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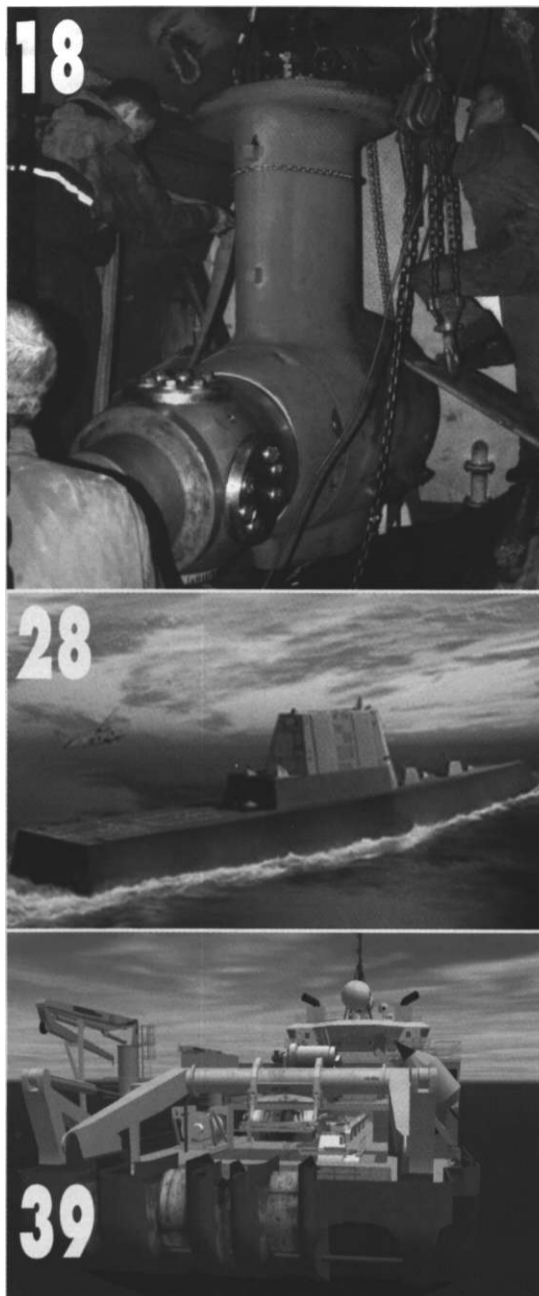
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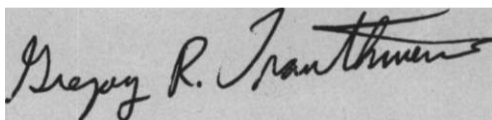
## Editor's Note

The "Don't Tread on Me" rattlesnake flag has been revived and ordered flown aboard the U.S. Navy fleet — per the May 31, 2002 order of Navy Secretary **Gordon England** — as a symbol of the nation's defiance against terrorism. The familiar symbol and phrase are deeply rooted in American history, and I highly recommend [www.foundingfathers.info](http://www.foundingfathers.info) for those of you interested in reading about its meaning to the U.S. (A special thanks to my editorial "guru" down south that keeps me abreast of such matters!)

The symbol will become familiar to the readers of *MR/EN* as well, as we "fly the flag" atop each of our special U.S. Navy reports, starting with this month's coverage of the new family of Navy ships under development. Written by Commander **Joseph Chiaravallotti**, U.S. Navy, and starting on page 28, the article entitled "The Littoral Combat Ship: Force Multiplier for the 21st Century Navy," provides an insider's view of the steps in place and under development to effectively rebuild the U.S. Navy for the next generation. All of the armed forces are aggressively re-evaluating the way in which they perform their maritime missions, an aggressive top to bottom review which has helped to redefine the missions themselves.

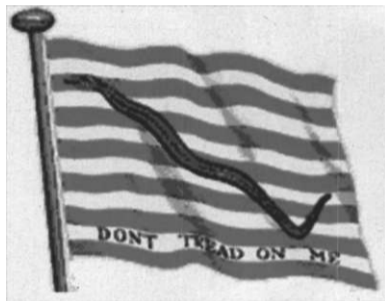
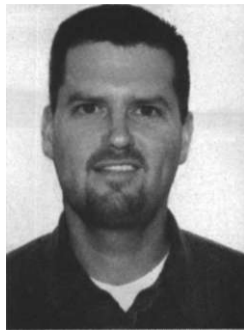
Though impressive and significant of a large capital investment for the coming decades, the naval and government side of the marine business is not the only source for immediate business. Though it may already sound trite, one can not underestimate the impact of new security measures on shipboard and port operations. Last month the U.S. Maritime Security Expo — held in New York on September 18-19 — was packed with sellers and buyers of the latest security products and systems. **Dennis L. Bryant** in his monthly Government Updates column (see page 12) entitled "The High Risk Pool of Cargo and Maritime Security" once again underscores how evolving policy will directly effect shipping operations. Companies that will lead and prosper — despite what may seem high compliance costs — will invest today in the establishment of verifiable, secure shipping operations.

Simply said, there is no other choice.



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## On the Cover



This month's cover exhibits a unique bowthrustrer repair technique devised and executed by Hydrex on the 5,477-TEU containership *Manjin Vienna*. (See related story on page 18).

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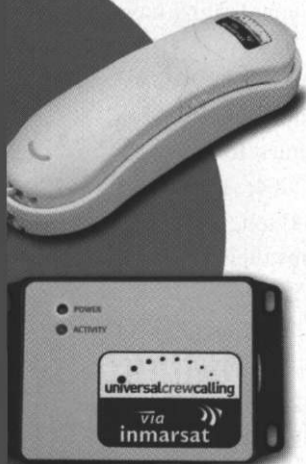
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News

## Fincantieri Proceeds on Costa Fortuna

Last month *MR* hopped aboard Costa Fortuna, currently under construction at Fincantieri's Sestri Ponente yard in Genoa. The 105,000-gt ship will be the largest cruise ship to ever fly the Italian flag, and the largest — in 30 years — to

be built by the historic yards in Sestri Ponente after the Michelangelo, built in 1965.

The company's new flagship will measure 892 x 124 ft. (272 x 38 m) and carry 3,400 passengers, and is due to enter

service in 2003.

Leading the tour aboard Fortuna was ubiquitous Carnival CEO **Micky Arison** and Fincantieri CEO **Corrado Antonini**. In a post-tour press conference, Arison defended his company's cornering on the cruise ship market, which may soon include the addition of Princess



Micky Arison, CEO (above), CEO Carnival Corp.; and Corrado Antonini (below right), CEO Fincantieri, led a tour of the upcoming Costa Fortuna at Fincantieri's Sestri Yard.

Cruise lines, pending governmental and shareholder approvals.

"When we acquired Costa and Cunard, neither had any ships under construction," said Arison. Now, they have three ships and two ships, respectively, under construction now. Concurring, Antonini noted that pre-Carnival, Costa Crociere built their ships in Germany.

Arison also added that Carnival, in contrast to popular perception, is very cognizant of a cruise line's heritage and history, noting that the Costa ships have returned to the Italian flag, the Holland America ships have returned to the Dutch flag, and the Cunard ships have returned to the British flag.

In addition to Fortuna, Costa has sister-ship Costa Magica under construction with Fincantieri, scheduled to enter service at the end of 2004, and Costa Mediterranea, an 86,000 ton, 2,680 passenger vessel under construction at Finland's Kvaerner Masa Yards.

Costa Crociere, an Italian member of the Carnival Corporation Group, currently has a fleet of eight ships totaling 414,000 gt with a capacity of 10,800 guests.

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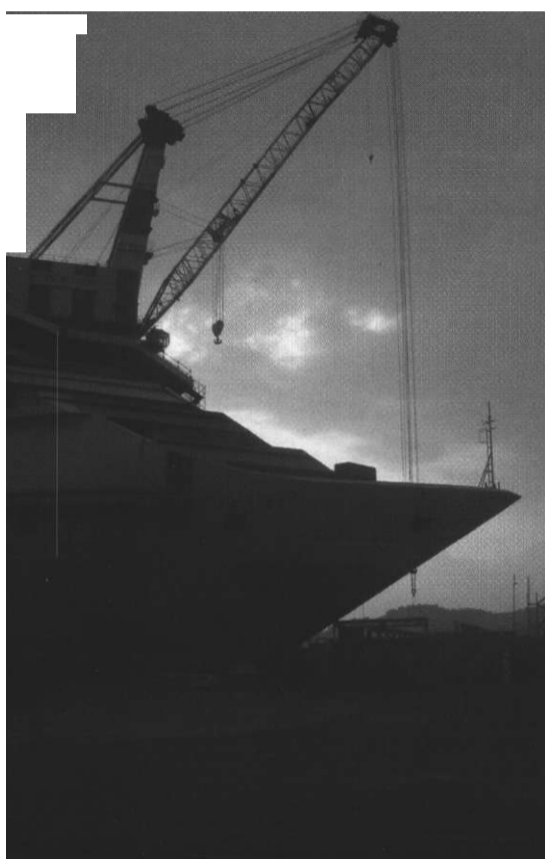
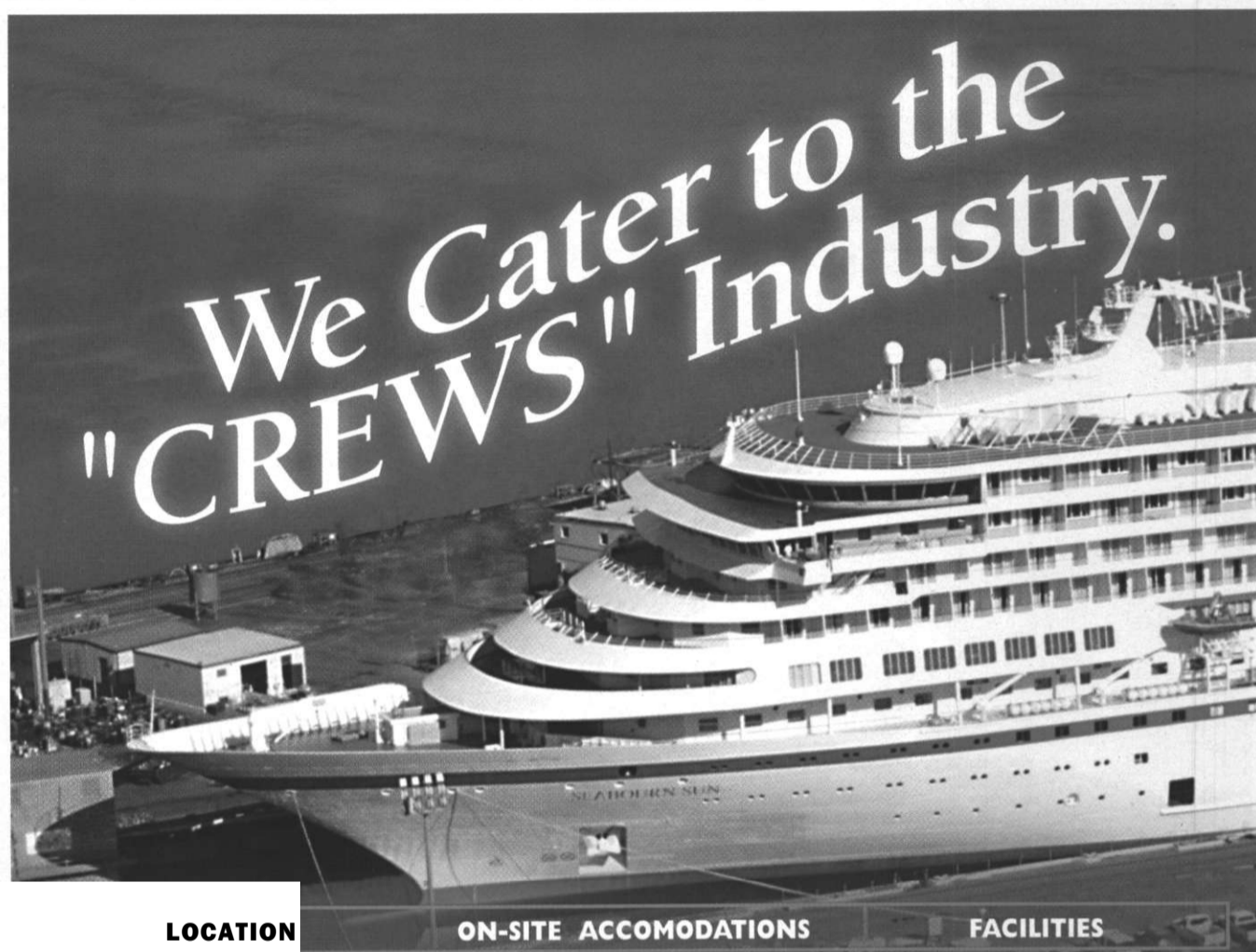
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Ship	Year	Capacity	GT
Costa Marina	1990	1,000	25,500
Costa Classica	1991	1,680	53,000
Costa Allegra	1992	1,000	28,400
Costa Romantica	1993	1,697	53,000
Costa Victoria	1996	2,394	75,200
Costa Atlantica	2000	2,680	85,700
Costa Tropicale	2001	1,411	36,000
Costa Europa	2002	1,773	54,000
Costa Mediterranea	2003	2,680	85,700
Costa Fortuna	2003	3,400	105,000
Costa Magica	2004	3,400	105,000

Costa Fortuna	
Tons	105,000 gt
Length	892 ft. (272 m)
Breadth	124 ft. (38 m)
Capacity	3,400
Crew	1,068
Cabins	1,359
	853 outside



Costa Fortuna At Sunset: Measuring 892 x 124 ft. (272 x 38 m), Costa Fortuna is the flagship of the fleet.

The shipyard boasts three docks (285, 255 and 250 m long), and currently there are three cranes (one 200-ton unit and two 60-ton units), with the planned acquisition of four new cranes (two 400-ton units and two 20-ton units).

The shipyard has built a number of notable ships in its more than two centuries of shipbuilding, from the large battleships Giulio Cesare and Caio Duilio, to the legendary transatlantic cruise lines Roma (1926); Rex (1931); Andrea Doria (1951); Cristoforo Colombo (1953); Leonardo da Vinci (1958); and Michelangelo (1965).

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**News**

**RoRo Vessel Jolly Rubino Runs Aground**

SMIT Salvage confirmed that the Italian flagged RoRo vessel, Jolly Rubino, ran aground off Cape St. Lucia on the Kwa-Zulu Natal coast, South Africa, in adverse weather conditions. With a dwt of 31,262, measuring 625 x 94 ft. (190.5

x 28.5 m), the vessel was reportedly carrying an unknown quantity of hazardous cargo (class 3).

The situation regarding its position changed dramatically on September 12; the vessel eventually running aground approximately 1 n.m. (1,852 km) north east of the lighthouse. The salvage tug

Wolraad Woltemade arrived on the morning of September 11, and the Anchor Handler Pentow Service was on site to monitor the situation at close range. The oil pollution abatement vessel Kuswag I remain in the vicinity and the oil pollution patrol aircraft 'Kuswag VII' will overfly the scene this evening



Smit Salvage responded to Italian-flagged Jolly Rubino, which ran aground off Cape St. Lucia on the Kwa-Zulu Natal Coast, South Africa.

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to assess the situation with respect to possible pollution. Jolly Rubino had approximately 1,100 tons of fuel oil and 225 tons of gasoil on board.

A salvage plan was formulated once the team boarded the vessel and a full inspection of the vessel had been completed. SMIT Salvage was awarded a Lloyd's Open Form (with SCOPIC) by the vessel's owners.

On the morning of September 12, the SMIT Salvage team flew to the casualty in order to evaluate the situation. A member of the team was lowered above the Jolly Rubino from the helicopter but couldn't be landed due to the heavy rolling of the vessel. The temperature on deck was measured as 90 degrees and the situation on board was deemed life threatening — ongoing explosions still being experienced and smoke and flame emanating from below deck.

The Master, Officers and Crew of Jolly Rubino, abandoned ship late September 10 after failing to extinguish a fire in the engine room.

On September 13, the Kuswag VII oil pollution patrol aircraft over flew the Jolly Rubino, and reports that fingers/tendrils of oil are emanating from the grounded vessel; a light 10-m slick lying parallel to the coast approximately 100 m from the beach moving northwards.

In addition, salvage efforts were delayed when an increase in the swell height being experienced in the vicinity of the grounded Jolly Rubino prevented salvage personnel from connecting the oil transfer hoses to be used in the ship-to-ship transfer operation. The SMIT Salvage team reported that swell height increased steadily and measured at 10-11 ft.

At press time, it was expected that the current ground swell condition would continue for the next three days, delaying the beginning of the next phase of the fuel removal operation.

## Rolls Royce Engine Passes Initial Tests

The new Rolls-Royce MT30 gas turbine has reportedly successfully run for the first time at the company's Bristol, UK site. "This is a great milestone in our drive to bring leading edge, proven, aero gas turbine technology to the marine marketplace," said **Saul Lanyado**, president, Rolls-Royce Marine.

Planned for availability early in 2004, the MT30 has a power rating of 36 MW, but is said to be comparable in efficiency to 25 MW units. A rating of 36 MW is available at the power turbine output shaft at ambient air temperatures up to 26 degrees C, with a corresponding specific fuel consumption of 0.207 kg/kWh. The unit burns DMA, a widely available marine fuel. Under tropical conditions of 32 degrees C air temperature, the output is 30 MW.

An eight-stage variable geometry axial low pressure compressor driven by a single stage IP turbine feeds air to the high pressure spool, comprising a four-stage compressor and single stage HP turbine. The MT30 will be supplied as a package on an optional bedplate with an acoustic enclosure, which is fitted with automatic fire detection and extinguishing, and houses the auxiliaries and the inlet and exhaust diffuser. The complete unit weighs about 22 tons dry, or 27 tons with bedplate, and measures 30 x 12 x 13 ft. (9.1 x 3.8 x 4 m).

The engine — which will target both commercial and military markets — has 80 percent commonality with the Trent 800 aero engine, which, since entering service in 1996, has logged more than two million flying hours and achieved 99.9 percent reliability. The MT30 is the 11th engine type Rolls-Royce has derived from core aero engine technology.

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## Crescent Tankships Orders Product Tankers

Crescent Tankships, part of the U.K. shipping group Crescent, has ordered two innovative 3,500 dwt chemical and oil tankers from the Rouse Shipyard, Bulgaria.

The order, accompanied by a series of options, follows the acquisition by Crescent of Camilla, a 1,880 dwt high specification product tanker.

"These orders, our first newbuildings since 1989, and the acquisition of the Camilla, show our confidence in the future of the clean products market in

Europe," says **Rob Bennett**, managing director of Crescent Tankships. "We believe this high intensity market will become even more demanding, so with the backing of the Clipper Group, we are moving to ensure we have the right vessels to meet the future high expectations of major charterers in these

trades."

For delivery in fourth quarter 2003, the two newbuildings will be LR class and British flag. They will have twin engines, twin screws, twin rudders and a high degree of operational redundancy, in addition to being double skinned throughout their length. "These vessels

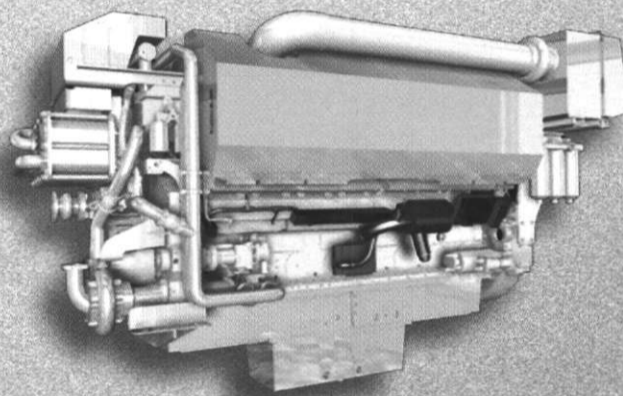
reflect a growing demand for segregated ballast in smaller ships, which cuts down on the likelihood of pollution and also reduces in port time. The double skin in the engine room area protects the bunker spaces."

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# The Risks of Cargo and Maritime Security

*The U.S. Government, and particularly the U.S. Customs Service, has focused on cargo as a major risk factor with regard to the maritime security of the United States. The following is an outline of some of the measures being adopted or considered by the Customs Service in its efforts to enhance maritime security and the impacts of those measures on shippers, intermediaries, and carriers.*

*By Dennis L. Bryant, Senior Maritime Counsel, Haight Gardner Holland & Knight, Washington, D.C.*

The measures can be grouped into three general categories: inspections, risk reduction, and container security. Inspections occur both in the United States and abroad and involve both use of technology and physical inspection. Risk reduction is an effort to identify at an early stage which cargos might present a risk to U.S. security. Container security is a specialized program to

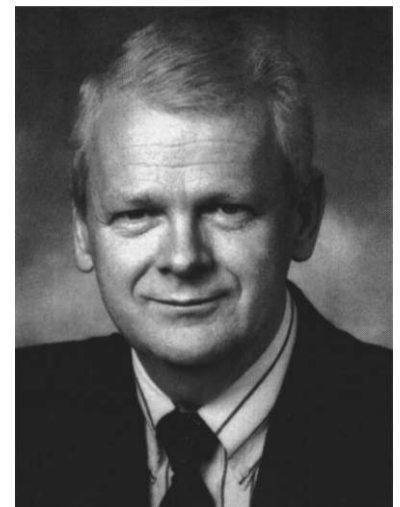
develop containers and related devices that will resist intrusion en route and provide some warning or indication if intrusion occurs.

## **Inspection Methods Vary from Hands-On to High Tech**

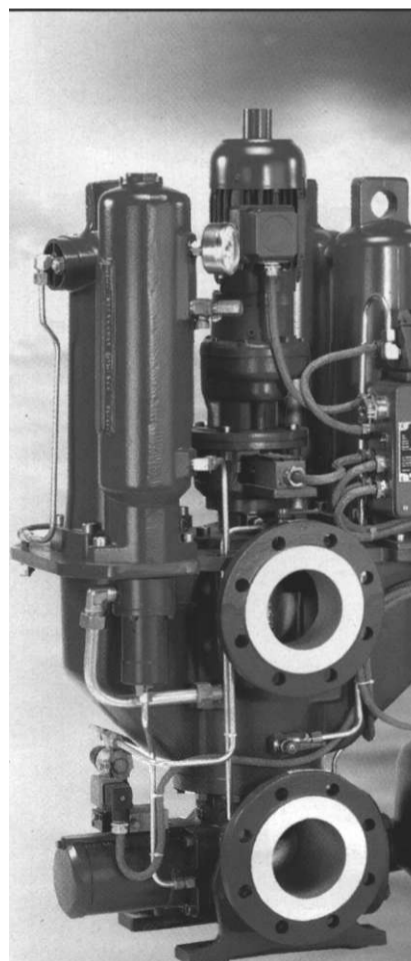
Traditionally, the U.S. Customs Service relied on physical inspection of cargo as the primary method to determine whether what was being imported into the United States matched what was on the bill of lading or other documentation. In part because compliance rates were fairly high, physical inspection rates fell to as low as two percent. This means that 98 percent of the cargo being shipped into the United States was not examined by the federal government, which placed heavy reliance on the good faith of the shippers and the accuracy of the documentation. That worked adequately when the only risk was commercial underreporting and the occasional smuggler. The terrorist attacks of September 11, 2001 dramatically changed the risk factors and led to a reexamina-

tion of government oversight provided to imports into the United States.

Increasingly, physical inspection by Customs officials is a last resort. Physical inspection of one container might involve two inspectors and last a full day. Technological inspections are being conducted with increasing frequency. They are far faster than physical inspection and better able to detect certain threats. X-ray machines that examine entire containers at one sweep are being used. These devices, which operate at a wavelength of about 10-10 m in the electromagnetic spectrum, can detect large and small objects inside containers and packing crates, allowing non-intrusive inspection. Drawbacks are that the devices emit fairly high levels of radiation and that the X-rays cannot penetrate certain materials, such as lead. Gamma-ray machines are being similarly employed to conduct non-intrusive inspections. Like X-ray machines, these can examine an entire container in one operation. Gamma-



**Dennis L. Bryant, Senior Maritime Counsel at the law firm of Haight Gardner Holland & Knight, Washington, D.C. provides a regular monthly column in MR/EN regarding current trends and developments dealing with various issues within the maritime industry.**



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## Government Update

rays operate at a wavelength of less than 10-11 m and can't detect small objects with the same capability as X-rays. On the other hand, traditional shielding, such as lead, does not generally prevent gamma-ray devices from examining the contents.

Devices are used to examine a variety of emissions from cargos and their containers. Radiation detectors are now worn on a regular basis by Customs inspectors and others, such as U.S. Coast Guard boarding officers. Other devices can detect minute traces of munitions or explosives.

