. Before the opening in Oslo in May 1965, a new name for the event was launched — The First International Shipping Exhibition.

Due to the slumping maritime markets towards the end of the 1960s, the next exhibition did not take place until the end of May 1968, and then again in 1971, when the name "Nor-Shipping" was used for the first time. From then on, Nor-Shipping has been a bi-annual event, organizing the 19th fair in June this year.

A significant change of course took place at the fair in the early 1980's, when the purely technical exhibition was transformed to an event covering also the economic and financing aspects of the shipping industry, in short, Nor-Shipping had found the format, which is its guideline even today.

For more information log on to:
www.nor-ship.com

Speakers' Corner At Nor-Shipping 2003

At this year's Nor-Shipping, scheduled from June 3-6, 2003, exhibitors are offered the opportunity to present interesting topics at "The Nor-Shipping Speakers' Corner" from a centrally located rostrum in the glass-enclosed "Main Street."

Each speaker will be allotted a maximum of 20 minutes for his/her presentation, with a further 10 minutes set aside for questions and answers.

When an exhibitor books the Speakers' Corner, it is automatically included in the Events Program, and merits a mention in the news column on the Nor-Shipping web site. If a sufficient number of papers are registered, organizers will consider establishing a special web page dubbed "Speakers' Corner" where the papers will be published after the reading on the soapbox.

This is a service offered solely to exhibitors. If interested, please contact **Svein O. Mogan** (som@messe.no) for registration. If you are not an exhibitor, but would like to know more about becoming one, contact **Laila Mikalsen,**

our marketing executive (tel.: +47 66 93 91 39 or e-mail to lm@messe.no)

Electronic Visitor's Guide Provides Added Value

A new feature of this year's Nor-Shipping Visitor's Guide has opened recently on the exhibition's web page. The Visitor's Guide is an electronic catalog, which gives the exhibitors several possibilities in terms of publicizing their companies and products. The complete guide is now open on the Nor-Shipping web site and it will remain open until the end of the year.

Fleet Management Contract to SIS

Seeking maximum efficiency through a single maintenance management system, ASP Ship Management (ASP) of Australia has chosen Star Information Systems (SIS) to supply fleet management software for its global operations. The software contract is for 20 vessels and ASP's Melbourne office with option for eventual SIS software deliveries to other worldwide offices. The contract also includes the full SIS fleet management software system range, Star IPS, Star CPS and Star Insurance.

Scheduled to be operational by July 2003, the Star Information System has been designed to provide uniform information and improved efficiency in: Requisitioning and purchasing, taking care of data exchanges between buyer and vendor; Ship maintenance management, comprising the basic modules for maintenance work planning and spare parts handling; Document handling of all document types, including texts, images, forms and reports on shore and on board; Event handling within Quality Assurance guidelines and in line with company and statutory requirements, improving safety and reducing insurance costs; and Reporting and managing guarantee claims, keeping track of claims for new buildings or new installations for use both on board and ashore.

Circle 63 on Reader Service Card

Latest From Solar Solve for Nor-Shipping 2003

Solar Solve Marine, the U.K.-based manufacturer of the Solasolv range of anti-glare, heat rejecting sunscreens, plans to display its latest products including the new range of specialist marine interior roller blinds.

Smoketite, which will be shown at this year's Nor-Shipping, is a roller smoke screen made from flame resistant fabric and is designed to act as a highly effective barrier across corridors or stairwells located within the same area of fire risk.

Circle 91 on Reader Service Card

CIMAC Circle at Nor-Shipping 2003

CIMAC has organized its first CIMAC Circle at Nor-Shipping on June 5, 2003, from 2 p.m. - 3:30 p.m. with the title 'Users' Views on Marine Diesel Engine Performance & Reliability'

After an introduction by **Lars Nerheim,** Rolls Royce Bergen, **Jørn Dragsted,** A.P. Møller, Chairman of CIMAC Working Group 'Engine Users', will present the users' view on Marine Diesel Engine Performance & Reliability based on statistics from the Working Group's database (Cimacuse) followed by a discussion with the audience.

For more information e-mail CIMAC@VDMA.ORG

Optimized Data Communication at Bergesen

Bergesen D.Y. ASA in Norway has, for a long time, tested different communication systems to improve data communication between ship and office. Electrical superintendent at Bergesen, **Odd Jarle Holtekjølen**, confirms that the decision has been made to install CommBox on 16 vessels. "We have tested CommBox on vessels with Inmarsat A, Inmarsat B, Inmarsat Fleet 77 and via GSM. CommBox has proven to us that it is a reliable and flexible solution" said Holtekjølen. "We have reduced our

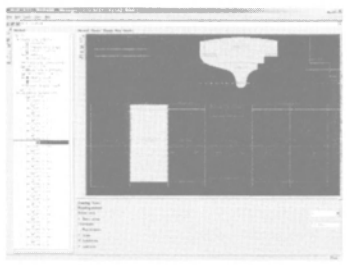
data communication cost with 65 to 70 percent on our pilot vessels. Taken in account the improved stability of established calls almost without failures the reduction of cost in some areas can be even more." Managing Director **Morten Aasen** at Virtek Communication says having Bergesen as its customer is a major acknowledgement for Virtek.

CommBox is a combined cost efficient E-mail server with a TCP/IP router designed for satellite communication. CommBox allows applications to use the link for mail transfer, file transfer and database replication.

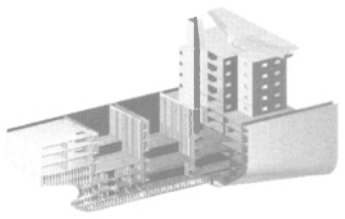
Circle 196 on Reader Service Card

NAPA Releases 2003.1

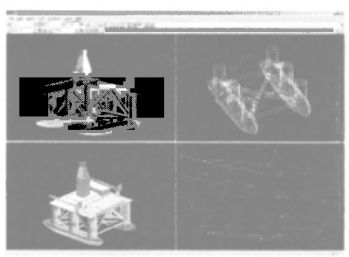
At press time, NAPA Release 2003.1 was scheduled for launch this spring. Efficiency and user-friendliness are promoted by enhancing the availability of the graphic user interface, and by designing tools for entire processes. For instance, the NAPA Manager process handling tool supplies the user with templates presenting complete calculation chains. The new version includes a number of new features, among them a generic optimization tool. NAPA Geometry now supports the renewed interactive parametric surface definitions. The user can design and choose the parameters desired, as all the main particulars of the ship are always available whenever the software is in use. The NAPA Manager, introduced in 2001 for organizing complex tasks, has forged ahead. The software now includes a number of template applications. The NAPA Manager allows experienced users to streamline their work processes in NAPA, and helps new users learn the system quickly. Also included in NAPA's new release are additions to the special features designed to handle the stability analysis of semisubmersibles, TLPs and other floating offshore structures. Of major significance is the development of a NAPA Manager application to guide the user through the stability evaluation process for offshore structures. This Manager application features special treatment of wind moment calculations, including the effect of underwater drag coefficients and thruster forces for dynamically positioned units.



Streamlined process in probabilistic damage stability: As the entire process is visible, the application itself serves as a guide for the user.



Here we see the NAPA Geometry Window with up to four separate, graphic areas and OpenGL graphics. A model used for wind moment calculations is shown (left), as well as a surface used in one pontoon (lower right) and the sectioned hull object used in stability calculations (upper right).



NAPA Steel improves efficiency of the whole design process through the utilization of a 3-D model in early structural design.

NAPA Steel Enhancements

Many new features of the NAPA Steel system, developed to increase the speed of modeling at the early stages of ship structural design, are also being introduced in conjunction with Release 2003.1. NAPA Steel can efficiently build a ship model of any ship type within 100-200 working hours. The system offers a wide variety of output possibilities. For instance, steel weight, welding lengths and production planning data can be calculated for the whole vessel, building blocks or for any other group of structures. The model can also be output to any FEM system as surfaces or nodes and elements.

Among the newest features of the NAPA Steel system are a number of interfaces made to support the flow of data between NAPA Steel and other software systems, such as Tribon Hull and Nupas-Cadmatic. Interfacing with some classification societies' systems is also available.

The new NAPA Steel - Tribon Hull interface produces Tribon schema from the NAPA Steel model. Details, such as cut-outs and corner notches, are added by the interface, based on organization-specific design rules. One of the benefits of the interface is that detail design is less prone to errors when it is based on a 3-D model from the start. The interface produces the basis for the detail design model for the whole vessel, and thus there will be no differences in modelling styles for one designer to another. Experiences gained so far have been very encouraging, showing that use of the interface can lead to significant time savings. The NAPA Steel - Nupas-Cadmatic interface is currently under development at Numeriek Centrum Groningen.

For more information on this new release

Circle 197 on Reader Service Card

SES Electrical Sees Bright Future

Sustained interest in diesel-electric propulsion and advanced power generation solutions for smaller ships is reflected in the projects completed or planned in the past year by Bergen-based Scandinavian Electric Systems (SES). Typifying the wide scope of SES' capabilities is a system due for delivery in the first half of 2003 for a DNV-classed, dynamically-positioned, seismic vessel for Volstad Shipping, Norway. SES was assigned to execute a complete study, engineering, harmonic calculations and commissioning of a 690V/60Hz installation embracing the following main elements: two 3,450kVA/720 rpm water-cooled IP54 generators; two 2,000kVA/900 rpm water-cooled IP54 generators; two compass thruster drive motors (each 2,000kW S1 1,800 rpm) with AC drives; one propulsion motor (2,500kW S1 1,200 rpm) with AC drive; and one side thruster motor (2,000kW V1 S1 900 rpm).

Among significant current commitments at SES is a system for a tanker building in Turkey for the Turkish owner Furtrans.

Due for delivery in March 2003, the DNV-classed installation will embrace a combined diesel-electric and take-me-home power solution (based on a 660kW/1,200 rpm IP23 AC motor and AC-inverter active front- end drive) and a 400kVA/1,800 rpm generator serving one shaftline.

Circle 195 on Reader Service Card

Tribon M2 Enhanced Again

Service Pack 3 of the Tribon M2 Shipbuilding system was released in early April, a version that includes further improved production information in the Assembly and Weld Planning applications and the new function Recording of Walk Through Paths in the Design Manager application. A new method for calculation of weld joints works more than 10 times faster than the previous version. The new version of the Assembly Planning application is delivered with Service Pack 3. Tribon M2 Assembly Planning helps define the vessel build strategy and create assembly production information, and also supports various activities in the work preparation and production engineering area. Both the production structure of a vessel, and the assembly structure, can be defined and maintained with Assembly Planning.

An example from Tribon M2 Assembly Planning showing a subassembly during the planning work.

Tribon M2 Weld Planning

A completely new method for automatic detection of weld joints has been implemented in the new version of the Tribon M2 Weld Planning application. Weld Planning also has a new user interface. A new method for calculation of weld joints works more than 10 times faster than the previous version. This new solution, based on the Tribon core technology, replaces the standard solid geometry method previously used.

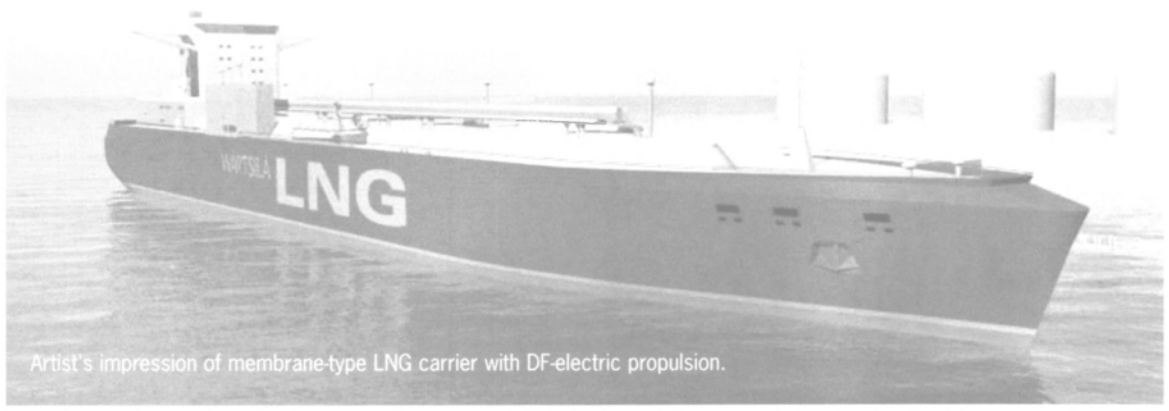
Recording of Walk Through Paths

A new function in the Tribon M2 Design Manager application is the Recording of Walk Through Paths. A walk-through in the ship model (Tribon PIM) can now easily be recorded and replayed. The recording is stored as a standard avi file format. The recorded walk through path can then easily be distributed to other design departments and offices to be displayed which simplifies the design reviews.

Walk-throughs can be used to present a ship arrangement in an efficient way.

Circle 194 on Reader Service Card

An Innovative LNG Carrier Concept



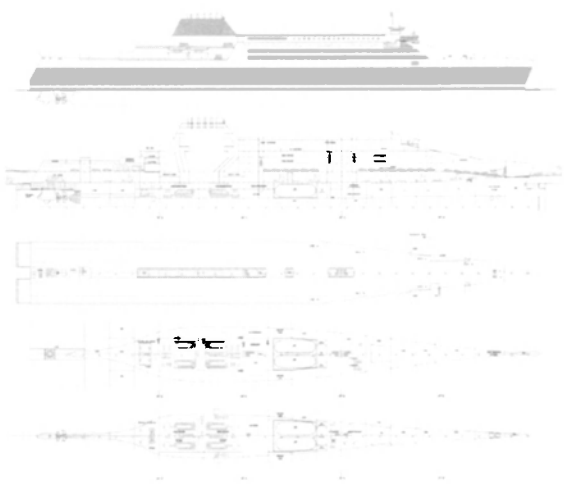
Artist's impression of membrane-type LNG carrier with DF-electric propulsion.

Concurrent with marine industry consolidation on the ship owning, building and supply fronts, increasingly innovative vessels concepts are originating from in-house design teams sitting with the major equipment manufacturers. Single-source supplier is today's mantra on the commercial and military fronts, with companies such as Wartsila leading the way. The company recently published details of an innovative new LNG carrier concept, the Wartsila DF-electric propulsion concept for liquefied natural gas (LNG) carriers, bringing together two technologies: electric propulsion and dual-fuel engines.

Outline of the DF-Electric LNG carrier

The Wartsila DF-electric LNG carrier concept is designed for a single-screw vessel with four cargo tanks and a capacity of about 138,000 cu. m. The hull has a transom stern, a single-skeg aft body and a bulbous bow. The propulsion machinery and accommodation spaces are arranged in the stern part. The cargo machinery room is arranged separate from the accommodation space on the upper deck.

Two cargo tank system variants can be applied: membrane and spherical types. Both variants have a length, (bp) of 902 ft. (275 m), breadth of 141 ft. (43 m) and 157 ft. (48 m) respectively, and design draft of 36 ft. (11 m). The main machinery consists of four nine-cylinder in-line Wartsila 50DF dual-fuel engines, each driving an alternator. Each main engine develops 8,550 kW at 514 rpm, giving a total output of 34.2 MW. The main generators feed the ship's electrical network and, through a variable-speed drive system, the propulsion motors. A 500 kW emergency diesel generator set is also installed. The single, five-bladed fixed pitch propeller is driven by two 13.5 MW AC propulsion motors through couplings and a twin-input/single-output reduction gear. There are also two 1,000 kW bow thrusters. To enhance the redundancy of the propulsion plant, the main engine rooms and casings are divided with a fire-resistant bulkhead. The main engine rooms are under diminished air pressure. A back-up arrangement of a thermal oxidizer is provided to dispose of boil-off gas during long periods of low-load operation. The service speed of the ship is about 19.5 knots at the design draft of 36 ft. (11 m) and with 15 percent sea margin, which corresponds to 27 MW shaft power. The power for accommodation and machinery ancillary consumers is about 1 MW.


General arrangement of the DF-electric RoPax vessel. The 807-ft. (246-m) vessel would carry 2,000 passengers, 1,500 lane meters for trucks and 350 cars at a service speed of 28 knots via 42,000 kW of propulsion power.

Duel Fuel Developments

Wartsila has eagerly developed dual fuel engines, with the creation of the 32DF and 50DF (see related story on page 41). In fact, the company recently logged an order for a Wartsila 50DF on the first LNG carrier to be using DF-electric propulsion.

Steam turbine propulsion dominates today's global LNG carrier fleet, as the availability of high power output and the possibility of using low-grade fuels as well as cargo boil-off gas. Whatever propulsion plant is chosen, there has to be some way of handling this boil-off gas either by utilizing it as fuel, or reliquefying it. Safety is of utmost importance in gas shipping, and LNG carriers have an excellent safety record. The reliability of steam turbine propulsion has helped to achieve this together with strict terminal regulations and procedures, and robust ship designs.

However, times are changing. Short-term contracts and even spot cargoes are becoming more common, owing to the increasing LNG demand and supply. (This, in turn, causes new problems, such as cargo sloshing, addressed in a related article on page 42).

Gas Ships: A Multi-Billion Opportunity

A number of factors, including instability in world oil markets at times, the return of bitter cold winters to the energy-hungry U.S. Northeast, and advances in the collection, transportation and cost-effective delivery of (primarily LNG) gas, have conspired to make this the decade of gas, and hence the decade of gas ships.

According to the latest statistics from Lloyd's Register, up to 50 ships over the next 10 years will be required for delivery, given the LNG maintains its current eight percent growth rate. As the average 138,000 cu. m. LNG tanker is going for about $150 million, according to World Gas Intelligence, this makes an approximate market of $7.5 billion over the next decade, on the LNG side alone.

A less scientific, yet sometimes equally effective, means to measure a market's potential is the "buzz" given a particular topic, whether it be via company information releases or the conference circuit.

Simply put, everyone's talking gas.

Not that gas does not have its challenges. Directly following the September 11 terrorist attacks in the US, several LNG receiving facilities were temporarily closed, as they were seen as an imminent risk. Similarly, local opposition to building, reopening or expanding LNG receiving facilities has iced some current projects, as options are weighed.

Regardless of market fluctuations, the need for gas is on the rise. Figure 1 shows the most likely worldwide growth of LNG import capacity over the next 10 years. On the ensuing pages, MR/EN looks in on some interesting ship and equipment developments.

Figure 1

	Current Consump. of LNG	New Capacity by 2012
Belgium	1.8	
China	-	10.5
Dom. Republic	2	-
France	7.6	6.8
Greece	0.4	-
India	-	17.8
Italy	3.8	6.5
Japan	54.1	4
Korea	15.9	8.3
Mexico	-	26.5
Portugal	-	2.3
Puerto Rico	0.5	-
Spain	7.2	12.6
Taiwan	4.6	4.3
Turkey	3.5	4.4
UK	-	3.8
USA	4.8	47.4

Existing Capacity 2002	**104 Mtpa**
New Capacity by 2012	**158 Mtpa**
Maximum Total Capacity, 2012	**262 Mtpa**

Source: Lloyd's Register

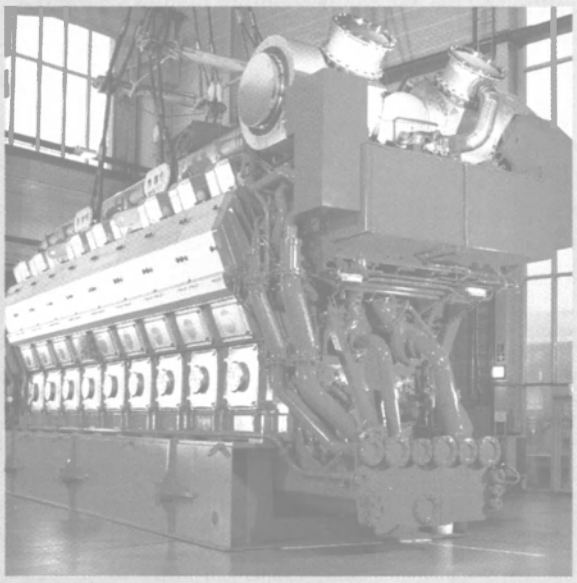
Ships in the Global LNG Trade

Route	End 2002	Due in 2003
Atlantic Basin	38	7
Pacific Basin	58	4
Mideast-Asia	36	1
Mideast-Europe	1	3
Global Traders/Uncommitted	3	4
Global Total	136	19

Source: World Gas Intelligence, Vol. XIV, No. 13, March 26, 2003

The Wartsila Dual-Fuel Engine

The latest gas engines introduced to the Wartsila family are the Wartsila 32DF and Wartsila 50DF engines. Wartsila successfully completed the factory acceptance test of the first Wartsila 50DF engine in a series of four dual-fuel engines for a 74,000 cu. m. LNG carrier. The vessel is currently under construction at the French shipyard Chantiers de l'Atlantique for the French gas holding company Gaz de France. Due for delivery in 2004, it will be powered by four Wartsila 6L50DF dual-fuel engine generating sets which will meet all the ship's propulsion and shipboard electrical requirements. The Wartsila 6L50DF



engines each develop 5,700 kW at 514 rpm.

The new engines have a four-stroke working cycle and can be run alternatively in gas mode or liquid-fueled diesel mode. In gas mode they run as a lean-burn engine according to the Otto cycle. Ignition is initiated by injecting a small amount of diesel oil (pilot fuel), giving a high-energy ignition source for the main fuel gas charge in the cylinder. The 'micro-pilot' injection system uses less than one percent of nominal fuel energy input. In liquid fuel mode the DF engine works just like any diesel engine, using a traditional fuel injection system. The Wartsila DF engine comes in two ranges, the 32DF and 50DF. Both are based on well proven diesel engines, the Wartsila 32 and the Wartsila 46. The power range for the DF engines starts at 2010 kW for the 6L32DF and reaches 17,100 kW for the 18V50DF.

Circle 178 on Reader Service Card

32 DF Main technical data

Cylinder bore/Piston stroke	320 mm/350 mm
Engine speed	720/750 rpm
Mean piston speed	8.40/8.75 m/s
Mean effective pressure	19.9 bar
Cylinder output	335/350 kW
Cylinder configuration	6,9 R 12, 18 V
Heat rate, shaft *)	Gas operation
Back-up fuel operation	7795 kJ/kWh (46.2 %)
	7890 kJ/kWh (45.6 %)

50 DF Main technical data

Cylinder bore/Piston stroke	500 mm/580 mm
Engine speed	500/514 rpm
Mean piston speed	9.7/9.9 m/s
Mean effective pressure	20.0/19.5 bar
Cylinder output	950 kW
Cylinder configuration	6, 8, 9 L 12, 16, 18 V
Heat rate, shaft *)	Gas operation
Back-up fuel operation	7300 kJ/kWh (49.3 %)

Some LNG carriers have even been ordered without any shipment contract or route, a previously unheard of practice.

Alternative Concepts

There are effectively four types of prime movers available for LNG carrier power plants: steam turbines, diesel engines (two- and four-stroke), dual-fuel engines and gas turbines. Steam plant development has virtually stood still for many years as there has been practically no market for marine applications other than LNG carriers since the 1973 Oil Crisis.