While these X-ray machines and other devices may serve as an excellent early warning system, they may also provide false positives. Two recent examples involve a shipment that arrived in

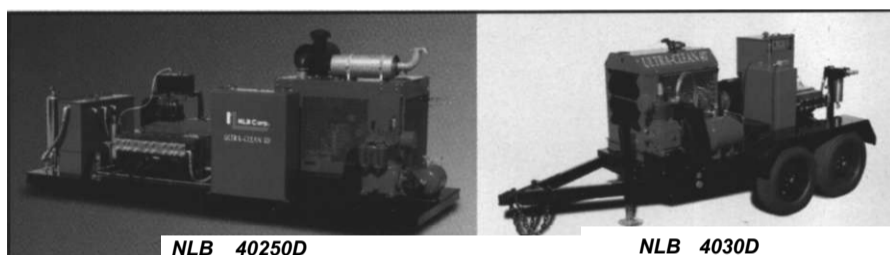
Miami in August and the container ship detained in New York in September. On August 8, the Customs Service was conducting a random X-ray examination of a container that had arrived from Israel. The X-ray revealed what appeared to be munitions. The bomb squad was called in and the container was carefully opened. Inside, along with other household goods, were two metal flower pots. One was made from a spent 155 mm artillery shell and the other was made from part of an exploded test missile. Neither was dangerous, but a portion of the port was shut down during the inspection. On September 10, U.S. Coast Guard personnel were conducting a routine examination of the container ship Palermo Senator when their radiation detectors were activated. A securi-

ty zone was immediately established around the vessel, which has recently arrived in Port Elizabeth, N.J. from Valencia, Spain. The vessel was escorted to anchorage near the Ambrose Light Tower where it was fully examined by personnel from the Coast Guard, Customs Service, FBI, Department of Energy, and U.S. Navy Seals. It was eventually determined that the radiation was being emitted by a container carrying clay tiles from Italy. Low level radiation is sometimes found in clay deposits. It has been reported that the vessel operator incurred demurrage costs exceeding \$50,000 while the vessel was being examined.

### Cargo Inspections in the United States

As noted previously, the rate of ran-

dom physical inspections of containers arriving in the United States has averaged at two percent, although the level has increased since the terrorist attacks. The U.S. Customs Service recently instituted a Sea Cargo Targeting Initiative. This initiative has three components: (1) adding new criteria to Customs automated systems that reflect the latest information about possible terrorist activities; (2) ensuring that all manifests are processed through the Automated Targeting System and reviewed by trained personnel; and (3) standardizing Customs procedure and practice when the system pinpoints a high-risk shipment. All high-risk sea cargo containers will be examined by non-intrusive inspection technology and the integrity of the container seal and the



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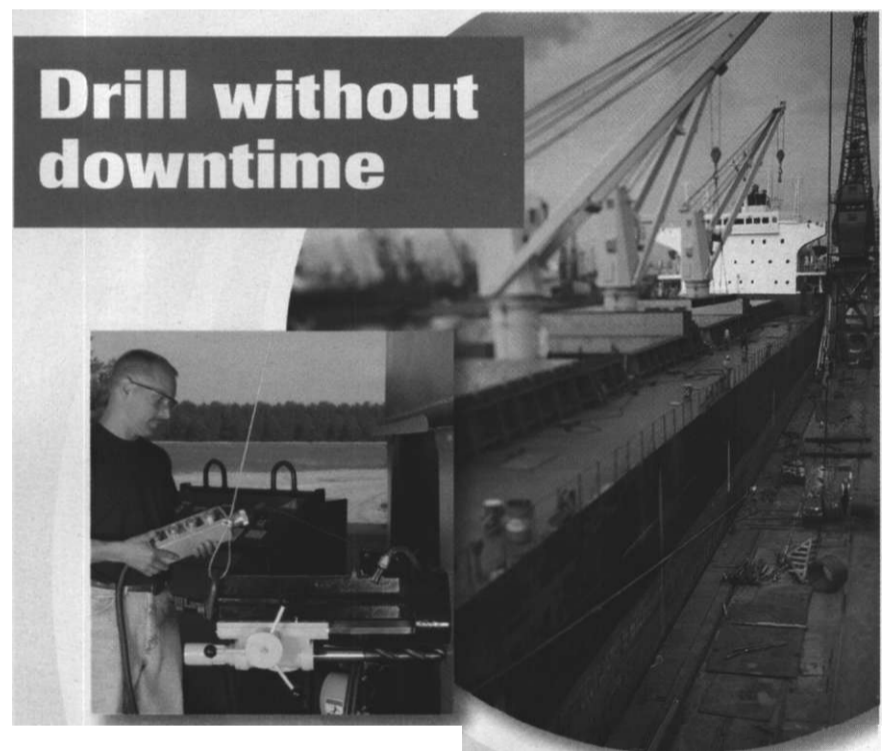
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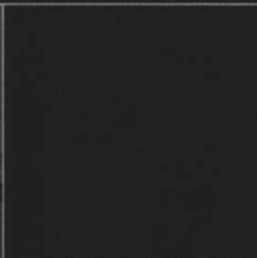
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## Government Update

container itself will be examined. The goal is to quickly segregate cargo into general and high-risk categories, so that general cargo can be processed rapidly.

Additionally, the Customs Service relies on intelligence reports, suspicious trading patterns, suspect paperwork, and reports from government agencies, such as the U.S. Coast Guard, to determine which containers and other cargo should be subjected to increased scrutiny.

## Cargo Inspections Abroad

Suspect containers scheduled to shipment to the United States are being identified before they leave the foreign country under two current programs: the Container Security Initiative (CSI) and the U.S.-Canada Smart Border Plan.

Under the CSI, U.S. Customs Service personnel are scheduled to be stationed (at the time of this writing) at the ports of Singapore, Rotterdam, Antwerp, Le Havre, Bremerhaven, and Hamburg. The U.S. Customs Service personnel work alongside the host country customs officials to target and pre-screen U.S.-bound cargo containers before those containers are loaded on the ship. The U.S. Customs Service hopes to develop agreements with the top 20 mega-ports involved in the U.S.-foreign trade so as to expedite the majority of such shipments. Controversy has arisen because some smaller ports are concerned that they will be placed at a competitive disadvantage, not having U.S. Customs Service personnel on site.

The United States and Canada have developed a bilateral approach because so much cargo bound for one

country arrives from overseas initially in a port of the other country. Thus, U.S. Customs Service personnel are assigned to various Canadian ports and personnel from the Canada Customs and Revenue Agency are assigned to various U.S. ports. The ports currently involved in the Smart Border Program are Newark and Seattle in the U.S. and Vancouver, Halifax, and Montreal in Canada.

The U.S. Government recently proposed to the International Maritime Organization (IMO), a specialized agency of the United Nations, that port states be authorized to stop and examine ships on the high seas when those ships are bound for a port of the port state.

## Risk Reduction

The U.S. Customs Service, along with numerous other federal agencies, is working to reduce the risk that terrorists will attack the United States by means of cargo shipped in international commerce. Increasing use is being made of intelligence-gathering through a wide variety of sources so as to identify potential problems before they manifest themselves. Two problems with such intelligence relate to data overload and quality. As the volume of intelligence information increases, it becomes difficult to distinguish between routine information (with its usual random variations) and information relating to actual threats. The quality of intelligence information varies drastically. Some is highly specific and accurate; much of it is vague; and some is totally erroneous. Acting on inaccurate intelligence information, as when the U.S. Customs Service requires an arriving vessel to 'pull' specific containers



Containership CMA-CGM Balzac, which was built by Hanjin Heavy Industries, could soon face stiffer security measures when coming in and out of ports.

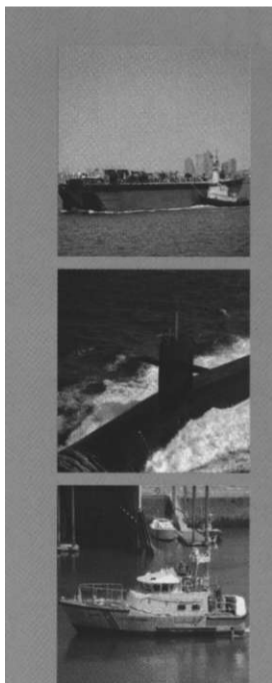
for detailed inspection even though the containers are not scheduled for offloading at that port, leaves everyone involved frustrated and encourages a lack of respect for the maritime security mission.

The Advance Manifest Filing initiative proposed by the U.S. Customs Service on August 8, 2002 has the potential to drastically change operational methods for all parties involved in U.S.-foreign trade. Under this initiative, if adopted, vessels carrying any cargo bound for the United States would be prohibited from loading the cargo onboard until 24 hours after they had submitted their manifest to the U.S. Customs Service for review. The concept is that the Customs Service would then have time to identify suspect cargoes and prevent their loading until thorough examination could be made. Doubts have been raised about whether the U.S. Customs Service could actually process in a timely manner the thousands of manifests it would receive daily. Additional concerns have been raised respecting non-containerized cargo, the role of non-vessel-operating common carriers (NVOCCs), freight remaining onboard for delivery to another port, and trade dislocation due to disparate treatment, among other things. International commerce has become increasingly time-sensitive. In many cases, cargo is not delivered until several hours before the vessel is due to depart. Obviously, the vessel's manifest cannot be prepared until the cargo has been delivered and the accompanying bill of lading presented. Time is money and the time lost in compliance with the proposed rule will be costly.

The Customs-Trade Partnership Against Terrorism (C-TPAT) is intended to provide shippers, carriers, intermediaries, and others involved in U.S.-foreign trade with an incentive to improve supply chain security. Businesses participating in this voluntary program agree to conduct a comprehensive self-assessment of supply chain security using C-TPAT guidelines, submit a supply chain security profile to Customs, develop and implement a supply chain security program, and communicate C-TPAT guidelines to other companies with which they have relationships. In return, participants may have a reduced number of Customs inspections when their cargoes arrive in the United States and access to the C-TPAT membership list, among other things.

Operation Safe Commerce is a more intense version of C-TPAT. Under this Operation, a container is spe-

*(Continued on page 23)*



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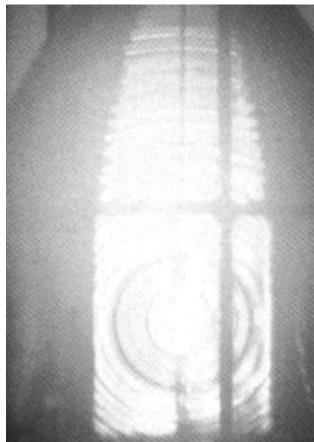
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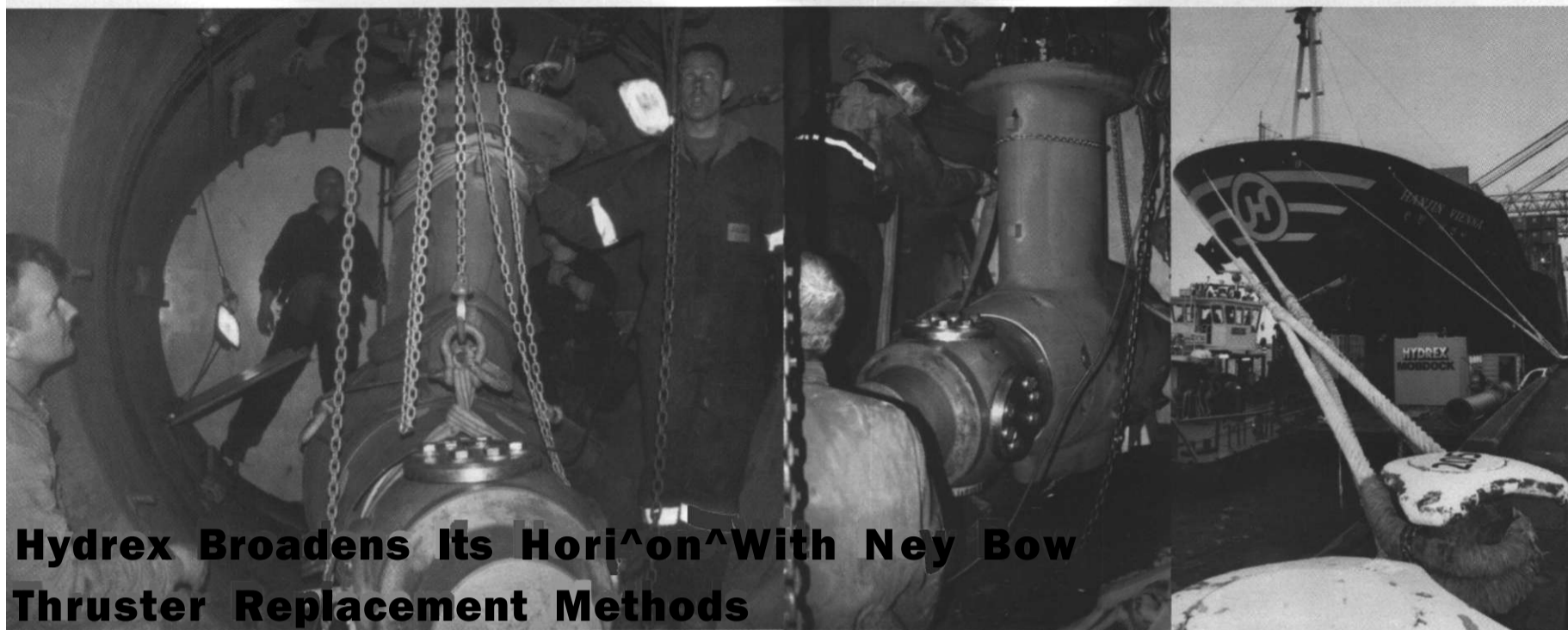
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## Hydrex Broadens Its Horizon With New Bow Thruster Replacement Methods

According to Boud van Rompay, executive director of Hydrex, "This new development will change the face of underwater repair work, as it provides a fast, yet top quality means to carry out such major jobs as thruster replacement and repairs."

Rompay is referring to the successful replacement of the removal, repair and subsequent replacement of the vessel's seven-ton bow thruster and propeller - all of which was performed within the loading and unloading schedule of a 5,477 teu container vessel — in the Port

of Rotterdam.

Relying on more than 30 years experience, Hydrex engineers developed the cofferdam principle and adapted to what is today known as the "mobdock" (mobile mini dry dock).

In this particular situation, the design of the vessel was studied in advance, followed by a technical plan that was created to remove the thruster underwater. Problems addressed included the shape of the vessel surrounding the bow thruster. Being irregular, it had to be measured precisely in order to construct

specially designed mobdocks — on both the port and starboard sides. The thruster tunnel had to be sealed completely in order to prevent any water entering while dismantling work was completed.

In response, a double-mobdock system was designed and manufactured before work commenced. Due to the degree of difficulty related to this task, Hydrex, (under Germanischer Lloyd certification) developed a new way to calculate, design and construct mobdocks for this purpose.

The new installation techniques

require exact precision in order to ensure water tightness, safety of workers and project success. Because weather conditions at the time of installation were inclement, installation was a challenge. However, since the mobdocks were well-designed, and the seals remained watertight, a secure and dry environment was present to commence the work 26-33 ft. (8-10 m) beneath the surface.

Following the first inspection, it was obvious that one of the propeller blades had been broken off. In response, the three remaining blades and blanks have to be secured over the positions where they had been. A support system for the block and tackle was then welded into place on the ship's hull and two large metal supports were cut away from the gearbox, at which time the thruster was lowered and secured so that it could be removed once the mobdocks were taken away.

The mobdock removal process involved bringing it back to the surface with the propeller blades inside. The thruster itself was then taken out from underwater, raised to the dockside and taken to the factory.

The vessel was able to sail on its next leg of the journey after loading with containers was complete. Repairs were performed on the thruster engine and propellers, and all was readied for the return of Hanjin Vienna to Rotterdam within the next couple of weeks. This time the procedure for fitting the mobdocks in place differed from the first time, as they were already lowered underwater prior to arrival of the vessel.

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## Keppel Performs Speedy FPSO Conversion

Keppel Shipyard, the marine unit of Keppel Corp. has broken new ground for fast track conversions of highly complex Floating Production Storage Offloading Facilities (FPSO) with the delivery of FPSO Brasil to Single Buoy Moorings (SBM), Inc.

The workscope on Brasil for the Keppel Yard is significantly larger than Espardarte FPSO, which the yard previously set a record in 2000 as the most complex conversion — completed in a little more than 10 months.

The 256,712-dwt Brasil will be leased to Petrobras SA for deployment in the Roncador Field in the Campos Basin off the coast of Brazil. The vessel, which is capable of handling up to 100,000 bpd of crude oil production and a storage capacity of approximately 1.7 million barrels, is on a very strict production deadline — according to shipyard executives.

## Nils Holgersson Up And Running Again

TT-Line ferry, Nils Holgersson, which had dropped out of service due to damage on one of its two pod drives, departed Lloyd Shipyard in Bremerhaven the evening of September 6, 2002, bound for Travemunde to resume scheduled service. Since



Siemens and Schottel had a replacement propulsion module already on hand for this project, the loss of the ferry's sail time was kept to a minimum due to an even exchange of the faulty module.

The work on Nils Holgersson, which was completed in a matter of five days, involved the repair of an installation error in the cabling of the vessel's monitoring system, which ultimately led to the failure of a drive — per an examination of the defective SSP at the Schottel-Antriebs-technik GmbH in Wismar.

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utives.

Keppel has also reached out to the Middle East market as a result of the integration of its offshore and marine businesses under its subsidiary — Keppel Offshore & Marine. For the first time, Keppel's O&M yard, Arab Heavy

Industries in Ajman, UAE, performed the repair of a jack-up drilling rig, Ekhabi, which was working in the Persian Gulf for its owner, Far East Marine Company. From Singapore, Keppel FELS supported and worked with AHI on the execution of the job for the rig.

## Ship Repair & Conversion

Keppel has another repair contract in the works for Foresight Drilling's Foresight Driller V, expected to be completed in October 2002.

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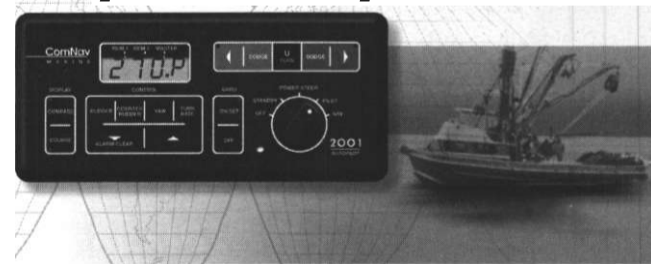
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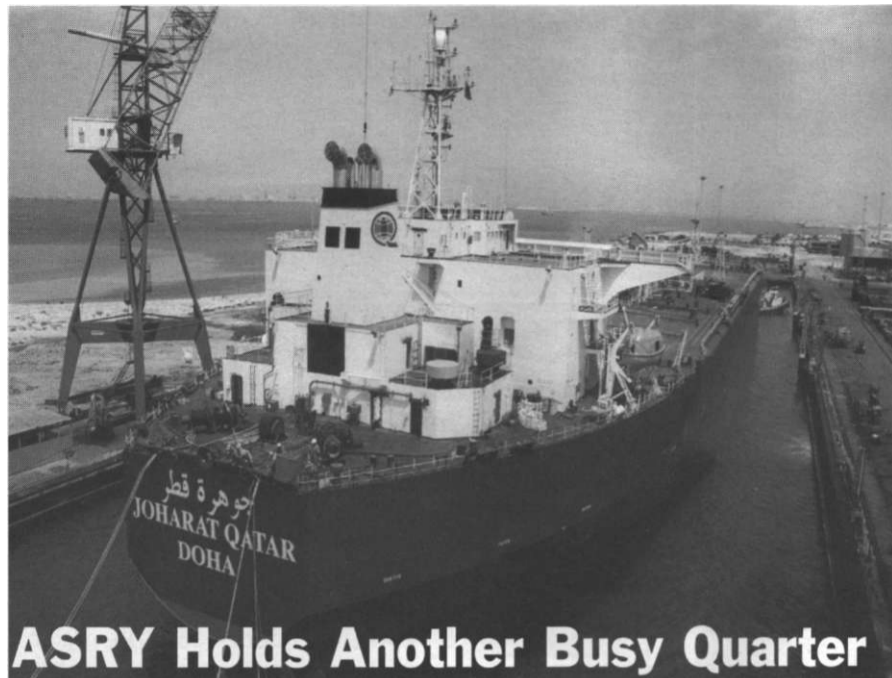
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## Ship Repair & Conversion



### ASRY Holds Another Busy Quarter

Throughout the last quarter — April-June 2002 — ASRY has not slowed down its workflow. The yard, which has been filled to capacity since the beginning of this year, repairing approximately 42 vessels, has been especially busy the last three months — repairing a selection of 23 vessels. Of this group, four were of ULCC and VLCC class - the largest being Stena King at 457,927 dwt. An additional six vessels were more than the 40,000 dwt size.

As is customary within ASRY, there has been a great diversification in the variety and amount of vessels that have been repaired during this period. These have ranged from large tankers to Bulk Carriers, RoRo and general cargo vessels. Work has also been performed on tug boats and floating docks.

Regarding the ULCC and VLCC range, vessels that visited ASRY recently, include A1 Tahreer at 284,532 dwt; Takai at 239,999 dwt, Berge Bragd at 310,999 as well as Stena King at 457,927-dwt.

The last quarter was also busy for the yard in terms of steel repairs with more

than 2,046 tons being replaced across a broad spectrum of vessels — representing an increase of approximately 64 percent during the first three months of the year.

Similarly there has been no halt in the demand for painting services during this period.

More than one million sq. m. of painting were completed, representing a 95 percent increase during the first three months of the year. With this in mind, ASRY has gone to establish itself as one of the leading yards in the world for blasting and painting services - now specializing in LNG and LPG carriers.

The yard has also established a joint venture with Hydrolink, the Sharjah-based specialist engineering company, to provide a complete range of hydraulic services to vessel owners and operators. The two Gulf companies have signed a co-operation agreement, allowing Hydrolink and ASRY to extend services they offer to mutual clients.

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## UMC Goes Beneath The Surface

Underwater Maintenance Specialists (UMC) has carried out another hull plate insert repair via its Dubai Team on VLCC at Fujairah Anchorage. In what is quickly becoming routine, UMC's Fujairah team took to the VLCC to fix its flat bottom plating. The area in question was experiencing internal corrosion, which led to a hole to form. Following initial inspection and conference with the vessel's owners and attending classification society surveyor, it was decided that the defective plating would be removed and replaced with new 31 mm thickness material. The affected area, of which was an internal frame, had to be cut back accordingly - a new 500 x 400 mm insert was then subjected to non-destructive testing - and repair was considered permanent. In addition, the exterior of the plate, was covered (as is standard practice at UMC), with an underwater coating to offer protection against corrosion.

Returning to the yard again is the U.K. Royal Fleet Auxiliary, which has once again awarded the routine underwater



propeller polishing of flotillas propellers, to UMC. The company, which has performed this type of the work for more than three years, will carry out some of the work from its offices located in the UAE.

UMC has also developed procedures and equipment for the in water replacement of stabilizers on a variety of vessels of different sizes. In these instances, not only were the stabilizers replaced, but the main and inboard bearings have also been renewed before the replacement stabilizer has been installed.

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## United Defense Receives Theater Surface Award

United Defense Industries, Inc. received the Theater Surface Combatants Award for Excellence, at its shipyard in Norfolk, Va. This award was presented to NORSHIPCO, a member of the United States Marine Repair (USMR) family of shipyards, during a ceremony at the yard in August. Rear Adm. **William J. Cobb, Jr.** presented the award to **Tom Epley**, NORSHIPCO's president and general manager. NORSHIPCO received this honor for providing exceptional support to the Program Executive Office for Theater Surface Combatants throughout the

planning, scheduling and execution of the Extended Docking Selected Restricted Availability for USS NORMANDY.

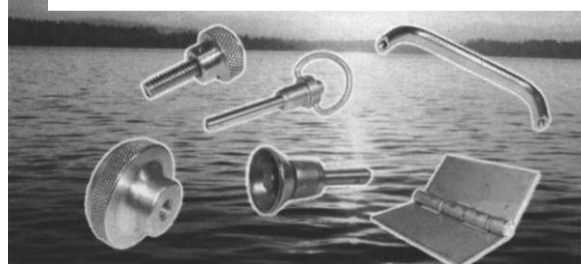
Additionally, NORSHIPCO met all milestones on or ahead of schedule and accomplished the entire work package seven days early.

The work package included system and component upgrades and regular maintenance, including hull girder modifications and installation of the all-electric ship alt.

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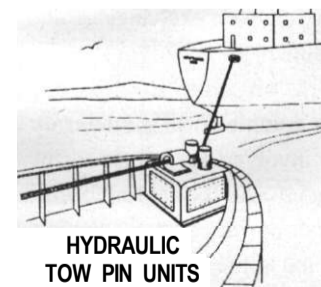


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# Where Everyone is A Celebrity

*That is the basic business principle that has sustained Dietmar Wertanzl, senior VP of Fleet operations for Celebrity Cruises, since he began his career with the industry in the late 1970's. Not even 30-years old, Wertanzl began on what was then known as Norwegian America Line's Vistafjord as a dining room steward, so swept up by the magic of sea travel.*

By Regina P. Ciardiello, managing editor

Wertanzl's philosophy is simple. Treat your employees and customers the way that you would want to be treated. He always falls back on this simple notion: In order to run a successful fleet — from both the hospitality and technical end — everyone must work together to educate one another. In fact, Wertanzl swears by three components that he says are key to running a successful fleet: "With people, Through people, For people." According to Wertanzl it is the people — both customers and staff — from the vessel's master, to the wait staff in the ship's restaurant, who make the brand what it is. "The key to a successful fleet starts with customer satisfaction," Wertanzl said. "Just think of it as an upside down pyramid, except your guests are on the top, and executives are at the bottom. We're all working toward a common goal, which is a customer-oriented philosophy with one link that combines nine ships into an entire fleet."

This "one ship concept" is the model for the rest of the Celebrity fleet. New technology and a high level of management, or the goals and values that are present on one Celebrity vessel — is the basis for an entire fleet.

## More Than Just A Job

For Wertanzl, his ties to the cruise industry are both professional and personal. It was through his love of travel, and through his interest in the glamour of classic ocean liners, he became enamored by the high seas. "I was always fascinated by old ocean liners," Wertanzl said. "I always envisioned myself somewhere in the travel and hospitality industry" His inspiration was furthered by a quote, which he lives by that was once said by the German philosopher Goethe, "If you haven't traveled, you've only read one page in the book," he added. Little did he know that several years later, he would turn his passion into a building block towards his career in the cruise industry.

So Wertanzl, eager and ready to learn — entered hotel management school in his native Austria — subsequently landing his first job on the Vistafjord as a dining room steward. Much of Wertanzl's business and management philosophies and styles were formed during his early days when he based his ambitions and work ethics on the advice and experience of his elders and contemporaries — a role, which he now has fallen into in his current position.

Prior to joining Celebrity this past May, Wertanzl, served as senior vice president of Hotel Operations at

Crystal Cruises — a position that was as fresh as it was challenging. Wertanzl supervised the hotel end of this new line, which at that time consisted of two vessels — Crystal Harmony and Symphony. While Wertanzl is quick to mention that the time he spent at Crystal was one that was unique and special, he was ready to accept Celebrity challenge this past spring when he was tapped by the line to take on his current position, which requires him to meld his hospitality skills with his technical knowledge.

Wanting to "make a difference" and to give something back to the industry that has been so kind to him, Wertanzl, desires to make a difference. He wants to not only be the best at his profession, but wants his staff to follow in his footsteps. Therefore, he has taken on the role of not only manager, but also as an advisor, mentor and role model to newly-hired staff, who now wear the same set of shoes that he did coming out of hotel school. As an unofficial "spokesperson" for the cruise industry, Wertanzl stresses to his contemporaries that this is an industry that is a lifestyle — as well as a job. Meaning that you must really love what you do and be driven — in order to succeed. This type of "passion" is reflexive of a trio of components that encompass Wertanzl's "Three Ship Segment" or simply stated: "Three S's - safety, service and style. According to Wertanzl, if these three items feed of each other, the rest will fall



Celebrity's senior VP of Fleet Operations, Dietmar Wertanzl, models his work ethic according to these three components: "With People, Through People, For People."

into place. "They (the 3 S's) all differ, but they all have to blend together," Wertanzl said.

While it's true that the technical engineers and officers onboard all Celebrity vessels must work to ensure that all classification and regulatory items are met for safe sailing, they also must understand the style and service end as well. As should someone such as a din-

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## Personal Profile • Dietmar Wertanzl

ing room steward be kept abreast of safety regulations onboard. "The principles of how the ship is managed are the same for everyone," Wertanzl said. Everyone works together to ensure that safety comes first."

With leadership a constant theme throughout the operation of each vessel in the fleet, the 3 S's are used as a tool to mend any loopholes that may occur. "We're only as good as the weakest link in our chain," Wertanzl said. "Leadership has to be throughout the marine and hotel sides — with the 3 S's there's no hole there."

### Positivity Despite Tragedy

When *MR/EN* spoke with Wertanzl via conference call from his office at Celebrity's Miami, Fla. headquarters, the nation was on the brink of the one-year anniversary marking the terrorist attacks on New York and Washington, D.C., which has had lingering effects on the economy and cruise segment. But according to Wertanzl, the industry is coming back with a vengeance. "Obviously the whole industry has suffered from this tragedy," he said, "But it's (the industry) is coming back faster than we ever anticipated."

According to Wertanzl, in the days following the terrorist attacks, Celebrity staff — both shoreside and at sea — adopted a Strive = Thrive philosophy. Meaning that quick thinking and proper planning in response to this tragedy's immediate impact, positioned the company for a rapid bounce back as of today.

Since the Port of New York/New Jersey was forced

to cease operations for several weeks following the terrorist attacks on New York City, Celebrity had to therefore reposition its Bermuda-bound *Horizon* and *Zenith* vessels to depart from the Port of Philadelphia — a move which despite the surrounding circumstances — proved beneficial for the company. The two vessels now operate permanent Bermuda cruises during the spring and summer months out of Philadelphia. In addition, Celebrity also operates another vessel headed towards Bermuda — *Galaxy* — out of the Ports of Baltimore, Md. (April - November); and Charleston, S.C. (December - March) on alternating 10 and 11-night cruises

While it may seem that the future of the cruise industry will come to a standstill (at last check there were no newbuilds scheduled beyond 2006), Wertanzl would disagree whole-heartedly - at least in terms of Celebrity's future. With the inauguration of four new vessels, which make up the Millennium Class, within the last two years, Wertanzl's strategic plan is to focus on maintaining a consistent profitability while continuing to employ and implement new technologies, such as Internet and e-mail access at sea.

But, while he wouldn't elaborate on what the future holds for the line, he did hint that this might just be the quiet before the storm for Celebrity. He didn't outline any big marketing or fleet expansion plans, or even go into detail of how the line would plan to expand, he just simply stated with the enthusiasm of a super hero: "Fasten your seatbelts — there's more to come."

## Gladding-Hearn Delivers New Bermuda Ferry Contract

Gladding-Hearn Shipbuilding, Duclos Corporation, has delivered two new fast ferries to the Government of Bermuda, Ministry of Transport. The first vessel was delivered in March; a sister ship arrived in Bermuda in June.



The ferries provide commuter and excursion service between Bermuda's capital, Hamilton, and the neighboring towns of Southampton and Dockyard.

The Somerset-Mass., shipyard was chosen from among 12 yards from four countries, Australia; Norway; Denmark and the U.S., that competed for the project. Designed by Incat Designs, Sydney, Australia, the 250-passenger ferries are part of new "seamless" transportation system involving integrated docks for bow loading and electronic tickets that are compatible with the government's bus system, explained government officials.

Each all-aluminum vessel measures 84 ft. (27.72 m) with a beam of 30 ft. (9.2 m), drawing 5.3 ft. (1.6 m).

The two ferries are powered by twin Detroit Diesel 12 V-2000 engines, each delivering 965 Bhp (720 BkW) at 2100 rpm. They drive 5-bladed Ni-Br-Al (nickel-bronze-aluminum) propellers via Twin Disc 2.5:1 reverse/reductions gears. When fully loaded the vessels reach a top speed of 25 knots. The main cabin of each vessel seats 110 passengers, while another 98 passengers can seat on the partially-covered upper deck. Passengers board and depart the vessels through doorsport and starboard at midship and at the bow. Interior accommodations include upholstered seating, a concession, two heads, and a 150,000 Btu air conditioning system.

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fContinued, from page 16)

daily sealed and monitored from closure until arrival at its final destination. The Operation is in the early development stage, but commenced with a shipment in June 2002 of automobile tail lamps from the Osram Sylvania plant in Nove Zamky, Slovakia to another plant in Hillsborough, N.H. Look for this Operation to be expanded as monies and technology permit.

#### Container Security

As demonstrated in Operation Safe Container, the emphasis is shifting from trying to find the needle in the haystack to monitoring the haystacks to keep needles out. The federal government and groups in the private sector are funding efforts to develop economical tamper-proof seals for use on containers. These seals would show if an attempt had been made to enter the container subsequent to sealing. Global positioning system (GPS) transponders are being developed for use on containers in an attempt to track those containers on a real-time basis to determine if they deviate from their intended track or are delayed for an inordinate amount of time. New containers are being developed that would be more tamper-resistant than current ones. After all, the doors are not the only way for a determined party to enter a container. These initiatives, when implemented, will not only raise the cost of container use, but will rapidly make old containers obsolete.

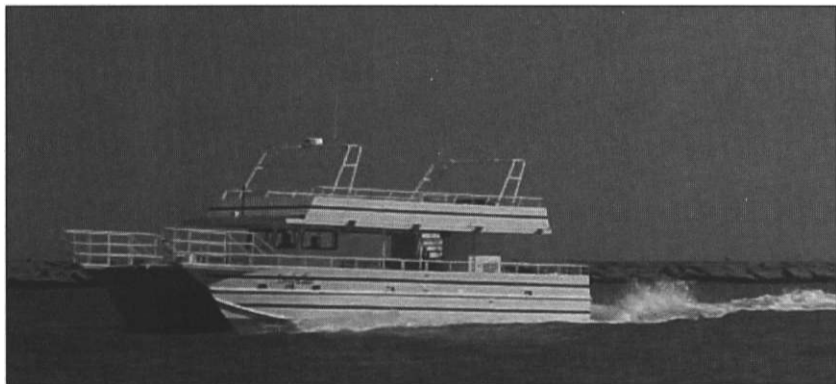
#### Summary

The traditional methods utilized with respect to sea-borne cargo in the U.S.-foreign trade will no longer suffice. Changes have been imposed because of the September 11, 2001 terrorist attacks and the re-examinations resulting therefrom. The integrity of U.S. supply chain has improved dramatically since that date and will continue to improve. Efficiency, though, has suffered and will continue to suffer until parties involved in the process implement new business models that accommodate the new security requirements while capitalizing in new technology.

In the meantime, unresolved issues include who ultimately bears the cost of added security measures and who bears the costs related to detention of a vessel (and delay of its cargo) due to unscheduled Customs examinations (e.g., box pulling).

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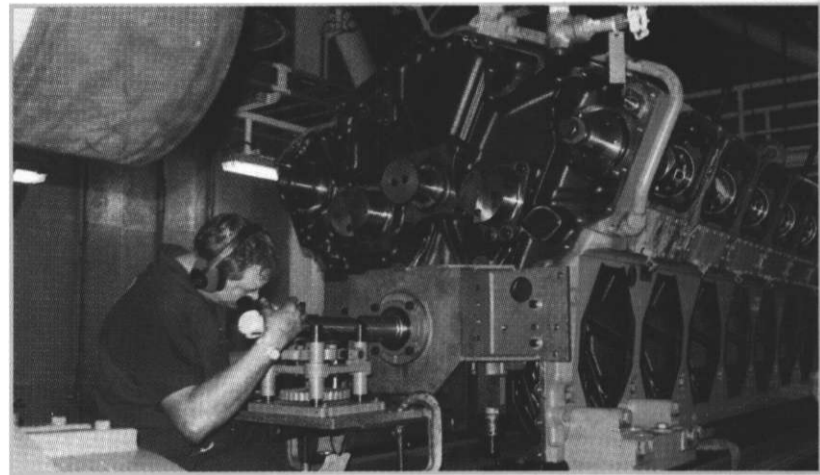
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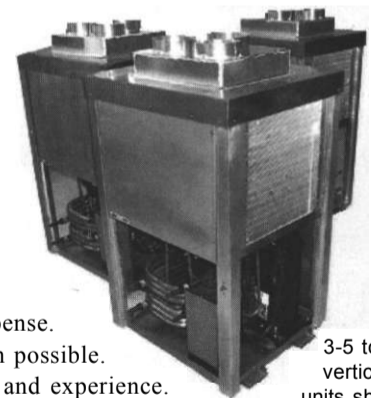
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Maritime Reporter & Engineering News

# Fresh Fuel Cell Initiatives

Two recent European initiatives, both involving power systems supplier Wartsila Corporation, have given fresh impetus to the development and application of fuel cell technology aboard ship. The Finnish organization has entered into a pact with Danish firm Haldor Topsoe aimed at bringing cost-competitive fuel cell powering solutions to the market. It has also thrown its weight behind a major new, industry-wide European research program focusing on the technology for commercial shipping.

Increased European efforts to make the concept a cost-acceptable reality in

waterborne transportation follow an early take-up in the naval field. A 250 kW Siemens fuel cell of the proton exchange membrane (PEM)-type is being installed as part of a hybrid power and propulsion configuration adopted for a German-designed series of new-build submarines.

In the U.S., the federal government has this year given a fillip to the concept of fuel cell power in commercial marine applications, through its award of a \$100,000 grant to the San Francisco Bay Water Transit Authority towards the development of a zero-emissions com-

muter ferry. The WTA is putting \$25,000 from its own resources into the exercise, entailing the design, cost estimates and final drawings for a fuel cell-equipped ferry.

The new agreement between Wartsila and Haldor calls for the development of fuel cell products in the power range beyond 250-kW, for both the marine market and the distributed power generation sector. The claimed attributes of the technology are ultra-low emissions, and high levels of reliability and efficiency, although the collaborators acknowledge that this raft of benefits



by David Tinsley,  
technical editor

must be provided at acceptable cost if market penetration is to be achieved.

Haldor Topsoe has a long track record in the field of catalysts and energy conversion, and its work on fuel cells has concentrated within the past five years on solid oxide fuel cell (SOFC) technology. One element of its research and development activities has been a 10-

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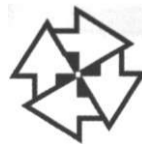


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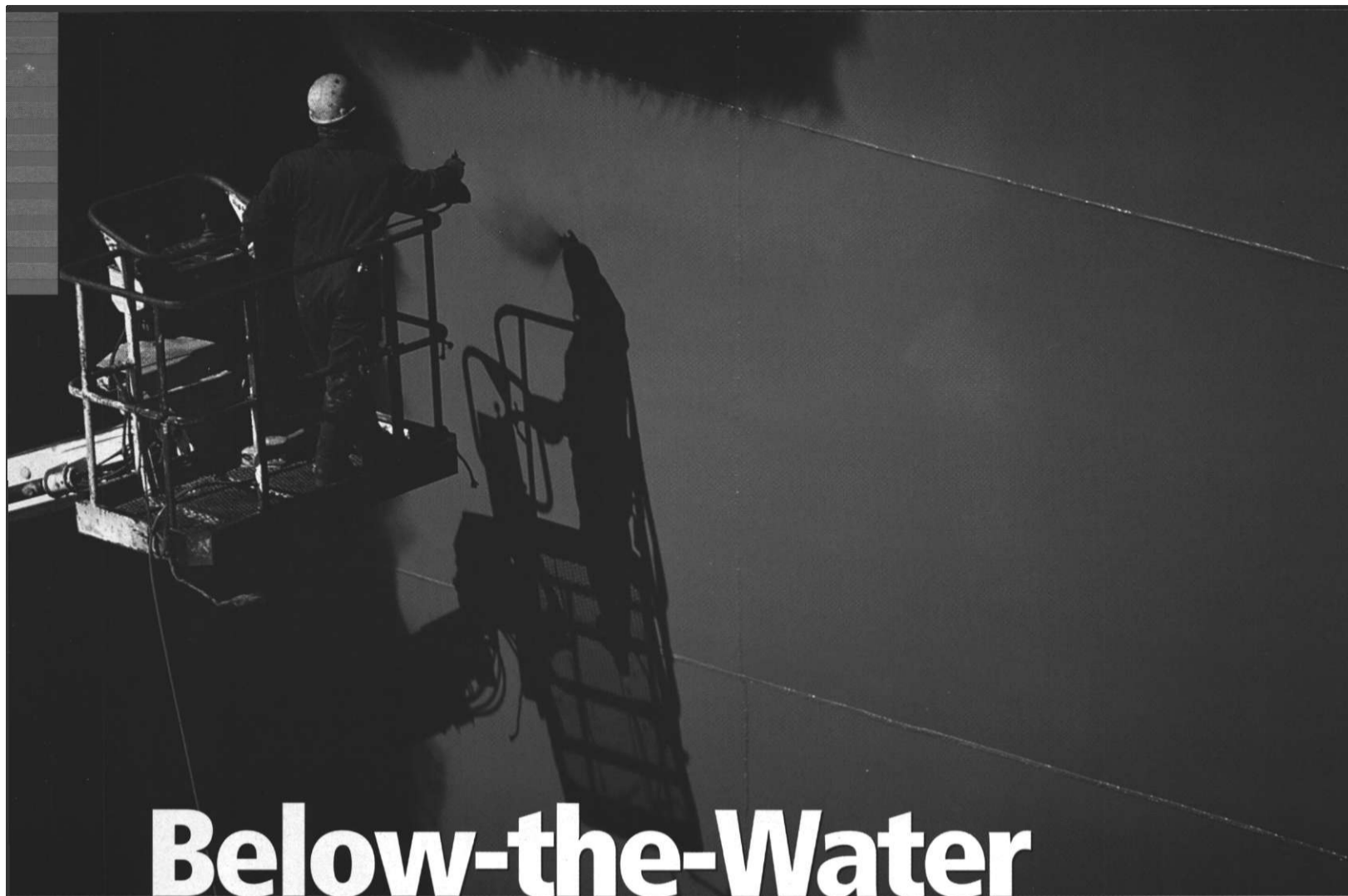
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## Investment in Design • By David Tinsley

year involvement in the Danish SOFC fuel cell program led by the Danish National Laboratory at Riso.

Readers of *MR/EN* may recall the firm's contribution to the seminal project involving the fitting of selective catalytic reduction (SCR) plant to the two-stroke MAN B&W engines in a series of 38,000-dwt bulk carriers delivered between 1989 and 1991 for transpacific trade into the San Francisco Bay area.

In addition to the cooperation with Haldor Topsoe, Wartsila is a participant in a new, European Union-aided pilot study to define the basis for the development of fuel cell systems for merchant ships. Implemented in June this year under the project name FC-Ship, the initiative has been prompted

by the perceived environmental bene-

fits of fuel cell technology, as regards both exhaust emissions and noise. EU funding is expected to account for more than 50-percent of the budgeted costs of the 24-month program.

Drawing in 21 companies and institutions from EU countries and Norway, and coordinated from Oslo by the Norwegian Shipowners' Association, FC-Ship's initial objective is to identify and define demand for fuel cell systems in both propulsion and auxiliary applications, evaluate safety and operational needs, and assess the economic and environmental potential for waterborne transportation. Conceptual designs of fuel cell-powered vessel, including a passenger ship, are to be prepared, and project teams will undertake case studies and examine infrastructural require-

ments.

If the prospects are regarded as worthwhile, FC-Ship will provide a framework for follow-on research and development to help nurture the uptake of the technology by commercial marine users.

### Simulating Evacuation

In Greek mythology, the Trojan hero Aeneas saved his father by carrying him out of the burning ruins of Troy on his shoulders. The story of Aeneas has inspired the name of a new computer tool developed in Germany for simulating and optimizing passenger evacuation from ships. Aeneas offers shipyards and shipowners a means of performing fast and reliable analysis of the evacuation process, providing increased planning security at the early design stages

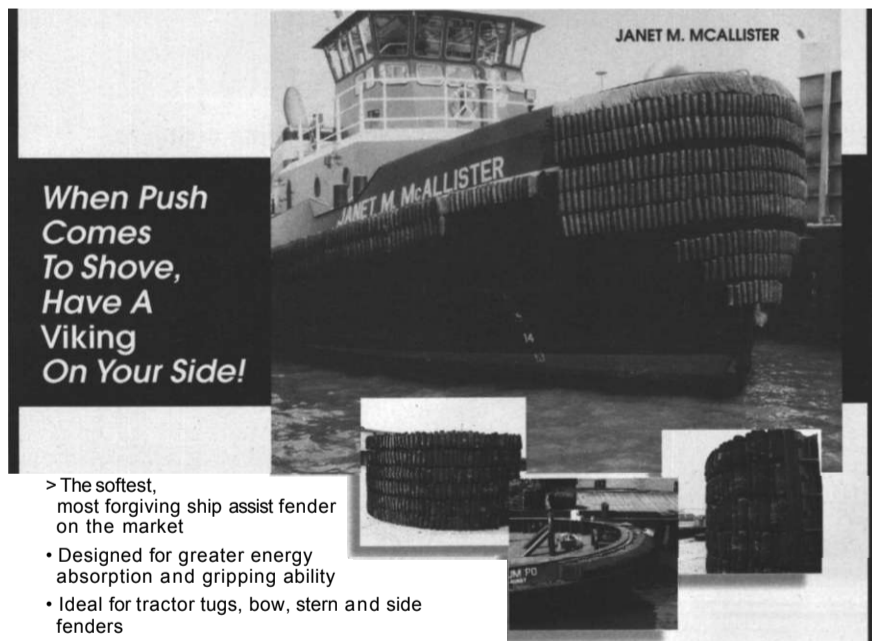
of a newbuild project, as well as assisting ongoing safety management and training functions.

Aeneas is the product of technical cooperation between classification society Germanischer Lloyd and pedestrian flow simulation specialist TraffGo, an offshoot of the University of Duisburg. It is designed to provide a realistic representation of evacuation processes by identifying optimum exit routes and possible bottlenecks. Fundamental to the whole are innovative computer models, known as 'agents', which each represent the main characteristics and actions of a passenger proceeding through the corridors, stairways, public spaces and decks of a ship in accordance with given scenarios.

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regard applications of the system in the field of safety management, such as for crew training purposes and for the improvement of emergency preparedness, as potentially even more important than the obligatory IMO evacuation analysis, where required. The versatile tool can also be used for operational needs, as in determining boarding and disembarkation times, or assessing passenger flows in public spaces, for instance.

### Purposeful Chinese

The growing stature of Chinese shipbuilding on the international stage is all the more impressive for the extent to which the industry is embracing specialized vessel categories and higher added-value forms of tonnage.

Whereas the output spread from other parts of the Far East is limited by the huge volume production requirements of large yards engaged in the low-margin fields of ship construction, China's shipyards are developing an ever-wider portfolio. A

growing capacity is underpinned by a propensity for meeting shipowners' specific needs across a very broad platform. To a large extent, the development is export-led, although the response to new domestic needs is also cultivating a broader industrial marine base.

One example is provided by Jiangnan Shipyard's current construction of the first of possibly two train ferries to link the Chinese mainland with the southern island of Hainan. This pioneering project, based on a home-grown design, entails a vessel type offering a loading capacity for about 40 rail-freight wagons, or alternatively 50 light trucks, plus facilities for 1,200 passengers.

Technical design work has also been carried out elsewhere in China for another infrastructural scheme, which envisions a new breed of rail ferry for a much longer route between Dalian and Yantai, across the Bohai Strait.

Sophisticated domestic projects of this nature provide a technical basis for future forays into the export newbuild market.

### Houston Celebrates Rickmers Hamburg's Maiden Voyage

The Port of Houston was the scene of festivities aboard Rickmers Hamburg last month as Rickmers representatives and customers alike celebrated the success of the Superflex Heavy MPC (multi-pur-



pose container carrier) vessel's maiden voyage.

Delivered June 20, Rickmers Hamburg's trip has taken her from Shanghai via Masan (South Korea) to Hitachi (Japan) and from there to the East Coast of North America. It was while on this stage of its voyage that she stopped off at the Port of Houston. Following the party and loading of U.S. exports, she will return to the Far East where she will join Rickmers' Round-the-World service. Her subsequent eastbound voyage will take her via the US once again. This time she will proceed to Europe, however, and is expected in Hamburg in November of this year, where additional festivities will commence.

"The highlight of the party was the discharging of a 242 ton generator, lifted by one of the vessel's four cranes. The largest of these are rated at 320 tons and can be twinned for lifts of up to 640 tons. This cargo operation was an impressive demonstration of the vessel's capabilities."

### Izar And Rolls-Royce Plan High Speed Cargo Vessel

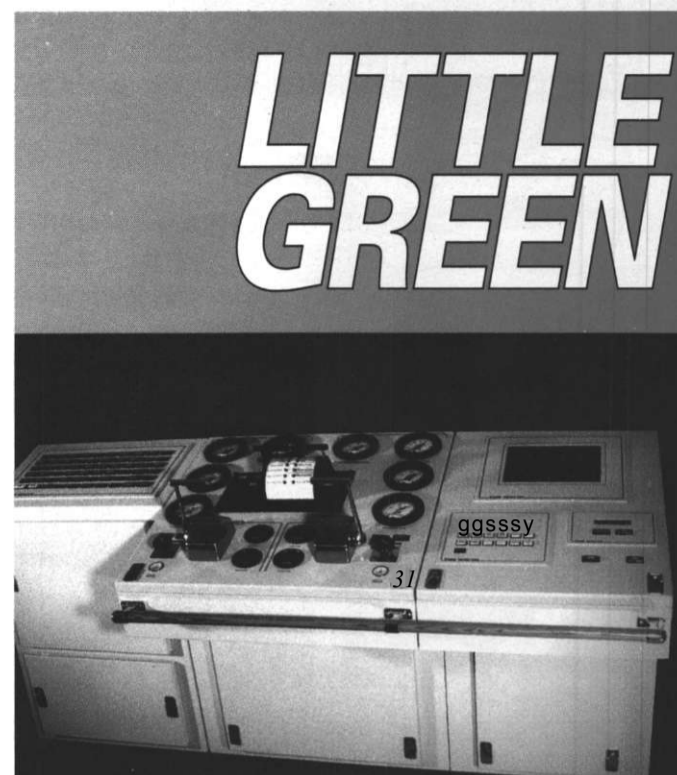
Spanish shipbuilder and designer IZAR and Rolls-Royce have signed a contract for a new 696-ft. (212-m), 3,400 dwt European High Speed Cargo Vessel (EHSCV), which is intended to be a cost-effective short-sea shipping alternative to road transport in Europe.