Diesel engines, by contrast, have come to dominate merchant ship propulsion, except for LNG carriers. The accumulated experience of thousands of diesel engine installations has helped to ensure the successful development of this technology. However, employing diesel engines for LNG carriers calls for total reliquefaction of the boil-off gas. The recent development of dual-fuel engines (liquid and gas fuels), derived from heavy fuel diesel engines, has made it possible to use the boil-off gas efficiently. Therefore propulsion based on dual-fuel engines is a strong option for modern LNG carriers today. When specifying propulsion machinery options for LNG carriers it is essential to consider the differences in operating profiles, fleet configurations and shipping routes. The basic case today is an approx. 138,000 cu. m. vessel with an operating speed of around 19.5 knots and the corresponding power required at the propeller of about 27 MW. However, future operating profiles of LNG carriers will require more flexibility from the power plant. Already there have been inquiries about ships that would normally operate at about 15 knots, but have to be capable of doing 19 knots on spot cargo trades. It is then very important that the power plant is efficient

Tank Gauges Help Ensure Safety

Saab Marine Electronics has been a pioneer in radar tank gauging, and offers to the LNG market what it terms one of the most reliable and safe methods to measure tanks. The LNG carrier offers a unique operational environment: a tank that is -160 degrees C and may not be opened for years. The Saab radar tank gauging solution, it maintains, is ideal for this market, as only a still pipe and cone antenna are inside the tank ... neither of which can break down or degrade in operation. The electronic box is placed outside the tank, making replacement, if needed, relatively simple, with the gauge serviced, tested and back on line in less than one hour.

Circle 176 on Reader Service Card

Aluminum Gone "Bad"

By John W. Waterhouse, P.E.,
President, Elliott Bay Design Group

There has been a lot of discussion in the marine industry over the past year with regard to "bad" aluminum. To briefly recap, a number of boat builders purchased aluminum from a supplier that met the requirements of ASTM 5083 H321. This alloy is accepted by both Lloyds Register (Lloyds) and Det Norske Veritas (DNV) for building aluminum vessels. After the aluminum was used to construct some vessels, the operators began to observe surface pitting corrosion. Upon investigation, it was discovered that the purchased plate had been treated differently during manufacturing, with the result that manganese nodules were precipitating out of the alloy, thus making it susceptible to intergranular corrosion. The result was that newly-built vessels had to be rebuilt and their original hulls scrapped. Owners weren't able to use their new boats, shipyards incurred costs to investigate and rebuild, and the aluminum distributor and provider are faced with claims. Not good all around.

In response to the investigation, the ASTM International Committee B07 and the Aluminum Association have been meeting with the U.S. Coast Guard and industry members to review and improve the relevant standards. Classification societies such as Lloyds, DNV, and ABS are also involved in the discussions. Beyond testing for chemical composition and mechanical properties, the standard will likely be expanded to include corrosion tests. Plates that have been tested and passed as suitable for marine use will also be marked clearly to prevent inadvertent mixing with non-marine aluminum. All of these measures should prevent a repeat appearance of unsuitable aluminum in high speed ferries and workboats.

As a designer of vessels, I am concerned that there is a more significant challenge that hasn't been addressed — namely the increasing use of third party standards in the marine industry. As vessels become more complex and more international in their design and construction, there is ample opportunity for misapplication of standards. Yet, there are increasing pressures on regulatory bodies such as the U.S. Coast Guard to use third party standards. For example, years ago the U.S. Coast Guard had developed a fire testing standard for marine interior materials. The problem for the industry was that this standard was different from the more common fire testing standards, thus forcing manufacturers to conduct expensive tests if they wanted to implement their products into the marine industry. The problem for the U.S. Coast Guard was to keep up with changes in materials and testing procedures so their standard did not become obsolete. Hence, as part of the rewrite of the Guide to Structural Fire Protection, NVIC 9-97, the U.S. Coast Guard now accepts Universal Laboratories, ASTM, and IMO standards for construction and testing of fire doors. Industry benefits by having more choice, manufacturers benefit by fewer tests, and the U.S. Coast Guard benefits by having others take on the burden of writing and updating standards.

I have been involved with several standards development committees, the ABS Americas Small Vessel Committee, NFPA 1925 - Marine Firefighting Vessels, and the Passenger Vessel Access Advisory Committee. It is both an enriching and a humbling process. Enriching because you learn details about the subjects that you could never learn elsewhere. Humbling because standards often reflect compromises between strong opinions.

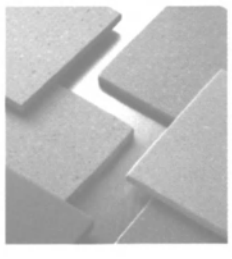
Therein lies my concern about third party standards. We often invoke them without really understanding what the standards say or, as in the case of the aluminum alloy specification, what they don't say (i.e. no corrosion test). Often there is no record of how the standard was chosen since committee discussions are seldom recorded. For example, the ADA minimum standard width for doorways is 32 in. Most people mistakenly associate that standard with wheelchairs. Actually, the width was chosen because it is the minimum practical width for persons with crutches to readily pass through the doorway.

Designers, builders, and operators are dealing with an ever increasing number of standards. The alphabet soup of ASTM, ANSI, ICS, ABYC, IEEE, NFPA, ISO, IEC, etc. is confusing. Obtaining copies of all of the relevant documents is aboth expensive and ongoing as the standards are revised. Reading the standards takes time and lots of caffeine to stay awake. The natural tendency is to assume that the code writers knew what they were doing so "use the standards and don't waste time on researching the details."

I don't have a solution to this challenge. I certainly encourage industry members to get involved by working on a standards committee. As an industry, we shouldn't rely upon others to make decisions that will affect our future. We also need to share our discoveries with others so we are all smarter. Just think about crutches the next time you pass through a doorway...and read the fine print when you order aluminum.

Dupont Surfaces - Corian Zodiaq

DuPont showcased its Corian Bas-Relief signature surfaces, a proprietary new technology that allows the material to be textured in an endless array of designs, at this year's Sea Trade Cruise Shipping Convention in Miami, Fla. Corian Bas-Relief signature surfaces can be used in a myriad of vertical applications including wall cladding, furniture, ceilings, room partitions, signboards, elevator interiors, border trims, waterfalls, merchandising displays, retail fixtures and transaction counter fronts.



DuPont offers a range of stock textures, including Bubbles, Waves, Rapids and Pillows.

Circle 36 on Reader Service Card

E Paint Company, Inc.

E Paint Company recently received approval for the commercial sale of its E Paint SN-1. This same paint type has also been chosen by the U.S. Coast Guard for use on its aluminum vessels. The company's product base also includes E Paint ZO, a single component, ablative antifouling paint formulated for commercial use, and EP2000, which is a high performance antifouling paint that yields a hard racing finish.

Circle 175 on Reader Service Card

Honeywell

Honeywell's high performance polyester fiber will be used for the first permanent synthetic mooring system in the Gulf of Mexico. Known as the 'Mad Dog' truss Spar, the installation, which is to occur this fall, will also signify the first use of polyester ropes for a Spar-based floating production system. Mad Dog will be moored in 4,420 ft. of deep water with an 11-line taut leg system in the U.S. Gulf's deep-water Green Canyon Block 826. Ropes involved will have a design minimum spliced breaking strength of 4,260 kips (1,932 tons); as per their manufacturer — Marlowe Ropes of the U.K.

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Honeywell Sensotec

Sensotec's new Flush Diaphragm Model 355 pressure transducer is a rugged, one piece, stainless steel unit, which features a flush diaphragm design, making it ideal for operations that involve the spraying or application of sealants, paints, coatings or other congealable media which can clog conventional pressure ports. The internally amplified Model 355 delivers a high level 4-20 mA or 0-5 VDC output, ready for PLC or instrument interfacing.

Circle 70 on Reader Service Card

INEXA Panel

INEXA Panel's TNF modular system has been providing a competitive benchmark for wall panel systems for the past 20 years. The TNF system ensures that all accommodation components are produced with pre-set dimensions — tailored into a modular concept. Available in two separate modules, 50 mm and 100 mm, the system has been developed throughout two decades — in close cooperation with leading shipyards. The system also provides quick installation, is cost-effective and is relatively easy to maintain.

Circle 41 on Reader Service Card

Jamestown Metal Marine Sales

Since 1962, Jamestown Metal Marine has been providing and installing interior accommodations for the marine industry. Based in Boca Raton, Fla., the company provides a full selection of services including design, material supply, manufacturing and installation for all types of vessels. Jamestown Metal Marine is also part of a corporate network that includes Jamestown Foreign Sales Corporation with vast knowledge and experience in the worldwide marketplace. Providing estimating and design development, planning and scheduling, and engineering and design integrations with approvals by regulatory bodies, Jamestown operates as exclusive agents and supplier systems for joiner systems and materials.

Circle 40 on Reader Service Card

Kalb Corporation

In a continuing effort to improve the quality of

the products offered to the power generation industry, the Kalb Corporation has begun incorporating a newly-developed insulating material as standard in its HeatBlocker Ultra Performance Exhaust Insulation blankets. This insulating material will replace the previously used ceramic fiber mat as the primary heat-attenuating barrier. Composed of a breakthrough in materials technology, this calcium, magnesium, and silica composite will extend HeatBlocker's effective temperature range to 1,832° F.

Circle 192 on Reader Service Card

NoFire Technologies

In December 1996, the IMO adopted amendments to the SOLAS convention in regards to fire safety measure for all vessels. According to Regulation 34, nearly all exposed and concealed surfaces must have low flame-spread characteristics of smoke and toxic products. Since then, tests for both characteristics have been standardized to Resolution A.653(16), and Resolution MSC.41(64), respectively.

Circle 61 on Reader Service Card

Sherwin Williams

Fast Glo Acrylic Safety Marking Paint, a new product from Sherwin-Williams Industrial and Marine Coatings group, has a single component acrylic with phosphorescent luminescent pigment that enables the paint to glow yellow/green in the dark for up to four hours. Ideal for improving emergency preparedness, and a smart choice for marking aisle ways, emergency routes, and stairways, Fast Glo works to identify safe passageways in the event of a power outage or failure of back-up power systems. When exposed to artificial light, Fast Glo can rejuvenate its glow-in-the-dark properties in 15 seconds. It can be applied by brush, roll or spray and is conveniently packaged in quart and gallon containers.

Circle 37 on Reader Service Card

Sigma Coatings U.S.A. B.V.

Developed from the success of Sigma Coatings' SigmaAlphaGen series, SigmaAlphaTrim is a new generation, tin-free antifouling. Designed to meet the 12 to 36-month dry-dock scheduled, the cost effective Sigma AlphaTrim is also fully compatible with most antifouling systems already in existence. Ideal when upgrading from TBT self-polishing antifoulings, SigmaAlphaTrim can also be applied as a one-coat system for 36 months service. Sigma AlphaTrim is designed for deep sea operating vessels with speeds of 15-25 knots and operational rates of 70-90 percent. The company has also researched and developed Sigmaplane Ecol HA, which is a high activity version of Sigmaplane Ecol HS that provides fouling protection - even under severe conditions.

Circle 179 on Reader Service Card

Thermax N.A.

Thermax's decorative marine interior joiner panels are not only non-combustible and non-toxic, but also meet the stringent requirements of agencies such as the U.S. Coast Guard, Lloyd's, ABS, Bureau Veritas and DNV. In compliance with the non-combustible requirements of SOLAS/IMO Resolutions, Thermax's products also adhere to Transport Canada, EU, MED and other regulatory bodies.

Circle 38 on Reader Service Card

Raytheon Marine and Nauticast Combine AIS Forces

Raytheon Marine is broadening its product offering to fulfill the new requirements due to the modification of international regulations. Therefore the company is now offering a SOLAS Class A ship borne AIS Transponder through its worldwide Reseller Network.

The new RM 808 AIS, which is Wheelmark Type Approved by BSH, Germany, is produced exclusively by Nauticast Schiffsnavigationssysteme AG, Austria. Nauticast supplies the RM 808 AIS based on its own X-Pack DS design, together with extended warranty and high-end accessories for ease of installation.

Circle 71 on Reader Service Card

MDS Granted Product Approval

Marine Data Systems (MDS) has become the first to be granted product approval by the U.S. Coast Guard (USCG) and the Federal Communications Commission (FCC) in the U.S., for its AIMS MIV Automatic Identification System (AIS). Prior to this, MDS has complied with all the AIS specifications and was awarded (Class A) Type Approval by the Bundesamt fur Seeschifffahrt und Hydrographie (BSH) in Germany — currently one of two test houses in the world that can grant AIS Class A type approval. MDS has participated in successful trials and projects in Canada, the Netherlands, Malaysia, the U.K. and South Africa.

Circle 10 on Reader Service Card

Major Cruise Lines Order Debeg UAIS

Carnival Cruise Lines, and Norwegian Cruise Line (NCL) have commissioned STN ATLAS Marine Electronics' new Debeg 3400 UAIS for selective installation on newbuildings as well as aboard some existing vessels. The project is part of a retrofit being carried out by Miami-based G A International Electronics in association with STN ATLAS U.K. Other major cruise line operators to have also recently commissioned systems include Holland America Line, P&O Princess Cruises and RCCL/Celebrity Cruises. Systems being supplied for cruise line operation also include, in some cases, a companion Debeg 3401 Display & Control Unit (DCU) for separate presentation of targets and own ship symbol in the form of situation displays, with triangular symbols indicating headings of targets. Target data, such as position, course, speed, heading, name and destination relative to own-ship's range and bearing can also be displayed. There are additional facilities for relaying safety-related messages and acceptance of external satcom interrogation.

Circle 57 on Reader Service Card

L-3's AIS is Compact

The L-3 AIS is a single box design with integral MKD making it the most compact AIS design available (overall dimensions are 7.3 x 6.4 x 3.3 in. or (18.4 x 16.2 x 8.2 cm)). Because of its compact size, the L-3 AIS simplifies installation, thus offering an ideal situation for retrofit or space-limited installations. With high reliability and low cost of ownership, the L-3 AIS provides shipowners with a scaleable AIS solution that can be tailored to best fit the specific needs of the bridge crew. This single box includes a DSC controller, a pair of SOTDMA controllers, internal GPS, and integral MKD. Offered with an optional integrated DGPS card and additional DGPS beacon receiver, the L-3 AIS provides DGPS positional information in the event of failure of the ship's primary DGPS system. Since AIS functions as an anti-collision device, L-3 developed an optional Windows-based Electronic Charting System (ECS) using C-Map technology. The L-3 ECS provides users with an ideal tool for displaying AIS and ARPA target information on a highly accurate geographic background

Circle 58 on Reader Service Card

Clear Your Course With JRC's JHS-180

In accordance with IMO and SOLAS requirements, which came into effect on July 1, 2002, Japan Radio (JRC) has developed its own AIS for mandated vessels. The shipborne system, which is a requirement on passenger vessels over 300 gt (international) and all vessels over 500 gt, can regularly broadcast the vessel's own information, while continuing to receive and display information broadcast from other vessels. Touted as a single unit structure, the device combines the antenna with transponder — guaranteeing easy installation and cost savings. In addition, collision avoidance is enhanced when interfaced with ARPA radar equipment and ECDIS, and JRC's own Guard Ring feature provides a guard zone setting so that the ship's Officer on Watch has early warning of potential threats. The device can also be interfaced to ship's sensors, such as gyrocompass, speed log and turn-rate indicator. With a built in GPS back up, the JHS-180 also has a channel management capability for areas that are absent from AIS access.

Circle 59 on Reader Service Card

Furuno Launches AIS

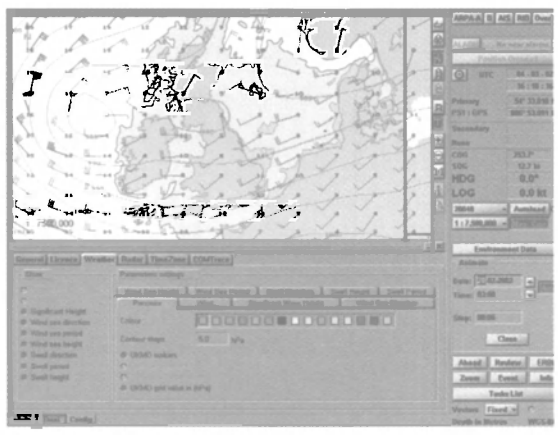
Furuno has developed and conducted internal and external testing, of the new AIS type FA-100, which is now under type approval with BSH in Germany. The FA-100 AIS is compact in design, easy to install and prepared to interface with other compatible equipment, such as Radar and ECDIS. Consisting of a combined

Integration Of AIS And ECDIS:
More Information, Better View, Improved Safety

By Mikhail Andrianov, project manager, Integrated Navigation Systems, Transas Marine Ltd.

Ever since the requirements set forth in the new Chapter 5 of SOLAS-74 Convention, adopted in IMO Resolution MSC.99(73) dd. December 5, 2000, came into effect, the AIS (Automatic Identification System) has been mandatory ship equipment for a major part of the world's sea fleet. On the whole, AIS systems, just like electronic chart systems (ECDIS and ECS) and other navigation aids, are intended for the improvement of safety at sea. As the AIS market is currently at the development stage, and holds quite definite prospects, we will consider the practical use of the AIS by ship handlers, as well as the practical advantages and feasibility of integrating AIS with electronic chart systems.

Legally, according to the IMO recommendations and rules, the AIS system should have a control panel in the form of a MKD (Minimum Keyboard Display). But at the same time, standard documents allow the AIS to be connected to the external navigational system (e.g., ECDIS) without a MKD, if the latter itself provides the MKD functionality. Many shipowners will consider it a waste to invest in an ECDIS/ECS with a built-in MKD functionality for the AIS, the more so given that the cost of a chart system (like an ECDIS) is considerably higher than that of an MKD. But in the practical application, the effectiveness of AIS - ECDIS system integration is obvious, and we are sure to see its rise in the future.



Weather Wizard provides the overlay of five-day animated weather forecasts on the electronic chart.

Collision Avoidance and Surveillance

In this respect, AIS-ECDIS system has indisputable advantages over other navigation aids like ARPA or radar. Firstly, because the AIS system operating range is the VHF range in the area. This is almost equivalent to the range, which the ARPA or radar operate in. Secondly, the ARPA/radar will only be able to show relative target mark on the screen by the bearing and range from own ship, whereas the ECDIS allows the target coordinates, its actual dimensions, full list of identifiers (Name, Call Sign, MMSI, IMO number) to be accurately determined and the collision avoidance information for this target (bearing and range to the target, CPA distance and TCPA time) to be promptly obtained. It is also possible to rapidly view additional information (Voyage Data) on the target for any moment in time. If there is a risk of collision with a target or of getting dangerously close to it, the ECDIS operator can quickly identify dangerous targets, obtain their parameters and promptly establish communication with these targets by transmitting a message via the AIS (Safety message) should the target fail to respond to the voice call on the VHF. Data on the messages transmitted from the ECDIS via AIS communication is archived in the ECDIS and will prove to be useful should an accident be considered in a court of law.

(Continued on page 48)

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Available worldwide.

Class A – SOLAS Transponder:
XS in size and XL in functions

- One lightweight, compact single unit (5,5 lbs.)
- Integrated VHF transmitter and receiver
- Inbuilt alphanumeric keyboard and display
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- Designed to IMO Standard

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by Siemens according to ISO Standards

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The AIS Company.

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control and electronic unit plus a junction box for cable connections, the device offers two antenna options — either a compact combined VHF/GPS antenna solution — or the use of separate GPS and VHF antennas. In standard configuration, the incoming AIS information will be presented at a six-line data display with further possibilities for scrolling and Graphic Mode Presentation. When integrated with compatible Radar and/or ECDIS equipment, the relevant information from AIS targets is transferred to this equipment, thus helping the navigator to centralize information. The company has also completed the development, as well as internal and external testing, of the new VDR type VR-5000.

Circle 60 on Reader Service Card

Sailor UAIS1900 and KDU1905 Gain "Wheel" of Approval

SAILOR UAIS1900 is an advanced integrated system with a 12-channel GPS and built-in VHF. To format the system so that it is operational, only a display system, such as the new KDU1905, a VHF antenna, a GPS antenna and power are needed. The new Keyboard Display Unit KDU1905 has a graphical display and the targets are either presented graphically or listed alphanumerically. The KDU1905 is easy to use, with large buttons and comes with a large 40 x 24 lines backlit display. It fulfils the IMO requirements of a mandatory control and display unit, and will often be used in combination with more advanced display systems already installed on board the vessel.

Circle 68 on Reader Service Card

SKANTI UAIS Is Proven Concept

Since the introduction of the SKANTI UAIS 2100 in January 2003, the system has proven to meet the market demand and has thus been sold in large quantities — and delivered world-wide. The SKANTI UAIS 2100 is fully functional by just connecting it to a display system, a VHF and a GPS antenna and power. Its main features include: Wheelmark approval, built in 12-channel GPS and VHF, compact design, flexible installation with just a few external connections, and water-resistance to IP66.

Circle 69 on Reader Service Card

Northrop Grumman Bridgemaster E Is Type Approved

Northrop Grumman Corporation's Sperry Marine business unit's Decca BridgeMaster E marine radars have been type accepted by QinetiQ for display of Automatic Identification System (AIS) data in accordance with the technical provisions of the International Maritime Organization Circular SN/Circ. 217.

The BridgeMaster E radar processes data from the AIS and automatically displays the AIS targets, which are shown graphically within the radar circle in accordance with IMO-prescribed symbology. The navigator can view additional information about a selected AIS target in a separate target tote window. Any displayed AIS targets infringing the defined CPA/TCPA limits or entering a guard zone will raise an alarm to alert the watchkeeper.

Circle 72 on Reader Service Card

Kelvin Hughes is IMO Compliant

Kelvin Hughes Limited, part of Smiths Marine Systems, now offers all of its Radar, ECDIS and VDR systems with full Automatic Identification System (AIS) interface capability. From July 1, 2002 the IMO, under the SOLAS Chapter V Convention, initiated the requirement for ships to carry AIS, by 2008 it will be mandatory for all vessels greater than 300 gt.

Circle 74 on Reader Service Card

McMurdo Commences New UAIS Training

Technical training courses covering all areas of installation and commissioning of Class A Universal Automatic Identification System (UAIS), are now available through Portsmouth, U.K.-based manufacturer McMurdo. The company has introduced the first of a new series of courses, designed to aid distributors, agents and installers in becoming fully qualified in both the theoretical and hands-on knowledge required to install, service and commission UAIS equipment.

Circle 180 on Reader Service Card

U.S., Canadian Seaway Corporations Open Waterway to Mandatory AIS

The U.S. Department of Transportation's Saint Lawrence Seaway Development Corporation (SLSDC) and the Canadian St. Lawrence Seaway Management Corporation (SLSMC) opened the binational waterway's 45th navigation season on March 31, 2003. This season also marks the inauguration of mandatory Automatic Identification System (AIS) use on commercial vessels entering waterway in North America to employ this technology as a requirement for transit.

Panama Canal Issues AIS Advisory

The Panama Canal Authority issued a maritime advisory stating that, effective July 1, 2003, vessels over 300 gt or measure 66 ft. (20 m) overall, must be equipped with an Automatic Identification System (AIS) transponder that meets IMO standards. Until January 1, 2005, when the AIS requirement comes fully into effect, portable AIS units may be rented from the Canal Authority. Owners and operators are reminded of the requirement for installation of a Pilot Plug and power source for AIS use by the Canal pilot.

Furthermore, the ECDIS allows target identification not only via AIS. For instance, the Navi-Sailor 3000 system has three layers of targets on display. These are targets from the ARPA connected to the ECDIS, (targets from the digital radar board (Radar Integrator)), which process targets from both the radar scanner and the AIS. All three target layers can be turned on simultaneously and plotted on the electronic chart. If a navigator acquires an important ARPA target by the range and bearing, with the use of ECDIS, it will be a matter of seconds to identify this target and obtain all the necessary identification information — if this target has an AIS system on board.

The identification data does not only include the ship identifiers, but also the ship type, dangerous cargo type, port of destination and time of arrival, and motion status. With regard to the motion status, it is worthwhile to add that in the conditions of limited visibility when the ship lights with "Not under command" status cannot be seen, time identification of such target on the ECDIS screen is essential in the analysis of the navigational situation.

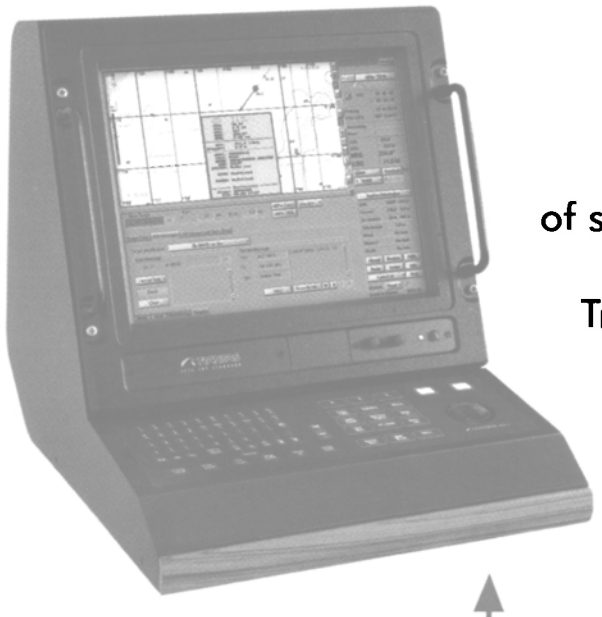
In this respect, the AIS-ECDIS integration offers unlimited possibilities. It is believed, but not confirmed, that the VTS services of the U.S. and Canada engaged in the ship pilotage in the Great Lakes (Seaway Authorities) were the first to achieve success in this. Without coming into conflict with the international AIS standards, these services transmit information on the lock passage schedules, weather information and water level data in the reference points to the ships via an AIS system. The entire data flow is promptly shown on the ECDIS electronic chart of the ships in this area, allowing navigators to make immediate use of it.

This has only been a short part of the long list of advanced principal capabilities that become available to navigators and shipmasters with an integrated AIS-ECDIS system. But even these capabilities are sufficient for shipowners to start to seriously consider interfacing their mandatory AIS transponders with still optional (but extremely powerful!) ECDIS equipment.

Monitoring of the Ship Traffic

Advantages inherent in the use of AIS systems as a tool for VTS and pilot services are clear and concise. In this case, port services have the capability to provide timely and efficient monitoring of the ship traffic flow in the waters under their responsibility. Prompt ship identification by MMSI number, Call Sign or name, as well as fast search in the target ship list, have been made possible owing to the AIS. Availability of DGPS systems built into the AIS allows sufficiently high accuracy detection of targets (up to 10 m). Provided the data on their dimensions is available, targets can be plotted with an utmost accuracy on an electronic chart in the port office's stationary ECDIS or ECS. The drawing below shows two targets obtained by the AIS system connected to the Navi-Sailor 3000 electronic chart system from Transas marine. It can be immediately seen how accurately the ships are presented: along the berth and entering the lock. In addition to the GMDSS equipment, AIS allows such communication to be established in a rapid fashion. If inadequate understanding in the voice communication between the VTS operator and watch officer should occur, or if there is some noise in the VHF radio station, the AIS allows the communication to be established in the shortest possible time. An accurate exchange can be made (in English), by using the message exchange system similar to one that is used by the SMS or paging communication in every-day life. With an adequate user-friendly interface of ECDIS or ECS, the navigator can be involved in such communication, at the same time constantly monitoring the progress of own ship and targets on the electronic chart, which is beneficial for safe navigation.

MEETING THE IMO
UAIS TRANSPONDER
CARRIAGE REQUIREMENTS



Transas proudly
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Navi-Sailor 3000 ECDIS

THE WINNING COMBINATION

MT-1 UAIS Transponder

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- Efficient collision avoidance tool
- Automatic incorporation of UAIS Transponder data into ECDIS calculations
- Advanced operations with target ship database
- Short Message Service

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IT SOLUTIONS AT SEA AND ASHORE

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detail design of our projects. I still do a lot of concept development and preliminary design work, but then I have to hand off to the design staff. However the L.A. boat was such an interesting challenge, and such a high-profile project that I took a lot of personal interest in it and dealt with a lot of the design detail myself. The hull form is totally unique, as was the whole approach to the design, which emphasized FiFi system performance above all else. The whole project also proved to be one of those rare projects where every player in the process; Owner, designer, builder, and major suppliers shared a common vision and enthusiasm for a common objective. The vessel has exceeded all expectations in every respect, and all of us at RAL are extremely proud of our contribution to the project.

MR/EN: Vessel design is far from exact science. What do you consider the most challenging aspect(s) of your profession?

RA: Although not an "exact" science, in that there is no unique solution to most design challenges; ship design still is (or at least should be!) very much a science. There is so much information available to us to ensure performance in every aspect of design that there is really no excuse for not delivering a vessel that works as specified, provided of course that the shipyard implements the construction according to the design. The enemies of this result however are always cost and time. Many owners do not see a value to proper engineering at the early stages of ship design, and do not want to invest the time required to ensure that all design problems are properly resolved at the design stage. So our challenge is always to prove that a thorough design package, properly engineered, is good value. In every case where we have been given a thorough design mandate, and in particular where our senior engineers are then also retained to act as the Owner's Representatives during construction, (such as the Los Angeles fireboat), the end result has been highly successful, and the engineering costs result in very much larger savings in shipyard "extras". After that, I take it as a personal challenge that every design issued under our name should be not only an efficient and well-planned workboat, but that it also should look good. I am always amazed how many really ugly, ill-proportioned boats still get built. A good-looking boat costs no more, and will generally offer a safer and better work platform, since the lines and house shapes that look best usually will result in better sightlines for the operator.

MR/EN: Do you have any "futuristic" vessel design ideas that you can share with us?

RA: There is little in the ship design world that is truly revolutionary; most developments are more "evolutionary", with progress measured in small increments of improved performance. The Owners in the workboat field seldom are interested in "futuristic", but are much more pragmatic and bottom-line oriented. However we are currently working on a couple of new designs that I believe will generate major interest, at least in the international tug sector. The first of these is the new "Z-Tech" tug design for PSA Marine of Singapore. This is a totally new concept that combines the best performance advantages of a Z-drive tractor tug with those of an ASD tug. The first two vessels of this class are currently under construction by Cheoy Lee Shipyards of Hong Kong for delivery at the end of the year. The second is a new design of VSP Escort Tug. We did a major design for a 10,000 bhp Escort tug about four years ago for a Norwegian client that is currently one of the high est powered, best performing dedicated escort tugs afloat. The new project will be similar, although smaller, but capable of generating the same level of indirect steering and braking forces.

MR/EN: If you could enact one change to make the marine business better/safer, what would it be?

RA: Magic wand time!! Given the chance I would eliminate Gross Registered Tonnage (GRT) and its derivative size measures from the rulebooks related to any form of workboat design or operation. No other single criterion in design or construction represents such inefficiencies in wasted time and effort for so little benefit. Tugs are built with inefficient proportions, excessive steel weight (read added fuel consumption!), and awkward and potentially unsafe spaces created, all in the interests of beating antiquated rules related to GRT hurdles for manning and crew qualifications. GRT has absolutely no relevance to a modern tug. Crew qualifications should be based upon the voyages a tug is licensed to undertake, and to the power/performance of the vessel, and nothing more.

MR/EN: How has the business side of your operations changed most significantly over your career?

RA: The biggest change has been the ability to serve a truly international clientele, electronically. At the moment we have active design projects in Canada, the U.S., Brazil, Chile, Singapore, Australia, Hong Kong, U.A.E., Turkey, Norway, Spain and the UK. Ten years ago it would have been impossible to contemplate such a client base. It means I travel a great deal, but in return I get to meet a lot of really nice people in this business, and see many corners of the world. Unfortunately my schedule usually doesn't permit spending much time in these places, so my "world album" tends to be full of pictures of shipyards and tugboats!

MR/EN: What tools do you and your staff use to stay current?

RA: Obviously we use the latest in CAD technology related to small ship design. This requires major investment on an on-going basis, but also results in significant gains in productivity and the technical capabilities we can offer.

MR/EN: What is your assessment of business prospects in the marine business today?

RA: We have been busier over the past two years than in any of the previous 15, and our order book is full until well into this year at present. So the current outlook is incredibly positive. However I have also been in the industry long enough to know it is very cyclical; the problem is the period and amplitude of those cycles are undefined! Uncertainty in the middle east may well lead to increased opportunities in North and South America, especially offshore oil exploration in the Arctic and on the west coast, areas in which we have a great deal of experience. Hopefully there will always be a demand for capable ship-design professionals. This is generally a reactive business; and we respond by being ready to work hard and long hours to meet our client's requirements with innovative and efficient designs.

MR/EN: What are the keys to longevity and success in this business?

RA: Honesty, professional integrity, hard work, and a lot of good luck!

MEETING THE IMO
UAIS TRANSPONDER
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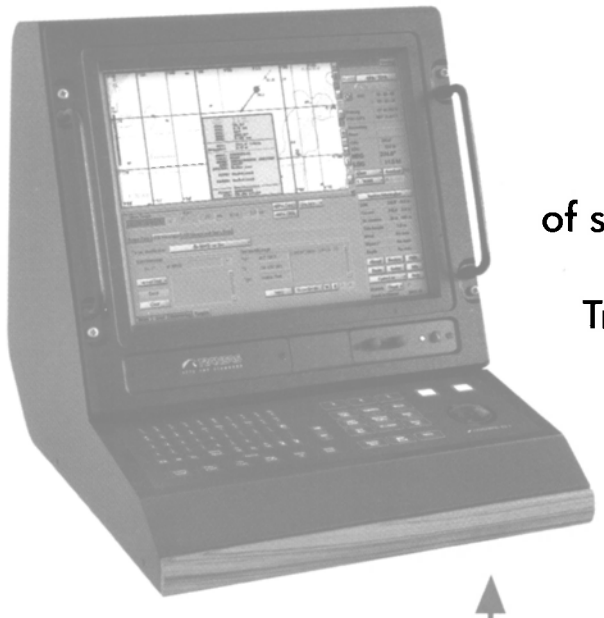

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- Short Message Service

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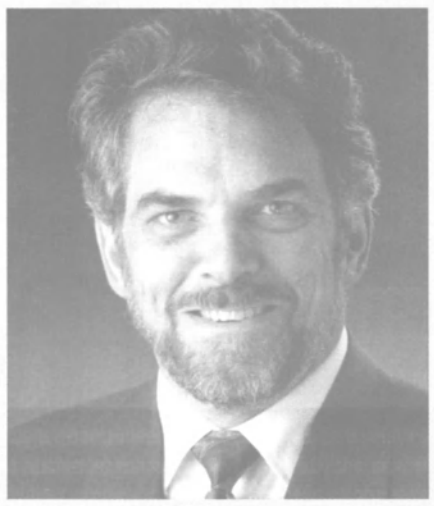
Robert Allan: Naval Architecture is in the Blood

Since the beginning of the 20th Century when **Robert Allan's** grandfather emigrated from Scotland to Canada, he treated the concept of naval architecture as a "science" rather than a trade. With little money but a lot of talent, the young man nurtured and grew a family business that would span three generations. From the time he accepted his first job as manager of a Canadian shipyard in 1919, **Robert Allan** started moving ideas from his head to innovative vessels. Armed with sketchbook and pencil, he opened his own naval architecture and marine engineering firm in his basement. All along, it was evident though that Robert Allan was exceptional. According to his grandson, **Robert G. Allan**, who has run the firm since 1982, when his father, (also **Robert Allan**) fell ill with cancer, Robert Allan was not only a talented artist, engineer and designer, but also a classic scholar. As a student of the Scottish poet **Robbie Burns**, Robert Allan could recite at a moment's notice some of the most beautiful prose from the world's great literary masterpieces. Allan recalls that his grandfather particularly favored the works of **William Shakespeare**. ***MR/EN*** recently spoke with Robert G. Allan, who since 1982 has held the position of president of his grandfather's firm. He discusses everything from the beginning of his firm, to the recent delivery of a spectacular fireboat for Los Angeles, to the future of vessel design.

— Regina P. Ciardiello

A series of highly successful 30.8-m, 4,000 bhp Z drive tugs designed by Robert Allan Ltd., and built by the Irving Shipbuilding Group. Sixteen of these vessels now service diverse ports in Canada, Ireland, Norway, Holland, Mexico and the Panama Canal.



Robert G. Allan serves as president of the firm that has beared his family name since 1930.

Robert G. Allan on:

Why he still believes in preserving original pencil sketches:

"You can never re-create the artistry of an original pencil drawing in CAD software. Back in the early days, drawings were done in ink on linen. If were to take these and digitize them, they would lose their authenticity."

Why he embraces innovative, "futuristic" vessel design:

"Attractive vessels that are aesthetically pleasing are important to our clients. It's pretty easy to keep cranking out the same stuff — but I don't think that's why we're here. On the other hand, there are owners who still think tugs should look as they did in the 1940s. We want to provide a cutting edge technology that is also safe for crews. There are many boats out there that may look pretty — but are not safe."

Maritime Reporter & Engineering News: What is your background?

Robert Allan: I am the third generation in my family to be a naval architect. Our business was started by my grandfather. He graduated from the University of Glasgow (Scotland) in 1907, in the very early days of this profession as a science rather than a "trade". He emigrated to Canada in 1919 to become the manager of one of the local Vancouver area shipyards, and then started in private practice as a consulting Naval Architect in 1930. My father started working in the business just after WW II, and he eventually incorporated the company as Robert Allan Ltd in 1962. The base of our business has always been the design of specialized workboats of all types, especially those that dominate our local B.C. waters, such as tugs, barges, ferries, fishboats and other specialty vessels such as fireboats, research vessels and SAR vessels.

Having grown up around the water and in small boats all my life, I always wanted to be in this business from an early age, and never wavered from that plan. After high school I studied for a couple of years at UBC in Vancouver, then in 1968 transferred to my grandfather's Alma Mater, the University of Glasgow, graduating from there with an honors degree in Naval Architecture in 1971. After working in England for a couple of years I joined my father at Robert Allan Ltd. in 1973. In 1982 my father died rather prematurely at age 65, and I was left to carry on the business, with the help of an extremely capable staff. In the '50's and early '60's, the business was a very small operation of about six people, working out of the basement of my grandfather's house, and then eventually it outgrew that constraint. Currently we have 33 employees in a 6,000 sq. ft modern office.

MR/EN: In your opinion, what are the 3 or 4 most significant changes in the business during your career?

RA: • Computer-based Design Technology. There is no question that the computer has totally transformed the way we do business in the 30 plus years of my professional career, especially in the past decade. In my early days this was still a "pencil-based" business, and the lines plan was sacrosanct. Once the lines were drawn then every aspect of the design revolved about it. Although in principle the same should still be true, now it is so much easier to both generate and then alter a lines plan that the whole design process has changed. Because of the ease of repeatability in CAD, and the general loss of technical capabilities within smaller shipyards (where the majority of our vessel designs now get built) we also now do a great deal more design definition in a project than was the case 20 or 30 years ago. Shipyard Design Capability. It used to be the case that nearly every shipyard we dealt with had at least a basic in-house engineering capability and, more critically, a well-established crew of journeyman tradesmen who could develop a basic design into a well-found ship. To a very large degree those capabilities no longer exist, and designers now must provide a much more detailed definition of the vessel in order to protect the interest of our shipowner clients. A major part of our business today is in the total definition of all steel parts and piping details for shipyard construction, something rarely contemplated in the pre-computer era. Now the software to do these tasks with almost 100 percent accuracy are readily available at competitive costs, and it makes it possible for us to offer these services with a high degree of confidence.

Designed for Gulf Canada Resources in 1981, this vessel is one that Robert Allan holds most near and dear. With the company garnering the contract just as Allan's father fell ill with cancer, the vessel was completed shortly after his death. The vessel also marked the younger Allan's first major design project — without the guidance of his beloved father.

• **Unitized construction/ Pre-outfitting.** The way in which ships get built has also changed into a much more manufacturing-based business than it was. It is now unusual to have a vessel built "from the keel up." Instead vessels of even quite small sizes are built in logical hull units, and often pre-outfitted prior to joining to the greater total assembly. It is thus increasingly important that we design ships with this type of unitized construction in mind, and pre-define where the logical unit breaks should be, with structural detailing designed accordingly.

• **Internationalization/Internet Information Exchange.** Robert Allan

Ltd has been in the international market place for design services since the 1960s, but in general only in limited quantities. We had a small joint-venture operation in Singapore in the late 1970s, but closed that down when my father died, which also happened to coincide with a major global downturn in shipbuilding activity. However, in the past five years the Internet and related email technology has made it possible for us to provide design support to shipyards around the world almost instantaneously. Instead of sending drawings by post or by courier, now almost every day we are transmitting drawings to shipyards in every corner of the world. Almost 90 percent of our business is outside Canada, and more than 70 percent is outside North America.

MR/EN: Discuss the one vessel, the one project, from which you have derived the most personal or professional satisfaction?

RA: A tough choice, but that would have to be ice-breaking Offshore supply vessels "Ikaluk" and "Miscaroo," (see photo on page 50) designed for Gulf Canada resources Inc in 1981. We won this contract just when my father was diagnosed with cancer, and he died shortly thereafter. It thus fell to me to deal with this very major project at a fairly tender age in my professional career. There was nothing like these vessels in the world at the time: Arctic Class IV, 15,000 bhp, (80 m) anchor-handling supply vessels. We developed a very unique design based on some prior experience with much smaller ice-class OSV's, and a lot of intuition. One vessel was built in Vancouver, and the other was built in Japan. Dealing with the Japanese Shipyard (NKK's-Tsurumi Yard) was an incredible learning experience for me, to see how well organized and efficient every aspect of their operation was. In the planning stages I would go to Japan for a week at a time with our Electrical Engineer and Gulf's Project Manager, and I had to meet alone with team after team of the shipyard engineering groups to resolve every detail of the ship, for hull form, steel, outfitting, piping and machinery. It was extremely challenging, but also extremely rewarding to see those ships take shape. In the final analysis these two ships have been extremely capable vessels, proving to be extremely capable ice-breakers and anchor-handlers. They are currently working in the offshore Sakhalin project under Smit's flag.

MR/EN: What do you count as your top three or four professional accomplishments?

RA: Managing to stay in business for all these years would be one (!), with the attendant growth of our business into an internationally recognized design firm a close second. However I could not have achieved any of this success without the incredible support of an exceptionally professional and capable staff. It is really important to emphasize how much a team effort this business is: I have two incredibly capable and talented lieutenants in **Hans Muhlert** (32 years at RAL) and **Ken Harford** (14 years), who are responsible for the day-to-day operation of the design office. I am also indebted to **Carol Nilson** (31 years) who as our office manager keeps every aspect of our personnel and financial dealings running smoothly. With the support of these three and the many other professional staff here, I am able to concentrate primarily on the further development of the business. Technically, I think my major accomplishment has been in the field of high-performance tug design. RAL has been fortunate to have a recent long run at developing some of the best performing tugs afloat.

Two generations of naval architects — **Robert Allan Sr.** (left), and **Robert Allan, Jr.** — when vessel design consisted of a simple pen to paper sketch. The accompanying, photo was originally part of an article on the firm that appeared in the local paper — *Vancouver Province* — in 1956.

We have done this by thinking "outside the box," performing applied research to tug performance, and developing hull forms that take maximum advantage of the modern omni-directional propulsion systems used, rather than simply emulating old twin-screw hull forms. We currently have more than 25 tugs under design development or under construction at various locations around the world, some of which will be among the most technically advanced tugs afloat for many years to come. I have also committed to writing numerous papers on the subject of tug design and performance, with the objective of sharing some of what we have learned with the next generation of naval architects. Finally, in terms of unique project accomplishments, I rank the new Los Angeles fireboat as one of my career highlights, (See related story next page). I don't often have the chance these days to get deeply involved in the

detail design of our projects. I still do a lot of concept development and preliminary design work, but then I have to hand off to the design staff. However the L.A. boat was such an interesting challenge, and such a high-profile project that I took a lot of personal interest in it and dealt with a lot of the design detail myself. The hull form is totally unique, as was the whole approach to the design, which emphasized FiFi system performance above all else. The whole project also proved to be one of those rare projects where every player in the process; Owner, designer, builder, and major suppliers shared a common vision and enthusiasm for a common objective. The vessel has exceeded all expectations in every respect, and all of us at RAL are extremely proud of our contribution to the project.

MR/EN: Vessel design is far from exact science. What do you consider the most challenging aspect(s) of your profession?

RA: Although not an "exact" science, in that there is no unique solution to most design challenges; ship design still is (or at least should be!) very much a science. There is so much information available to us to ensure performance in every aspect of design that there is really no excuse for not delivering a vessel that works as specified, provided of course that the shipyard implements the construction according to the design. The enemies of this result however are always cost and time. Many owners do not see a value to proper engineering at the early stages of ship design, and do not want to invest the time required to ensure that all design problems are properly resolved at the design stage. So our challenge is always to prove that a thorough design package, properly engineered, is good value. In every case where we have been given a thorough design mandate, and in particular where our senior engineers are then also retained to act as the Owner's Representatives during construction, (such as the Los Angeles fireboat), the end result has been highly successful, and the engineering costs result in very much larger savings in shipyard "extras". After that, I take it as a personal challenge that every design issued under our name should be not only an efficient and well-planned workboat, but that it also should look good. I am always amazed how many really ugly, ill-proportioned boats still get built. A good-looking boat costs no more, and will generally offer a safer and better work platform, since the lines and house shapes that look best usually will result in better sightlines for the operator.

MR/EN: Do you have any "futuristic" vessel design ideas that you can share with us?

RA: There is little in the ship design world that is truly revolutionary; most developments are more "evolutionary", with progress measured in small increments of improved performance. The Owners in the workboat field seldom are interested in "futuristic", but are much more pragmatic and bottom-line oriented. However we are currently working on a couple of new designs that I believe will generate major interest, at least in the international tug sector. The first of these is the new "Z-Tech" tug design for PSA Marine of Singapore. This is a totally new concept that combines the best performance advantages of a Z-drive tractor tug with those of an ASD tug. The first two vessels of this class are currently under construction by Cheoy Lee Shipyards of Hong Kong for delivery at the end of the year. The second is a new design of VSP Escort Tug. We did a major design for a 10,000 bhp Escort tug about four years ago for a Norwegian client that is currently one of the high est powered, best performing dedicated escort tugs afloat. The new project will be similar, although smaller, but capable of generating the same level of indirect steering and braking forces.

MR/EN: If you could enact one change to make the marine business better/safer, what would it be?

RA: Magic wand time!! Given the chance I would eliminate Gross Registered Tonnage (GRT) and its derivative size measures from the rulebooks related to any form of workboat design or operation. No other single criterion in design or construction represents such inefficiencies in wasted time and effort for so little benefit. Tugs are built with inefficient proportions, excessive steel weight (read added fuel consumption!), and awkward and potentially unsafe spaces created, all in the interests of beating antiquated rules related to GRT hurdles for manning and crew qualifications. GRT has absolutely no relevance to a modern tug. Crew qualifications should be based upon the voyages a tug is licensed to undertake, and to the power/performance of the vessel, and nothing more.