The monohull EHSCV, which will be powered by two Rolls-Royce MT30 gas turbines and Rolls-Royce Kamewa waterjets, will boast a baseline design enabling 124 trailers to be carried at a service speed of 37 knots — economically competitive with road transport on routes above 300 n.m.

The design meets the needs of ship owners wishing to develop fleet plans in line with the European Union's Marco Polo program, which is designed to give financial support to projects which improve the environmental performance of Europe's freight transport system.

Jose Ramon Lopez, IZAR director for Innovation, said, "We believe there is a strong market for this ship, which offers a cost-effective solution to an urgent European transport issue."

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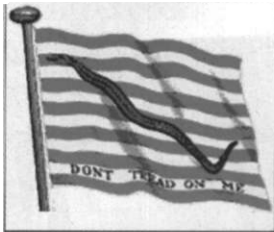
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# The Littoral Combat Ship: Force Multiplier for the 21st Century



By *Commander Joseph Chiaravallotti, U.S. Navy*

*The Littoral Combat Ship (LCS) is a new ship design concept being considered to combat emerging threats in the littoral. It will be a relatively small, focused-mission combat ship that will revolutionize the way the U.S. Navy builds and fights ships. LCS, with its high speed, shallow draft, and maneuverability, will be optimized to serve as a force-multiplier for other larger, multi-mission ships.*

## Old Problem/New Solution

The U.S. Navy in the first years of the 21st century faces a similar problem that confronted naval powers at the turn of the last century. The capital ship then was the Dreadnought. Its mere presence could have an impact on events at sea and ashore. In an age of direct, line-of-sight operations, the missions of the fleet required naval forces to operate in the littoral, that area of naval operations close by friendly or adversary coastlines. The Royal Navy, and other navies with capital ships, came to realize that when their capital ships were operating in the littoral, they were increasingly vulnerable to a much smaller and less



expensive weapon: the motorized torpedo. These torpedoes were deployed from very small and very fast Torpedo Boats, which presented a particularly challenging target for the Dreadnought's massive but slow-firing and slow-train-

ing guns. The Torpedo Boat, with its high speed, shallow draft, and maneuverability was optimized to oppose the Dreadnought. To counter the Torpedo Boat threat, the Royal Navy developed the Torpedo Boat Destroyer, the forerunner of our current day Destroyer. The Torpedo Boat Destroyer was far less capable than the Dreadnought, but because it was a small, faster, and much more agile ship, it was very capable of hunting down and destroying Torpedo

Boats. Just as the Torpedo Boat Destroyer was developed to counter littoral threats more than a century ago, the LCS would counter current and future threats in the littoral.

The U.S. National Military Strategy requires the Navy to project power ashore, assure access, and support fast-moving forces. To do this, the Navy must position itself in the littoral with persistence in the face of a rapidly changing, highly technical and sometimes unconventional or asymmetrical threat. The need for assured access for U.S. forces has been recognized for some time. However, the events of the last two years, to include the recent war on terrorism, has brought a sense of focus and energy for the need to provide assured access in a very dangerous and unpredictable environment.

## A "Family" Approach

The LCS is a key element of the Navy's innovative Surface Combatant Family of Ships (SCFOS) approach. The family includes the multi-mission DD(X) destroyer, CG(X) cruiser and the existing AEGIS fleet of guided-missile destroyers and cruisers, and the focused-mission LCS. The Family of Ships concept evolved from the Mission Need Statement for the U.S. Navy's Surface Combatant for the 21st Century, and has two major advances from previous shipbuilding programs. First, the SCFOS approach can easily adapt to, or incorporate, advances in technology with less technical risk and without major modifications to the ship's structure. Secondly,

Top This past spring, Northrop Grumman was awarded the coveted DDX contract from the U.S. Navy to complete system design for this new family of advanced, surface combatant vessels.

Bottom: Rear Admiral Don Loren views an 36-ft. (11-m) RHIB (Rigid Hull Inflatable Boat), which has been configured for unmanned operation by the Navy's Coastal Systems Station in Panama City, Fla. The Navy plans to rely heavily on unmanned systems for the Littoral Combat Ship. Admiral Loren is deputy director, Surface Ships, Surface Warfare Division, in the Office of the Chief of Naval Operations. (U.S. Navy photo by Rob Cole.)



Joint Venture HSV-X1, a high-speed wave-piercing catamaran, is one of the transformational ship concepts being evaluated by the Navy. (U.S. Navy photo)

the focus on a "family" of ships provides the design flexibility to fulfill all operational requirements across the broad spectrum of naval warfare areas.

Technology is maturing at such a rapid pace that traditional ship designs and installed combat systems can become outdated even before entering the fleet in significant numbers. The life cycle of most U.S. Navy ship classes, from initial concept design to decommissioning and disposal of the last ship can reach up to 40 or 50 years, sometimes more. The Navy thus faces considerable challenges in ensuring that its ships stay ahead of advancing threats while remaining highly capable and operationally relevant.

Currently, the means available for modernizing ships' systems is through field changes to machinery and weapons systems. Although very effective in keeping installed systems up to date, this means of enhancement is not intended to replace entire legacy systems with modern ones. As such, the Navy's new surface combatants will ensure adaptability through modular design, spiral development and open architecture. Modular design will enable a ship like LCS to remain at the highest state of technological readiness throughout the ships' life span.

Since WW II, for example, despite the fact that "programmed" surface combatant operational lifetimes grew to as much as 35 years, the Navy rarely retained surface warships past the 26th year of service regardless of the hull's remaining service life. This problem could be overcome by the LCS design. As new technology matures, it will be installed in modules for test and evaluation. Once the technology has been proven ashore, the modules can be installed in ships for at-sea testing and integration with other systems. When the risks of installing the technology have been mitigated to an acceptable level, operational units can replace legacy models with more technologically advanced ones. Moreover, the LCS design could allow for modules to be replaced without putting the ship in dry-dock, cutting holes in the side of the ship, or running lengths of cables and piping throughout the ship, which will reduce modernization costs. This process will not only be used to upgrade installed systems, but also for changing out entire systems. It will also significantly reduce the risk of investing in new technology by not jeopardizing an acquisition program on the success or failure of a single technology.

Modularity also enables the Force Commander to tailor LCS for the anticipated threat in the theater that the force will deploy. LCS will optimize its configuration in secondary mission areas for a specific threat area, adding significant and focused capability to the force and greatly enhancing war fighting capability and flexibility.

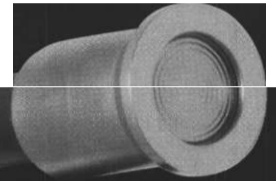
#### From DD21 to LCS

The DD21 was the forerunner to the Family of Ships program. The DD21 designers faced a challenging task: design a ship to perform traditional multi-mission tasking such as Anti-Air Warfare, Anti-Surface Warfare, and Anti-Submarine Warfare. In addition, the DD21 was required to conduct Precision Strike, Volume Fires, and In-Stride Mine Avoidance.

These and other questions resulted in the Navy restructuring its next-generation surface combatant program in November 2001. Instead of designing one ship to do everything, the Family of Ships will disperse capabilities between the relatively large multi-mission DD(X) and CG(X); and the smaller, faster, focused-mission LCS. While DD(X) and CG(X) will conduct traditional surface warfare missions — as well as Precision Strike, Volume Fires, Area Air Defense, and Ballistic Missile Defense — the LCS will take on the unique challenges associated with fast-paced, shallow-water littoral operations.

As a focused-mission ship, LCS will also complement today's AEGIS ships (Arleigh Burke-class destroyers and Ticonderoga-class cruisers) by engaging the enemy in areas where it would be impractical to send larger ships. Speed, shallow

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## Navy



draft, and maneuverability will allow LCS to employ its mission packages much more effectively and keep the larger, multi-mission ships from being placed in sub-optimum positions. As such, LCS is optimized to serve as a force-multiplier to the other SCFOS members.

As a ship specifically focused on the mission of providing assured access and countering the threat of mines, small boats and diesel submarines, LCS offers the opportunity to significantly optimize warfighting abilities in these areas and employ a family of unmanned vehicles to do these missions. LCS could also be capable of conducting secondary missions such as Maritime Interdiction Operations and Homeland Defense (MIO/HLD); Special Operations; Command, Control, Communications and Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR); and logistic support for movement of personnel and supplies.

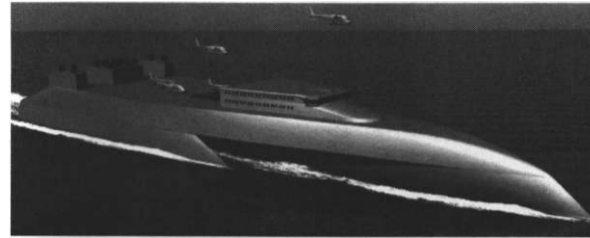
To accomplish its assigned missions, LCS will need characteristics that are tailored to fight in the littoral. In addition to its speed, shallow draft, and maneuverability, LCS will operate as part of a netted and distributed force. In this net-centric force, LCS will need to provide near-instantaneous flow of useful tactical data to a maritime or ground component commander. This netted architecture will allow participating units to share data from key sensors and weapons scattered by various units throughout an operating theater. LCS

will benefit from the combined sensor data from all platforms, keeping LCS' installed sensors to a minimum and reserved for self-protection and critical mission capabilities.

LCS is expected to have a flight deck and hanger for operating and maintaining manned rotary wing aircraft. The flight deck will also be able to operate, fuel and support Unmanned Air Vehicles. Indeed, LCS will make extensive use of a variety of organic manned and unmanned aerial, surface and underwater vehicles. These organic vehicles will be fully netted to the ship in order to facilitate real-time data exchange and support littoral warfare combat operations. And, they will provide inherent modular-mission capability through easily interchangeable vehicle payloads. Finally, the ship's configuration will allow for the rapid launch and recovery of boats and SOF craft while the LCS is operating at tactical speeds.

To enhance mission accomplishment and survivability, LCS can leverage the latest in human systems interfaces, integrated through a robust local-area network. These smart systems will take into account optimal manning concepts, ship operations, crew support services, and an Integrated Command Environment type approach. LCS can also leverage its modular capabilities while accommodating a crew size determined primarily by a ship's mission package detachments.

The Navy recently asked industry to help explore different approaches to meeting the requirement for a focused-mission, high-speed ship optimized for littoral combat. The information gained through these studies will be reviewed and may be used to formulate future



The Navy will evaluate various hull designs for the Littoral Combat Ship. LCS will be configured with mission modules for its focused missions, and will rely on helicopters and unmanned systems. (Illustration courtesy of Kvaerner Masa)

ship requirements. The Navy will select up to six contractors to conduct the ship concept design studies. Each proposal must provide one specific concept for a ship that could be built in the United States, but foreign industry can participate in the concept study effort. While the proposals sought by the Navy are not concepts for a specific ship that we build, they will be a critical step in defining what kind of platform will best help us meet the challenges of operating in the littoral and meeting mission requirements.

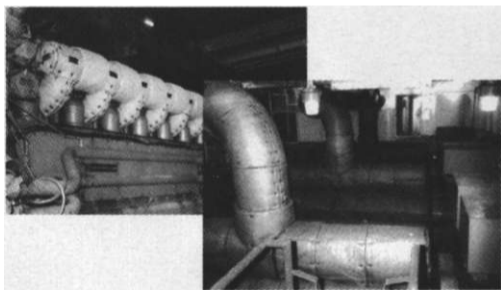
The result of all of these efforts will help the Navy find a best-of-breed solution to the requirements of a high-speed focused mission ship operating in the littoral.

### An All-Around Solution

With its high speed, shallow draft, maneuverability, and modular characteristics, LCS will be optimized to confront littoral threats that can deny access of U.S. forces to a given theater of operations. It will offer unique capabilities that no other platform can provide. Employing netted sensors and organic weapons for self-defense, LCS will break new ground for use of remotely employed sensors and delivery of weapons by a family of unmanned vehicles operating on, above and below the ocean's surface. Its modular, focused-mission design will enable rapid insertion of new technology throughout the ship's service life. In short, LCS has the potential to be a key element of the U.S. Navy's Surface Combatant Family of Ships.

Commander Chiaravallotti is assigned to the Surface Ship Branch, in the Surface Warfare Division, in the Office of the Chief of Naval Operations staff.

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## NASSCO Delivers USNS Soderman to U.S. Navy

National Steel and Shipbuilding Company (NASSCO), a wholly owned subsidiary of General Dynamics, delivered USNS Soderman (T-AKR 317) to the U.S. Navy. The Soderman is the eighth and final new construction ship completed by NASSCO under the U.S. Navy's Strategic Sealift Program.

The eight newbuilds were completed at NASSCO from 1993 to 2002 under the Navy's 20-ship Strategic Sealift Program. All of the ships were named for U.S. Army Medal of Honor recipients. The USNS Soderman was named for Private First Class William A. Soderman, a World War II recipient of the Medal of Honor for his heroic actions in Belgium in 1944.

The sealift new construction ships are large, medium-speed, RoRo ships (LMSRs). The ships are assigned to the U.S. Navy's Military Sealift Command, and are prepositioned to quickly deliver U.S. Army tanks, armored personnel carriers, tractor-trailers, and other equipment and supplies to potential areas of conflict around the world. The ships also can provide surge sealift support of remote military actions. Their multi-use capabilities make these cargo ships among the most flexible ever built.

The USNS Soderman is 950 ft. (289.5 m), has a



beam of 105 ft. (32 m) and displaces approximately 62,000 long tons when fully loaded. The ship has over 390,000 square feet of cargo carrying space. The gas turbine-powered ship will be able to sustain speeds up to 24 knots when fully loaded. The strategic sealift ships are the largest ships that can fit through the Panama Canal.

NASSCO is building two RoRos for Totem Ocean Trailer Express and has begun construction of the first of four double-hull tankers for BP. Vortmann added that NASSCO has also been awarded contracts to build the first three T-AKEs, a new, innovative class of dry cargo ammunition ships that will meet the Navy's logistics needs for the next 40 years.

## Family of Ships Employs Spiral Design

The U.S. Navy's Surface Combatant Family of Ships (SCFOS) will employ a transformational acquisition approach and focuses on developing a ship that can accommodate modular combat systems. The Littoral Combat Ship (LCS) combat systems modules will be developed separately from ship construction and will be integrated in an open systems architecture model. Additionally, early LCS development will heavily leverage pre-existing technologies. By leveraging the existing R&D efforts performed by the Navy and industry and accelerating the timeline for requirement development and acquisition, LCS will keep delivery times significantly shorter than those of traditional ship programs. To allow LCS to take advantage of and to incorporate emerging technologies, the program will employ a spiral development process.

The Navy's Spiral Development effort for the SCFOS is being led by Rear Admiral **Don Loren**, and the Program Executive Office (PEO (S)), Rear Admiral **Charles Hamilton**.

As the Deputy Director, Surface Ships in the Office of the Chief of Naval Operations, Loren is the resource sponsor for the U.S. Navy's current and future surface combatants. He is responsible for surface ship warfighting requirements, maintenance, repair, modernization, and readiness on the OPNAV staff.

"Spiral development allows progressive fielding of more capable systems and more capability over time as technology matures, says Loren. "It gives us the potential for more rapid fielding of systems," says Loren. "It reduces initial costs and mitigates risk.

According to Loren, the Navy will require "Technology Management Plans" to ensure that technology insertion is properly planned and managed to avoid excessive ship impacts. "Through the spiral development process, technology gained during the development of one ship, such as DD(X), can also be leveraged for the other members of the family," he says.

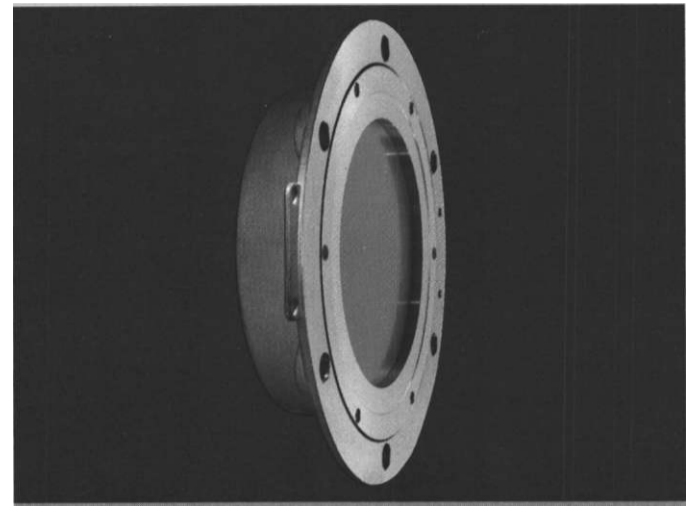
Loren says the Navy will also develop a Technology Insertion Plan for evolving DD(X) and seeding technology to Family of Ships, and evaluate scalability of DD(X) to CG(X).

The LCS acquisition approach focuses on developing a ship that can accommodate modular combat systems. Combat systems modules and unmanned vehicles will be developed separately from ship construction and will be integrated in an open systems architecture model.

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## Navy

# New Warships Will Transform U.S. Navy



Maritime Dominance in the 21st Century calls for naval forces that can project power forward, provide assured access in the littoral environment and support a wide variety of joint and combined operations. To meet this challenge, the U.S. Navy's surface combatant fleet of the future will be a "Family of Ships."

Defeating and deterring future national threats requires a broad range of capabilities from long-range missile defense, precision strike and volume fires to assuring friendly access in the dangerous littoral regions of the world.

Transformation of the future fleet will start with the DD(X) technology development effort, from hull and propulsion to sensors and weapons.

DD(X) will provide sustained, offensive, distributed, and precise firepower at long ranges to support forces ashore and to conduct time-critical strikes on land targets. DD(X) will feature the Advanced Gun System (AGS), a fully-automated 155-mm gun with advanced munitions that can hit targets upwards of 100 miles away with pinpoint accuracy. The state-of-the-art Multi-Function

Radar (MFR)/Volume Search Radar (VSR) radar suite planned for DD(X) will have long-range/overland aircraft and cruise missile detection capability. The DD(X) Integrated Power System (IPS) and its electric-drive propulsion will significantly reduce the amount of interior space traditionally required for

shipboard engineering and propulsion, while reducing manpower and other operating costs. IPS will make DD(X) more survivable, too, as the distributed, reconfigurable power system will have greater redundancy. The integrated power system may also provide sufficient power for future directed energy weapons.

While DD(X) will be larger than cur-

rent destroyers, its advanced automation and human systems integration will enable it to have a much smaller crew, resulting in more room for shipboard habitability as well as improved quality of life/service.

Featuring a tumblehome hull and unique superstructure design, DD(X) will rely on full-spectrum stealth, to include radar, acoustic, infrared, magnetic, and visual signatures. With state-

ballistic missile threats.

Today's in-service AEGIS surface combatants, USS Arleigh Burke- (DDG-51)-class destroyers and USS Ticonderoga (CG-47)-class cruisers, are also members of this future family of ships.

A Cruiser Conversion program for the Ticonderoga-class will facilitate bridging the gap between the current fleet and the new family of surface combatants. They will get the new 5-in./62-gun, Tactical Tomahawk missiles and upgrades to command and control capabilities, enabling them to perform Area Air Defense Commander (AADC) missions. The converted AEGIS cruisers become of paramount importance to provide the Fleet with substantial improvements in combat capability, manning reduction potential and readiness, as well as service life extensions.

The Arleigh Burke destroyers will comprise a significant portion of the surface combatant force structure. New DDG's will continue to enter the fleet for years to come. As the DD(X) technologies are matured and become available, evolutionary upgrades will be considered for the AEGIS fleet.

LCS, the focused-mission member of the family, will be optimized to combat anti-access threats. The intricacies of the littorals demand more expansive, detailed "coverage" inshore that may best be satisfied by a number of smaller, high-speed, and highly maneuverable ships. Possessing modular systems,

### *The Family of Ships will consist of four main elements:*

- Advanced, multi-mission destroyers, DD(X) capable of providing Precision Strike and Volume Fires;
- Advanced multi-mission cruisers, CG(X) providing sustained air superiority against air-breathing aircraft and missiles, as well as ballistic missile threats;
- Agile focused-mission Littoral Combat Ships (LCS) capable of defeating enemy littoral defenses including mines; fast, armed small boats; and submarines
- In-service multi-mission AEGIS Fleet

of-the-art network-centric information technologies, DD(X) will operate seamlessly with other naval, ground, and land-based air forces.

The other multi-mission member of the Family of Ships, CG(X), will project air dominance by fielding vastly improved sensors and air defense weapons systems. Additionally, the CG(X) robust theater missile defense capability will meet current and future

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The selected candidate will serve as the liaison between DOT and the contractor to monitor the project and provide recommendations. The selected candidate must be available to travel between New York City and Marinette, Wisconsin and act as DOT's on-site representative. Additional responsibilities will include establishing and monitoring project schedule, recommending solutions to potential disputes and problems; establishing and monitoring budget and providing upper management with updated progress reports.

Requirements: Baccalaureate degree from an accredited college and five years of full-time satisfactory experience in the repair and maintenance or gasoline, diesel and diesel/electric engines/motors and auxiliary marine equipment including repair and maintenance of steel, aluminum and fiberglass vessels; eighteen months of which must have been in a high-level supervisory or administrative capacity. Education from an accredited college may be substituted for experience on the basis of one year of college for 6 months of experience.

Preferred candidate will also have experience in design, construction, project management, operation and maintenance of ferry or similar vessels comparable in size with largest Staten Island ferry boats. Proven experience in a Senior Management position.

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(Continued from previous page)

LCS will employ both manned and unmanned vehicles and on-board weapons systems to optimize naval combat operations in the littoral areas. With its unique open-system architecture, modular design approach, and adaptability for spiral integration of combat systems and mission package upgrades, LCS will be uniquely suited to meet the near and future requirements for assured access. (See related article this issue.)

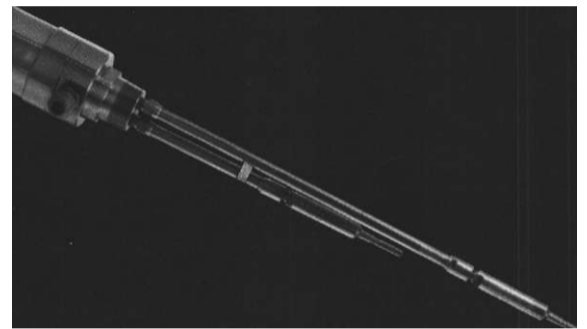
The Navy hopes to be able to award detail design and construction contracts for the first two LCS ships in the FY05 - FY06 timeframe, with deliveries scheduled in FY07 and FY08.

Construction of the first DD(X) is planned for FY05 with scheduled delivery in FY11. The CG(X) will be a follow-on program to DD(X),

with a DD(X) scalable hull form and a common propulsion plant architecture. Both ships will use many of the same innovative technologies to optimize crew size, increase Joint "Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance" (C4ISR) connectivity, and reduce operating and support costs. The CG(X) will replace Ticonderoga-class cruisers as they retire.

The future family of ships, DD(X), CG(X) and LCS, along with the Navy's in-service Aegis combatants, will provide a broad range of transformational capabilities to assure warfighting success across the entire spectrum of the maritime and littoral battlespace. When not acting independently, these future warships will operate in a jointly netted, distributed warfighting environment to maximize their overall effectiveness.

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## "Start Spreading the News ..."

*Fifth San Antonio Class  
Ship to be Named New York*

At a ceremony held on September 7, 2002, aboard the Intrepid Sea, Air and Space Museum in New York Harbor, Secretary of the Navy **Gordon England** announced his decision to name the fifth ship of the San Antonio class of Amphibious Transport Dock ships, "New York," to honor the state, the city and the victims of Sept. 11. The Secretary will be joined by New York Gov. **George Pataki** and many other leaders from the city and state of New York.

In doing so, Secretary England noted that long-standing relationship between the U.S. Navy and people of New York. "USS New York will project American power to the far corners of the earth and support the cause of freedom well into the 21st century," England said. "From the war for independence through the war on terrorism, which we wage today, the courage and heroism of the people of New York have been an inspiration.

Today, thousands of New Yorkers serve with America's Navy and Marine Corps at home and abroad protecting America's interest and promoting peace, security and stability around the world. These dedicated young Americans are the strength of our military and our nation. USS New York will play an important role in our Navy's future and will be a fitting tribute to the people of The Empire State," England said.

Both Gov. Pataki and New York City Mayor **Michael Bloomberg** thanked the U.S. Navy for honoring all New Yorkers by naming this ship. Governor Pataki noted, "USS New York will ensure that all New Yorkers and the world will never forget the evil attacks of September 11th, and the courage and compassion New Yorkers showed in response to terror."

Four previous ships have been named New York. The first, a gondola (1776), was scuttled after suffering heavy damage during the defeat at the Battle of Valcour Island on Oct. 11, 1776.