MR/EN: How has the business side of your operations changed most significantly over your career?

RA: The biggest change has been the ability to serve a truly international clientele, electronically. At the moment we have active design projects in Canada, the U.S., Brazil, Chile, Singapore, Australia, Hong Kong, U.A.E., Turkey, Norway, Spain and the UK. Ten years ago it would have been impossible to contemplate such a client base. It means I travel a great deal, but in return I get to meet a lot of really nice people in this business, and see many corners of the world. Unfortunately my schedule usually doesn't permit spending much time in these places, so my "world album" tends to be full of pictures of shipyards and tugboats!

MR/EN: What tools do you and your staff use to stay current?

RA: Obviously we use the latest in CAD technology related to small ship design. This requires major investment on an on-going basis, but also results in significant gains in productivity and the technical capabilities we can offer.

MR/EN: What is your assessment of business prospects in the marine business today?

RA: We have been busier over the past two years than in any of the previous 15, and our order book is full until well into this year at present. So the current outlook is incredibly positive. However I have also been in the industry long enough to know it is very cyclical; the problem is the period and amplitude of those cycles are undefined! Uncertainty in the middle east may well lead to increased opportunities in North and South America, especially offshore oil exploration in the Arctic and on the west coast, areas in which we have a great deal of experience. Hopefully there will always be a demand for capable ship-design professionals. This is generally a reactive business; and we respond by being ready to work hard and long hours to meet our client's requirements with innovative and efficient designs.

MR/EN: What are the keys to longevity and success in this business?

RA: Honesty, professional integrity, hard work, and a lot of good luck!

The Big One: L.A. Fireboat 2

The Los Angeles Fire Department (LAFD) has accepted its new fireboat, L.A. Fireboat 2, which is the largest in the U.S. according to its length of 105 ft. (32 m) and a fire-fighting capacity of more than 10,300 cu. m. /hr. Built to replace the 75-year-old Ralph J. Scott, it was designed by Robert Allan Ltd. And constructed in 18 months by Nichols Brothers Boat Builders.

The basic principle of this ship was developed by Voith Schiffstechnik, Germany and it is based on the Voith Water Tractor. During fire fighting the pumps are running with 70 percent of the main engine power and the remaining 30% are sufficient for the vessel to maintain an exact position.

The vessel has a unique hull form developed by Robert Allan Ltd. in order to create very low wake wash profile at medium speed patrol operations within the Port of Los Angeles. According to **Doug Moore**, chief engineer at the LAFD's Fire Station #112, where the vessel will be home-ported, "The new fireboat was able to match the LAFD's needs for a design that incorporates the abilities of an escort tug with the latest in firefighting technologies." Moore, who also served as the fireboat's project manager, added that he was equally impressed with the vessel's efficient fuel savings, which can be attributed to its unique hull form and Detroit Diesel engines. "The cruising fuel economy of this vessel is twice than what we expected," he said. A radio-controlled model was constructed and tested in order to verify that the wake profile was acceptable, and also to verify speed and maneuverability characteristics. The forward hull is typical of a VSP propelled vessel, however the aft end has a quite different form, more reminiscent of the style of high-performance ASD tugs for which the designers are noted.

Propulsion and steering control are provided by twin Voith cycloidal propellers, Model 26 GII/165, provided by Voith Schiffstechnik, each driven by an MTU/Detroit Diesel Model 12V4000 diesel engine, rated 1,800 bhp (1,343 kW) at 1,800 rpm, which also drive a fire pump through a front end PTO. In addition, a pair of MTU/Detroit Diesel 8V-4000 pump engines each drives two fire pumps. All machinery is resiliently mounted for minimization of noise and vibration transmission.

The fire-fighting system delivers a total of 36,000 U.S. gpm at the system operating pressures of approximately 10 bar (136,080 lpm or 8,165 cu. m. /hr.) delivered from a total of six pumps to all the monitors. The entire fire-fighting pump and monitor system was provided by Unitor AB (formerly Svenska Skum AB). The main piping is a major design feature, prominently mounted in a ring around the upper boundary of the deckhouse, with the monitors mounted directly above. The wheelhouse is designed to provide maximum possible all around visibility, with excellent overhead visibility through large visor windows. To keep a clear view, it is outfitted with a Wynn wiping system.

The largest fireboats show their power.
(Photo credit: The Port of Los Angeles)

Main Particulars - L.A. Fireboat 2

Length, o.a.	105 ft. (32 m)
Beam, molded	29 ft. (8.84 m)
Depth, molded	13.3 ft. (4.06 m)
Maximum draft	15.16 ft. (4.6 m)
Propulsion	Voith
Main Engines	MTU/Detroit Diesel
Fire fighting Pump & Monitor System	Unitor
Window wiping system	Wynn
Glass	Garibaldi
Propulsion Engine Driven Pumps	(2) @ 1,470 cu. m./hr. at 12.5 bar
Pump Engine Driven Pumps	(2) @ 1,250 cu. m./hour at 12.5 bar
	(2) @ 800 cu. m./hour at 12.5 bar
Water monitors	(1) @ 2,500 cu. m./hr., 150 m throw, (3) @ 800 cu. m./hr., 100 m throw
Water/foam monitors	(2) @ 1,250 cu. m./hr., 135 m throw, (2) @ 225 cu. m./hr., 75 m throw
Under-wharf monitors	(2) @ 450 cu. m./hr.
Foam storage	(2) 11,500 l tanks
Foam pumps	(2) @ 620 lpm
	(2) at 220 lpm

SNAME Set for October 17-20 in San Francisco

This year's World Maritime Technology Conference, sponsored by the Society of Naval Architects and Engineers (SNAME), is scheduled from October 17-20, 2003 at the Moscone Center in San Francisco, Calif. With booth space is selling out quickly (only 40 left to go at last count), it's only a matter of time before the exhibition hall will be complete.

To reserve your space now, please contact Rob Howard at tel: (561) 732-4368; or e-mail: howard@marinelink.com.

Garibaldi Glass on L.A. Fireboat 2

Using a frameless window, direct-glaze technique, Garibaldi Glass Industries supplied a tempered glass laminate combination to provide both strength and safety on the LAFD's newest vessel — L.A. Fireboat #2. The windows were coated with a baked on perimeter black ceramic frit during manufacturing and were then bonded into place using a Sika polyurethane adhesive. The bonded window application will reduce long term maintenance and eliminate all potential for leaks, an important concern considering the 38,000 gallons per minute of water that can be launched into the air around them. Garibaldi's frameless glass has also been installed aboard vessels built for Navy, Coast Guard, and Fire/Rescue service.

Circle 171 on Reader Service Card

Wynn Installs Wipers

Wynn Marine completed the installation of a window wiping system for a new Los Angeles Fireboat. The wiper system is based on the Type C Internal motor Straight line wiper from Wynn's heavy duty Ocean Range. Wynn wipers use materials such as 316 stainless steel. Good wipers are are particularly important for operation on the LA Fireboat, which can pump as much as 38,000gpm of water into the air, a condition that can seriously affect visibility on bridge windows. In conjunction with the wiper system Wynn has also installed its top of the range Series 3000 control system which comes with either a flat keypad or highly flexible touch screen LCD. The control system can handle up to 50 wipers on one circuit.

Circle 169 on Reader Service Card

Ship Trio is Largest to Sail St. Lawrence River

The largest ships ever to be deployed in the St. Lawrence River are on target to start services later this year with the keel laying in South Korea of Canada Maritime's 4,100 teu containership Canmar Spirit. The first ship in the newbuilding program, Canmar Venture, is on schedule for delivery in July with the Canmar Spirit following in September. The ships, which are being built by Daewoo Shipbuilding & Heavy Machinery, will each be 965 x 106 ft. (294 x 32.2 m), with a draft of 35 ft. (10.7 m). Their nominal capacity is 4,100 teu, with a service speed of 22 knots. These are two of three ships ordered to operate in Canada Maritime's Northern Service. OOCL, Canada Maritime's long-standing partner in the St. Lawrence Coordinated Service (SLCS) has ordered the third vessel. SLCS offers three weekly routes through the Montreal Gateway. Route 1 links Montreal with Thamesport, Antwerp and Le Havre; Route 2 links Montreal with Antwerp and Hamburg and Route 3 links Montreal with Liverpool.

Propulsion Stays Firmly Based on Diesel Engines

By: Prof. Dr. Wolfram Lausch,
MAN B&W Diesel Aktiengesellschaft, Germany

Today, about 97 percent of the 90,000 ships of 100 gt and above in the International merchant fleet are propelled by large-bore, highly charged diesel engines. In the past couple of years, the discussion about alternative forms of propulsion increased, especially on the subject of gas turbines and hydrogen fuel cells (FC).

Ships need a propulsion system that can provide reliable transportation from point A to point B within an acceptable period of time - with maximum cargo load, at competitive capital costs, operation costs and maintenance costs - with minimum pollutant emissions.

A fitting example for the following consideration is a modern 100,000-dwt shuttle tanker. The transport of a cargo of 108,000 cu. m. liquids over a distance of 10,000 sea miles requires 1,600 cu. m. of Heavy Fuel Oil (HFO), approximately 90 cu. m. of Marine Diesel Oil (MDO) and 15 cu. m. of lube oil. The total consumed volume equals 1.6 percent of the transported cargo volume. The total space needed for engine, fuel and lubricants is just 2.4 percent of the shuttle tanker's cargo volume. The operating costs for this voyage amount to approximately $250,000 with maintenance costs of approximately $20,000. First costs for the propulsion plant average approximately seven percent of the ship's total price.

The power onboard the cruise vessel Norwegian Dawn is based on MAN B&W V 48/60-type medium-speed diesel engines.
(Photo courtesy of Meyer Werft Shipyard, Papenburg, Germany).

Immature Fuel Cells

Of the optional ship propulsion systems known today, the fuel cell is the least mature one. On the other hand, fuel cells currently enjoy great public and political focus and are often hailed as the energy conversion technology for the future, mainly due to the promising environmental properties when using hydrogen as fuel.

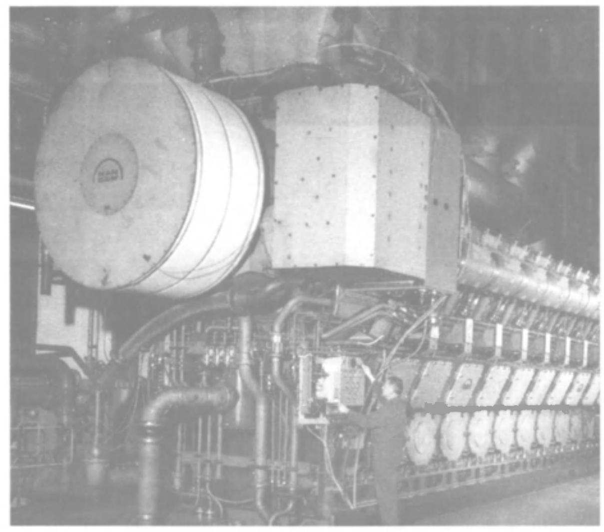
Because of lack of hydrogen, most FC demonstration plants use methanol in connection with so-called reformers, which transform methanol chemically into hydrogen, which means a reduction of the efficiency, and a production of CO_2 and NOx. Therefore the ideal solution would be a hydrogen infrastructure, which would allow direct use of hydrogen in order to achieve maximum efficiency and zero pollutant emission. Such an infrastructure is missing today and even in the foreseeable future.

In shipping, use of both hydrogen and methanol as fuel is more or less ruled out, at least with today's storage technologies. In addition to the missing infrastructure and storage to support such fuel types, they do not have the same power density as diesel fuels. Therefore ships would need a much larger tankage volume to cover the same distance as with diesel fuels. In this case, the ships would transport fuel, not cargo.

If the 100,000-dwt shuttle tanker was driven by a future (hypothetical) FC system based on gaseous hydrogen - assuming the same propulsion efficiency as with the current diesel-based power plant - it would require huge fuel tanks reducing the 108,000 cu. m. tanks for the liquid cargo by more than 20,000 cu. m.

Perhaps the most uncertain point about the applicability of FC technology is the cost factor. The processes of mass production are still unknown, and many of the presently required materials are still very expensive. In terms of costs per kW, fuel cells currently are 10 to 20 times more expensive than diesel engine plants.

Even if, in future, there was a complete hydrogen infrastructure available on this planet, diesel engines could burn hydrogen with high efficiencies. This is one of the results of a five-year theoretical and experimental study, which MAN B&W Diesel conducted together with the University of Munich a few years ago.



MAN B&W medium speed diesel engine 18V 48/60B. Having the same bore and stroke as the earlier type 48/60, the new B version achieves higher output at lower fuel consumption rates and lower emissions.

The Future Belongs to Diesel Engines

The proven technologies for marine diesel propulsion suggest that alternative technologies will not challenge the reign of traditional propulsive power production by diesel engines onboard ships. The alternative technologies might find a niche, with gas turbines rather close and FC as GenSets in submarines. Even if a new form of propulsion was to beat diesel engines in efficiency there would still remain the long way to mass production. Main diesel engines in the multi-MW output range will not disappear from the market, especially as long as low-priced, low-quality heavy fuel oils are allowed to be burned in them. However, diesel technology has to be constantly cared for and upgraded by the engine industry, in particular with respect to noise and exhaust gas emissions.

Circle 47 on Reader Service Card

Hext Named V. Ships Marine CEO
V.Ships has appointed **Richard Hext** as CEO of the Groups' Marine Services Division, effective April 7, 2003. The move follows a restructuring of the Group into two operating divisions — Ship Management and Marine Services. Hext previously was with LevelSeas, and before than worked with the Swire Group for more than 20 years.

$129M Deepwater Contracts
Northrop Grumman Corporation's Ship Systems sector has been awarded two Deepwater contracts totaling $129 million for the detail design and long lead material procurement for the U.S. Coast Guard's first new National Security Cutter (NSC).

Pair of MAN B&W Engines To Japan
MAN B&W Diesel AG has secured an order from Mitsubishi Heavy Industries, for the production and delivery of two 9L58/64 large-bore Diesel engines for use on a RoRo passenger ferry as from next year.

Radio Holland Opens Curaçao Office
Radio Holland Group will open a new regional branch office in Curaçao, which will be in full service by June/July 2003.

MHI Suffers Fire Damage on LNG
Japan's Mitsubishi Heavy Industries (MHI) extinguished a fire on an LNG being built at the Nagasaki yard. According to reports, the nearly completed ship is being inspected for possible damage.

GD Wins $59.2M Contract
The U.S. Navy has awarded General Dynamics Electric Boat a $59.2 million contract modification for Virginia-class submarine lead-yard services. Under the terms of the contract, Electric Boat will maintain, update and support the Virginia-class design and related drawings and data for each submarine, including technology insertion, throughout its construction and post-delivery maintenance period.

Micky Arison chairman and CEO of Carnival Corp. & plc, and his wife **Madeleine** applaud traders on the New York Stock Exchange floor Tuesday, April 22, 2003, during the first day of trading for the cruise conglomerate on both New York and London exchanges. Carnival's dual- listed company transaction with P&O Princess Cruises closed April 17. The new corporation features 13 distinct cruise brands encompassing 66 ships with more than 100,000 berths.
(Photo by Andy Newman/Carnival Corp. & plc)

EB Granted $7.1M USS Seawolf Plan
The U.S. Navy has awarded General Dynamics Electric Boat a $7.1 million contract for planning in support of the USS Seawolf (SSN-21) selected restricted availability (SRA). Under the terms of the contract, Electric Boat will perform advance planning, design, and documentation in preparation for the SRA, which is scheduled to be performed at the Groton shipyard from February to September 2004.

Glerum Joins Multraship
Paul Glerum has joined the Dutch towage and salvage company, Multraship, as senior salvage master.

Furuno Promotes Four
Furuno U.S.A. has recently promoted four executives. **Dean Kurutz** has been promoted to marketing manager. **Matt Wood** has been promoted to the position of Sales Manager. **Eric Kunz** has been promoted to Senior Product Manager. **Brad Reents**, Furuno USA, Inc.'s Controller, has been appointed to the Furuno USA's Board of Directors in the capacity of Treasurer.

Wren Joins EBDG
Reginald Wren has joined Elliott Bay Design Group (EBDG) as a senior mechanical engineer. Wren, who is a licensed Professional Engineer, holds a B.S. in Mechanical Engineering from the University of Washington and a M.B.A. from Seattle University.

New Head of KH Chart Services
The international team of Kelvin Hughes has been strengthened with the appointment of Dr. **Yiorgos Palierakis** as Director of Charts and Maritime Services based at the company's London headquarters.

Rogowski Named Global GM
Honeywell, Colonial Heights, Va., has named Gregory S. Rogowski as general manager of its Performance business. Rogowski, who was most recently general manager of the Americas for Honeywell Performance Fibers, will succeed David Knowles, who was promoted to vice president and general manager of the newly formed Honeywell Performance Products.

Fein, Navy Lab Exec, Retires
Executive Director **James A. Fein** will retire from Naval Surface Warfare Center's Carderock Division in Bethesda, Md., completing 34 years of service. Fein, a naval architect started in 1969 at what was then the David Taylor Research Center. His previous position was that of Director, Hydrodynamics Group, Naval Sea Systems Command (NAVSEA) where he served as the senior technical advisor to the Navy for hydrodynamics issues related to ships, submarines and undersea weapons.

Sim Kee Boon Retires from Keppel
Keppel Corporation Limited (KCL) announced that **Sim Kee Boon** will retire from the position of Senior Advisor at the end of June. Boon was appointed Senior Advisor to the Keppel Group in January 2000, when **Lim Chee Onn** succeeded him as Executive Chairman of KCL.

MTN, Xantic Signs Agreement
Maritime Telecommunications Network (MTN), provider of satellite-based communications, networking and other services to the cruise and offshore oil and gas industries, has signed a cooperative agreement with satellite communication providers Xantic, which will offer a complete range of Inmarsat services.

MedLink Receives USCG Approval
The U.S. Coast Guard has approved MedLink to teach STCW-compliant medical training courses at Colonna Yachts' mega yacht refit yard in Norfolk, Va. In order to receive STCW certification, MedLink had to obtain U.S. Coast Guard approval on the courses' curriculum, instructors and locations.

BC Ferries Becomes British Columbia Ferry Services
Effective April 2, BC Ferries became a new, independent company called British Columbia Ferry Services Inc.

Bunker Industry Fueled by Word Affairs

By Nick Ladis, chairman of the International Bunker Industry Association and managing director of Piraeus-based NL Transoil

Bunkering is an industry in its own right, but one that is squeezed by events, which happen in the much bigger industries that we are the bridge between. We are vital to both the energy and shipping markets, and at the mercy of both. When the energy markets move, our prices move. When crude availability is tight, bunkers suffer. When air quality laws force refineries to change their practices, bunkers suffer. And when shipping suffers an accident, bunkers can also suffer. Until recently, bunkering was at the mercy of regulators and regulations, which were not necessarily aimed at it.

Fuel oil has been very much in the European news over the last few months, simply because a lot of it was spilled from the stricken tanker Prestige, off north Spain. The vessel fell apart in heavy seas, and the subsequent pollution from the cargo of fuel oil made, and still makes, big headlines in France and Spain. Even the word "fuel" has become part of the vocabulary of the man in the street. To them, it means a nasty toxic black substance, which pollutes their beaches.

The Prestige accident was probably not directly a result of anything to do with bunkering, although ABS has suggested that the use of the ship as a bunker storage vessel caused structural damage, but it has had major repercussions for bunkering. Firstly, it has focused public attention on the large quantities of bunker fuel, which are shipped past their coast. And they don't like that. We in bunkering know that there will be more and more fuel moving, because the patterns of supply and demand are changing. As refineries in the U.S. and Asia upgrade, they have less and less residual fuel, which means less local bunkers. Russia still has some way to go on refinery upgrades, and a big desire to sell bunkers. Because of this, the oil comes from there to where it is needed. But France and Spain have been quick to identify tankers carrying such fuel and chase them offshore, outside their 200-mile EEZs. This was an action of debatable legality, but which now looks likely to be condoned, and become enshrined in law, as the major EU coastal states are now discussing with IMO the implementation of special areas which would force tankers to route themselves a minimum of 100 miles out to sea from the French and Spanish coasts. INTERTANKO has cautiously welcomed these moves, and from the bunker point of view, if they prevent more fuel spilling on beaches, it can only be a good thing.

The net effect on the bunker business will be negligible, simply a longer distance for tankers to travel, but tanker ton-miles are cheap, even today, so it is unlikely to have a major effect on bunker prices. Shipowners may even welcome the move, as it means more freight for them.

Potentially more serious for the bunker business were the initial proposals by the European Commission to phase out all single hull tankers almost immediately. The proposal, as drafted, included all tankers over 600 dwt, which would have effectively hit a large portion of the European bunker barge fleet. Some, but if not all, EU states have already banned single hull tankers carrying heavy oil from their ports, but have sensibly made local exception for smaller ships, allowing bunkering to continue unimpeded.

IBIA lobbied the European Commission, and alerted the press to the fact that the EC proposal for accelerated phasing out of small single-hull tankers was likely to have an unnecessary and severe effect on bunkering in Europe. It was a classic case of legislators reacting to public opinion, but not necessarily being fully aware of the consequences of their actions. Fortunately, the European system has many checks and balances. The Commission did listen to IBIA, and recently announced that it was modifying is proposals to allow smaller single hull tankers up to 5,000 dwt to continue trading until 2008. And fortunately again, the EU presidency is currently in the hands of Greece, which is the world's leading shipping nation.

Action by the Greek government has led to moderation of the original proposals, and the latest news is that the whole question of new phase-out limits for single hull tanker is returning to IMO. Bunkers are not really affected, as their transportation around Europe will have to be in double hulls anyway, simply because of the immediate ban on single hulls carrying heavy and dirty cargoes.

The European Commission is still actively trying to address public concerns about safe and clean shipping, and is under intense pressure from some heads of state, such as France's president Chirac, to impose new rules on liability and also to enforce criminal sanctions for oil spills. On March 5, 2003, the EC presented a proposed EU Directive to be considered by the EU Council of Ministers and the European Parliament, under which "criminal sanctions will be applicable to any person who has been found to have caused or contributed to illegal pollution intentionally or by means of gross negligence", including the master, the owner, the operator, the charterer and/or the classification society of a ship/barge. The draft directive does not detail what specific penalties could be imposed, but it does state that they would have to include custodial sentences in order to serve as effective deterrents.

The proposal as it has been made appears to be a regional amendment MARPOL, and is also based on the assumption that every oil spill must be the result of negligence. It could have serious consequences for bunker suppliers, and for ships' crews taking bunkers.

As Chairman of IBIA I would like to underline the need for proper investigation and impact analysis before new regulations are introduced. What is needed now is efficient implementation and enforcement of the rules adopted in the IMO. I would also like to emphasize the need for international regulation of the tanker and bunker industry, and I am worried that other regions are now considering taking their own measures as a reaction to the EU's regional initiatives. The EU Prestige proposals alone would not destabilize oil supplies, and in the main, the bunker industry can live with them. But if other regions follow suit, a raft of measures all over the world, taken in combination, have the potential, in addition to creating confusion, instability and lack of uniform implementation, to restrict significantly tanker availability and in turn to disrupt oil supplies.

No one wants that, most especially the bunker industry, which is a vital part of the energy supply chain on one hand, and everyone else's supply chains on the other. So IBIA will continue to lobby for common sense, for pragmatic responses to accidents, and for IMO to be the governing body for world shipping, providing global solutions.

IBIA has learn a lot about how the EU as a whole has worked throughout the last year, first as it reacted to EC regional proposals for sulphur limits, and then as it saw how Prestige proposals would have affected bunker barges, and moved successfully to have the proposals changed. Our voice as a bunker industry has been heard, and that positive engagement, with regulators and with other industry bodies, is good for all of us. I think we will have much to do in coming years.

Massive Maxima Delivered in Rotterdam

Maxima, a giant, 6,745-metric ton double-hulled tanker barge which took two years to finish, was recently delivered in Rotterdam for the combination of bunker supplier Chemoil/All Round Fuel Trading (ARFT), fuel oil transportation company FTS/Hofftrans, and shipbuilder Breko Nieuwbouw under the name Maxima Tankers BV, *BunkerNews Daily* reported on April 23.

The delivery is significant, as it is just before the EU was expected to abolish single-hulled bunker barges over 5,000 dwt and the phase-out of barges over 600 dwt.

The tanker barge's hull was constructed in Russia and transported through the River Volga and the River Danube to the Amsterdam-Rotterdam-Antwerp region for fitting.

Maxima was designed to give ships a quicker bunkering time and to cater to increasing requests for bunker stems of 4,000 mt and over, according to a Chemoil/ARFT's official.

Lube Oils on Test

Modern tools of research take many, increasingly high-technology forms, but large test machinery is especially apposite to the marine field, with its blend of applied science and solid, practical disciplines. Giving tangible form to a commitment to developing lube oils suited to evolving technical and operational needs, TotalFinaElf's maritime lubricants specialist

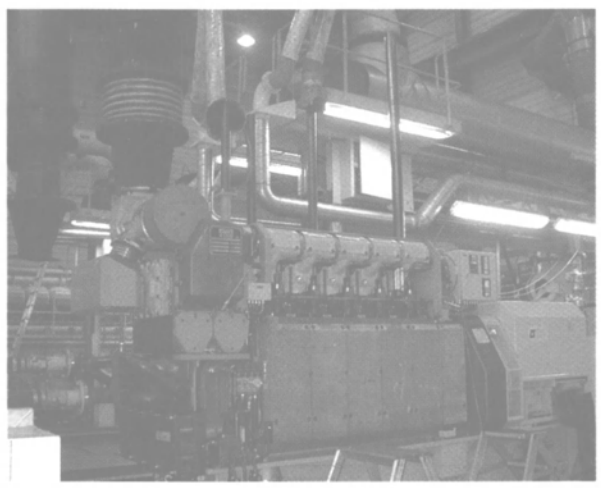
Lubmarine has ploughed $2-million into a new, purpose-built test engine in France.

Derived from a five-cylinder medium-speed diesel of the MAN B&W 16/24 type, the Innovator-4C evaluation and research engine is due to be brought into service this month (May) at the TotalFinaElf Research Center (CRES) at Solaize, near Lyons. It will replace the single-cylinder, Elf-Optimizer test bench, based on a Pielstick PC2.6 engine, first installed at Solaize 20 years ago and extensively modified in 1994 in response to changing development requirements.

The Innovator-4C will be used for validating both two-stroke and four-stroke engine formulations prior to in-service trials, and for fundamental research, including experiments with new additives, synthetic and biodegradable base stocks. Lubmarine plans to run the engine for between 3,000 and 4,000 hours/yr., depending on test needs and schedules. The ultimate goal, of course, is the provision of lubricants engendering greater fuel economy, lower maintenance costs and longer engine life.

The five cylinders of the 16/24 base engine have been reconfigured into three separate lubrication circuits, two for testing and one for operational requirements. This will allow two formulations to be compared simultaneously under common conditions of temperature and pressure. The capability to undertake two tests in tandem, in combination with the engine's very high safety margins, means that meaningful results will be obtainable faster, bearing favorably on project timeframes and on testing system productivity at Solaize.

— By David Tinsley



Due to be brought into service this month, the Innovator 4C Evaluation and research engine from MAN B&W will replace the single-cylinder Elf Optimizer test bench.

Lubmarine, TotalFinaElf's marine lubricants specialist has dedicated a hefty sum — $2 million — into a new, purpose-built test engine in France.

EMMF: Getting Heavy With Bunkers

Higher viscosity bunker fuels do not automatically contain more harmful elements than lighter ones, according to ExxonMobil Marine Fuels (EMMF), which has recently been supplying 500 centiStokes fuel in response to customer demand.

Emphasizing that quality and safety must be prime considerations with all fuel supplied, irrespective of viscosity, EMMF says the two crucial prerequisites for using 500 cSt fuel are the ability to heat it to a sufficiently high temperature to inject it into the vessels' engines, and the provision of purification equipment able to deal with the higher specific gravity of the product.

The fuel must be maintained above its minimum pumping viscosity while in storage awaiting use. Storage tank heating coils are required, which are able to maintain the fuel at a stored temperature at or above 45 degrees C. Modern purifier systems are capable of ensuring that the fuel is effectively and sufficiently cleaned. Finally, the ship's main engine fuel oil pre-heaters must be able to raise the fuel to between 140 and 155 degrees centigrade. At these temperatures the new fuel is at the typical engine fuel injection viscosity of between 15 and 10cSt. The additional heating required to use the 500cSt fuel should be easily covered at sea by the vessel's exhaust gas boiler. In port, the boiler will typically consume extra fuel to maintain oil storage tank temperatures. But EMMF points out that, given the saving in the initial cost of the 500cSt product and the limited in-port time of many vessels today, there is the potential for significant savings to be made. Many shipowners are now able to benefit from the possible cost savings involved in using heavier fuel without impairing the performance of their vessels. EMMF says that shipowners whose vessels can use the fuel may realize considerable economies over the course of a vessel's annual operational life.

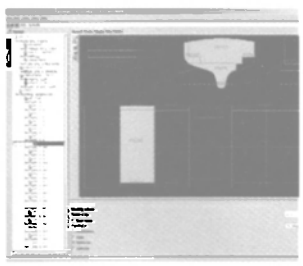
Circle 12 on Reader Service Card

Onboard-Napa Power Yields Fuel Savings

Onboard-NAPA Power is a state-of-the-art optimization tool for ship operation, developed by Onboard-Napa Ltd. The latest version of Onboard-NAPA Power features automatic ship-to-shore reporting of fuel consumption and fuel inventory with Web-browser-based viewing.

The complete 3-D hydrodynamic model of the ship is used together with the latest weather and sea-state forecasts and current data in defining the optimum operation profile. The ship's current trim and draft are also taken into account.

All main and auxiliary engine configurations can be handled, including the latest gas turbine installations and electric podded propulsion systems. Interfaces to navigation, weather and machinery automation systems are included, thereby minimizing officer input. All data related to planning and actual performance during the voyage or cruise can be saved and reported.



The fuel consumption and inventory data reported ship-to-shore can be stored on a company intranet server for easy distribution.

For example, the financial and technical departments can utilize this data by means of a simple Web-browser-based interface. Office personnel on shore and crew members are able to follow the fuel consumption of each fleet vessel during different voyages.

Onboard operational optimization and accurate ship-to-shore reporting are effective incentives for economical vessel operations. The existing installations have on average resulted in fuel savings of at least three percent.

Circle 84 on Reader Service Card

MES Develops Alpha Lubricating System

Mitsui Engineering & Shipbuilding Co. (MES) has developed a new electronically-controlled lubricating system, which will reduce the consumption of diesel engine cylinder lubricating oil. Known as the Alpha Lubricating System, the device recently achieved a high level of savings in cylinder oil on a large containership of 4,900 TEUs, which is equipped with a Mitsui MAN B&W 10K9OMC engine of 59,00 bhp. At last count, the saving rate of the ship as of today is 20 percent plus, and it is expected to reach more than 50 percent in the near future.

The Alpha Lubricating System, by application of the electronic control device, can quickly inject the oil at optimum timing, and can easily be installed on existing engines.

Circle 85 on Reader Service Card

Vickers' Hydrox Bio 68 Garners Recognition

Sterntube oil manufacturer Benjn. R. Vickers & Sons was honored for its unique, new lubricant — Hydrox Bio 68 — at this year's Sea Trade Awards. The award, which was presented in the Protection of the Marine and Atmospheric Environment category, was presented to **Peter Vickers,** the company' chairman and managing director. In 2002, after more than five years of research and development trials, the U.K-based company introduced Hydrox Bio 68 — a readily biodegradable sterntube lubricant. The product, which embodies all the essential features of the Hydrox range, is also designed to have minimal impact on the marine environment. In fact, external tests on the product have demonstrated its low toxicity and its non-toxic effects on fish, daphnia and shrimp.

Circle 76 on Reader Service Card

Manufacturing Better Bearings for the Marine Industry

In the last few decades, the maritime industry has faced increasing pressures to perform with less and still earn a profit. Fuel costs have skyrocketed. Labor costs have risen dramatically. Down time for repairs has cut into profit margins. Marine engineers and maritime operators have been looking for ways to make repairs more efficiently so they can streamline their operations and maximize their personnel and equipment.

Craft Bearing Company, Inc. has an answer.

Craft Developed A Better Bearing Design

Craft Bearing was founded with one goal in mind: to make world class split cylindrical roller bearings. Through American ingenuity, craftsmanship and pride in service, Craft Bearing has accomplished that goal.

Before Craft went into production, it spent years of exhaustive research and development to create a superior split bearing design. First, it made sure that its roller bearings had all the inherent features of conventional anti-friction cylindrical bearings; it then took the next important step of engineering and precision machined the entire bearing, seals and housing assembly into halves. All bearing parts can be easily separated and installed or removed from the shaft without removing the other components. Repair cost and down time is greatly reduced. The result is a better bearing for the maritime industry that is answering today's marine engineering needs.

Craft Builds Many Improvements Into Its Bearing

Craft's external self-aligning cartridges and pedestal/flange housings are machined from ductile iron for greater tensile and yield strength. Craft then uses a baked-on powder coating instead of a painted coating for a greater resistance to the elements and chemicals. Their innovative and patented roller cage assembly (made out of bronze on large and heavy duty sizes) has a fitted pocket for the rollers. This design assures the precise radial alignment of the rollers is maintained for maximum load characteristics and durability. In addition, the cage provides lubrication pockets, which further improve the bearing life. Featuring a black oxide finish, each clamp collar fits with precision forming the roller track. For sealing, Craft provides an aluminum triple labyrinth design that clamps to the shaft using a double "O" ring in the bore. The seal rotates with the shaft providing positive seal against the elements while not causing shaft or seal wear.

Craft's Product Line Continues to Expand

Craft Bearings are available in three duty ratings (S1, S2, S3) to best suit load, speed, and life requirements. Bearings are available from 1 7/16 to 32" bore and metric equivalent. Craft provides its customers with same day shipping on bearings through 12"/300 mm for its S1 and S2 series and prompt responses on larger sizes and special custom orders. Introduced early in 2002, Craft's Stainless Steel Split Pillow Blocks are manufactured with stainless steel housings, cartridge and hardware for use in harsh conditions that other bearings could not withstand. Craft's continued dedication to product improvement through research development and testing keeps it a leader in bearing design.

Craft Flange Bearings Prove Highly Effective in Marine Industries

The Marine Industry not only needs bearings that are both highly reliable and easily maintained, it needs bearings that can be installed in a variety of mounting situations.

To meet that need, Craft engineers have developed Flange Housings that are proving themselves to be valuable on propulsion shafting for such vessels as high-speed ferries, passenger car ferries, tow boats, and many other applications where flanges allow more efficient mounting than pillow blocks.

Over the past few years, the company has produced flange bearings across all product sizes from 2 3/16" thru 12" and they are increasing their stock on a regular basis.

Craft's Clients Realize Immediate Benefits

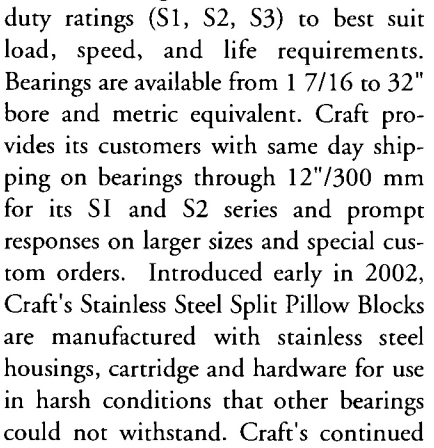
Craft's American-made split roller bearings are built to last longer, making them extremely reliable bearings for marine propulsion shafting, conveyors, deck machinery and fans. America's pilots appreciate Craft's dependability under heavy use in all sorts of weather and sea conditions. Engineers value the ease of maintenance and at sea repair. Craft's split roller bearings have greatly simplified and expedited both bearing inspection and bearing change out. Also, the bearing can be left in place for easier inspection and far easier replacement without disturbing ancillary equipment or shaft alignment. As a result, ship owners and captains benefit from the savings in reduced downtime between repairs.

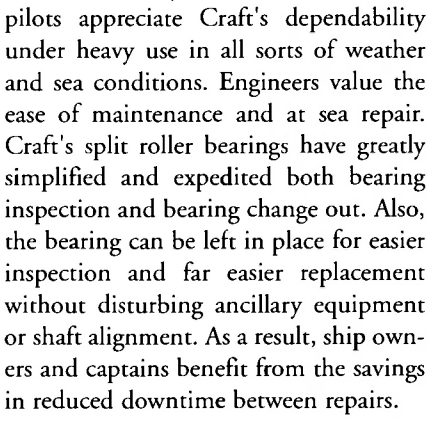
Craft Takes Customer Service To A Whole New Level

Another important difference with Craft is its absolute commitment to customer service. While some companies may not be responsive to their customers' needs, Craft is committed to providing technical support and customer service that is second to none. Through careful inventory control, its employees ensure same-day shipping for standard bearings at no extra charge and rapid response for special applications and custom bearings. In addition, Craft's experts are always available so customers who need assistance can talk to a human being, not a machine.

The Experts Pick Craft

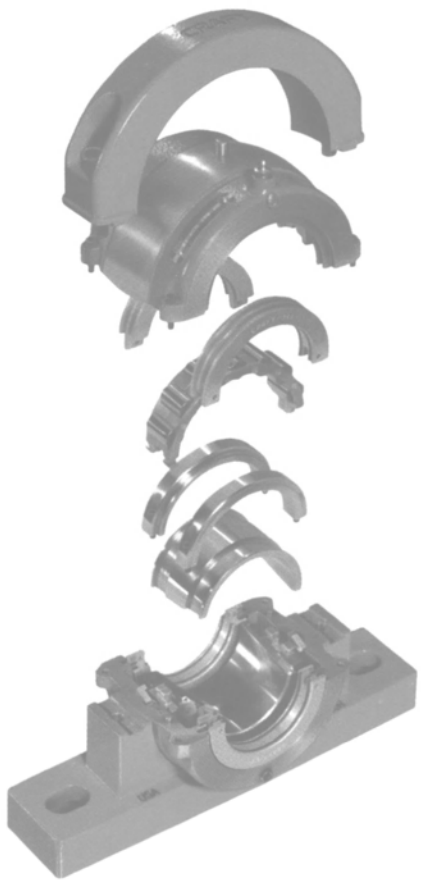
Over the years, Craft has received important recognition for its American made split bearings. Their split roller bearings are approved by the Department of Defense and is the only split roller bearing that is Lloyds Register





Craft split bearing on a propulsion shaft.

CRAFT
ENGINEERED TO MAKE YOUR JOB EASIER
Bearing Company, Inc.



Type Approved. Also, their bearings are directly interchangeable with foreign split bearings.

Craft Forges Ahead With American Craftsmanship

Relying on American know-how, Craft Bearing has staffed its facility in Newport News, Virginia, with top American engineers, machinists and workers who take great pride in their work. After setting high standards for excellence, it has rigorously trained all of its employees to meet these standards. As a result, Craft consistently delivers high quality split bearings on time. The American-made Craft Split Roller Bearings are fast becoming the industry standard in marine applications worldwide. Over the years, Craft Bearings have proved their reliability and dependability time and time again.

For more information on specific applications, visit www.craftbearing.com or call 757-247-6000 or

Circle 215 on Reader Service Card.

Aura Marine

Aura Marine AMB Boosters ensure constant pressure, cleanliness and correct injection viscosity of fuel. AMB Booster is easy to install and all service items are well in hand. The unit is suitable for most engine types with power up to 18,000kW.

Circle No. 101

Bloksma

The Bloksma oil & water heater is a compact heat exchanger for heating heavy fuel oil, lube oil, diesel oil or water by means of steam thermal oil or hot water. The thermal calculation is based on the latest heat-transfer technology, which ensures an optimal design of the heater. It is available in four standard shell diameters up to 320 mm.

Circle No. 102

C.J. Diesel

C.J. Diesel Injection is an ISO 9001:2000 registered company established in 1982. They have built up a reputation for its expertise in all aspects of diesel injection technology. They specialize in the overhaul repair and calibration of all types of heavy marine.

Circle No. 103

Dylon

Dylon Lubricant Tecnologies has developed a synthetic industrial lubricant, designed for the loads and speed with open gears and ball mills. The new product, Dylon Grade LB-355, utilizes a high molecular weight polymer which imparts adhesion to all gear surfaces. It can be manually applied during normal gear maintenance or pumped through existing delivery systems rated for NLGI 2 grease.

Circle No. 104

ExxonMobil

EMMF recently started supplying heavier fuel at the port of Singapore, in response to customer demand, and confirms that comparison trials have been carried out on board some of NOL large containerships. Regarding the latest issue of horsepower, Steve Walker, says the NOL trials proved that higher viscosity fuels do not automatically contain more harmful elements than lighter ones.

Circle No. 105

Gems

Gems Sensors introduced the all-new Detector line of Micropower Impulse Radar MIR liquid level sensors. Dems Detector MIR sensors, is an affordable radar liquid level sensors that are now available in two series: MIR-800 Series sensors feature solid waveguide rods, while the MIR-900 Series sensors feature fully encapsulated, flexible rods.

Circle No. 106

Servomex

Servomex Group has introduced its electrically heated European Zone 1 approved sample cell for the company's 2500 series infrared process gas analyzers. It is an efficient, reliable and effective alternative to the use of steam-heated cells to keep process samples above their dew point. It is suitable for monitoring a single component or component group in either a gas or sample stream.

Circle No. 107

Jet Lube

Jet Lube's new compound and lubricants catalog is now available in a printed version or on CD-ROM. It includes sections on marine, sealants, greases, lubricants, specialty compounds, accessories, and directional drilling compounds. Descriptions, container sizes, and performance data are listed for anti-seize compounds, thread sealants, penetrants, coatings, cleaners, and degreasers

Circle No. 108

KME

Kent Modular Electronics offers products such as CRT Monitors for OEM Integration to Service Replacement and Flat-Panel Systems for Human-Machine Interfaces. For marine, military or naval applications they can provide displays. KME specilizes in slow scan monitors to solve worldwide legacy problems.

Circle No. 109

LeMag

The Lehmann & Michels permanently mounted Prement online measures the cylinder pressure continuously, from each cylinder at the same time. Once installed, you receive continually indicated power, max. cylinder pressure, main trend etc. on your PC.

Circle No. 110

Mid-West

At Mid-West Instruments of Sterling Heights, Mich., the company's engineers work closely with their firms to customize gauges and switches to meet requirements for optimal installation and performance. To emphasize confidence in prodcution performance, Mid-West provides a five-Year Warranty on all gauge and switch products.

Circle No. 111

MMC

The MMC Oxygen-sensor tells you the exact depth of the sensor and percent of oxygen in the inert gas in each tank. The unit is battery operated, portable, with a built-in self-calibrating feature, and is approved by BASEEFA as intrinsically safe. Just lock it on an MMC vapor control valve and lower the sensor to the correct ullage level.

Circle No. 112

US Filter

U S F i l t e r ' s Electrocatalytic Products offer hypochlorination and electrochemical equipment designed to control biological fouling and corrosion for ships and offshore facilities. The company manufactures Capac, a permanent, on-board corrosion protection system that prevents electrolysis and galvanic corrosion from attacking the submerged surfaces of vessels.

Circle No. 113

Power Service

Power Service Products offers a complete line of diesel fuel additives. Their diesel fuel supplement prevents fuel gelling in temperatures as low as -40°F. To meet NCWM Standards for Premium Diesel Fuel, a diesel fuel must pass the Cummins L10 Test for injector cleanliness. Diesel Kleen +Cetane Boost contains 250 percent more injector-cleaning detergents to clean dirty injectors.

Circle No. 114

QMI

New QMI equipment to derect oil mist in the atmosphere extends the protection provided by the QMI Multiplex system, or can be used as a stand-alone solution in sensitive operating environments. The Atmosphere Oil Mist Detector can work independently or with the Engine Detectors within an integrated system.

Circle No. 115

Rollo

Fuel Injection Equipment Repair Ship Roll (FRS Rollo) is specialized in the supply and reconditioning of all types of diesel fuel injection equipment and related components. FRS Rollo has the capability to overhaul fuel pumps, injectors and nozzles from a vast range of main and auxiliary engines.

Circle No. 116

Spectro Oil

Spectro Oil and its sister company Jet-Care maintain three full wet-chemistry labs in New Jersey; Hampshire, U.K.; and Basle, Switzerland. Marine services include: oil and filter analysis, to detect foreign elements that may indicate component wear and suggest impending failure; fuel analysis, and hydraulic fluid analysis, to monitor metal contamination and the condition of the fluid.

Circle No. 117

BlueMarble

BlueMarble Two Cycle Oil and Blue Marble Xlube reduce friction and improve engine performance. EnviroFuels' Diesel Fuel Catalyzer reduces fuel consumption and smoke from diesel engines. BlueMarble and EnviroFuels products, from www.envirofuelslp.com, utilize proprietary technologies to modify the surface chemistry of metal, reducing friction and oxidization for tremendous results.

Circle No. 118

Vuyk

Ship owners and shipyards alike find Vuyk Engineering to be their highly flexible and motivated partner for design, engineering services and marine operations for all types of vessels, such as: general cargo vessels, containerships, dredging vessels, tugs, offshore supply vessel, tankers and (mega) yachts.

Circle No. 119

Xantic

The Xantic ChatCard delivers numerous advantages for companies and users alike. It can be used for Inmarsat-A, -B, -M, mini-M and GAN MultiMedia, making it a cost-efficient solution. Accounting is simpler because users pay in advance. ChatCard can be used without staff and crew needing to interfere with valuable equipment.

Circle No. 120

Goodway

Goodway offers tube and pipe cleaning equipment for HVAC maintenance, and is well known in both the vacuum and pressure washer markets. All Goodway Products are manufactured using the highest quality components by highly trained technicians under an ISO-9001 registered quality management system.

Circle No. 121

DC Marine

DC Marine Consultancy is a British owned company based in Dubai, UAE, involved in the marine and offshore industries where its activities include Marine Engineering Services, consultancy, engineering solutions, main sub-contractor selection, ship and rig repairs, and procedures and upgrades.

Circle No. 122

HBM

HBM, Inc. is a supplier of complete systems solutions for industrial and laboratory measurement applications, including force, torque, weight, strain, displacement and pressure. Founded in 1950, HBM is a wholly owned subsidiary of Spectris plc., and has its North American Headquarters in Marlborough, Mass. and representatives throughout the world.