Though a tactical defeat, the fierce resistance of the outnumbered Americans postponed a British invasion from Canada.

The second, a frigate (1800-1814), served to protect American commerce and project American naval power, particularly along the Barbary Coast of North Africa. The third USS New York, an armored cruiser (1893-1938), served as flagship of the North Atlantic Squadron during the Spanish-American War and, later, flagship of the Asiatic Fleet before being renamed Saratoga in 1911.

The fourth, a battleship (1914-1946), served in the North Sea blockade of Germany during WW I and provided shore bombardment during the invasions of North Africa, Iwo Jima, and Okinawa during WW II. One submarine was named New York City and served from 1979-1997.

The 684-ft. (208.4-m) amphibious transport dock ship will be built by Northrop Grumman Ship Systems in New Orleans and carry a Navy crew of 363 and 699 Marines.

The ship will be used to transport and land Marines, their equipment and supplies by embarked air cushions or conventional landing craft or amphibious vehicles, augmented by helicopters or vertical take off and landing aircraft in amphibious assault, special operations, or expeditionary warfare missions.

## Navy

### Retired Radm. Foley to Lead Gulfport Facility

Retired Rear Adm. **John B. "Jay" Foley III**, USN, one of the U.S. Navy's outstanding leaders during a 33-year career, has been named vice president of Northrop Grumman's shipbuilding operations in Gulfport, Miss.

Foley, who recently retired from the Navy as commander, Naval Surface Force, U.S. Atlantic Fleet, will bring his leadership and naval expertise to the Gulfport facility, effective Sept. 16, 2002.

"We are delighted to have Jay Foley joining our team," said Dr. **Philip A.**

**Dur**, Northrop Grumman corporate vice president and president of the company's Ship Systems sector. "His leadership, operational experience and intellectual reach will make him an important contributor to Northrop Grumman Ship Systems and our future programs.

Our Gulfport facility is set to reach

new heights in our shipbuilding business plan as our 'center of excellence' for composite structures. Through Jay's guidance, I have every confidence the facility will become a center of excellence for composite ships."



**RADM John "Jay" Foley** USN

Dur noted that modern ship designs increasingly use composite materials in construction. Additionally, the Navy is interested in faster, lighter ships that may be built entirely of composite materials. Foley will lead this transition to composites for future ships now being designed by Northrop Grumman Ship Systems, as well as shipbuilding programs that are now underway. These include Aegis destroyers, San Antonio-class LPDs, future large-deck amphibious ships, the DD(X) 21st century destroyer, and the U.S. Coast Guard's Deepwater program. The facility will also be a center for research and development of high-tech composites for naval ships.

"I am looking forward to this challenge and my operational experience will enable me to contribute to the continued growth of Northrop Grumman Ship Systems and their long tradition of quality products," Foley said.

The Gulfport facility covers 120 acres and is dedicated exclusively to module assembly and composites manufacturing. The facility currently employs approximately 900 people who are engaged in ship unit fabrication for both Ingalls Operations in Pascagoula and Avondale Operations in New Orleans. The facility is already recognized as one of the premier advanced composite manufacturing facilities in the nation.

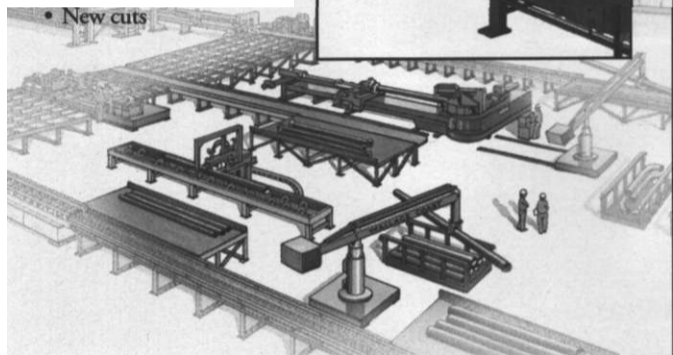
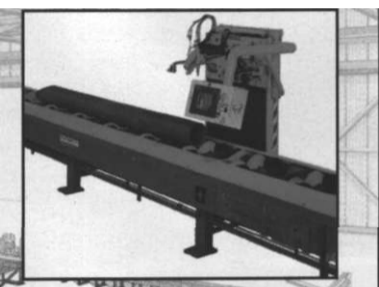
Foley earned his commission in the Navy through the NROTC program at the College of the Holy Cross in Worcester, Mass. He also attended the National Security Program for Senior Executives at MIT.

He served as executive officer on the Ship Systems-built USS Callaghan (DDG 995) in San Diego, and has commanded USS Quapaw (ATF 110), USS Estocin (FFG 15), USS Monterey (CG 61), Cruiser-destroyer Group 8 and the USS Dwight D. Eisenhower Battle Group, where he completed a Mediterranean Sea/Arabian Gulf deployment in July 2000.

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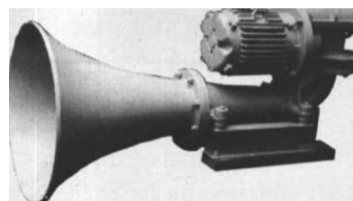
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Maritime Reporter & Engineering News

## UFRJ Wins Student Design Competition

A team from the Naval and Ocean Engineering Department at the Federal University of Rio de Janeiro (UFRJ) has won the first International Student Offshore Design Competition sponsored by the Society of Naval Architects and Marine Engineers (SNAME) and the Ocean, Offshore and Arctic

located offshore Brazil in the Campos Basin.

Design team students worked as interns for the independent Brazilian offshore and ship design company Projemar during the competition

The award winning "Maracana" FPSO features a symmetrical ship

form measuring 886 x 157 x 98 ft. (270 x 48 x 30 m) and a load capacity of 1.5 million barrels.

The UFRJ team members are: **Rodrigo Klim Gomes, Eleandro Meira de Oliveira, Joao Alberto Rangel de Almeida, Antonio Goncalves de Vasconcelos Neto,**

**Maiza Pimenta Goular** and **Cassiano Rodrigues Neves.**

With *Maritime Reporter & Engineering News* serving as ISODC's official publication, the corporate sponsors for the competition were ABS (American Bureau of Shipping), Conoco and Projemar.



Standing (left to right): UFRJ Assistant Professor and Advisor **Alexandre Alho, Eleandro Meira de Oliveira, Antonio Goncalves de Vasconcelos Neto**; Front (left to right): **Rodrigo Klim Gomes, Alberto Rangel de Almeida** and **Maiza Pimenta Goular**. (Not pictured: **Cassiano Rodrigues Neves**.)

Engineering Division of the American Society of Mechanical Engineers (ASME) with their entry "Preliminary Design of the 'Maracana' FPSO Unit."

The entry was one of eight projects submitted by students from universities around the world.

The UFRJ team was honored with a cash prize of \$1,500 and the opportunity to present the Maracana floating production/storage and offloading unit (FPSO) to industry at the SNAME Annual Meeting in Boston on September 25-28.

**Alexandre Alho**, Assistant Professor, UFRJ and Advisor to the six person award-winning design team, said that in order to simulate an actual commercial project, the team was divided into six main categories: structure, stability, marine engineering, sea keeping and costs with a team leader or project manager.

"The biggest challenge for us was this was not a conversion of an existing ship but an FPSO design from the beginning," said **Joao Alberto Rangel de Almeida**, Team Leader.

The students used research and data from Petrobras to base their design model on a site-specific structure

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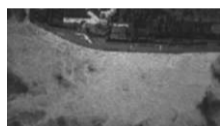
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A specialty vessel, which will be used for installing wind turbines offshore, is under construction in China at the Shanhaiguan shipyard for Mayflower Energy Ltd.

It is little secret that efforts to develop and harness new forms of clean power is an ever-present global task to serve the dual purpose of ensuring a cleaner environment and to be less taxing on non-renewable resources. The wind has emerged as a viable, if sometimes unreliable and often more costly\*, option to generate power, (see chart next page)

Plans to build the U.K.'s largest offshore wind farm, to provide electricity for 50,000 homes in Wales, has been given the green light. The North Hoyle Offshore Wind Farm will feature 30 wind turbines, located five miles off the Welsh coast between Prestatyn and Rhyl in North Wales. There are currently two additional major offshore wind farm projects under consideration for the UK, and the hope is, by 2010, to power more than three million homes with this renewable energy source.

"The U.K. government has plans that will require the installation of 1,300 new 2MW offshore turbines over the next ten years," says **David Donnelly**, Chairman of Mayflower Energy. "There are also plans for major installations around other European coasts. We expect demand for this type of specialist vessel to be very high, and we are happy that Graig has helped us to contract with a Chinese shipyard for the construction of this technologically advanced vessel to install the turbines."

Offshore 'wind farms' have thus come into vogue, but the efficient installation of these massive units in the aquatic environment requires a specialty vessel.

### The Plan

Mayflower Energy recognized that there is an emerg-

\*The estimated costs to society and the environment from fossil fuels and nuclear power, not including nuclear waste and decommissioning costs, as determined by the EU study ExternE.

Sources: Wall Street Journal, August 27, 2002, page A10, International Energy Agency, ExternE, Wind Power Monthly.

ing market for vessels, which can efficiently install offshore wind turbines, which are likely to be of multi-megawatt size, with tubular towers rising about 100 m above the water surface and blades cutting a 100 m diameter circle.

Mayflower Energy is based in Middlesbrough in England, and is staffed by a small team with experience from the offshore heavy lift industry. It is a subsidiary of Mayflower Corporation, a large U.K.-based company whose main business is producing buses and specialized trucks and manufacturing steel pressings for the motor industry. Recognizing that increased investment in offshore wind energy would require capable installation vessels, Mayflower Energy came up with the TIV concept. The potential market is considerable, with several hundred-wind turbines to be installed off the coasts of Denmark, Sweden, Ireland, Germany, Holland, Belgium, France and the U.K., over the next few years from 2003. One location alone off Denmark, for example, is scheduled to have 72 wind turbines with a rated total output of 150MW.

### The Ship — Mayflower Resolutions

Captain **James Cook** was born in the village of Marton, Yorkshire on October 27, 1728 and is very much a local hero in these parts close to Middlesbrough and eventually sailed from the Port of Whitby on Wind Powered vessels (Sailing Ships). Therefore it is no coincidence that Mayflower Energy has chosen the name Resolution as that was the vessel appointed by the Admiralty as Captain Cook's flagship, which set sail on July 13, 1772.

The \$45 million ship, a world first, will be capable of carrying the parts for up to 10, 3 MW wind turbines and should be able to install them at the rate of one a day. The 426 x 125 x 26 ft. (130 x 38 x 8 m) vessel will have six jack-up legs so it will be able to provide a stable work platform in waters up to as shallow as 9 ft. (3 m), and as deep as 115 ft. (35 m). Mayflower said that the use of its vessel would be cheaper for windfarm construction than current jack-up barge methods.

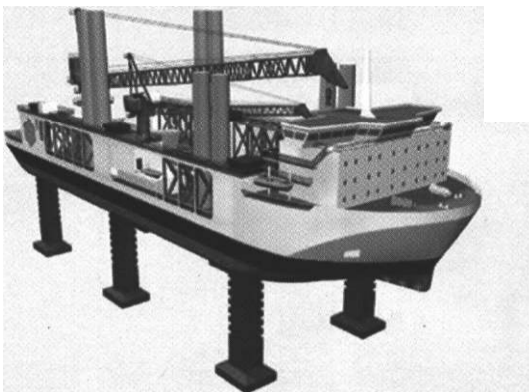
Mayflower's brief was to design a vessel that will

**Mayflower Resolution Main Particulars**

Classification	DNV +1A1, Self-elevating Unit, EO DYNAPOS-AUT, Crane
Number of Jackup Legs	6
Flag State	Isle of Man
Range	25 Days - Full Crew / Deck Load
Length	428 ft, (130.5 m)
Breadth	125 ft. (38 m)
Depth	26 ft. (8 m)
Type/Number Offshore Wind Turbines	10
Maximum Payload	3,000 Te Jacking
Main Crane	Max Capacity
	300 Te@ (25.5 m)
	250 Te@ (29.5 m)
	240 Te@ (30.5 m)
	200 Te @ (35 m)
	50 Te @ (80 m)
Accommodation	50 Single Berths

**Operating Conditions**

Jacking Operations	3 m maximum wave
Jacked Survival	100 Year Storm (Force 12 Beaufort Scale) 50-year wave 14.0 meters
Minimum Operating Depth 10% Cargo	7 ft. (2.2 m)
Minimum Operating Depth 100% Cargo	10 ft. (3.2 m)
Max Operating Depth	35 m (increase possible)
Transit Speed	10.5 Knots
Jacking Capacity	2,500 Te per leg
Holding Capacity	3,500 Te per leg
Jacking Speed	1m/min
Max. Draft Loaded	9 ft. (3 m)
Max. Draft Lightship	8 ft. (2.4 m)



The vessel — originally known as the TIV-1 and to be officially named Mayflower Resolution — was developed by Knud E Hansen in Denmark and incorporates a host of new marine technologies.

mitigate the risks associated with working in the North Sea, giving an installation solution by focusing on the following criteria: the vessel must be highly maneuverable, dynamically positioned, high speed jacking capability all of which will increase the vessels operating potential.

In transit, carrying wind turbines from base to offshore site, and in maneuvering into position for jacking, the Mayflower Resolution will be driven by a diesel electric system powering four azimuth thrusters and three tunnel thrusters

The Mayflower TIV will be able to carry the components for ten wind turbines of 2 to 3.5MW rating. Typically the towers will be in two tubular sections about 98 - 164 ft. (30-50 m). These will be lowered in turn on to a prepared foundation rising a few meters above sea level and bolted together. The heavy gearbox/generator in the nacelle will then be installed on the tower, using the installation vessel's main crane with a capacity of 300 tons at 25.5 m radius and 110 m hook height. The three blades will be assembled on the hub on board the vessel, using a smaller 50-ton crane, and the unit will then be installed on the nacelle.

A transit speed of 10.5 knots will enable the vessel to shuttle to and from the base collecting the next batch of turbines with the minimum use of time, and also travel between jobs. On site, and jacked up, it will be able to sit out the 100 year storm, and the 50 year wave (Beaufort force 12,

and 14 m height). Between wind energy contracts, the TIV is likely to attract offshore oil and gas contracts such as shallow water platform renewals.

The whole of the aft part of the vessel, (1,750 sq. m.), is available for transporting, assembling and manipulating turbine components, with additional space for the tower sections themselves in racks along the sides between the hydraulically operated legs. A total payload of 7,200 tons can be carried, and the working deck is stiffened for 10 t/sq. m. loading and 50-ton forklift trucks. The minimum operating water depth is 7 ft. (2.2 m) with 10 percent cargo on board, increasing to 10 ft. (3.2 m) with a full load.

Mayflower Resolution will have accommodation for 50 people in single berth cabins, and all facilities for a 60-day endurance, arranged in the forward mounted superstructure, with the bridge above. This unusual vessel will be classed by DNV with Self Elevating Unit and Dynpos AUT notation, and will be cleared for worldwide operation.

Graig Shipping has provided a full support package for the supervision of the building of Mayflower Resolution at China's Shanhaiguan yard. "Chinese shipyards are now first choice for new vessel types," says **Hugh Williams**, CEO of Graig. "Not only are they competitive on pricing, but they are flexible and willing to adapt to new technology and new designs. We are very happy that we have been able to help Mayflower find the right yard, the right designer and the right classification society to get this new offshore industry off to a good start." Graig advised Mayflower on choice of yards, introduced Denmark's Knud E Hansen as the designer and DNV as a suitable class society, and assisted in yard negotiations. Graig's China-based supervision team will now oversee the building and delivery of the first vessel, which is due to enter service in February 2003.

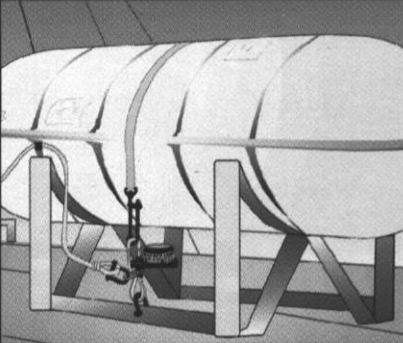
**The "Cost" of Wind**

Cost of various electricity generation technologies, in cents kW/hr.

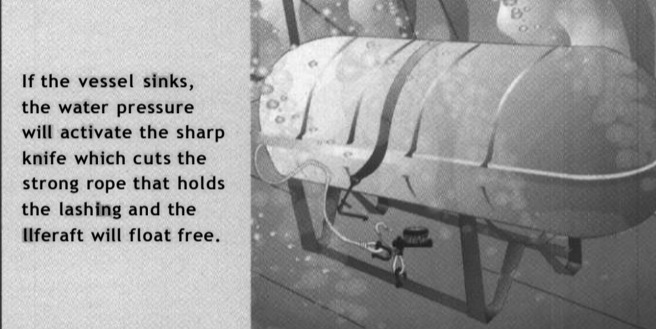
Source	Generation Cost	Est. External Cost of Generation*
Coal	3.11-3.41	1.94-14.6
Gas turbine	2.53-3.41	0.97-3.89
Nuclear	3.31-5.74	0.19-0.58
Good wind site	5.84	0.05-0.24
Optimal wind site	3.89	0.05-0.24

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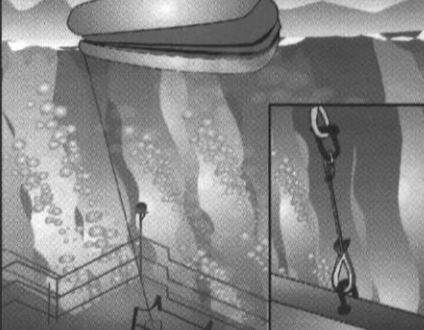
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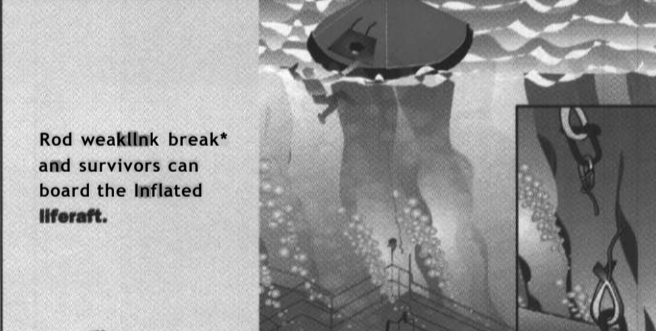
**Hammar H20 secured to liferaft cradle and attached to liferaft lashing with slingshook. Painter line shackled to weaklink and strong rope with single point connector.**




**If the vessel sinks, the water pressure will activate the sharp knife which cuts the strong rope that holds the lashing and the liferaft will float free.**



**As the vessel sinks, the painterline will be stretched and the liferaft starts to inflate.**



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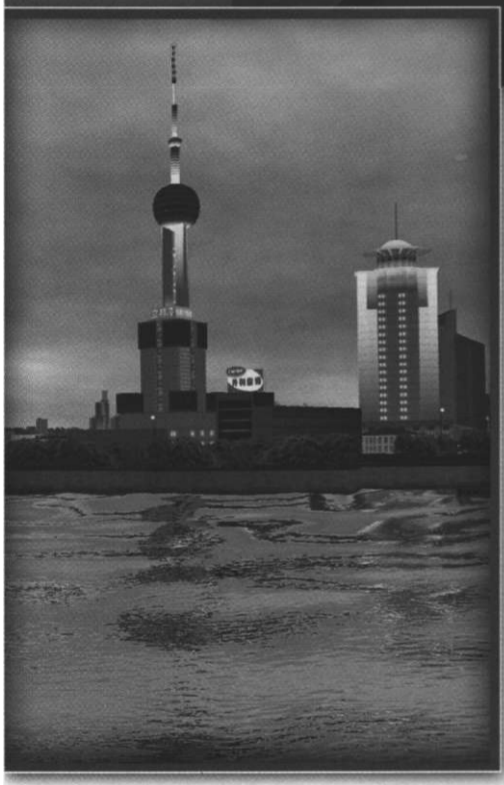
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**The Suppliers**

Just as the practice of single-sourcing complete packages of equipment and machinery, albeit long applied, has gathered tremendous pace over the past decade in the commercial marine sector, the uptake of functionally-integrated systems has had a signal bearing in driving ship technology forward. Building on its own track record in the naval field, in particular, and on the longstanding policy of the absorbed Ulstein interests to supply 'coherent' systems to offshore support ships, Rolls-Royce has landed an integrated ship systems deal spanning an innovative vessel designed to install wind turbines offshore.

Ordered by U.K. firm Mayflower Energy in recognition of an emerging market for ships to build up the many offshore windfarms planned by North European countries, the 426-ft. (130-m) Mayflower Resolution will transport and position parts for up to 10 wind turbines at a time. The design has been conceived to minimize the risks associated with year-round deployment in the North Sea, and features a jack-up capability to provide a stable offshore working platform.

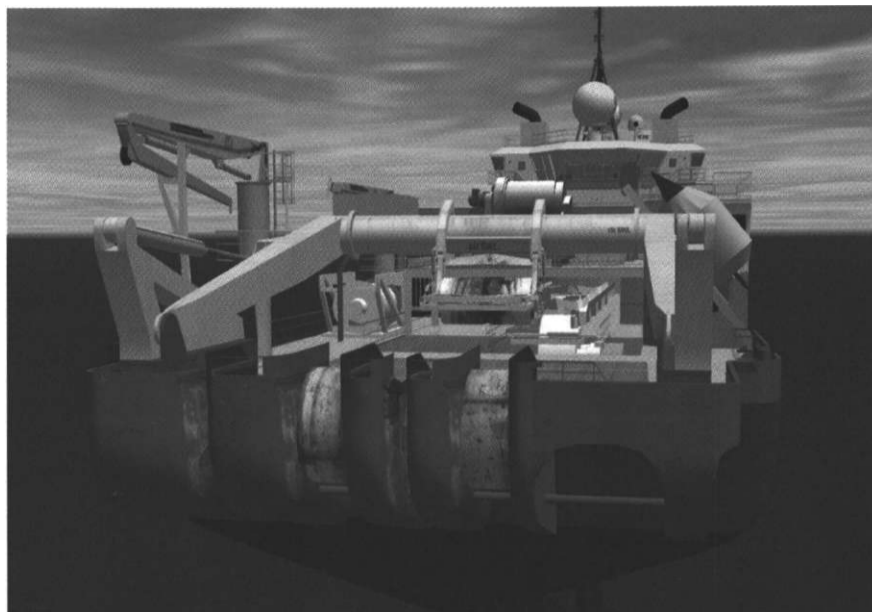
Rolls-Royce has been selected to supply the integrated ship systems, including the entire diesel-electric propulsion plant and also the bridge outfit, including navigation, communications, automation and dynamic positioning. Although the broad portfolio of Rolls-Royce products will be accessed for the contract, much equipment is being sourced from other manufacturers.

In fact, the U.K.-owned group considers that the order "fits well with the Rolls-Royce strategy of taking increased responsibility for integrating complete ship systems, building on years of supplying comprehensive equipment packages for offshore support vessels."

Mayflower Resolution, which will be constructed at the Shanhaiguan Shipyard in northern China, will be propelled by four Ulstein Aquamaster azimuth thrusters fitted in nozzles, augmented in maneuvering and dynamic positioning mode by three Kamewa Ulstein controllable-pitch tunnel thrusters. Power for propulsion and shipboard services will be primarily met by four gensets, made up of 1,824-kW Mitsubishi high-speed diesels and Newage Stamford alternators.

Mayflower Energy is currently marketing the vessel both to wind energy companies and to the offshore oil and gas industry, and is confident of having contracts in place when the newbuild is ready for operation in spring 2003.

# Virtual Subsea Reality



A world-first virtual reality simulator for the sub-sea cable installation industry has been developed to offer improved training and reduce the costs and risk inherent in offshore operations. The system has been developed by the Virtual Reality Centre at Teesside for their Darlington-based client CTC Marine Projects. The simulation includes unique virtual replicas of CTC Cable Ships, Cable Ploughs, and ROVs (Remotely Operated Vehicle). The virtual system will interface to a number of third party control systems including A-frame & tow winch control, drum & linear cable engine control and plough and ROV diagnostics/control. The system will be operated on-shore in CTC's state of the art VR-training suite.