Circle No. 123

York

Since 1914, York has supplied custom air conditioning and refrigeration systems to the commercial marine industry as well as the U.S. Navy. The company has a broad degree of specialties, including, system evaluations; design and engineering; equipment selection, installation; retrofits and upgrades; service and repair; and maintenance programs and financing.

Circle No. 124

Lonseal

Lonseal's toughest sheet vinyl, the Lonplate safety surface, has added a new pattern to its range of designs — Titanium #168. The Titanium pattern of Lonplate I features an aluminum-sheen finish. It can be used for all sorts of interiors, especially places where rugged slip-resistance is required.

Circle No. 125

Algae-X — Optimal Fuel and Oil Quality

Created with the premise of reversing the process of fuel breakdown, Algae-X's fuel conditioning process optimizes fuel droplet size, which is designed to result in combustion efficiency, improved filterability, as well as lower operating costs.

Based in Fort Meyers, Fla., Algae-X provides upgrades to the combustion process of engines and turbines. According to the company, improved combustion saves fuel and reduces carbon deposits, smoke, harmful emissions and maintenance. In addition, the company also works to preserve fuel once it is stored and can also improve its filterability. These improvements also contribute to the reversion of sludge build up, prevention of tank cleaning and the enhancement of oil/water separation.

Introduced in Mid-April, 2003, the FPS-500 Fuel Polishing & Recirculating System is the latest offering from Algae-X.

Algae-X works to remove the sludge and water that can accumulate at the bottom of fuel and oil storage tanks via its MTC 1000 system.

Developed to naturally remove these deposits, the system is a three-stage fuel conditioning and tank cleaning system that can remove free water and particulate down to five micron. Subsequently, the fuel is treated with Algae-X's Magnetic Fuel Conditioner — reversing the process of fuel breakdown. The last stage following the filter bypass involves an industrial type water block fine filter that removes the smallest of particles and in-trained water.

Options on the MTC 1000 include: water sensor alarm, automatic drain valve and remote monitoring.

Algae-X in mid-April introduced its latest model Fuel Polishing & Recirculating System - the FPS-500.

Touted as a self-contained system that allows fuel to be periodically re-circulated to easily remove water, sludge, algae and inorganic debris from the fuel, the system also eliminates microbial contamination.

Principal components include: ALGAE-X model 500 Fuel Conditioning Unit, Separ Fuel/Water Separator & Filter, six hour manual timer, fuel pressure gauge and a continuous duty gear pump.

The FPS-500 improves and maintains the quality of diesel fuel, hydraulic oil and other distillate fuels. It prevents tank sludge, clogged filters and keeps your fuel in a pristine condition.

Circle 75 on Reader Service Card

BUYER'S DIRECTORY

This directory section is an editorial feature published in every issue for the convenience of the readers of MARITIME REPORTER. 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 assumes no responsibility for errors. If you are interested in having your company listed in this Buyer's Directory Section, contact Mike Lowe at (212) 477-6700.

ABS/USCG APPROVED VALVES
Norriseal PO Box 40525 Houstor, TX 77240
ACTUATORS, VALVE
J.A. Moody Equipment Specialist Inc., 3223 Phoenixville Pike, Malvern, Pa 19355, (800) 355-3810 (Norteast); 809 Pecan Forest Court, Chesapcake, VA 23322, (757) 641-0080 (Southeast); 2130 7th Ave. W, Scattle, WA 38119, (206) 691-1000 (West); www.jamesi.com
AIR CONDITIONING AND REFRIGERATION
Adrick Marine, 81 Mahan St., W. Babylon NY 11758
Bailey Refrigeration, 4986-1 Eucid Road, Virginia Beach, VA 23462
Cospolich Refngeration, 14695 Highway 61, Norco LA 70079
Flagship Marine 2427 SE Dixie Highway, Stuart, FL 34996
Port-A-Cool, P.O. Box 2108, Center, TX 75935
Stork Bronswerk Inc., 3755 C boul.Matte, Brossard, Quebec Canada J4Y2P4
Taylor Made Environmental PO Box 15299 Richmond, VA 23227
AIRHORNS/SIGNALING EQUIPMENT
Airchime Mfg. Co. Ltd., 5478 267th Street, Gloucester Industnal Estate, Langley, B.C. Canada V4W 3S8
Kahlenberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241
ALARMS, FACTORY MUTUAL-APPROVED
NREC 1701 Engineers Rd Belle Chase, LA 70037
SELCO 353 A Asbury Commons Dr., Atlanta, GA 30338
ALUMINUM BOATS
Island Boats 6806 Highway 90 East New Iberia LA 70560
Sea Ark Marine PO Box 210 Monticello AR 71655-0210
William E Munson Co., 18130 Sunset Way, Edmonds WA 98026
ANCHORS AND CHAINS
Crandall Dry Dock Engineers Inc., P.O. B. 505804, MA 02150
Edgewater Machine and Fabricators, 400 Megan Z Ave. Edgewater, FL 32132
GJ Wortelboer Jr. B.V. PO Box 5003, 3008 AA Rotterdam, Netherlands
Washington Chain Inc., Box 3645, Seattle, WA 98124
AUTOMATED SELF UNLOADING
Seabulk Systems Inc., Suite 100 3751 Shell Road, Richmond, British Colambia, CANADA V6X2W2
AUTOPILOT SYSTEMS
Beier Radio1990 Industrial Ave Harvey, LA 70058
ComNav Marine Ltd., #15-13511 Crestwood Place, Richmond,BC V6V 2G1
Mackay Communications, 2721 Discovery Dr., Raleigh, N.C. 27616-1851
BALLAST
Ballast Technologies .,4620 S. Coach Dr., 85714 , Tucson, AZ
Redland Genstar Inc., Executive Plaza IV, Hunt Valley, MD 10912-1031
BARGE RENTALS
Cashman Equipment, Three Dolphin Way, Boston, MA 02210
BEARING—Rubber, Metallic, Non-Metallic
American Babbitt Bearing PO Box 3069 Rt 2 Huntington, WV 25702
Craft Bearing 5000 Chestnut Ave., Newport News, VA 23605
Duramax Marine LLC 17990 Great Lakes Parkway, Hiram,OH 44234
Orkot Composites., 2535 Prairie Rd., Unit D, Eugene, OR 97402
Sohre Turbomachinery 132 Gilbertville rd PO Box 889 Ware, Mass 01082
Thordon Bearings Inc., 3225 Mainway, Burlington, Ont., CANADA L7M 1A6
Vesco Plastics, P.O. B. 40647, Cleveland 2022 SOUTH AFRICA
BILGE SYSTEMS
Fast Systems 14040 Santa Fe Trail Dr Lenexa, Kansas 66215-1284
Westfalia Separator Inc.,100 Fairway Court, Northvale, NJ 07647
BLOCKS & RIGGING
Skookum, P.O. Box 280, Hubbard, OR 97032
BOILERS (HEAT RECOVERY)
Deltak LLC 2905 Northwest Blvd Ste 150 Plymouth MN 55441 USA
BOATBUILDER
Allen Marine PO Box 1049 Sitka AK 99835
Hike Metal, Box 698, Wheatley, ON Canada N0P 2P0
Kvichak Marine, 469 NW Bowdoin Pl.,Seattle WA 98107
Rosborough Boats, 37 Crane Lake Drive, Halifax, NS, Canada B3S 1B5
Sea Ark Marine PO Box 210 Monticello AR 71655-0210
Washburn Doughty, P.O. Box 296, E.Boothbay ME 04544
BOLLARDS
Mantime International, 100 E. Vermilion Street #212, Lafayette, LA 70501
BRIDGE SUNSCREENS
Martek Marine Blinds, Unit 46, Century Business Centre, Maversway, Rotherham, South Yorkshire, S63 5DA
BROKERS
Marcon International, Inc., P.O. Box 1170, Coupeville, WA 8239-1170
Mowbray's Tug & Barge Sales Corp., 35 De Hart St., Morristown NJ 07960
BRUSHES
Sohre Turbomachinery Inc 132 Gilbertville Rd PO Box 889 Ware, MA 01082-0889
BULKHEAD SEALS/PANELS
CSD North America, 880 Candia Rd., Unit 10, Manchester, NH 03109
Thermax, 15006 Shaw Rd., Tampa, FL 33625-5500
Thermax 3115 Range Rd Temple, TX 76501
BUOYS
Datrex, P.O. Box 1150, Kinder, LA 70648
Urethane Products 9076 Rosecrans Ave Bellflower, CA 90706
BUTTERFLY VALVES
Norriseal PO Box 40525 Houston, TX 77240
CABLE MANUFACTURER
Falmat Inc.,1873 Diamond St., San Marcos,CA 92069
CABLE TRANSIT SYSTEMS
CSD North America, 880 Candia Rd., Unit 10, Manchester, NH 03109
CALIBRATIONS
Standard Calibrations Inc., 908 A Ventures Way, chesapeake VA 23320
CAD/CAM SYSTEMS
Albacore Research, 4196 Kashtan Place, Victoria, B.C. Canada V8X4L7
Autoship Systems Corp., #403, 611 Alexander St., Vancouver, BC. Canada V6A1E
Creative Systems, Inc., P.O. B. 1910, Port Townsend,WA 98368
Kockums Computer Systems AB, PO Box 50555, S-202 15 Malmo SWEDEN
Scientific Marine Services, Inc., 101 State Pl., Suite F, Escondido, CA 92029
Ship Motion Associates, 10 Danforth St., Portland, ME 04101-4567
CAPSTANS
G.J. Wortelboer Jr BV, P.O.B. 5003, 3008 AA Rotterdam, Netherlands
Superior Lidgerwood Mundy, 1101 John Ave., Superior, WI 54880
CARGO MONITORING & CONTROL SYSTEM
Hermatic Inc., 4522 Center St., Deerpark, TX 77536
CAST IRON REPAIR
In-Place Machining 1929 N. Buffum St, Milwaukee, WI 53212
CHAINS
Crandall Drydock Engineers PO Box 505804 Chelsea, MA 02150
Washington Chain, P.O. Box 3645, Seattle, Wa 98124
CHEMICALS/CHEMICAL CLEANERS
Gotar Technologies Inc., 1101 Boul Des Chules CP 5010 Quebec City, Canada G1E 6B4
Uniservice Americas 57174 Hardin Rd, Slidell, LA 70461
CLASSIFICATION SOCIETY
Lloyds Register 71 Fenchurch St London EC3M 4B5
CNC PLATE CUTTING
Advanced Fabricating Inc PO Box 3721 Galveston, TX 77552
COATINGS / CORROSION CONTROL / PAINT
Anker Marine Paints, 21 Charles Street, Westport, CT 06880
Chesapeake Specialties Products, 5055 North Points Blvd, Baltimore Md 21219
Chugoku Marine Paints PO Box 73 4793ZH Finaart The Netherlands
Dalseide Shipping Services, NC-5397 Bekkjarvik Norway
DeFelsko Corporation, 802 Proctor Avenue, P.O.Box 676, Ogdensburg,NY 13669
Esgard, Inc., P.O. Drawer 2698, Lafayette, LA 70502
Ferro Corp., 1301 North Flora St., Plymouth, IN 46563
Flow International corp., 23500 64th Ave. south Kent, WA 98032
Hempel Coatings, 10-3511 Viking Way, Richmond, B.C Canada V6V1W1
International Paint Inc., General Offices, 6001 Antoine Drive, Houston,TX 77091
Jamestown Distrib., P.O. Box 348, Jamestown, RI 02835
Jotun Paints Inc, 1401 Severn St., Baltimore,MD 21230
Mascoat Products, 10890 Alcott Unit 102 Houston, TX 77084
Nace Int'l, 1440 South Creek Dr., Houston, TX 77084
Resto Motive Laboratories PO Box 1335 Morristown, NJ 07962-1235
Sherwin Williams, 101 Prospect Avenue, Cleveland OH 44115
Sigma USA, PO Box 816, Harvey, LA 70059
Wasser High Tech Coatings, 8041 South 228th St., Kent, WA 98032
COMMUNICATIONS SERVICE
Comsat Maritime Services, 6560 Rock Spring Drive, Bethesda, MD 20817-1146
Maritel Marine Communications, 16 E. 41st St., NY, NY 10017
Maritime Telecommunications Networks, Inc., 3044 N Commerce Pkwy Miramar FL 33025
COMPOSITE PILINGS
Hardcore Composites 618 Lambsons Lane New Castle DE 19720
COMPOSITE FENDERING SYSTEM
Hardcore Composites 618 Lambsons Lane New Castle DE 19720
COMPOUNDS
Philadelphia Resins, P.O. Box 309, Montgomeryville, PA 18936
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Hatlapa Uetersener Maschinenfabrik Tornescher WEG 5-7 D-25436 Uetersen, Germany
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Autoship Systems Corp., #403, 611 Alexander St., Vancouver, BC. CANADA V6A1E
Creative Systems, Inc., P.O. B. 1910, Port Townsend, WA 98368
Fleet Technology, 311 Legget Dr., Karata, Ontario, Canada K2K 1Z8
Lloyd's Register, 100 Leadenhall St., London, England EC3A 3BP
MIL Systems, 200-1150 Morrison Drive, Ottawa, Ontario K2H 8S9
Navigator PC, Plantation Technology Park, 6601 N W 14th St. Suite 4, Plantation, FL 33313
Ship Motion Associates, 10 Danforth St., Portland, ME 04101
COMMUNICATIONS
Beier Radio1990 Industnal Ave Harvey, LA 70058
Inmarsat Ltd., 99 City Road,London City EC1Y 1AX England, UK
Japan Radio, 1011 SW Klickitat Way, Bldg B, Suite 100, Seattle,WA 98134
Mackay Comm Inc 2721 Discovery Dr Raliegh NC 27616-18
Rydex: An Inmarsat Ventures Co., 130-13111 Banler Place, Richmond,BC V6V2J1
Seawave, 76 Hammarlund Way,(Tech 3) Middletown, RI 02842
World-Link Communications, 74 Main St. Framingham,MA 01701
COMPUTER SOFTWARE SYSTEMS
Autoship Systems Suite 312-611 Alexander St Vancouver BC V6A1E1
Spec Tec Professor Koth's Vey 1366 Lysaker Norway
CONSOLE - GMDSS
Furuno USA, Inc., 4400 NW Pacific Rim Blvd., Camas, WA 98607
Japan Radio, 1011 SW Klickitat Way, Bldg B, Suite 100, Seattle,WA 98134
Mackay Communications, 2721 Discovery Dr., Raleigh, N.C. 27616-1851
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Elliot Bay Design Group 5301 Shishole Ave NW Ste 200 Seattle WA 98107
Hornblower Marine Services, PO Box 112476, Campbell, CA 95011-2476
CONTAINER LIFT SPREADERS
Tandemloc Inc.,824 Highway 101, Havelock, NC 28532
CONTROL SYSTEM - Monitoring/Steering
Beier Radio1990 Industnal Ave Harvey, LA 70058
Electronic Marine Systems, 800 Ferndale Pl., Rahway N J 07065
Electrowave USA, 6125 W. Sam Houston Pkwy. Ste 406, Houston,TX 77041
Governor Control Systems, 3190 S.W. 4th Ave., Ft Lauderdale, FL 33315
G.R. Bowler 2261 Lake Rd, Ontario, NY 14519
Kobelt Manufacturing Co., Ltd., 8238-129 street, Surrey, B.C. V3W0A6
Kockum Sonics, Inc., 819 Veterans Blvd., Suite 201, Kenner, LA 70068
MMC International, 60 Inip Dr, Inwood NY 11096
Motor Services Hugo Stamp, 3190 S.W Launderdale, FL 33315
Prime Mover Controls, 3600 Gilmore Way, Burnaby BC V5G 4R8 Canada
Scientific Marine Services, Inc., 101 State Pl., Suite N, Escondido, CA 92029
Seastate, 2 Egmont Road, Henderson, WA-6166, Australia
Stork Kwant, P.O. Box 23, 8600 AA Sneek, Netherlands
Tano Corp.,57017 Citrus Blvd., Suite E, New Orleans, LA 70123
CORROSION CONTROL
DMC Clad Metal, PO Box 680633, Houston, TX 77268
Gardner Denver Water Jetting Systems 8807 Emmett Rd. Suite 100 Houston, TX 77040
Spectrum Trading 108-B Oak St Alpharetta GA 30004
Ultra Strip 3515 SE Lionel Terrace Staurt, FL 34996
COUPLERS- Tug & Barge
Intercontinental Engineering, P.O. Box 9055, Kansas City, MO 64168
COUPLINGS
Acomann International Corp., 4710 Habana Ave., Tampa FL 33614
American Vulkan, 2525 Dundee Rd., Winter Haven, FL 33884
Centa Corp., 815 Black Hawk Dr., Westmont, IL 60559
Geislinger, Hallwanger Landesstr.3, 5300 Hallwang,Salzburg, Austria
Geislinger Corporation, 200 Geislinger Drive,Battle Creek, MI 49015
Mapeco Products, 91 Willenbrock Rd. Unit B, Oxford, CT 06478
MMC Int'l, 60 Inip Drive, Inwood, NY 11096
CRANE–HOIST-DERRICK—WHIRLEYS
Bisso Marine Co. P.O. Box 4113, New Orleans, LA 70178
E. Crane 241 Executive Dr. #3 Marion OH 43302
Edgewater Machine & Fabricators, P.O. Box 358, Edgewater, FL 32132-0358
Holly Hoist Corp., P.O. Box 86, St. Clair Shores, MI 48080-0086
Liebherr-Werk Nenzing Gmbh PO Box 10 A6710, Nenzing Austria
Mi-Jack Products, 3111 West 167th Street, Hazel Crest, IL 60429
Westmont Industries, 10805 Painter Ave.,Santa Fe Springs, CA 90670
CRANKSHAFT DEFLECTION ANALYZER
Prisma Teknik AB Sweden, www.prismateknik.com
CRANKSHAFT GRINDING
Goltens - New York Corp., 160 Van Brunt St., Brooklyn, NY 11231
CRANKSHAFT REPAIR
Goltens - New York Corp., 160 Van Brunt St., Brooklyn, NY 11231
In-Place Machining 1929 N. Buffum St Milwaukee, WI 53212
Waltz & Krenzer, 91 Willenbrock Rd., Oxford, CT 06478
CUTTING AND WELDING MACHINES
Bug-O-Systems, Inc., 3001 W. Carson St., Pittsburgh, PA 15204
ESAB Cutting Systems, 411 South Ebenezer Road, Florence, SC 29501
DAMPERS
Geislinger Corporation, 200 Geislinger Drive,Battle Creek, MI 49015
DATA RECORDERS
L3 Communications, PO Box 3041 Sarasota FL 34230-3041
DECK MACHINERY — Cargo Handling Equipment
Coastal Marine Equipment, Bldg 9114 MISAAP Ind Complex, Stennis Space Center,MS 39529
C.S. Controls Inc. 101 Dickson Rd. Houma, LA 70363
Edgewater Machine and Fabricators, 400 Megan Z Ave Edgewater, FL 32132
Hatlapa Uetersener Maschinenfabrik Tornescher WEG 5-7 D-25436 Uetersen, Germany
Intercontinental Engineering, P.O. Box 9055, Kansas City, MO 64168
Lantec, 5827 Production Way, Langley, B.C. V3A 4N5 Canada
Markey Machinery, P.O.Box 24788, Seattle WA 98124
Rapp Hydema, 4433 27th Avenue West, Seattle WA 98199
Seabulk Sytems 3851 Shell Rd Ste 200 Richmond, BC Canada V6X-2W2
Skookum, Inc., P.O. Box 280, Hubbard, OR 97032
Smith Berger Marine Inc., 7915 10th Ave. S., Seattle, WA 98108
Superior Lidgerwood-Mundy, 1101 John Ave., Superior, WI 54880
Timberland Equipment Ltd. & Almon Johnson, 459 Industrial Avenue, Woodstock, ON N4S7Z2 Canada
W.W. Patterson 3 Riversea Rd Pittsburg, PA 15233
DESALINATION - REVERSE OSMOSIS
G.E.T., Inc., 3135 Golden Avenue, Long Beach, CA 90806
Pall Rochem, 5775 Rio Vista Drive, Clearwater, FL33760-3114
Reverse Osmosis of South Florida 12301 SW 133 Court, Miami, FL, 33186
DESIGN CONSULTING
Fleet Technologies, 311 Legget Dr., Kanata, Ont, K2K 1Z8 Canada
DIESEL CYLINDER INDICATORS
Kiene Diesel, 325 S. Fairbanks St., Addison, IL 60101
DIESEL ENGINE — Spare Parts & Repair
Caterpillar, Inc., Engine Div., P.O. Box 610, Mossville, IL 61552-0610
Cummins Marine, 4500 Leeds Ave., Suite 301, Charleston, SC 29405
Deutz Canada Inc., 4420 Garand St., Montreal, Que. H4R 2A3
GE Marine Engines 1 Neuman Way Cincinnatti, OH 45215
Giro Engineering Limited, Talisman,Duncan Road,Park Gate,Southampton,Hants SO31 7GA England
Goltens Marine, 322 Broad Ave., Wilmington, CA 90744
H.P.International, Inc., 3812 W. Linebaugh Ave., Tampa, Fl 33624
Industnal Estate, New Territories, HONG KONG
MAN B&W Diesel AG, Stadtbachstrasse 1, D-86153 Augsburg 1, GERMANY
MAN B&W Diesel A/S, Teglholmsgade 41, DK-2450 Copenhagen SV, DENMARK
MAN B&W Diesel, 17 State St., New York, NY 10004
Marine Exhaust Systems of Alabama, P.O. Box 698, 757Nichols Ave., Fairhope, AL 36533
Marine Turbo & Diesel Inc 1090 7th St Richmond CA 94801
Mansо USA, Inc., 100 Davidson Ave., Somerset, NJ 08873
Motor-Service AB, Box 2115, S-144 04 Ronninge, SWEDEN
Motor Services Hugo Stamp, 3190 S.W. 4th Ave., Ft. Lauderdale, FL 33315
NREC 1701 Engineers Rd Belle Chase LA 70037
Reagan Equipment, 2550 BelleChase Hwy., Gretna, LA 70054
Rolls -Royce Commercial Marine Houston 10255 Richmond Ave
Scardana Americas Bkg., 502 Empire St., Greefield Park, J4V1V7 Canada
Wartsila Diesel, 201 Defense Highway, Annapolis, MD 21401
DIESEL ENIGINE OVERHAUL
Goltens - NY Corp., 160 Van Brunt St., Brooklyn, NY 11231
Governor Controls Systems 3190 W. 4th Ave Ft Lauderdale FL 33315
Marine Turbo & Diesel Inc 1090 7th St Richmond CA 94801
DIESEL FUEL DECONTAMINATION (www.bunkerbuyer.com)
Algae X Intnl PO Box 4011 Ft Myers Beach, FL 33932
PRI 3750 Hacienda Blvd., Suite A Davie, FL 33314
DIGITAL TORQUE METER SYSTEMS
Instruments, Computers & Controls 78 Londonderry Tpke Hookset NH 03106
DISPLAY TECHNOLOGY
Azonix-Dynalco 3690 NW 53rd St., Ft.Lauderdale,FL 33309
Kent Modular Electronics Ltd.,611 Maidstone Road, Rochester ME1 3QO
DIVING & SALVAGE
Bisso Marine Co. P.O. Box 4113, New Orleans, LA 70178
H.J. Merrihue, P.O. Box 23123, New Orleans LA 70183
DOCK FENDERING SYSTEMS
Plastic Pilings Inc., 1485 South Willow Ave., Rialto, CA 92376
DOORS - MARINE & INDUSTRIAL
Juniper Int'l.,72-15 Metropolitan Ave., Middle Village, NY 11379
Manly Marine, PO Box 86788, N. Vancouver B.C. Canada V7L 4L3
Mapeco , Inc., 90 Forest Ave., Locust Valley, NY 11560
Walz & Krenzer, 91 Willenbrock Rd., Unit B4, Oxford CT 06478
DRIVES
Allied Systems 2300 Oregon St Sherwood OR 97140
DRIVESHAFTS
The Cline Company, 600 Buncombe St., Greenville, SC 29602
DRUG TEST KITS
Sun State Specialty K-9s, Inc.,1500 Beville Road, Daytona Beach, FL 32114
DRY DOCKS-Design
Crandall Dry Dock Engineers Inc., P.O. Box 505804, Chelsea, MA 02150
Heger Dry Dock Engineers, Inc., 13 Water St., Holliston, MA 01746
ELECTRICAL EQUIPMENT
Callenberg Equipment 2010 N. Miami Ave, Miami, FL 33127
MMC International, 60 Inip Dr, Inwood NY 11096
ELECTRONIC INFORMATION SUPPORT
Scandinavian Micro Systems, P.O. Box 155, N-1411, Kolboton, NORWAY
Scientific Marine Svcs., 101 State Pl., Ste. P, Escondido, CA 92029
ELECTRICAL INSTRUMENTS
Selco USA, 2508 Lake Brook Ct., Atlanta, GA 30360
ELECTRONIC CHARTS
C-Map Commercial 133 Falmouth Rd., Mashpee, MA 02649Marine Electronics
NOAA Office of Coast Survey, 1315 East-West Hwy.,Silverspring, MD 20910
Solutions, 1522 Crabapple Cove, Jacksonville, FL 32225
ELECTRONICS
C-MAP, P. O. Box 212, 4371 Egersund Norway
Furuno USA, Inc., 4400 NW Pacific Rim Blvd., Camas, WA 98607
Sure Seal Connections, 3951 South Plaza Dr. Suite 240, Santa Ana, CA 92704
Standard Horizon, 10900 Walker St., Cypress, CA 90630
EMERGENCY LIGHTING
Intenslite International Ltd.,Unit 6, Ettenck Riverside-Dunsdale Road, Selkirk, Scotland TD7-5EB
EMPLOYMENT
All American Marine P O Drawer 191237 Tillman's Corner, AL 33619
Military Sealift Command PO Box 120 Code APM-124 Virginia Beach,VA 23458- 0120
Peter D. Juan ESQ, 14 Lafayette Court, Greenwich Ct 06830
ENGINEERING SERVICES / MARINE ENGS
Callenberg Equipment 2010 N. Miami Ave. Miami, FL 33127
Scientific Marine Services, Inc., 101 State Pl., Suite F, Escondido, CA 92029
U.S.M.M.A., 300 Steamboat Rd, Kings Point, NY 11024
ENGINE ROOM LIGHTING/MONITORING & CONTROL
GMT Electronics, 171 Main Street, South River, NJ 08882
Mackay Communications, 2721 Discovery Dr., Raleigh, N.C. 27616-1851
ENGINE ROOM REPLACEMENT PARTS
Mansco USA, Inc., 100 Davidson Ave., Sommerset, NJ 08873
ENGINES
GE Marine Engines, 1 Neuman Way, Cincinnati, OH 45215
Wartsila NSD Corporation, box 252, Vasa, finland Fin-65101
EQUIPMENT RELIABILITY ANALYSIS SOFTWARE
Resurgence Software Inc., Advanced Technology Center, 2021 Lakeshore Drive, Suite 21D, New Orleans, LA 70122
EVACUATION SYSTEMS
DBC, 12351 Bridgeport Rd., Richmond, BC Canada
Fleet Technology 311 Legget Dr Kanata Ontario K2K 1Z8
EVAPORATORS
Alfa-Laval Separation, Inc., 955 Mearns Rd., Warminster, PA 18974
Beaird Industries, 601 Benton Kelly St., Shreveport, LA 71106
Sasakura Engineering, 7-32 Takeshima, 4-chome, Nishiyodogoaw, KY, Osaka555, Japan
EQUIPMENT DISTRIBUTOR
Total Marine Solutions 4350 Oaks Rd, Ste 501, Ft Lauderdale FL 33314
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EXTRUDED RUBBER PRODUCTS
Clean Seal Inc., P.O. Box 2919, South Bend, IN 46880
FAIRING COMPOUND
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FANS - VENTILATORS - BLOWERS
Jon M. Liss Associates, Inc., 411 Borel Ave., San Mateo, CA 94402
FASTENERS
Jamestown Distributors, P.O. Box 348, Jamestown, RI 02835
Superbolt, P.O.B. 683, Carnegie, PA 15106
FENDERING SYSTEMS/BUOYS - Dock & Vessel
Dolphin USA 2241 Barraud Ave Norfolk, VA 23504
Duramax Marine LLC 17990 Great Lakes Parkway, Hiram,OH 44234
Maritime International, 100 E Vermilion Street #212, Lafayette, LA 70501
Plastic Pilings Inc., 1485 South Willow Ave., Rialto, CA 92376
Poly-Hi-Solidur, 2710 American Way, Ft. Wayne, IN 46899
Schuyler Rubber Co., 16901 Woodred Rd., Woodinville, WA 98072
Seaward Int'l P.O. Box 98, Clearbrook, VA 22624
Urethane Products 9076 Rosecrans Ave Bellflower, CA 90706
Viking Fender Co., 1160 State St., Perth Amboy, NJ 08861
FILTERS/FILTER SYSTEMS (www.bunkerbuyer.com)
Algae X Int'l, PO Box 4011, Ft Myers Beach, FL 33932
Boll Filter, 9822 General Drive, Suite 180, Plymouth, MI 48170
G.E.T., Inc., 3135 Golden Avenue, Long Beach, CA 90806
Hellan Strainer 3249 East 80th St Cleveland, OH 44104
FIRE & SAFETY PRODUCTS
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DBC Marine Safety Systems, 101-3760 Jacombs Rd. Richmond, BC, Canada V6V1Y6
Fr.Fassmer &Co. D-27804 Berne/Motzen, Germany, IndustriestraBe2
IFSTA/Fire Service Programs, 9030 N. Willis, Stillwater, OK 74078-8045
IMSSCO Corporation, 2040 Harbor Island Drive, Suite 201 A, San Diego,CA 92101
Port Canaveral Marine Fire Fighter Academy, Canaveral Port Authority, P.O. Box 267, Cape Canaveral, FL 32920
FLANGES
Jesse Engineering, 5225 7th St. E. Tacoma, WA 98424
FLOW CONTROLS
Hoffer Flow Controls 107 Kitty Hawk Lane, Elizabeth City, NC 27906
FUEL ADDITIVES
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FUEL DECONTAMINATION (www.bunkerbuyer.com)
Algae X Int'l, PO Box 4011, Ft. Myers Beach, FL 33932
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Power Research Inc 3750 Hacienda Blvd Ste A, Davie, FL 33314
FULL SERVICE SHIPYARD & REPAIR
Marisco, Ltd. 91-607 Malakole Rd Kapolei, HI 96707-1831
GALLEY EQUIPMENT
AR Larsen, 15040NE 95th St. Redmond, WA 98052
Cospolich Refrigerator Co.,PO Box 1206 Destrehan LA 70047
Dutchess Baker's Machinery Co., 1101 John Ave, Superior WI 54880
Jamestown Metal Marine Sales, Inc., 4710 Northwest Second Ave, Boca Raton, FL 33431
Lang Manufacturing Co., 6500 Merrill Creek Pkwy, Everett WA 98023
GANGING & SAMPLING
Hermatic Inc., 4522 Center St., Deerpark, TX 77536
GAS DETECTORS
ENMET, PO Box 979, Ann Arbor, MI 48106
Vigilant Marine Systems, 2667 E.28th St. Suite 521, Long Beach, CA 90755
GAS TURBINES
GE Marine Engines 1 Neuman Way Cincinnatti, OH 45215
GEARS & GEAR REPAIR
Goltens - New York Corp., 160 Van Brunt St., Brooklyn, NY 11231
Karl Senner Inc., 25 W Third, Kenner LA 70062
The Falk Corp., PO Box 492, Milwaukee, WI 53201-0492
GENERATOR CONTROLS
Con-Select Inc PO Box 8745 Mandville, LA 70471
Selco USA, Inc.,2508 Lake Brook CT. Altanta, GA 30360
GMDSS — GEAR BOXES & BEARINGS
Beier Radio, 1990 Industnal Ave Harvey, LA 70058
Furuno USA, Inc., 4400 NW Pacific Rim Blvd., Camas, WA 98607
Renk AG, Goegginger Street 73, 86159 Augsberg, Germany
GOVERNORS
Motor Services Hugo Stamp, 3190 S.W. 4th Ave., Ft. Lauderdale, FL 33315
GPS
Leica Navigation 23868 Hawthorne Blvd Torrance CA 90505-5908
Standard Horizon, 10900 Walker St., Cypress, CA 90630
GROUNDINGS
Sohre Turbomachinery 132 Gilbertville Rd PO Box 889 Ware, Mass 01082-0889
HATCHES AND DOORS
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Manly Marine, P.O. Box 86788, N. Vancouver, BC V7L 4L3 Canada
HEAT EXCHANGERS
Alfa-Laval Separation Inc., 955 Mearns Rd., Warminster, PA 18974
Duramax Marine LLC 17990 Great Lakes Parkway, Hiram,OH 44234
Tranter, Inc., P.O. Box 2289, Wichita Falls, TX 76307
HEAVY FUEL TREATMENT
Algae X Int'l, PO Box 4011, Ft. Myers Beach, FL 33932
HIGH SPEED FERRY BUILDERS
Incat Australia (Pty) Ltd.,18 Bender Drive, Hobart 7009, Australia
HOISTS
Coastal Marine Equipment, Bldg 9114 MISAAP Ind.Complex, Stennis Space Center,MS 39529
Holly Hoist Corp., P.O. Box 86, St. Clair Shores, MI 48080-0086
HORNS/WHISTLES
Airchime Mfg. Co. Ltd., 5478 267th Street, Gloucester Industrial Estate, Langley, B.C. Canada V4W 3S8
Kahlenberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241
Kockum Sonics, Inc., 933 Industry Rd., Ste105, Kenner, LA 70062
HOSES/HOSE FITTINGS
JGB Enterprises, Inc. 115 Metropolitan Drive, Liverpool, NY 13088
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Cunningham Marine Hydraulics 201 Harrison St, Hoboken NJ 07030
Offshore Inland 3521 Brookdale Dr.S. Mobile AL 36618
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Stearns Manufacturing, PO Box 1498, St Cloud, MN 56302-1498
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INCINERATORS
Therm-Tec Inc., PO Box 1105, Tualatin, OR 97062
INFLATABLES
Willard Marine, 1250 Grove St,, Anaheim, CA 98286
INFRARED IMAGING EQUIPMENT
Flir Systems,16505 SW 72nd Ave., Portland, OR 97224
INSPECTION EQUIPMENT
Staveley Instrument, 421 N.Quay St.,Kennewick, WA 99336
INSTRUMENTATION
Hoffer Flow Controls, 107 Kitty Hawk La., Eizabeth City, NC 27906
Thermo Electron, 6801 Cochran Rd., Solon, OH 44139
INSULATION
Lit Industries, 516 Costner School Rd.,Bessemer City, NC 28016-9801
Mascoat Products, 10890 Alcott, Unit 102, Houston, TX 77043
Pacor, Inc., P.O. Box 107, Westville, NJ 08093
Shannon Enterprises of WNY Inc., 162 Sweeny St., North Tonawanda, NY
Superior Energies Inc., 3115 Main Avenue, Groves TX 77619
INTERIORS
Custom Ship Interiors, Inc., P.O. Box 882, Solomons, MD 20688
Hopeman Brothers, P.O. Box 820, 435 Essex Ave., Waynesboro, VA 22980
Insulations, Inc., Rt. 5, 12360 Leisure Rd. Baton Rouge, LA 70807
Jamestown Metal Marine 4710 NW 2nd Ave., Boca Raton, Fla. 33431-4870
Maritime Services Corp., 3457 Guignard Drive, Hood River, OR 97031
JOINER—Watertight Door—Paneling—Ceiling System—Decking
Custom Ship Interiors, Inc. P.O. Box 882, Solomons MD 20688
Hopeman Brothers, Inc., P.O. Box 820, Waynesboro, VA 22980
Maritime Services Corp., 3457 Guignard Drive, Hood River, OR 97031
Panel Specialists, Inc./Thermax, 3115 Range Rd., Temple, TX 76501
Walz & Krenzer, 91 Willenbrock Rd., Unit B4, Oxford CT 06478
K-9 DETECTION
Sun State Specialty K-9s, Inc.,1500 Beville Road, Daytona Beach, FL 32114
KEEL COOLERS
Duramax Marine LLC 17990 Great Lakes Parkway, Hiram,OH 44234
R.W. Fernstrum & Co., 1716 Eleventh Ave., Menominee, MI 49858
The Walter Machine Co., Inc., 84-98 Cambridge Avenue, Jersey City, NJ 07307
LASER ALIGNMENT
Boland Industrial & Consulting Services, P.O.B. 91360, Mobile, AL 36691
LUDECA 1425 NW 88th Ave Miami FL 33172
LAUNDRY EQUIPMENT
Richard Galley Supply, PO Drawer 4035, Houma, LA 70361
LEAK REPAIR
Indumar Products Inc 2500 Tanglewilde, Suite 260, Houston TX 77063
LIFEBOATS/RAFTS
DBC Marine Safety Systems, 101-3760 Jacombs Rd. Richmond, BC, Canada V6V1Y6
Edgewater Machine & Fabricators, P.O. Box 358, Edgewater, FL 32132-0358
Fassmer & Co.D-27804 Berne/Motzen, Germany, IndustriestraBe2 v
Norsafe AS, P.O. Box 115, N-4818 Faervik, Norway
Viking Life Saving Equipment, 1625 N. Miami Ave., Miami, FL 33136
Willard Marine Co., Inc., 1250 N. Grove St., Anaheim, CA 92806
Wolong International, 151 Chin Swee Road #03-14, Manhattan House, Singapore 169876
LIFEBOAT SERVICING
Technofibre Pte.Ltd., 51 Shipyard Road, Singapore 628139
LIFEBOAT TESTING
Water Weights, Inc., 5139 Brook St., Suite E, Mont Claire, CA 91763
LIFESAVING EQUIPMENT
Viking Life Saving Equipment, 1625 N. Miami Ave., Miami, FL 33136
LIFT EQUIPMENT
Mi-Jack Products, 3111 West 167th Street, Hazel Crest, IL 60429
LIFT EQUIPMENT TESTING
Water Weights Inc., 5139 Brooks St., Suite E, Montclair, CA 91763
LIGHTING SYSTEMS / EQUIPMENT
ACR Electronics, Inc., 5757 Ravenswood Rd., Ft. Lauderdale, FL 33310-5247
Archway Marine, 4501 Swan Ave., St. Louis, MO 63110
Goltens Marine, 160 Van Brunt St., Brooklyn, NY 11231
Kockum Sonics, Inc., 933 Industry Rd., Ste105, Kenner, LA 70062
L.C. Doane, P.O.Box 975, Essex CT 06426
Pauluhn Electric Mfg. LLP, 1616 North Main Street, Pearland, TX 77581
LINE & NET CUTTERS
Spurs Marine, 201 SW 33rd St., Ft. Lauderdale, FL 33315
LIQUID OVERFILL PROTECTION SYSTEMS
King Engineering Corp., P.O. Box 1228, Ann Arbor, MI 48106
LOAD MEASURING EQUIPMENT
Water Weights Inc. 5139 Brook St Ste E Mont Claire, CA 91763
LOAD TESTING
Water Weights Inc. 5139 Brook St Ste E Mont Claire, CA 91763
LUBRICANTS/LUBRICATION SYSTEMS
Benjamin R. Vickers & Sons Ltd., Airedale Mills, 6 Clarence Road, Leeds, W.Yorkshire England, UK LS10 1ND

Companion Products, Inc., 2040 Johnson Ct. Unit A, Kingston, IL 60145-0009
Exxon Mobil Marine Lubricants, 3225 Gallows Rd. Fairfax, VA

MACHINERY MAINTENANCE, REPAIR AND TESTING
Goltens - New York Corp., 160 Van Brunt St., Brooklyn,NY 11231
Mackay Communications, 2721 Discovery Dr., Raleigh, N.C. 27604-1851

MANAGEMENT SYSTEMS & SERVICE
Insulations, Inc., Rt. 5, 12360 Leisure Road, Baton Rouge, LA 70807
PCS Marine, 174 Colonnade Road S., Nepean, Ontario K2E715

MARINE & OFFSHORE SIGNAGE
Maritime Associates, PO Box 1788, Crystal Bay, NV 89402

MARINE CONSULTANTS
Boland Industrial & Consulting Services, P.O.B. 91360, Mobile, AL 36691
Hall Associates of Washington, Inc., P.O. Box 1554, Mukiteo, WA 98275
PCS Marine, 174 Colonnade Road S., Nepean, Ontario K2E715

MARINE CONSTRUCTION/REPAIR
Sundial Marine, 5605 N.E. Sundial Road, Trautdale, OR 97060

MARINE CRANES
Liebherr-Werk Nenzing GMBH, P.O. Box A6710, Nenzing, Austria

MARINE DECKING & FLOORING
Flexible Decking, 2708 N. Australian Ave. Ste. 9, West Palm Beach, FL 33407
Hopeman Brothers, Inc., P.O. Box 820, Waynesboro, VA 22980
Insulations, Inc., Rt. 5, 12360 Leisure Road, Baton Rouge, LA 70807
Slipnot Safety Flooring WS Molnar Co. 2545 Beavfait St., Detroit, MI48207

MARINE ELECTRONICS
ACR Electronics, Inc., 5757 Ravenswood Rd., P.O. Box 5247,
Ft. Lauderdale, FL 33310-5247
Beier Radio, 1990 Industrial Ave Harvey, LA 70058
Callenberg Engineering 2010 N. Miami Ave, Miami, FL 33127
Furuno USA, Inc., 4400 NW Pacific Rim Blvd., Camas, WA 98607
GMT Electronics, 171 Main Street, South River, NJ 08882
Hatteland Display, Bogstadveien 19, N-0355 Oslo, Norway
JRC, 1011 SW Klickitatway Bldg B, Suite 100, Seattle WA 98134
Jotron Electronics, Box 85, NO-3280TJODALYNG, Norge
Kockum Sonics, Inc., 933 Industry Rd., Ste105, Kenner, LA 70062
Leica Navigation, 23868 Hawthorne Blvd., Torrance CA 90505-5908
Marine Electronic Solutions, 1522 Crabapple Cove, Jacksonville, FL 32225
Raytheon Marine GmbH, High Seas Products, Postfach 1166
D-24100 Kiel, Germany
(Distributor for Raytheon) Klein Navigation, 11 Klein Drive, Salem NH 03079
Saab Marine Electronics AB, Box 13045, 402 5Goteborg,SWEDEN
Scandinavian Micro Systems, P.O. Box 155, N-1411, Kolboton,NORWAY
Scientific Marine Services, Inc., 101 State Pl., Suite F,Escondido, CA 92029
Standard Horizon, 10900 Walker St., Cypress, CA 90630

MARINE ENGINEERING
Elliot Bay Design Group, 5301 Shilshole Ave. NW, Ste. 200, Seattle, WA 98107
Robert Allan Ltd., 1639 W. 2nd Ave. Suite 230, Vancouver, BC Canada V6J 1H3

MARINE EQUIPMENT
Baltic Spare Services Ltd 8 Astronodomow St., 80-299 Gdansk,Poland
Commercial & Marine Products, 3924 Forest Dr., #11, Columbia,SC 29204
Plastic Pilings Inc., 1485 South Willow Ave., Rialto, CA 92376
Scardana Americas Bkg., 502 Empire St., Montreal, Greenfield Park, j4v1v7
Superior Lidgerwood-Mundy, 1101 John Ave., Superior, WI 54880
Waterman Supply, P.O.Box 596, Wilmington, CA 90748

MARINE GLASS
Bent Glass Design INc., 3535 Davisville Rd.,Hatboro PA 19040
Garibaldi Glass Industries 7344 Winston St. Burnaby, BC Canada V5A 2G9

MARINE HARDWARE
HMS Marine Hardware, 333 W.Merrick Road, Valley Stream, NY 11580-5219

MARINE MANAGEMENT
Hornblower Marine Services, PO Box 112476, Campbell. CA 95011-2476

MARINE RADIOS
Standard Horizon, 10900 Walker St., Cypress, CA 90630

MARINE SERVICES
Conam Inspection, 192 International Blvd., Glendale Heights, IL 60139

MARINE THERMAL IMAGER
Arion International 720 Glen Eagle Drive #100 Winter Springs, FL 32708

MARITIME SECURITY
SeaWolf Marine Patrol, 2551 South Shore Blvd. Suite C, League City, TX 77573

MARITIME TRAINING & SCHOOLS
Marine Safety Intl., Marine Terminal Laguardia Airport, NY 11371

METAL ALLOY DISTRIBUTORS
Diversified Metals 49 Main St Monson, MA 01057

METERS
Selco USA, 2508 Lakebrook Ct., Atlanta, GA 30360

MONITORING SYSTEMS
GR Bowler 2261 Lake Rd Ontario, NY 14519
Mackay Communications, 2721 Discovery Dr., Raleigh, N.C. 27616-1851
Prime Mover Controls, 3600 Gilmore Way, Burnaby BC V5G 4R8 Canada
Vigilant Marine Systems, 2667 E.28th St. Suite 521, Long Beach, CA 90755

MOORING LINES
Bayer Faser Building F18 DV Marktg Monofil 41538 Dormagen, Germany

MOORAGE FACILITY
Sea Ark Marine, PO Box 210, Monticell,o AR 71655-0210
Washington North Tongue Point 1300 Dexter Ave., N. Ste 205 Seattle, WA 9810

MOTOR PROTECTION
Marine Safe Electronics, 261 Millway Ave. #12, Concord Ontario L4K 4K9