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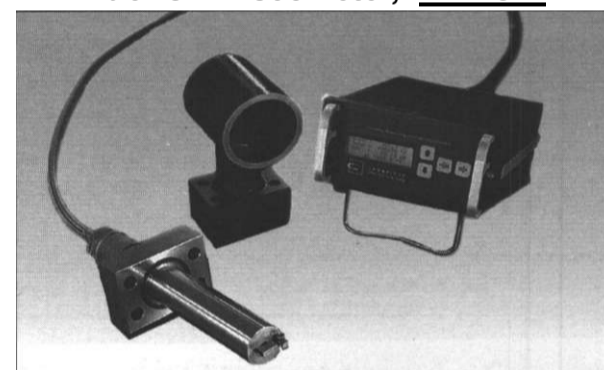


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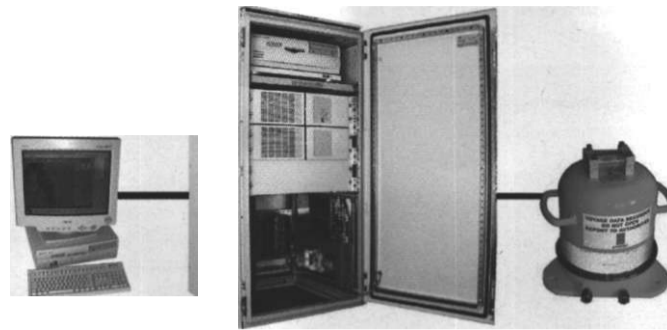
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# KMSS Maritime Black Box: More Than Just A VDR

On July 2, 2002, a host of new regulations of concern to most ship builders and owners was implemented according to the recent revision of the International Convention for the Safety of Life at Sea (SOLAS). In conjunction with amendments to Fire Safety and AIS regulations. The reworked SOLAS Chapter V includes new conventions on the use of Voyage Data Recorder's (VDR's), sometimes referred to as maritime black boxes. VDR's offer much the same in functionality as the black boxes found in commercial aircraft, and are specifically designed for after-incident information purposes, however some VDR's offer far more than simple data recording.

Kongsberg Maritime Ship Systems (KMSS) is behind one such VDR - the Maritime Black Box (MBB). Under-



standing that the primary function of a VDR is data recording, KMSS has created a unit that supersedes the requirements of SOLAS and the IMO, but also offers a range of extra features of benefit to navigation, safety and training purposes. KMSS, instead of rushing a product to market, instead decided to strategically develop a complete VDR package. "We were willing to delay our entry

into the market to ensure that we produced a product that we felt met the demanding requirements of the worlds ship owners," said **Svein-Erik Larsen**, vice president of Navigation Systems at KMSS.

Discounting the extra functionality for the moment though, the core responsibility of the MBB is to record and store data, for retrieval after an accident or

incident. Should something go terribly wrong at sea, recovery of the VDR and more importantly its stored data is of utmost importance. The ability to withstand enormous stress is therefore paramount in the design. KMSS's MBB is fitted with a Protected Storage Unit (PSU 10), which houses a solid-state recorder similar to those used in the aircraft industry. The PSU has a capacity to store up to 12 hours of radar, sensor and audio data in the event of an incident at sea - information which is essential to accident investigators and ship owners in the aftermath of any accidents. Tested in extreme conditions, the PSU meets requirements specified in SOLAS V, IMO A.861 and the performance standard given by IEC 61996. Also, in the event that the unit becomes detached

(Continued from previous page)

tion of cables operations — taking into account sea-state, ship dynamics, catenary behaviour and soil variations. The system also has the capability to accurately model views of the seabed terrain, facilitating fault diagnosis and analysis.

The project relied heavily on CTC

Marine Projects for their experience and on Thales GeoSolutions for the provision of geotechnical data, which allowed accurate modeling of plough behavior. The system fully interfaces to survey systems, Simrad sonar and Kongsberg's APOS system using their own protocols.

This ensures that the VR Center soft-

ware uses actual data for all of its simulated behaviors. The ROV interfaces with SIMRAD Sonar data, TSS - tracking systems, Kongsberg — APOS and SMD's diagnostic launch & recovery systems.

What makes this system so spectacularly different is that all of its simulated functions occur in real-time. That means trainees can control a perfectly engineered, 3-D virtual replica of the plough, ship and ROV systems. They are able to see the virtual systems adjusting and moving just as the real equipment would. The unique system also allows trainees to descend to the virtual seabed to see the effects that their bridge based virtual controls are having on the virtual plough's behavior.

Plans for phase two of the project include a live-link from the virtual system to the real vessels out-at-sea. This will be enormously useful in the event that ship-sonar detects a change in predicted terrain or unexpected soil types along the planned route. The simulator will then be fed live-data from the seagoing vessel allowing on-shore experts to safely try out options before re-laying the best solution back to the crew out at sea. In the event that a plough becomes disabled or damaged, the system can also be used to rehearse recovery before the real-crew make the real-world attempt. Given the high-risk and expensive consequences of mistakes, the simulator blows any cost benefit arguments right out of the water.

The project is due for completion at the end of 2002 and will have taken 18-months to develop, but **Tim Dear**, the VR Center's Business Development Director, says it has actually accounted for around eight-man years of effort and a considerable amount of ground-breaking software development. The software principles of the system are applicable to a wide range of sub-sea and offshore activities, for example, the fully functional ROV simulator includes umbilical management & collision, cable tracking, propulsion systems, telemetry and manipulator systems and could be adapted to perfectly mimic behaviours of any ROV or AUV.

The client CTC Marine Projects, are delighted with our work and are officially launching the Darlington simulator early in 2003. "The system enables CTC to rapidly respond to demand in the sub-sea cable sector. Plough pilots do a tremendously difficult job and we have an ongoing requirement to maintain and expand our team of qualified operators" says **Jake Tompkins**, CTC's Project Manager for the simulator.

The VR Center, established in 1996, is a University owned company and employs nearly 40 full-time staff. Skills are broadly split between programming for software development and computer modelling for the visualization side of projects. As the name suggests, the Virtual Reality Center specializes in the development of real-time environments.

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from the vessel, an Underwater Locator Beacon (ULB), is designed to enable the unit to be found quickly and easily.

The KMSS PSU specifications conform to the 1997IMO suggestions on VDR's, which also cover the operation of the MBB. They state that the VDR should continuously maintain sequential records of pre-selected ship systems data relating to the status and output of the ship's equipment, and command and control of the ship. The VDR should also be entirely automatic in operation and be subject to annual performance tests. The heart of the KMSS MBB is the DCU 10 Data Collection Unit and meets the IMO's standards with ease. As the central unit, the DCU controls the main functions of the entire MBB set-up and is the point that all sensor nodes are connected to. It requires a continuous power supply and countless interfaces, all of which are housed in the DCU 10 cabinet, which also comes prepared for AIS and ECDIS installation.

Eighty percent of all accidents at sea are caused by human error. Be it watchmen not handling a situation using the correct procedures, or crew with inadequate training, four out of five accidents are caused by humans, and not technology. The maritime industry relies on continuous training of crew, and the valuable data taken from the KMSS MBB can be used for these purposes. The KMSS Replay and Evaluation Unit (REU 10) fulfills this function for the KMSS MBB. Using data downloaded from the PSU and DCU, the REU serves as an efficient tool for evaluation of ship operations. Crew and ship's personnel can learn from both their own and other people's experience using the REU, making it a valuable training tool. The fact that the data collected by the PSU and parallel DCU is used to its maximum potential, is part of the reason that the KMSS MBB has already proving so successful with the world's ship owners and ship builders. **Borje Jansson** of Viking Lines said, "The MBB from KMSS was well worth the wait. I knew that they would develop the best solution. The cost of fitting on older ships is the main concern, but there are solutions available to ship owners. KMSS understands the maritime environment, and has designed its MBB with ease of fitting and implementation in mind. The modular design allows the MBB to be installed on almost any vessel using the minimum of space.

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**Svein-Erik Larsen** has worked for KMSS (or 12 years, the majority with the responsibility (or sales of all Norcontrol products in the Far East region. Larsen was responsible for setting up the KMSS J/V company in Korea in 1999 and also spent several years handling Strategic Alliances world wide including working out agreements, implementing and building up knowledge locally. He has held the senior vice president - Navigation Systems position for two years, responsible for the business area Navigation System in KMSS.

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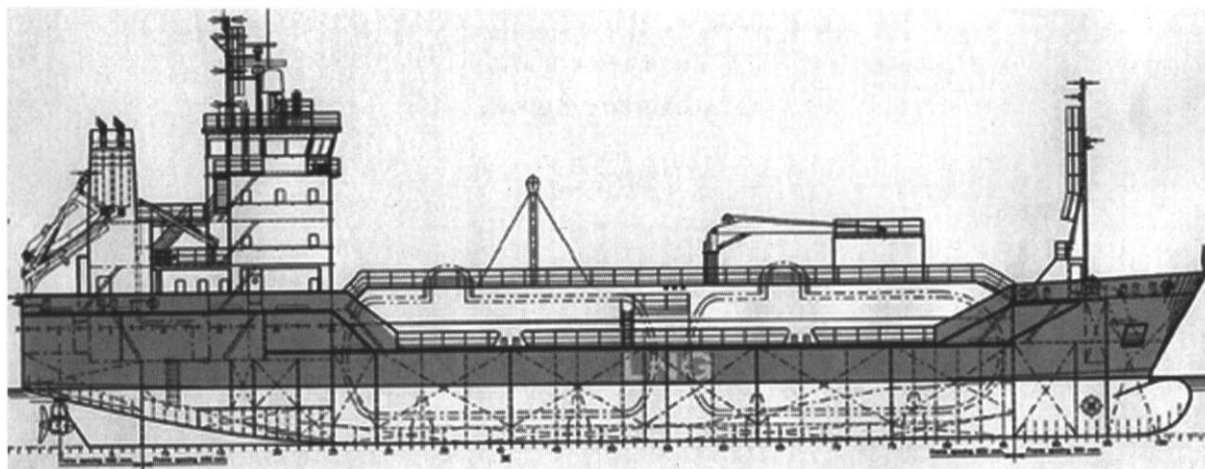


OWNER OPERATOR	COUNTRY SO	SHIPYARD	TYPE	No	TEU	DWT	DEUV	PRICE M
PACIFIC RICHFIELD	SINGAPORE	KEPPEL OFFSHORE MARINE	AHTS	1			03	
SAMOS STEAMSHIP	GREECE	HITACHI ZOSEN	BULK CARRIER	1		200,000	04	
MITSUMI O.S.K. UNES [MOD	JAPAN	NKK CORP.	BULK CARRIER	1		200,000	04	
NIPPON STEEL CORP.	JAPAN	MITSUMI	BULK CARRIER	1		177,000	03	
SANTOKU SENPAKU	JAPAN	NAMURA ZOSENSHO	BULK CARRIER	1		176,000	05	
FORMOSA PLASTKS	TAIWAN	ISHIKAWAJIMA HARIMA H.I. (IH)	BULK CARRIER	2		170,100	05	
JAPANESE INTERESTS	JAPAN	NAMURA ZOSENSHO	BULK CARRIER	1		170,000	04	
TRASMED SHIPPING	MALTA	BOHAI SHIPYARD	BULK CARRIER	2		170,000	05	68
TAIWAN NAVIGATION	TAIWAN	CHINA SHIPBUILDING CORP.	BULK CARRIER	1		77,000	04	21
EUROPEAN INTERESTS	UNKNOWN	SUMITOMO	BULK CARRIER	2		76,500	04	
SAFETY MANAGEMENT OVERSEAS	GREECE	TSUNEISHI	BULK CARRIER	3		76,000	05	66
EMIRATES TRADING	UAE	SANOYASCORP.	BULK CARRIER	2		75,000	04	
NIARCHOS	GREECE	DAEWOO	BULK CARRIER	2		74,000	04	46
ITOCHU CORP.	JAPAN	SANOYASCORP.	BULK CARRIER	5		74,000	04	
ITOCHU CORP.	JAPAN	IMABARI SHIPBUILDING	BULK CARRIER	3		74,000	04	
ITOCHU CORP.	JAPAN	TSUNEISHI	BULK CARRIER	2		74,000	04	
PARADISE NAVIGATION		HUDONG SHIPYARD	BULK CARRIER	2		72,000	04	
SETAF SAGET	FRANCE	NANTONG COSCO KHI	BULK CARRIER	1		55,000	04	18
VICTORIA STEAMSHIP	UK	NEW CENTURY	BULK CARRIER	2		52,300	04	36
VAN OMMEREN CUPPER	DENMARK	OSHIMA SHIPBUILDING	BULK CARRIER	1		52,200	04	17
VAN OMMEREN CUPPER	DENMARK	TSUNEISHI	BULK CARRIER	1		52,200	04	17
PORTUNE	PORTUGAL	TSUNEISHI	BULK CARRIER	4		52,200	05	
JJ UGLAND	NORWAY	TSUNEISHI CEBU	BULK CARRIER	1		52,000	05	19
PHOENIX BULK CARRIERS	US	ZHEJIANG	BULK CARRIER	2		51,000	05	36
DA SIN	CHINA	NANTONG COSCO KHI	BULK CARRIER	1		49,500	03	
JAPANESE INTERESTS	JAPAN	MITSUMI	BULK CARRIER	1		48,400	03	
JAPANESE INTERESTS	JAPAN	SHIN KURUSHIMA	BULK CARRIER	1		30,000	03	
VAN OMMEREN CUPPER	DENMARK	NEW CENTURY	BULK CARRIER	2		27,000	04	29
MINERAL SHIPPING		ZHONGHUA SHIPYARD	BULK CARRIER	1		25,000	04	
HERMAN BUSS AG.	GERMANY	ZHOUSHAN	BULK CARRIER	2		22,000	04	30
LIBERTY MARITIME	US	OSHIMA SHIPBUILDING	BULK CARRIER / ORE CARRIER	1				51,000
ORION SCHIFFFAHRTS	GERMANY	HAKODATE DOCK	BULK CARRIER / ORE CARRIER	1				31,550
UNKNOWN	UNKNOWN	DAMEN SHIPYARDS	BUOY TENDER	1		900	04	28.52
GERMAN KG	GERMANY	JJ. SIETAS	CONTAINER	4	1,700		04	
MEDITERRANEAN SHIPPING CO.	SWITZERLAND	SAMHO NEW SHIPYARD	CONTAINER	2	4,900		04	94
MEDITERRANEAN SHIPPING CO.	SWITZERLAND	SAMHO NEW SHIPYARD	CONTAINER	1	6,400		04	65
KOREA MARINE TRANSPORT CO.	KOREA	HANJIN	CONTAINER	2	2,000		03	47
GERMAN K/G	GERMANY	JJ. SIETAS	CONTAINER	4	820		04	
ZIM ISRAEL IOFER GROUP)	ISRAEL	HYUNDAI HEAVY INDUSTRIES (HHI)	CONTAINER	4	5,000		04	
CARNIVAL CRUISE UNE	US	FINCANTIERI	CRUISE SHIP	1			05	450
SOUTH AFRICAN MARINE	GREECE	SHIN KURUSHIMA	CHEMICAL TANKER	2		32,000	03	
JAPANESE INTERESTS	JAPAN	SHIN KURUSHIMA	CHEMICAL TANKER	1		30,050	03	
FAIRFIELD CHEMICAL CARRIERS	US	KITANIHON	CHEMICAL TANKER	4		29,900	03	
JAPANESE INTERESTS	JAPAN	WATANABE	CHEMICAL TANKER	4		25,000	04	112
STOLT NIELSEN	NORWAY	WATANABE	CHEMICAL TANKER	4		25,000	04	
PAN OCEAN SHIPPING	KOREA	SHIN KURUSHIMA	CHEMICAL TANKER	1		20,000	04	
AMORETTI ARMATORI GROUP	ITALY	JIANGSU YANGZUIANG	CHEMICAL TANKER	1		19,000	04	
BERUANLAJU TANKER	INDONESIA	ASAKAWA SHIPBUILDING	CHEMICAL TANKER	2		14,000	04	36
JAPANESE INTERESTS	JAPAN	SHIN KURUSHIMA	CHEMICAL TANKER	1		8,650	03	
BERUAN LAJU TANKER	INDONESIA	SHITANOE ZOSEN	CHEMICAL TANKER	2		8,500	04	
CHINESE INTERESTS	CHINA	IHC HOUAND	DREDGER / SUCTION HOPPER	1				12,000
MODEC INC. (MITSUI GROUP)	JAPAN	SAMSUNG	FPSO	1			03	
Pn EXPLORATION		YANTAI RAFFLES SHIPYARD	FSO	1			03	
VINASHIP	VIETNAM	BACH DANG	GENERAL CARGO	1		11,500	04	
ITALTKH	ITALY	VOLHARDING	GENERAL CARGO	1	310		03	
ALGERIA / HYPROC / ITOCHU / MOL		KAWASAKI H.I.	LNG	1		71,000	06	
NIPPON YUSEN KAISA (NYK)	JAPAN	KAWASAKI H.I.	LNG	1			06	
MITSUMI O.S.K. UNES IMCHJ	JAPAN	SAMSUNG	LNG	4			05	640
KUNE	JAPAN	MITSUMI	ING	1			06	
LEIF HOEGH / MOL	NORWAY / JAPAN	MITSUBISHI H.I.	LNG	1			06	190
UNIQUE SHIPPING	KOREA	NKK CORP.	ire	1			04	57
JAPANESE INTERESTS	JAPAN	YAMANAKA ZOSEN	IPG	1			03	
PACIFIC CARRIERS	SINGAPORE	JIANGSU YANGZUIANG	MULTI-PURPOSE	1		25,000	04	16
PACC SHIP MGRS.	SINGAPORE	KOUAN	MULTI-PURPOSE	1	1,400	25,000	04	15
PHOENIX REEDEREI	GERMANY	JIANGDONG CHANGJIANG	MULTI-PURPOSE	2		12,500	04	22
MITSUMI O.S.K. UNES (MOL)	JAPAN	SHIN KOCHI JUKO	MULTI-PURPOSE	2		12,000	04	

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# Tech Helps Ignite Gas Ship Market



All signs point to a lucrative investment opportunity in Liquefied Natural Gas (LNG) carriers, as market demands for the product and improved production efficiency spreads around the world. There has been an increased effort on behalf of shipbuilders and ships equipment suppliers to design and build vessels and systems to maximize safety, effectiveness and durability of these unique ships. Profiled in the following report are brief updates on some of the more interesting projects.

## Keeping Clean

Scheepswerf Bijlsma is currently building what it terms the world's first Bi-Fuel LNG tanker. The "Kyoto" tanker will be built for the account of Knutsen OAS, Norway and will be delivered October 2003. The 226-ft. (68.8-m) ship derives its name due to its unique propulsion plant, an arrangement which is designed to help minimize the ship's impact on the environment by running on boil-off gas as well as diesel for back up. The boil-off gas will be LNG from the cargo tank to maintain the right pressure and temperature inside the cargo tanks. The required cargo temperature will be -164 degrees C.

The DNV-classed gas tanker is a double hull LNG tanker designed as a 2G type gas tanker, and is designed for a maximum speed of 14 knots, service speed of 12 knots. It is equipped with two Azimuth thrusters and one bow thrusters to deliver excellent maneuverability. Model tests were done at the basin of HSVA Hamburg.

The vessel has four auxiliary engines, two diesel engines and two gas engines. The power capacities of all engines are about the same. As per regulation of class the vessel is equipped with two separate engine rooms.

Each Azimuth thruster is powered by a frequency-controlled electric motor of 900 kW. During normal sailing condition the boil-off is enough for running the engines. If necessary, the cargo can be heated to get more boil-off. Two additional gas compressors are installed on top of one of the cargo tanks for pumping the gas into the engine room. The vessel is made for unmanned engine room.

The vessel is equipped with two cargo tanks, each with a capacity of 550 cu. m. The cargo tanks are made of stainless steel. The insulation of the tank is calculated to get boil-off suitable for running the main engine without spilling of gas. Each tank is equipped with two submerged frequency controlled cargo pumps. A nitrogen generator including a nitrogen tank is placed in the engine room for inerting all necessary spaces including cargo tanks. Cargo control can be done from the wheelhouse.

## Plug and Play

Another reported world first comes from France, where Alstom reportedly will be the first to install electric propulsion technology on an LNG carrier, a ship under construction at Alstom's Chantiers de l'Atlantique shipyard in France for the French utility Gaz de France.

No stranger to the use of electric propulsion onboard ship's Alstom has a long-history of placing this equipment aboard cruise ships, chemical tankers and other types of merchant and naval vessels. The innovative LNG ship, with a capacity of 74,000 cu. m., is scheduled for delivery to Gaz de France by the end of 2004.

It will be propelled through a variable frequency main propulsion system, via a gearbox. The electric drive principally consists of two 9,550 kW, 1,200 rpm synchronous motors, supplied by two synchroconverters associated with a propulsion control and monitoring system. **Martin Murphy**, Vice-President of Alstom's Marine & Offshore activity, said: "This new contract confirms the innovative capability of Alstom, based upon proven expertise and prestigious references in the field of marine electrical propulsion. Current and

Main particulars — Kyoto Tanker	
Length, (o.a.)	226 ft. (68.87 m)
Breadth	38.7 ft. (11.8 m)
Depth	18 ft. (5.5 m)
Draft	10.8 ft. (3.3 m)
Deadweight	640 tons
Gross Tonnage	1,500

Tank Capacities	
Cargo tanks 100%	1,100 cu. m.
Fuel oil bunkers	abt. 84 cu. m.
Potable water	abt. 34 cu. m.
Ballast water	abt. 598 cu. m.

future LNG carriers will benefit from its reliability, flexibility and simple operation in addition to being the most cost-efficient propulsion solution available on the market."

## Stationary Object

Mitsui & Co., Ltd. And IHI recently signed the formal contract for the construction of a LPG FPSO vessel for Single Buoy Mooring Inc. of Monaco. The FPSO vessel will be used for the Sanha Condensate Project at the Cabinda Block-0 located off Angola. The project is operated by a major oil group consisting of Sonangol, ChevronTexaco, TotalFinaElf and Agip.

Scheduled for completion from the IHI Kure Shipyard in mid-2004, this will reportedly be the world's first newbuilding of a FPSO vessel for liquefied gas, and will have a daily production capacity of 6,000 cu. m. and storage capacity of 135,000 cu. m.

The vessel is designed for continuous operation for 20 years without drydocking, and will include LPG storage tanks and LPG production plants such as gas separators, gas refrigerators, and boil-off gas reliquefaction units on the upper deck.

The IHI SPB tank system (Self-supporting, Prismatic-shape, IMO Type-B) will be used for the storage tanks of the new LPG FPSO vessel, which is durable against the low temperature of LPG minus 50 degrees Celsius.

Mitsui and IHI delivered the world's first purpose-built LPG FSO vessel, Escravos LPG FSO, for the Escravos Gas Project (Phase-I) operated by Chevron-Texaco in 1997. It has been operated for five years without any downtime.

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## How Far Has E-Procurement Come in the Maritime Community?

As dot-com firms that lacked a solid foundation disappeared from the landscape, the strongest are left standing amid the rubble. It is worth noting that at the height of the 'dot-com' boom and

phenomenal statistics from various research groups, Gartner Group predicted that 75 percent of e-business projects would fail because of a lack of understanding of technology and poor busi-

ness planning.

Of the companies predominately built on smaller amounts of capital from within the industry such as Oslo, Norway-based MarineProvider — from day



Tony Giambrone (at left), of Maersk Line with MarineProvider's CEO, Collin Lewis, worked together to establish a user-friendly electronic procurement solution.

one there was a vested interest in not only the day-day operations of the company via its investors, but there was a mission that MarineProvider had — which was to assist companies already within the maritime community.

### Slow and Steady Wins the Race

MarineProvider has emerged as a leading supplier of e-Procurement solutions in the marine industry, and now has more 40 percent of buyers that have signed up to use an e-Procurement system as clients, including Maersk Line, Ltd.; Golar LNG; Sun Cruises; and China Navigation. Collin Lewis, CEO of MarineProvider is confident that this is just the beginning of the company's already-established client base.

"It's clear that we (MarineProvider) are moving through the early adopter phase and that significant activity is taking place in the e-procurement sector, we've seen the concerns our clients have regarding e-Procurement evolve, and crucially one area that has changed is the understanding that e-Procurement can be an intricate part of maritime business strategies not in the future but now."

The impact MarineProvider is seeing varies from a complete transformation of existing procurement business to just a peripheral effect on current operations. However, the bottom line is that there is now strong recognition that there will be e-procurement in the marine industry. While some organizations are overcoming the barriers to e-business transformation, many companies still perceive significant risks and uncertainties, and there was a slowing of the predicted implementation of e-business in general.

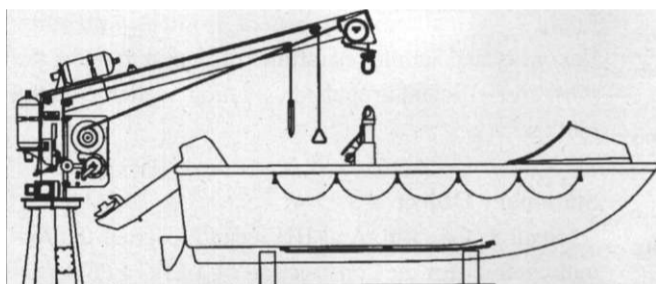
Many companies adopted a "wait and see" attitude before investing heavily in

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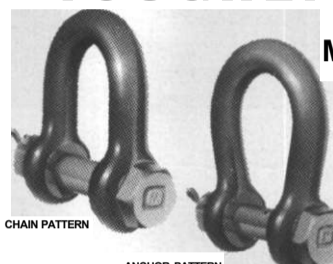
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relatively unproven systems that promised large and timely returns. The shakeout of e-commerce has alleviated some of the uncertainty, but has also interjected new concerns. Suppliers fear that the benefits of supply chain integration are accruing disproportionately towards the buy side.

In order to ease these concerns, MarineProvider has been very careful to provide a solution that will remove inefficiencies on the supply side.