MOUNTING SYSTEMS
Machine Support Inc.,109B 86th Street, Virginia Beach, VA 23451

NAVAL ARCHITECTS, MARINE ENGINEERS
A.K. Suda , Inc., 3004 19th St., Metairie, LA 70002-4989
Alan C. McClure Associates, Inc., 2600 South Gessner, Houston, TX 77063
Band, Lavis, & Associates, 900 Ritchie Hwy, Suite 203, Severna Park, MD 21146
Bay Engineering, 253 N. First Ave., Sturgeon Bay, WI 54235
C. Baxter & Associates, P.O. Box 9006, Mobile, AL 36609
CDI Marine Co., 9550 Regency Square Blvd. Ste. 400, Jacksonville, FL 3222
Computer Sciences Corporation-Advance Marine Center, 1201 M St. SE,
Washington, DC 20003
CT Marine, 56 Crooked Trail, Rowayton, CT 06853
Cunningham & Walker, 1762 Providence Hollow Lane, Jacksonville, FL 32223
DeJong & Lebet, Inc., 1734 Emerson Street, Jacksonville, FL 32207
Designers & Planners, 2120 Washington Blvd. Ste.200, Arlington, VA 22204
Elliot Bay Design Group 5301 Shishole Ave NW Ste 200 Seattle WA 98107
Fleet Technology, 311 Legget Dr., Karata, Ontario, Canada K2K 1Z8
George G. Sharp, Inc., 100 Church St., New York, NY 10007
Guido Perla & Assoc., 720 3rd Ave., Ste. 1200, Seattle, WA 98104
James S. Krogen, 799 Brickelli Plaza Ste. 701, Miami, FL 33131
Jamestown Marine Service, Marine Science & Tech Center 1084 Shennecossett Rd
Groton, CT 06340
John J. McMullen Associates, Inc., 4300 King St., Suite 400, Alexander, VA 22302
John W. Gilbert & Assoc., Inc., 199 State St., Boston, MA 02109
Kvaerner Masa Marine Inc., 201 Defense Highway, Suite 202, Annapolis, MD 21401
M. Rosenblatt & Son, Inc., 2341 Jefferson Davis Hwy, Arlington, VA 22202
Maritech, Seacliff, Bay Road, Newmarket, NH 03857
Maritime Design, 13000 Sawgrass Village Circle, Ponte Vedra Beach, FL 32082
MCA Engineers, Inc., 2960 Airway Ave., #A-103, Costa Mesa, CA 92626
McElroy Machine & Mfg Co., Inc., P.O. Box 4454, Biloxi, MS 39535-4454
MH Systems 10951 Sorrento Valley Rd#2FSan Diego CA 92121
MIL Systems, 200-1150 Morrison Drive, Ottawa, Ontario K2H 8S9
Nautical Designs, Inc. 2101 S. Andrews Ave,Suite 202, Fort Lauderdale FL 33316
R.D. Jacobs & Associates, 11405 Main St., Roscoe, IL 61073
R.J. Mellusi & Co., 71 Hudson St, New York, NY 10013
Robert Allan Ltd., 1639 W. 2nd Ave. Suite 230, Vancouver, BC Canada V6J 1H3
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 Blvd, St. Petersburg, FL 33702
Seaworthy Systems Inc., P.O. Box 965, Essex, CT 06426;
The Glosten Assoc. Inc., 600 Mutual Life Bldg., 605 First Ave., Seattle, WA 98104
TIMSCO, P. O. Box 91360, Mobile AL 36691
VUYK Engineering, P.O.Box 204, 9700 AE Groningen, The Netherlands
Washburn Doughty, P.O. Box 296, E. Boothbay, ME 04544

NAV/COMM EQUIPMENT
Beier Radio 1990 Industrial Ave, Harvey LA 70058
C-Map/Commercial, 133 Falmouth Rd., Mashpee, MA 02649
C-Map, P.O. Box 212 4371 Egersund Norway
St. Johns, Newfoundland, Canada A1A 2GB
Chartco, New North Road, Hainault, Ilford Essex, 166 2UR England,UK
Electronic Marine Systems, 800 Ferndale Pl., Rahway, N.J. 07065
Furuno USA, Inc., 4400 NW Pacific Rim Blvd., Camas, WA 98607
Mackay Communications, 3691 Trust Dr., Raleigh, NC 27616
Scandinavian Micro Systems P.O. Box 155, N-1411, Kolboton, NORWAY
Standard Communications, P.O. Box 92151, Los Angeles, CA 90009
Transas Marine USA, 19105 36th Ave. W. St. 101, Linwood, WA8036

NAVIGATION
Comnav Marine Ltd.,#15-13511 Crestwood Pl., Richmond, BC V6V2G1
D&B Technologies, 1400 S.Orland Ave., Winter Park, FL 32789
Kongsberg Maritime Ship Systems AS, PO Box 1009 3194, Horten, Norway
Nauticast AG, Mariahilfer Strasse 50/2/11.A-1070 Vienna, Austria
Transas Marine USA 19105 36th Ave West Ste 101 Lynwood, WA 98036

NOZZLES/NOZZLE SYSTEMS
Harrington Marine, 6720 124th Ave., Fennville, MI 49408
NautiCAN Research and Develop.,P.O. Box 428-115 Kelvin Grove Way, Lions
Bay,BC V0N 2E0

OIL SPILL RESPONSE
Marine Preservation Association, 8777 No.Gainey Center Drive Suite 105, Scottsdale,
AZ 85258

OFFSHORE MARINE CONSTRUCTION
Amfels 5177 Richmond Ave Ste 1065 Houston TX 77056

OFFSHORE TOWING
Tidewater, 601 Poydras Street, New Orleans, LA 70130

OIL/WATER SEPARATORS
Alfa-Laval Separation, Inc., 955 Mearns Rd., Warminster, PA 18974-0556
MMC International, 60 Inip Dr, Inwood NY 11096
Sasakura Engineering, 7-32 Takeshima, 4-chomNishiyodogoaw,KY, Osaka555,
Japan

PAINTS/ANTI-FOULANTS
Jotun Paints Inc, 1401 Severn St., Baltimore,MD 21230
Sigma USA, PO Box 816, Harvey, LA 70059
Wasser High Tech Coatings, 8041 South 228th St., Kent, WA 98032

PAINT REMOVAL
Ultra Strip Systems 3515 SE Lionel Terrace Stuart, FL 34996

PARTS LOCATOR SERVICE
Inventory Locator Service 3965 Mendenhall Rd, Memphis, TN 38115

PFD's (Personal Flotation Devices)
Stearn's Mfg Co. PO Box 1498 St Cloud, MN 56302-1498

PIPE FITTINGS/CUTTINGS/CONNECTING/ SYSTEMS
GS-Hydro U.S., 1395 Bluehills Ave.,Bloomfield CT. 06002
Jesse Engineering, 5225 7th St. East., Tacoma, WA 8424
Neptune Research, 1685 Latham Rd., West Palm Beach, Fl 33409
Norma Products (U.S.) Inc. 31132
Century Drive, Wixmon, MI 48393
RAMCO Manufacturing Co.,365 Carnegie Avenue, Kenilworth, NJ 07033

PIPE LEAK REPAIR
CSD North America 88o Canada Rd, Manchester, NH 03109

POLLUTION CONTROL PRODUCTS
Enecon Corporation, 125 Baylis Rd., Melville, NY 11747-3800

PORTABLE FOAM APPLICATORS
IMSSCO Corporation, 2040 Harbor Island Drive, Suite 201 A, San Diego,CA 92101

PORTABLE VENTILATORS
Americ Corp 1910 E. Devon Ave Elk Grove Village, IL 60007

PORT DEVELOPMENT
RTM Star Center, 2 W.Dixie Hwy., Dania, FL 33004
Sasakura Engineering, 7-32 Takeshima,4-chome,Nishiyodogoaw,KY, Osaka555, Japan

PORT SECURITY
Foss Environmental, P.O. Box 3535, Seattle, WA.98124

PRECISION FLAME CUTTING/SAWING
Ronson Technical, 2146 B Flintstone Dr., Tucker, GA 30085

PRESSURE INDICATORS
Lehman & Michaels GmbH & Co. kg.
Marlow Ring 4, D-22525 Hamburg Germany

PREVENTATIVE MAINTENANCE
Marine Safe Electronics 37 Staffern Dr Concord Ontario L4k 242

PROPULSION EQUIPMENT
ABB Drives Inc., P.O. Box 372, Milwaukee, WI 53201-0372,
ABB Industry Oy, P.O. Box 185, 00381 Helsinki, FINLAND
ABB TURBOCHARGER, INC.,1460 Livingston Avenue, North Brunswick, NJ 08902
AlstomPower Conversion, 3 Ave. Des Trois Chenes 90018 Belfort Cedex France
Brunvoll A/S, P.O. Box 370, N-6401, Molde, Norway
Caterpillar, 100 NE Adams Street, Peoria, IL 61629-2320
Centa Corp., 8185 Cass Ave., Darien, IL 60561
Cummins Marine, 4500 Leeds Ave., Suite 301, Charleston, SC 29405
Fincantieri, Diesel Engines Div—GMT, Bagnoli della Rosandra 3334, Trieste, ITALY
Geislinger Corporation, 200 Geislinger Drive,Battle Creek, MI 49015
Goltens Worldwide, 160 VanBrunt St., Brooklyn, NY 11231
Harbormaster Marine Inc., 31777 Industrial Rd., Livonia, MI 48150
Harrington Marine, 6720 124th Ave.,Fennville, MI 49408
Jan Verhaar Omega Thrusters 2340 AC Oegstgeest Holland
Jan Verhaar Omega Thrusters, P.O. Box 119, 2340 AC Oegstgeest, NETHERLANDS
Karl Senner Inc., 25 W Third, Kenner LA 70062
KawasakiHeavy Industries, Ltd., World Trade Center Bldg.,4-1 Hamamatsu-cho,2-chome,Minato-ku,Toyko 105-6116, Japan
Konrad 1421 Hanley Rd Hudson WI 54016-9376
LA.ME.srl, Marine Division, Via Della Fornace 4, Opera (MI) Italy
MAN B&W Diesel, 17 State St., New York, NY 10004
MAN B&W Diesel A/S, Ostervej 2, DK-4960 Holeby, DENMARK
MAN B&W Diesel A/S, Alpha Diesel, Niels Juels Vej 15. DK-9900 Frederikshavn,
DENMARK
MAN B&W Diesel GmbH, Stadtbachstrasse 1, D-86153 Augsburg 1 GERMANY
Mapeco , Inc., 91 Willenbrock Rd., Unit B4, Oxford CT 06478
Markisches Werk, P.O. Box 1442, D-5884 Halver GERMANY
Mitsui O.S.K. Techno-Trade Ltd, 3-4, 2-Chome Uchikanda, Chiyoda-ku, Toyko, 101-0047
Japan
Napier Turbochargers, PO Box 1, Waterside South Lincoln LN5 7FD England
Omnithruster Inc., 30555 Solon Ind. Pkwy., Cleveland, OH, 44139
Orion Corp., 1111 Cedar Creek Rd., Grafton, WI 53024
Propulsion Systems Inc 601 NE 26th Court, Pompano Beach, FL 33064
Rolls -Royce Commercial Marine Houston 10255 Richmond Ave
Ste 101 Houston TX 77042
Schottel Inc., 675 Industrial Blvd., Sugar Land, TX 77478
Schottel Gmbh & Co. KG-Mainzer Strasse 99-D-56322-Spay GERMANY
Schottel-Werft, Manizer Strasse 99, D-56322 Spay/Rhein, GERMANY
Siemens Electric Ltd. 1180 Courtney Park Rd. Mississauga, Ontario Canada
The Falk Corp., PO Box 492, Milwaukee, WI 53201-0492
Voith Schneider America Inc., 121 Susquehanna Ave., Great Neck, NY 11021
Voith Schiffstechnik GMBH & Co., PO Box 2011, 89510 Heidenheim Germany
Wartsila Lips, 3617 Koppens Way, Chesapeake, VA.,23323
ZF Marine Group 3131 SW 42nd St., Ft. Lauderdale, FL 3331
ZF Marine Group, Ehlerstr.50, 88046 Friedrichshafen, Germany

PUMP—Repair—Drives
Advanced Environmental Systems, 2 Sutton Rd., Webster, MA 01570
Fybroc-Div.of Met-Pro, PO Box 144, Harleysville, PA 19438
Mack Boring & Parts Company, 2365 Route 22 West, Union, NJ 07083
Reagan Equipment, 2550 BelleChase Hwy.,Gretna LA 70054
Scardana Americas Bkg.. 502 Empire St., Greefield Park, J4V1V7 Canada

RADIATION DETECTION
Thermo Electron, 6801 Cochran Rd., Solon, OH 44139

RADARS —ARPAS
Ampco Pumps Co.,4424 West Mitchell St., Milwaukee WI 53214
Beier Radio 1990 Industrial Ave., Harvey, LA 70058
Furuno USA, Inc., 4400 NW Pacific Rim Blvd., Camas, WA 98607
Kelvin Hughes Ltd New North Rd Hainavlt, Ilford Essex 1G6 2UR

REMOTELY OPERATED VEHICLES
VideoRay LLC, 415 Engleview Blvd., Exton, PA 19341

REVERSE OSMOSIS
GET Inc 3135 Golden Ave LongBeachCA

RH PROPULSION
Goltens, 160 Van Brunt St., Brooklyn, NY 11231

RIGID INFLATABLE BOATS
Willard Marine, Inc. 1250 N. Grove St., Anaheim. CA 92806

ROPE—Manila—Nylon—Hawsers—Fibers
Cortland Cable Co., 44 River St.(PSR), Cortland, NY 13045-0330
Marlow Ropes, South Road, Hailsham, E. Sussex, BN27335
Pelican Rope Works, 4001 W.Cariage Way,Santa Ana,CA 92704
Puget Sound Rope, 1012 Second St., Anacortes, WA 98221

ROTATING EQUIPMENT
FCS, Inc., 22 Main Street, Centerbrook, CT 06409

RUDDER BEARINGS & BUSHES
Duramax Marine, 16025 Johnson St., P.O Box 67,
Middlefield, OH 44062-006
Orkot Composites., 2535 Prairie Rd., Unit D, Eugene, OR 97402
Thordon Bearings, Inc., 3225 Mainway, Burlington, Ontario L7M 1A6

SAFETY & ENVIRONMENTAL SOLUTIONS
Total Marine Solutions 4350 Oaks Rd, Ste 501, Fort Lauderdale, FL 33314

SAFETY MANAGEMENT CONSULTANTS
Modern Maritime 67 Bow Street, Ste. 3, Portsmouth, NH 03801

SAFETY PRODUCTS
Brookdale International, 1-8755 Ash St., Vancouver BC, V6P6T3
D&B Technologies, 1400 S.Orland Ave., Winter Park, FL 32789
DBC Marine Safety 101 3760 Jacombs Rd Richmond
BC V6V146
Fab En Co, Inc 2012 Karbach Houston, TX 77092
Lalizas SA, 21 Haidariou St., 545 Piraeus,Greece
Liferaft Systems of Australia 5 Sunmont St Derwent Park
Tasmania, Australia 7009
Walport"WUSA"39-5A Dover Rd SouthToms River NJ 08757
L3 Communications PO Box 3041 Sarasota FL 34320-3041
N.Vancower, Bc Canada VZP 3n4
Norwegian Maritime Equip. AS, Box 244, NO-5460 Husnes, Norway
Slipnot Safety Flooring WS Molnar Co. 2545 Beavfait St Detroit, MI 48207
Steams Mfg Co PO Box 1498 St Cloud, GA 56302-1498
Viking Life Saving, 1625 N. Miami Ave., Miami, FL 3313

SANITATION DEVICE—Pollution Control
Envirovac Inc., 1260 Turret Dr., Rockford, IL 61111
Headhunter Inc.,4100 Ravenswood Road, Ft. Lauderdale, FL 33312
Hydroxyl systems Inc., 9800 McDonald Park Road, Sidney, BC V8L 3S8
Microphor, 452 E. Hill Rd., Willits, CA 95490
Sanitary For All, 3909 Witmer Road, PMB 472, Niagara Falls, NY, 14305

SATELLITE COMMUNICATIONS
Beier Radio 1990 Industrial Ave, Harvey,LA 70058
Comsat Maritime Services, 6560 Rock Spring Dr Bethesda MD 20817-1146
Furuno USA, Inc., 4400 N.W. Pacific Rim Blvd, Camas WA 98607
KVH Industries Inc., 50 Enterprise Center, Middletown, RI 02842
Land Sea Systems, 509 Viking Drive ,Suite KLM, Virginia Beach, VA 23452
Mackay Communications, 3691 Trust Dr., Raleigh, N.C. 27616
Nera Satcom AS, Box 91, NO-1375 Billingstad, Norway
Norwegian Telecom, Postboks 6701 St. Olivs Plass, N-0130, Oslo, Norway
Stratos, 1501 Metcalfe St., Suite 1900, Ottawa, Ontario K2P 1P1 Canada

SCARIFIERS
Desmond-Stephan, P.O.B. 30, Urbana, OH 43078

SEALS
Circle Seal Controls Inc., 2301 Wardlow Circle, P.O. Box 3300 Corona, CA
Duramax Marine, 16025 Johnson St., Middlefield, OH 44062
ExpresSeal, 204 Cemetery Road, Lancaster, NY 14086-9504
Orkot Inc., 2535 Prairie Rd., Unit D, Eugene, OR 97402
Sure Seal Connections. 3951 South Plaza Dr. Suite 240, Santa Ana, CA 92704

SEATING
H.O. Bostrom 818 Progress Ave Wankesha, WI 53186

SELF UNLOADING SYSTEMS
Seabulk Systems 3851 Shell Rd Ste 200 Richmond CANADA V6X 2W2

SENSORS
Electronic Marine Systems, 800 Ferndale Pl., Rahway, N.J. 07065

SHAFT HORSEPOWER MEASURING SYSTEM
Instruments, Computers & Controls 78 Londonderry Tpke Hookset NH 03106

SHAFT SEALS
Duramax Marine LLC 17990 Great Lakes Parkway, Hiram,OH 44234

SHAFTS
American Vulkan, 2525 Dundee Rd., Winter Haven, FL 33884
Geislinger Corporation, 200 Geislinger Drive,Battle Creek, MI 49015

SHIP LIFTS
Synchrolift Inc., Two Datran Center, 9130 S. Dadeland Blvd., Miami, FL 33156-7850

SHIP MANAGEMENT
Eurasia Group, 22A Floor Chinachem Exchange Sq., 1 Hoi Wan St., Quarry Bay
Hong Kong

SHIPBOARD HUMAN RESOURCES
PO 101073 Ft Lauderdale, FL 33310

SHIPBOARD TESTING
Dayton T. Brown, 555 Church St., Bohemia, NY 11716

SHIPBUILDING—Repairs, Maintenance, Drydocking
Allen Marine PO Box 1049 Sitka, AK 99835
Astilleros Espanoles, S..A. Ochandiano, 14-16 28023 El Plantio SPAIN
Atlantic Marine, Inc.,P.O. Box 3202, Mobile, AL 36652
Atlantic Marine, Inc., 8500 Heckscher Dr., Jacksonville, FL 32226
Atlas Metal Sales, 1401 Umatilla St., Denver CO 80204
Austal USA 100 Dunlap Dr Mobile AL 36602 USA or PO Box 1049,
Mobile, AL 36633
Bender Shipbuilding & Repair, P.O. Box 42, Mobile AL 36601
Bisso Marine Co., P.O.Box 4113, New Orleans, LA 70178
Blount Marine. 461 Water St., Warren, R.I. 02885
Bollinger Lockport & Larose, P.O. Box 250, Lockport, LA 70374
Curacao Drydock Co.,Box 3012, Willemstad, Curacao, Netherlands Antilles
Cascade General Inc., 5555 N. Channel Ave., Bld. 71, Portland,OR 97217
Detyens Shipyards Inc.,1670 Drydock Ave., Bldg 236 North Charleston,SC
29450
Eastern Shipbuilding Group, 2200 Nelson Street, Panama City, FL 32402
Fincantieri Cantieri Navali Italiani Spa, Merchant Shipbuilding Div., 34123 Trieste, ITALY
Friede Goldman Halter, 525 E. Capitol Street, Suite 402, Jackson, MS39201
Gladding Hearn,1 Riverside Ave., Somerset, MA 02725
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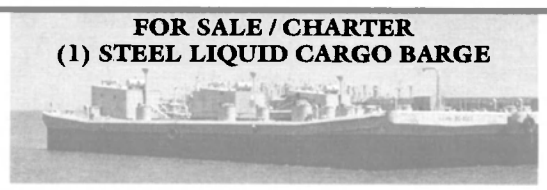

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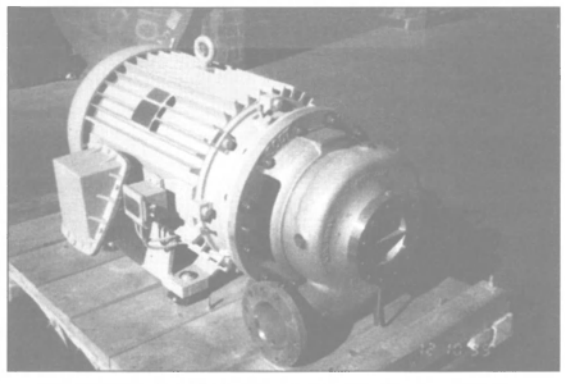

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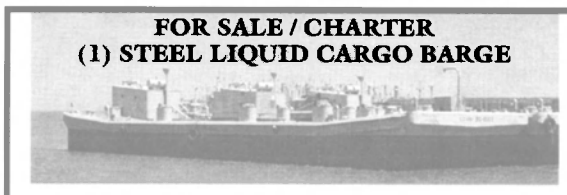

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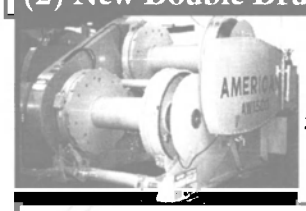

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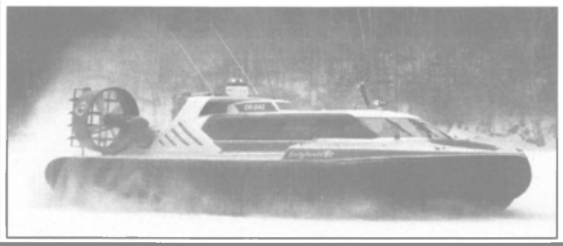

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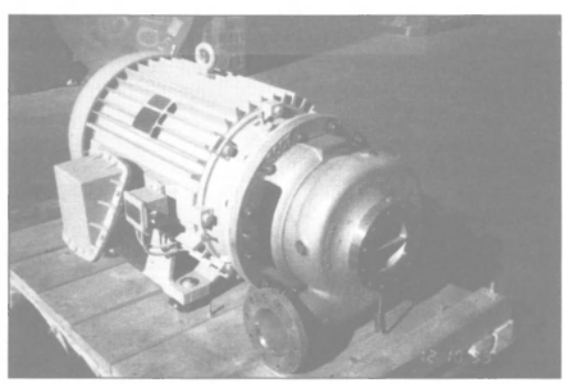

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For more information about the Point Sur and Moss Landing Marine Laboratories visit:
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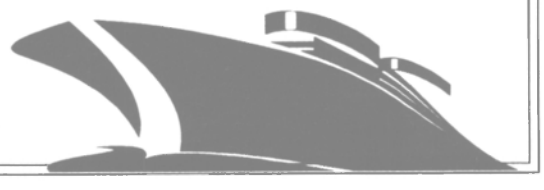

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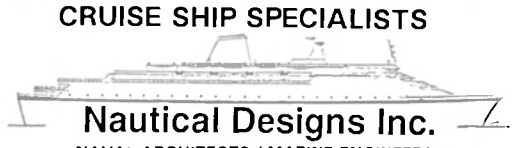

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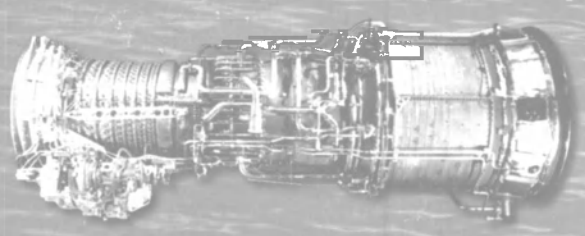

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