"An e-procurement solution should reinforce relationships with suppliers, not replace them, Lewis said. "MarineProvider's focus is on complementing - not substituting the relationship."

The company is aware that you cannot have e-Procurement without integration; that is why the largest part of MarineProvider's investment went into standardization of interfaces, connectors, out of the box solutions, XML type appliances to connect different systems.

MarineProvider believes that as its customers begin to see early gains from e-commerce, they will want to implement it within other areas of their business. In the maritime industry, an example of this would be the partnership that MarineProvider has established with online fuel exchange company Oceanconnect.

With a variety of businesses continuing to see e-business as a long-term strategy, these same companies are already moving into the next-generation of their e-business implementations.

**Tony Giambone** of Maersk Line, Ltd. in Norfolk Va. spent almost two years analyzing the claims of various e-commerce companies before deciding to move ahead with MarineProvider.

"We (Maersk Line), wanted an electronic procurement solution that was easy for our staff to use, offered a very safe e-business environment that was quick to implement. There was no cost to the suppliers, thus taking away the barriers to entry and introducing our supply partners to e-Procurement trading."

MarineProvider has built integration adaptors into leading systems such as AMOS, JDE, PeopleSoft, SAP, ShipNet and more and offers ship owners a total solution from ship to shore to supplier all electronically.

And MarineProvider's strategies and business philosophies have melded together as one, as transaction volumes have grown significantly during 2002 with over 19,000 in Q2 of 2002 and 11,000 in July alone. Suppliers are also

beginning to see the benefits of receiving standard documents from multiple buyers and are subsequently contracting MarineProvider to integrate into their systems.

Stock listed on the Oslo OTC with headquarters in Oslo, Norway, Marine-

Provider also has offices in New Jersey; Houston, Texas; London, U.K.; and Hong Kong.

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*Thanks to Marine Provider's New York office and Ron Taylor - V.P. Business Development for their contributions to this article.*



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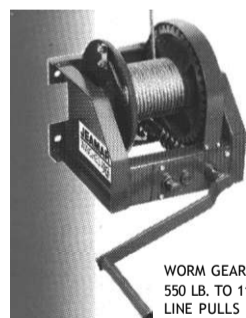
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Marine Coatings

# Coatings Corrosion — A Natural Predator

An old naval submariner once said there are really only two types of ships — submarines and targets. However when it comes to corrosion, all ships are targets. Corrosion is the natural predator of all steel that operates in salt water environments. The primary weapon used to protect steel on ocean going vessels is protective coatings or linings.

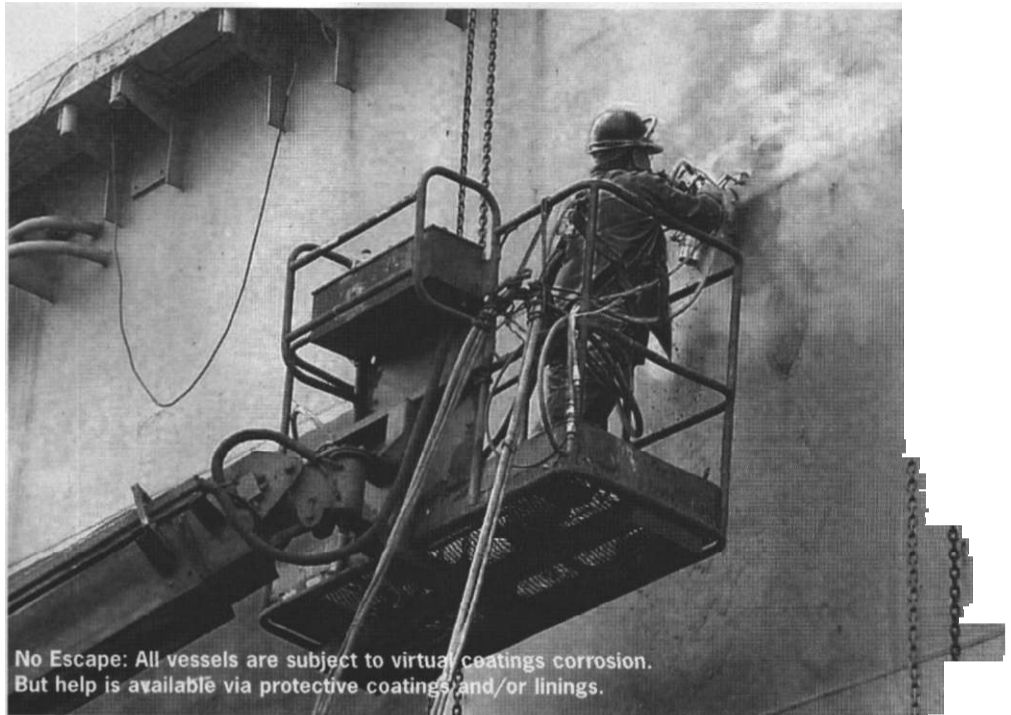
In the past few years, significant technologies have emerged that offer the opportunity for ship owners and ship builders to double or triple the life of the protective coatings on their ships. These comprehensive improvements have taken place in virtually every major process involved with coating marine vessels. By taking advantage of these emerging technologies, some ship owners and shipyards are improving their profits by increasing the life of their coating systems and eliminating hazardous waste disposal costs.

Believe it or not, the primary motivation for investing in state-of-the-art technologies was government regulations. In the United States, the U.S. Navy took the leading role in experimenting with and implementing new processes and products. These initiatives are already having a positive impact and the Navy expects to drasti-

cally reduce their corrosion related maintenance costs based on life cycle cost analysis. For example, initial indications reveal that the service life of ballast tanks can be increased from seven years to 20+ years. This translates into significant cost and time savings for the fleet.

Ship owners, like the U.S. Navy and commercial owners, are focused on the long-term operating cost of their vessels. Their primary interest is finding state-of-the-art technologies and process improvements that not only comply with government regulations increase the service life of the coatings applied on their vessels. Ship builders, on the other hand, are primarily interested in the immediate implications of their processes. Their focus is on environmental compliance (i.e. pollution prevention, waste management) and production efficiencies.

The technological advances in recent years have met the needs of both the ship owners and the ship builders. Several areas identified that require improvements include: (1) New coatings formulations that met air quality regulations and increased coating life expectancy; (2) new or enhanced non-visible surface contamination detection



No Escape: All vessels are subject to virtual coatings corrosion. But help is available via protective coatings and/or linings.

methods; and (3) improved inspection.

On the technology side, ship owners have focused their efforts on testing new types of coatings that eliminate known problems, comply with environmental regulations, and offer substantial improvements in the life cycle of the coatings. For example, the U.S. Navy realized that the coatings in ballast tanks were only lasting 7-10 years. After investigating the problem, they discov-

ered that the primary cause of the premature coating failures was improper design of the steel edges and inaccessible areas. Unlike European shipyards, where all the edges on stiffeners are rounded to facilitate the application of coatings, in the United States edges are "sharp." This makes it very difficult to obtain sufficient coating protection on the edges since most coatings shrink away from sharp edges.

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## Marine Coatings

The Navy realized it was financially impractical to require that all edges be rounded. They choose instead to develop a test protocol for extremely high or 100 percent solids coatings that exhibited "edge retentive" properties for the edges of the stiffeners in their vessels,

thus making them easier to coat. They decided that approved products needed to maintain at least 70 percent of the film thickness that was applied to the flat surface on the edge. Initially, only one coating manufacturer made a commercially available product that met the

Navy's requirement. Now, however, there are several approved coatings manufacturers, including at least two U.S. approved suppliers.

Currently there is much interest in the ship owner and ship builder community regarding the tributyltin (TBT) ban.

TBT is currently used to protect the bottoms of nearly 75 percent of the commercial vessels. For years TBT has been the primary and most cost-effective biocide used on the underside of ships to provide antifouling protection. However, since TBT causes mutations in certain marine organisms, it is scheduled to be removed from the list of approved products. The TBT ban begins to take effect in 2003, with the complete ban scheduled to be effective date in 2008.

Currently, alternative technologies under consideration as replacements for TBT include "easy release" coatings based on silicone or fluoropolymer technology, and ablative self-polishing coatings with biocides that are well established and with known performance (i.e. Cu20 and CuSCN) or the less established and metal free organic and reduced metal metallo-organic biocides. At this point, some ship owners have voiced considerable concern that the commercially available replacements for TBT are far more expensive (up to two times more costly) and do not last nearly as long as TBT. Five year projections for marine antifouling coatings predict that demand for these products will double by 2008. If past response to environmental regulations holds true, the coating manufacturers will develop products that meet the demands of both the regulators and the owners.

On the process side, ship owners recognized the importance of removing soluble salts before painting or coating surfaces. The traditional method of abrasive blasting previously painted tanks and ship surfaces did not remove the non-visible soluble salts. More significantly, when these non-visible salts are blasted into the surface they result in a significant reduction in the service life of coatings, especially in immersion conditions. Owners recognized they needed test methods for nonvisible contaminants and began to develop these.

The second generation of chloride tests (i.e. the Bresle Cell and Bresle Kit) is currently being used by the U.S. Navy and others. This method consists of placing a patch on the surface, injecting a liquid beneath the patch using a syringe, massaging the liquid on the surface, extracting the liquid with the syringe, and then testing the solution with a titration test strip. According to some published literature, because the Bresle Test Method extracts only 45 = 60 percent of the salts on the tile sur-

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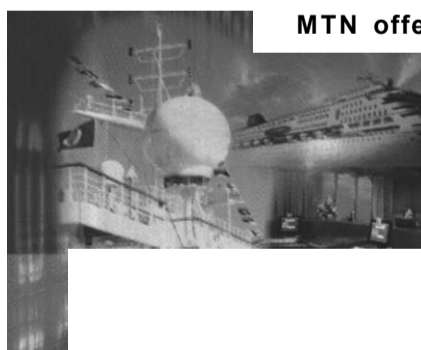
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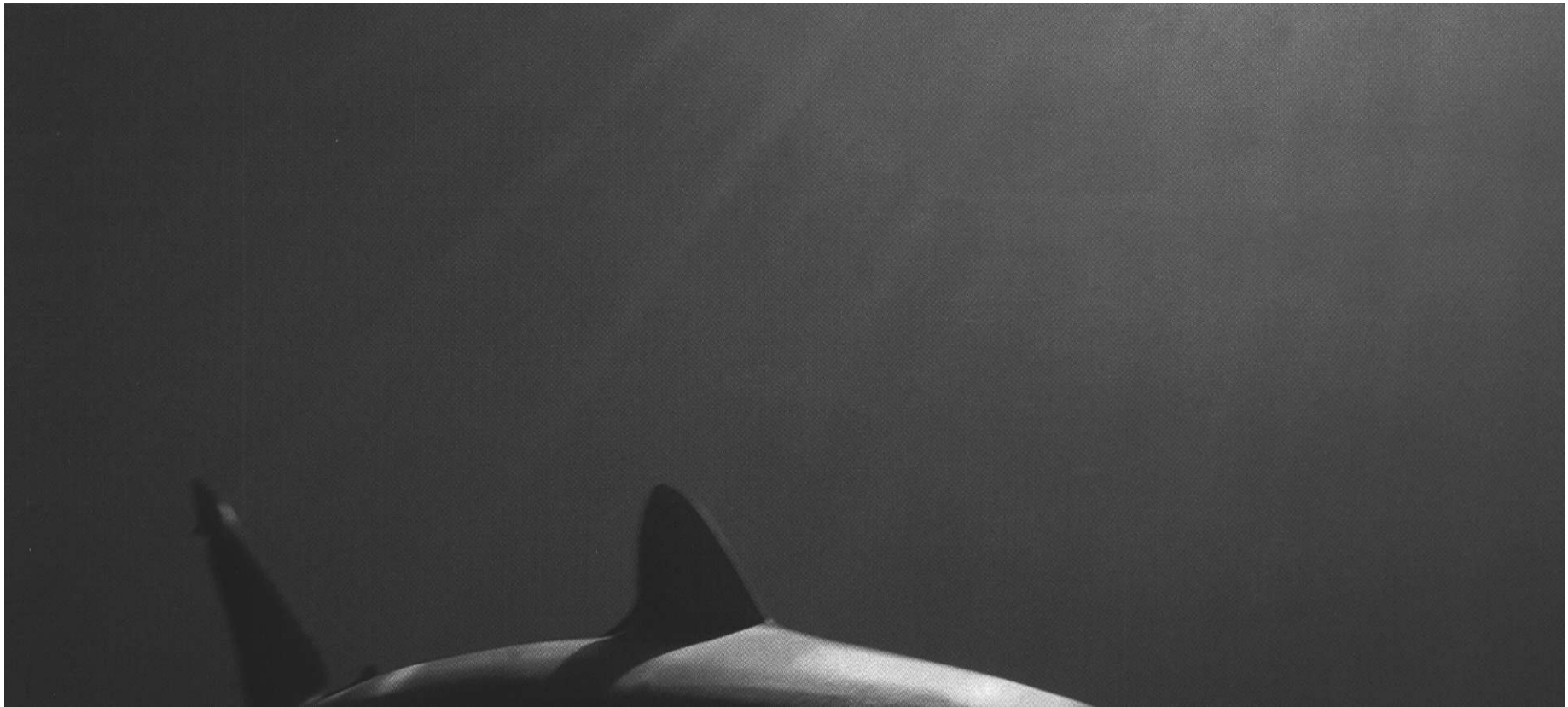
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face, the Bresle test results must be multiplied by 2 in order to determine the chloride level for comparison with other methods.

The third method available to detect non-visible chlorides is commonly referred to as the Chlor\*Test kit. From an inspection standpoint, it is the most field-friendly test. It consists of filling a receptacle with a pre-measured solution and attaching the device to the surface. The rubbery outer skin of the device containing the solution is massaged for a specified amount of time and then the device is removed from the surface. A kitagawa tube is broken on both ends and inserted into the solution and read in parts per million. This method is easier to use. Since the reading is obtained directly, there is no need to remember to perform the additional math steps required when using the other methods.

Ship owners and ship builders are beginning to realize the importance of using qualified inspectors to ensure that coating materials are applied in accordance with the specifications and product data sheets. The old saying, "you get what you pay for," is not exactly accurate. You most likely won't get what you pay for if you don't perform inspections using qualified inspectors. It has been said you get what you inspect, not what you expect.

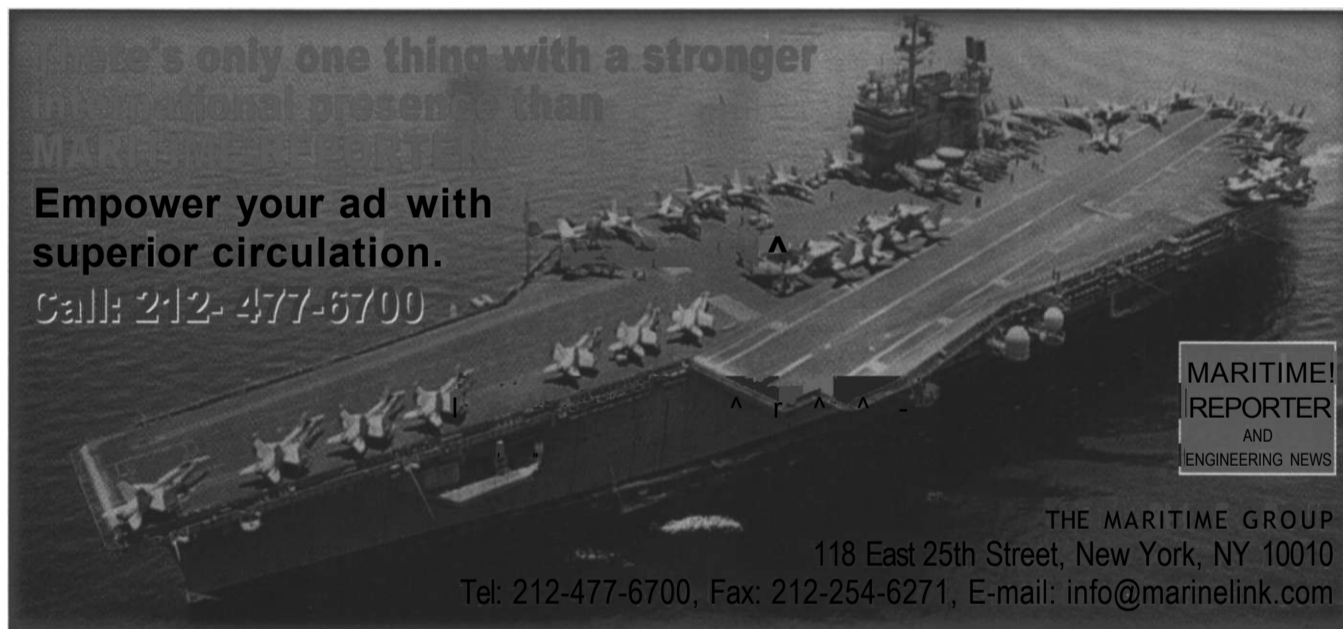
Consider some of the following technologies that have been incorporated into various ship building and repairing processes in the past few years, (1) ultra high pressure water jetting, (2) edge retentive 100 percent solids coatings, (3) powder coatings, (4) plural component spray equipment, (5) non-visible salts detection testing. All these technologies, and others, have increased the need for qualified and knowledgeable inspectors.

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The program ends with a comprehensive oral exam that, when passed, results in certification of the individual as a NACE Coating Inspector — a certification that is recognized globally.

For more on the latest advancements in coating inspection and coatings technology, plan to attend CORROSION/ NACExpo/2003, March 16-20, 2003, in San Diego, CA.

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## Haraco Services Now Part of Miihlhan Group

Haraco Services Pte Ltd, a Singapore based Corrosion Protection Contractor formed in 1986, has been recently acquired by the Miihlhan Group, a worldwide operating Surface Protection Specialist, based in Germany.

Haraco established its name as a reputable contractor, providing Tank Internal Coating to Sembawang Shipyard, a leading Repair Yard in Singapore.

They also provide their Corrosion Protection Services as well as Fireproofing to the Oil and Gas Industry, Offshore Engineering and Power Generation. In 1994, Haraco was accredited with ISO 9002 Certification by Det Norske Veritas.

Miihlhan is one of the few worldwide operating Surface Protection Specialists and the only one with a history of more than a century. The name stands for pioneering the abrasive blasting method in Europe, in particular the marine industry. By now, they are covering the whole spectrum of Surface Protection and hold patented technologies known as p-jet(r), p-fast(r) and p-joint(r).

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## New DynaMatch System Provides Versatility

NCP Coatings, Inc., innovators in commercial and industrial paint and coating products since 1948, has developed DynaMatch, one of the most versatile tint mix system available.

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This family of NCP Coatings bases includes standard alkyds, chain stopped alkyds, silicone alkyds, acrylic enamels, alkyd acrylic bakes, polyester bakes, acrylic urethanes, polyurethane, and textured polyurethane. The DynaMatch system also includes a variety of primers, catalysts, reducers, and additives to compliment these bases.

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## Monitoring & Control Products

### CMR

C M R now offers the Clarine Marine Rack 101, which is engineered to meet demands of a small-ship monitoring system. C M R's Clarine Marine Rack 101 is a completely centralized, designed to eliminate the need for separate monitoring and alarm units. Designed to mount flush in the wheelhouse console, the Rack 101 features standard display formats for a traditional "console look" on a 12" (305 mm) LCD screen. It also has an integrated logic functions and can replace PLCs on workboats, OSVs and crew boats and tugs.



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### HBM

HBM data acquisition systems and software has released its new T10FS series of torque transducers. Featuring higher speeds and smaller mass moments of inertia than its counterpart the T10F Torque Flange, the T10FS is designed for high-performance automotive testing applications where high speeds with accuracy are required. The T10FS is based on a modified T10F measuring body, and similarly uses the transverse stress measurement principle. Primary applications for the T10FS include Formula One engine test stands, transmission test stands and chassis roll test stands.



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### Scott

The Scott Mini-SA personal gas monitor has an ergonomic full feature design that makes it easy to use and maintain. At 127 g, it is compact and lightweight and can be clipped to a users belt or lapel. Sensors are interchangeable and automatically configure enabling new or different sensors to be changed in the field. Its oxygen sensors have a two year life warranty while its large LCD display allows for easy menu driven operation by displaying actual reading of toxic gases giving the user the choice of displaying TWA, STEL or peak readings.

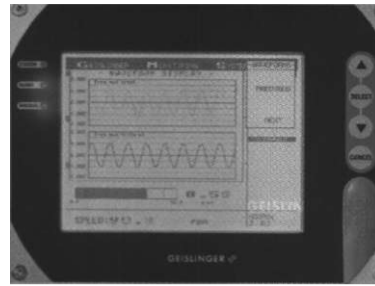


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### Geislinger Debuts GMS Mark4

At the SMM exhibition in Hamburg last month, Geislinger unveiled its fourth generation of an instrument designed to continuously monitor torsional vibration amplitudes. The instrument — Geislinger Monitoring GMS Mark4 — has three monitoring functions for which the software is tailored to the specific requirements: detection of engine misfiring; monitoring of the Geislinger Damper; and monitoring of the coupling. For processing the calculated values, the system unit can be connected to a PC and the data can be sent directly to Geislinger for analysis. Type approval is from DNV, electrical and environmental testing according to IACS E-10 rules. The company reasons that optimal operation of the engine is delivered from an early detection of problems, yielding increased service life.



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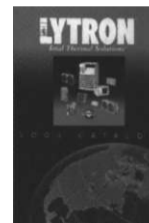
Sensotec introduces the application of force measurement technology to traditional resistance welding techniques. By combining the Model, WEL weld-thru load cell with a Model WGM Weldmeter, it is possible to control the electrode force at the time of firing for spot and projection welds. This technology works in combination of the new constant voltage weld controllers to provide an economical control system which triggers the weld when the proper force is reached.



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### Lytron

Lytron has introduced its revised 2003 Thermal Management Guide. The new 2003 guide includes: an overview of cold plate technologies; a description of new Press-Lock technology; performance data for Third Generation Kodiak Recirculating Chillers; Various coolant fluid's thermal properties; product weight and volume, and conversation factors; Specifications, performance data, options, ordering information, product pictures and selection guidelines for Lytron's thermal management products.



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Ultima

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[www.maritimereporterinfo.com](http://www.maritimereporterinfo.com)

### Vibro

Alpha Acoustiki Ltd., located in Athens, is a firm that specializes in noise and vibration control in Greece. Experience has been gathered in acoustics, noise and vibration control in buildings, machinery, industrial installations and transportation services. The company designs and manufactures high technology Antivibration systems under the brand name VIBRO brand name. Our highly specialized engineers can deal with any vibration and noise control problem primarily with the use of the VIBRO vibration control systems.



**Circle No. 115**  
[www.maritimereporterinfo.com](http://www.maritimereporterinfo.com)

### K-TEK

The KM26 Magnetic Level Gauge from K-TEK not only measures acids, solvents, petrochemicals and liquid to liquid interfaces in a variety of industries but is safe for total and interface applications that are toxic, corrosive, flammable or high pressure and yet is easy and safe to maintain with no gauge glasses to clean. In addition, the KM26 MGL is cost-effective. It can cost far less than replacement glass, gaskets & cushions. K-TEK is a NA manufacturer of mgl's that offer extruded outlet connections that attach to the KM26 to the storage vessel eliminating distortions to the chamber affecting float travel and alignment problems.

**Circle No. 122**  
[www.maritimereporterinfo.com](http://www.maritimereporterinfo.com)

### Magtrol

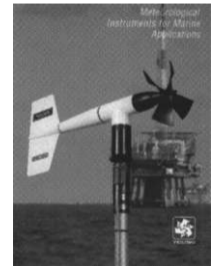
Magtrol's new brochure provides reliable systems for measuring and monitoring load, force and weight. The brochure is comprised of Magtrol's extensive product offering including load measuring pins, load-force-weight sensors, strain transducers, load monitoring units, load conditioners and displays, all of which can be purchased individually or integrated into complete measurement systems. Magtrol's measurement systems are extremely accurate providing safety, control and overload protection for static or dynamic measurement, and are able to withstand the most extreme environmental conditions.



**Circle No. 108**  
[www.maritimereporterinfo.com](http://www.maritimereporterinfo.com)

### Young

From coastal workboats to remote ocean buoys, Young meteorological instruments perform in demanding applications. Many commercial and scientific organizations rely on Young sensors to provide accurate data through the harshest conditions, such as: Harbor surge forecast experiment for NOAA-NOS (National Ocean Survey) at Brandywine Shoal Light, Delaware Bay.



**Circle No. 118**  
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### Perennial Monitoring Systems

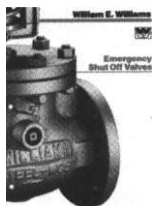
Perennial Monitoring Systems introduces the first low-cost, high-tech, easy-to-install engine monitor. Each unit continuously collects data from up to four engines. LCD provides current conditions and alarming. Stores 2 million downloadable PC readings for detailed engine analysis. Lease/purchase for under \$100mo.



**Circle No. 120**  
[www.maritimereporterinfo.com](http://www.maritimereporterinfo.com)

**William E. Williams**

The Williams Emergency Shut-Off Valves (ESOV) are utilized in major refineries, petrochemical plants, dockside marine installations, fuel storage terminals, pipeline distributions, and offshore rigs throughout the world. They are recognized for their quality and dependability. In addition to the basic ESOV, Williams offers six modified emergency valve systems: Pneumatic actuated, Nema-7 Solenoid, High Pressure switch, Temperature Sensitive, High Level Shut-Off and Gas Overpressure Shut-Off.



**Circle No. 117**  
[www.maritimereporterinfo.com](http://www.maritimereporterinfo.com)

**Ampco**

Ampco Pumps has supplied nickel aluminum bronze pumps to the marine industry for more than 50 years. The recently introduced RC2 Series of self-priming pumps are suitable for bilge, ballast, fire and wash-down applications. Ampco offers one week lead time on nickel aluminum bronze pumps with flows from 5 GPM to 1600 GPM.



**Circle No. 101**  
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**International Paint**

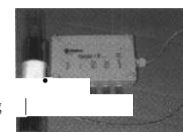
For over 100 years, International has provided solutions to the global Marine industry's constantly evolving needs and earned a reputation of trust and quality. Technology leaders in TBT free antifouling, abrasion resistant coatings, ballast tank coatings and fouling control systems, International marine coatings are engineered to deliver proven performance in service while representing value for money.



**Circle No. 119**  
[www.maritimereporterinfo.com](http://www.maritimereporterinfo.com)

**Comrod**

Comrod has developed a new multifunction antenna system called MAS1 which allows simultaneous transmitting and multi-receiving through a single cable and antenna. Its compact design using the latest technology makes the MAS1 unique because it builds 140 mm onto a standard VHF-antenna with 43 mm diameter. The new MAS1 can receive Navtex, DGPS, AM/FM radio, SSB, Weatherfax and VHF, as well as transmit on VHF. Optionally, also cellular GSM can be received and transmitted.



**Circle No. 102**  
[www.maritimereporterinfo.com](http://www.maritimereporterinfo.com)

**ShipTech**

ShipTech Marine Consultants (Naval Architects & Marine Engineers) has issued its new brochure and can be viewed through their new web site at the address: [www.shiptech.com](http://www.shiptech.com) ShipTech Marine Consultants looks forward to servicing existing and new customers.



**Circle No. 121**  
[www.maritimereporterinfo.com](http://www.maritimereporterinfo.com)

**Cross**

Cross Equipment Incorporated is a world wide equipment company, is located near the gulf coast in Houma, La. Their inventory includes a wide variety of makes and models of winches and deck equipment to meet your specific needs. The Cross Equipment Inventory includes: Winches, Levelwinds, Diesel HPU, Spooling Units, Deck Equipment, Hose /Umbilical Reels, Fairleads, Sheaves and Blocks.

JJCH05SJ



**Circle No. 103**  
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**Virtual Reality Center**

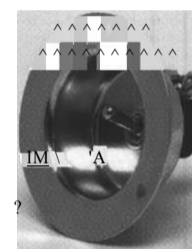
The Virtual Reality Center specializes in the development of complex real-time simulation & visualization software. Its most recent project was a fully functioning cable plough simulator including the vessel, vessel dynamics, launch and recovery operations, ROV, sea states and real time accurate terrain modeling. The system is considered to be the most advanced of its kind.



**Circle No. 123**  
[www.maritimereporterinfo.com](http://www.maritimereporterinfo.com)

**Cole Hersee**

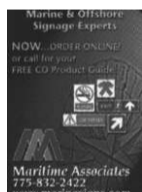
Cole Hersee has introduced its Recessed Toggle Switch for marine comprised of a standard toggle switch centered at the bottom of a plated steel bowl measuring .892 in. deep. This new design prevents accidental actuation of the switch by passengers. The steel casing fits into a 2 in. diameter hole and has an outer rim diameter of 3 3/16 in. (81 mm). The rim also has 3 holes for mounting.



**Circle No. 124**  
[www.maritimereporterinfo.com](http://www.maritimereporterinfo.com)

**Maritime Associates**

Maritime Associates has the capabilities to supply signage needs, including complete shipboard conversion projects and sign upgrading services. They are a manufacturer with the flexibility to produce signs, cost-effectively in the U.S., in a wide range of materials, mounting and installations methods. Order online, or contact them for a free CD product guide. See their new product lines, including their innovative photoluminescent material, bright white, and the SlimLine Low Location Lighting System.



**Circle No. 125**  
[www.maritimereporterinfo.com](http://www.maritimereporterinfo.com)

**IMSSCO**

The Department of Navy, Office of Naval Research Laboratory and NAVSEA have approved IMSSCO Inc.'s gold PFA-95 by way of Test Assessments and Doctrinal Validation. A near term need and request for order (RFQ) was issued by Coastal Systems System Station Panama City. IMSSCO Inc. of San Diego, Calif., received multiple sole source awards per FAR regulations. ABS has type-approved the PFA-95 per SOLAS and Class requirements for documented Ready Reserve Fleet and other such commercial ships.



**Circle No. 126**  
[www.maritimereporterinfo.com](http://www.maritimereporterinfo.com)

**NSL**

NSL can provide an independent naval architecture and marine engineering design service, as well as undertaking technical support for repair, conversion and new-build contracts, using the latest design techniques and software, including shipcam and autocad systems. NSL offers a unique, competitive and comprehensive service to a variety of projects, including ferries, offshore, tankers, MoD vessels, aluminum fast craft, cruise ships and coastal vessels.



**Circle No. 112**  
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**Reiss**

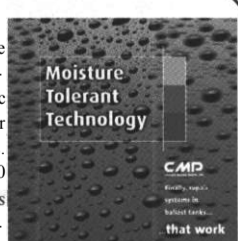
Reiss Manufacturing manufactures silicone rubber seals, gaskets, tubing, grommets, shielding, sound insulation and bellows for the Marine industry. Ronsil silicone rubber can be formulated to withstand temperatures from 178 to 600 degrees. Silicone rubber is not affected by UV, ozone, minerals, many chemicals and oils, and it does not take a compression set as many organic rubber seals because of the fluctuations of outside ambient temperatures.



**Circle No. 116**  
[www.maritimereporterinfo.com](http://www.maritimereporterinfo.com)

**CMP**

Chogoku Marine Paint manufactures synthetic resin paints for marine vessels. The Nova 5000 Barrier is designed especially for ballast water tanks. The barrier is designed to be easily applied at a high film thickness and then prevents water penetration, and corrosion is halted. The new Umeguard Super-H, a highly abrasive cargo holding coating, is designed to extend the period between major grit blasting of cargo hold to 50 percent.



**Circle No. 129**  
[www.maritimereporterinfo.com](http://www.maritimereporterinfo.com)

**Oil Safe**

Prevent equipment-damaging lube contamination and costly oil spills with Oil Safe Lubrication Tools. Whether you need to transport your oil 20 feet or 20 miles, the unique Oil Safe sealing system will keep your lubricants safe from contamination and spills. Oil Safe Lids are available in eight bold colors, allowing you to color code lubricants, thus minimizing the risk of topping off your machinery with the wrong oil.



**Circle No. 130**  
[www.maritimereporterinfo.com](http://www.maritimereporterinfo.com)

**Thermax**

Thermax, non-combustible, non-toxic, marine construction boards are used worldwide for joiner bulk heads, panels, liners, ceilings, door and furniture cores. Thermax has all major regulatory body certifications (USCG, Canada, DNV et al) and meets the requirements of IMO/SOLAS resolutions. Thermax is sold, distributed, warehoused laminated and cut to size in North America by PSI.



**Circle No. 131**  
[www.maritimereporterinfo.com](http://www.maritimereporterinfo.com)



**Taylor Made**  
 Taylor Made Environmental supplies marine HVAC solutions under the Cruisair and Marine Air Systems brand names. Product lines include self-contained seawater-cooled units and split-gas systems, as well as chilled-water systems. The company offers extensive applications engineering support and a worldwide service network.

**Circle No. 132**  
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# 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**  
Nomsael PO Box 40525 Houston, TX 77240

**ACTUATORS, VALVE**  
JA Moody Equipment Specialist, Inc., 3223 Phoenixville Pike, Malvern, Pa 19355, (800) 355-3810 (Northeast); 809 Pecan Forest Court, Chesapeake, VA 23322, (757) 641-0880 (Southeast); 2130 7th Ave. W. Seattle, WA 98119, (206) 691-1000 (West); www.jamoesi.com

**AIR CONDITIONING AND REFRIGERATION**  
Adrick Marine, 81 Mahan St., W. Babylon NY 11758  
Bailey Refrigeration, 4986-1 Euclid Road, Virginia Beach, VA 23462  
Cosopolch Refrigeration, 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, Brassard, Quebec Canada J4Y2P4  
Taylor Made Environmental PO Box 15299 Richmond, VA 23227

**ALARMS, FACTORY MUTUAL-APPROVED**  
NREC 1701 Engineers Rd Belle Chase, LA 70037  
SELCO 353 AAsbury Commons Dr., Atlanta, GA 30338

**ALUMINUM BOATS**  
Island Boats 6806 Highway 90 East New Iberia LA 70560  
Sea Ark Marine PO Box 210 MonticelloAR 71655-0210  
William E Munson Co., 18130 Sunset Way, Edmonds WA 98026

**ANCHORS AND CHAINS**  
Crandall Dry Dock Engineer Inc., P.O. B. 505904, MA 02150  
GJ Wortelboer Jr. BV, 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 Columbia, 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, MD10192-1031

**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 2506 58th St Hampton, VA 23661  
Kahlenberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241  
Okot 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 L7M1A6  
Vesco Plastics, P.O. B. 40647, Cleveland 2022 SOUTH AFRICA

**BILGE SYSTEMS**  
Fast Systems 14040 Santa Fe Trail Dr. Lenexa, Kansas 66215-1284

**BLOCKS a RIGGING**  
Skookum, P.O. Box 280, Hubbard, OR 97032

**BOILERS (HEAT RECOVERY)**  
Deltak LLC 2905 Northwest Blvd Ste 150 Plymouth MN 55441 USA

**BOAT BUILDER**  
Allen Mahne PO Box 1049 Sitka, AK 99835  
Hike Metal, Box 698, Wheatley, ON Canada N0P 2P0  
Kivchak Marine, 469 NW Bowdoin Pl., Seattle WA 98107  
Sea Ark Marine PO Box 210 Monticellk) AR 71655-0210  
Washburn Doughty, P.O. Box 296, E.Boothbay ME 04544

**BOLLARDS**  
Maritime International, 100 E. Vermilion Street #212, Lafayette, LA 70501

**BRIDGE SUNSCREENS**  
Martek Marine Blinds, Unit 46, Century Business Centre, Maversway, Rotterdam, 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. Moristown 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**  
Nomsael PO Box 40525 Houston, TX 77240

**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, Vokfiria, 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. Bulfum St, Milwaukee, WI 53212

**CHAINS**  
Crandall Drydock Engineers PO Box 505804 Chelsea, MA 02150  
Washington Chain, P.O. Box 3645, Seattle, WA 98124

**CHEMICALS**  
Uniservice Americas 57174 Hardin Rd, Slidell, LA 70461

**CLASSIFICATION SOCIETY**  
Lloyds Register 71 Fenchurch St London EC3M 4BS

**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 Plots Blvd, Baltimore Md 21219  
Chugoku Marine Paints PO Box 73 47932H Finaart The Netherlands  
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  
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 IntH, 1440 South Creek Dr., Houston, TX 77084  
Resto Motive Laboratories PO Box 1335 Monmouth, 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 Martne 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 16936

**COMPRESSORS**  
Hatipaga Uetensener Maschinenfabrik Tomescher WEG 5-7 D-25436 Uetersen, Germany

**COMPUTER / COMPUTER SOFTWARE**  
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 Leggett Dr., Karata, Ontario, Canada K2K1Z8  
Uoyrfs Register, 100 Leadenhall a, London, England EC3A 3BP  
Nil, 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 Radio-1990 Industrial Ave Harvey, LA 70058  
Inmarsat Ltd, 99 City Road, London City EC1Y 1AX England, UK  
Jw Radio, 1011 SW Klickitat Way, Bldg B, Suite 100, Seattle, WA 98134  
Mackay Comm Inc: 2721 Discovery Dr, Raleigh NC 27616-18  
Rydex: An Inmarsat Ventures Co., 130-13111 Barber Place, Richmond,BC V6V2J1  
World-Link Communications, 74 Main St, Frantinglan,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, Bkig B, Suite 100, Seattle,WA 98134  
Mackay Communications, 2721 Discovery Dr, Raleigh, N.C. 27616-1851

**CONSULTANTS**  
Captain RJ, Undethil & Associates, P.O. Box 1030 Groves, TX 77619  
Elliot Bay Design Group 5301 Shishole Ave NW Ste 200 Seattle WA 98107

**CONTAINER LIFT SPREADERS**  
Tandemloc Inc,824 Highway 101, Havelock, NC 28532

**CONTROL SYSTEM - Monitoring/Steering**  
Beier Radio1990 Industrial Ave Harvey, LA 70058  
Electronic Marine Systems, 800 Ferndale Pl, Rahway, NJ 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., 919 Veterans Blvd., Suite 201, Kenner, LA 70068  
MMC International, 60 Inip Dr, Inwood NY 11096  
Motor Services Hugo Stamp, 3190 S.W. Uuenderdale, a 33315  
Scientific Mahne Services, Inc., 101 State Pl, Suite N, Escondido, CA 92029  
Stork Kwant, P.O. Box 23, 8600 AA Snnek, Netherlands  
Tano Corp,57017 Citrus Blvd., Suite E, New Orleans, LA 70123

**CORROSION CONTROL**  
Spectrum Trading 108-6 Oak StAlpharetta GA 30004  
Gardner Denver Water Jetting Systems 8807 Emmett Rd, Sute 100 Houston, TX 77040  
Ultra Strip 3515 SE Lionel Terrace Staurt, FL 3499%

**COUPLERS- Tug & Barge**  
Intercontinental Engineering, P.O. Box 9055, Kansas City, MO 64168

**COUPLINGS**  
Acomarin 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, Hatwanger Landesstr 3,5300 Harhwang Salzburg, Austria  
Geislinger Corporation, 200 Geislinger Drive,Battle Creek, MI 49015  
Mapeco Products, 91 WHenbrock Rd, Unit B, Oxford, CT 06478  
MMC Intl, 60 hip Drive, Inwood, NY 11096

**CRANE-HOIST-DERRICK—WHIRLEYS**  
Bisso Mahne Co. P.O. Box 4113, New Orleans, LA 70178  
E. Crane 241 Executive Dr, #3 Marion OH 43302  
Edgewater Machine 1, Fabricators, P.O. Box 358, Edgewater, FL 32132-0358  
Holy Host Corp, P.O. Box 86, St Clair Shores, MI 4808M088  
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 Yak Corp., 160 Van Brunt St, Brooklyn, NY 11231

**CRANKSHAFT REPAIR**  
Goltens-New Yak Corp, 160 Vfel Brunt St, Brooklyn, NY 11231  
In-Place Machining 1929 N. Bulfum St Milwaukee, WI 53212  
Waltz S Krenzer, 91 WHenbrock 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 Dlive,Baffle Creek, MI 49015

**DATA RECORDERS**  
L3 Communications, PO Box 3041 Sarasota FL 34230-3041

**DECK MACHINERY — Cargo Handling Equipment**  
Edgewater Machine 8 Fabricators, P.O. Box 358, Edgewater, FL 32132-0358  
Hatipaga Uetensener Maschinenfabrik Tomescher 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  
Seabuk Sytems 3851 Shell Rd Ste 200 Richmond, BC Canada V6X-2W2  
Skookum, Inc, P.O. Box 280, Hubbard, OR 97032  
Smith Berger Marine Inc., 791510th Ave. S, Seattle, WA 98108  
Superior Uderwood-Mundy, 1101 John Ave., Superior, WI 54880  
Timberland Equipment Ltd, A Almon Johnson, 459 Industrial Avenue, Woodstock, ON N4S7Z2 Canada  
W.W. Patterson 3 Reverse Rd Pittsburg, PA 15233

**DESALINATION - REVERSE OSMOSIS**  
G.E.T., Inc., 3135 Golden Avenue, Long Beach, CA 90806  
Pal Rotfiem, 5775 Rio Vista Drive, Clearwater, FL33760-3114  
Reverse Osmosis of South Florida, 12301 SW, 133 Court Miami, FL, 33186

**DESIGN CONSULTING**  
Fleet Technologies, 311 Leggett Dr, Kanata, Ont K2K1Z8 Canada

**DIESEL CYLINDER INDICATORS**  
Kiene Diesel, 325 S. Fairbanks St, Addison, IL 60101

**DIESEL ENGINE — Spare Parts a 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 a, Montreal, Que. H4R 2A3  
GE Marine Engines 1 Neuman Way Ondrnnatt, OH 45215  
Giro Engineering Limited, Talsman,Duncan Road,Park Gate Southampton,Hants S031 7GA England

**Goltens Marine, 322 Broad Ave, Wtlongton, CA 90744**  
H.P.Intermakml, inc., 3812 W. Unebuhg Ave, Tampa, FL 33624  
Industrial Estate, New Territories, HONG KONG  
MAN BAW Diesel AG, Stadtbachstrasse 1, D-86153 Augsburg 1, GERMANY  
MAN BAW Diesel A/S, Tegholmsgade 41, DK-2450 Copenhagen SV, DENMARK  
MAN BAW Diesel, 17 State St, New York, NY 10004  
Marine Exhaust Systems of Alabama, P.O. Box 698, 757NicholsAve, Fairhope, AL 36533  
Marine Turbo S Diesel Inc 1090 7th St Richmond CA 94801  
Mattso USA, Inc, 100 Davidson Ave, Somersct, NJ 08873  
Motor-Service AB, Box 2115, S-144 04 Ronninge, SWEDEN  
Motw Services H190 Stamp, 3190 S.W. 4th Ave, FL 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  
Scaidana Americas Bkg, 502 Empire St, Greenfield Park, J4V1V7 Canada  
Wartsila Diesel, 201 Defense Highway, Annapolis, MD 21401

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Marty Marine, PO Box 86788, N. Vancouver B.C. Canada V7L 4L3  
Mapeco, Inc., 90 ForestAve, Locust Valley, NY 11560  
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MMC International, 60 Inip Dr, Inwood NY 11096

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Scientific Manne Svcs, 101 State Pl., Ste. P, Escondido, CA 92029

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NOAA Office of Coast Survey, 1315 East-West Hwy, SilverSpring, MD 20910  
Solutions, 1522 Crabapple Cove, Jacksonville, FL 32225

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Furuno USA, Inc., 4400 NW Pacific Rim Blvd, Camas, WA 98607  
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Standard Horizon, 10900 Walker St, Cypress, CA 90630

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Scientific Marine Services, Inc., 101 State Pl, Suite F, Escondido, CA 92029  
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**Poly-Hi-Soldur, 2710 American Way, Ft Wayne, IN 46899**

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IFSTA/Fire Service Programs, 9030 N. Willis, Stillwater, OK 74078S045  
IMSSCO Corporation, 2040 Hartvir 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

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**FLUID SEALING AND PACKING**  
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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  
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Panel Specialists, Ino/Themax, 3115 Range Rd, Temple, TX 76501  
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Edgewater Machine & Fabricators, P.O. Box 358, Edgewater, FL 32132-0358  
Fassmer & Co.D-27804 Bemotzen, 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  
Wolung International, 151 Chin Swee Road #03-14, Manhattan House, Singapore 169876

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Technofibre Pte.Ltd, 51 Shipyard Road, Singapore 628139

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Archway Marine, 4501 Swan Ave, St. Louis, MO 63110  
Goltens Marine, 160 Van Brunt St, Brooklyn, NY 11231  
Kockum SonKs, Inc., 933 Industry Rd, Ste105, Kenner, IA 70062  
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Pauluhn Electric Mfg. Co, Inc. P.O. Box 53, Peartand, TX 77588

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D-24100 Kiel, Germany  
(Distributor for Raytheon) Klein Navigation, 11 Klein Drive, Salem NH 03079  
Saab Marine Electronics AB, Box 13045, 402 Göteborg, SWEDEN  
Scandinavian Micro Systems, P.O. Box 155, N-1411, Kolbotn, NORWAY  
Scientific Marine Services, Inc., 101 State Pl., Suite F Escondido, CA 92029  
Standard Horizon, 10900 Walker St., Cypress, CA 90630  
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Commercial & Marine Products, 3924 Forest Dr., #11, Columbia, SC 29204  
Plastic Plings 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  
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Bay Engineering, 253 N. First Ave., Sturgeon Bay, WI 54235  
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CDI Marine Co., 9550 Regency Square Blvd. Ste. 400, Jacksonville, FL 32222  
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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  
Designs & Planners, 2120 Washington Blvd. Ste 200, Arlington, VA 22204  
Elliot Bay Design Group 5301 Shilshole Ave NW Ste 200 Seattle WA 98107  
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Guido Peria & Assoc., 720 3rd Ave., Ste. 1200, Seattle, WA 98104  
James S. Kroger, 799 Brickell Plaza Ste. 701, Miami, FL 33131  
Jamestown Marine Service, Marine Service & Tech Center 1084 Shennecossett Rd  
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M. Rosenblatt & Son, Inc., 2341 Jefferson Davis Hwy, Arlington, VA 22202  
Marine Design & Operations, Inc., 225 E. 1st Ave., Roselle, NJ 07203  
Maritech, Seaciff, 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 Rdr#2 San Diego CA92121  
ML Systems, 200-1150 Morrison Drive, Ottawa, Ontario K2H 8S9  
Nautical Designs, Inc. 2101 S. Andrews Ave, Suite 202, Fort Lauderdale FL 33316  
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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, 1812 Gandy Blvd., St. Petersburg, FL 33702  
Seaworthy Systems Inc., P.O. Box 965, Essex, CT 06426;  
The Glosten Assoc. Inc., 600 Multiple Life Bldg., 605 First Ave., Seattle, WA 98104  
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Washburn Doughty, P.O. Box 296, E. Boothbay, ME 04544  
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C-Map/Commercial, 133 Falmouth Rd., Mashpee, MA 02649  
C-Map, P.O. Box 212 4371 Egersund Norway  
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Chartco, New North Road, Hainault, Iford Essex, 166 2UR England UK  
Electronic Marine Systems, 800 Femdale 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, Kolbotn, NORWAY  
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D&B Technologies, 1400 S.Orland Ave., Winter Park, FL 32789  
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Japan  
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Japan  
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Centa Corp., 8185 Cass Ave., Darien, IL 60551  
Cummins Marine, 4500 Leeds Ave., Suite 301, Charleston, SC 29405  
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Geislinger Corporation, 200 Geislinger Drive, Battle Creek, MI 49015  
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Hartmaster Marine Inc., 31777 Industrial Rd., Livonia, MI 48150  
Harrington Marine, 6720 124th Ave., Fenville, MI 49408  
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Karl Senner Inc., 25 W Third, Kenner LA 70062  
Kawasaki Heavy Industries, Ltd., World Trade Center Bldg, 4-1 Hamamatsu-cho, 2-  
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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  
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MAN B&W Diesel A/S, Alpha Diesel, Niels Juels Vej 15, DK-9900 Frederikshavn,  
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MAN B&W Diesel GmbH, Stadtbachstrasse 1, D-86153 Augsburg 1 GERMANY  
Mapeco, Inc., 91 Willenbrook Rd., Unit B4, Oxford CT 06478  
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Napier Turbochargers, PO Box 1, Waterside South Lincoln LN5 7FD England  
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Schottel-Werft, Manizer Strasse 99, D-56322 Spay/Rhein, GERMANY  
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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  
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Reagan Equipment, 2550 BelleChase Hwy, Gretna LA 70054  
Scardana Americas Bkg., 502 Empire St., Greenfield Park, J4V1V7 Canada  
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BC V6V146  
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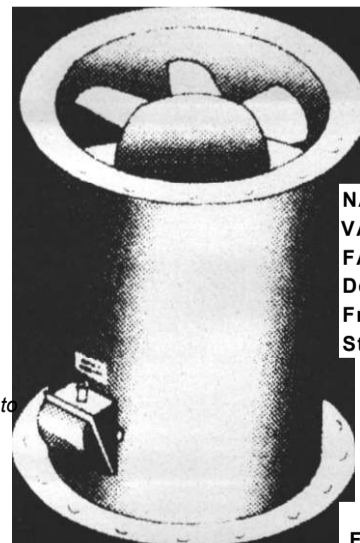
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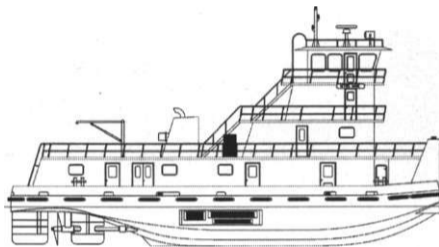
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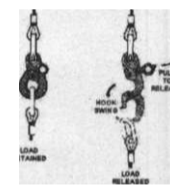
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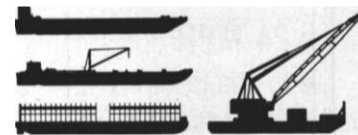


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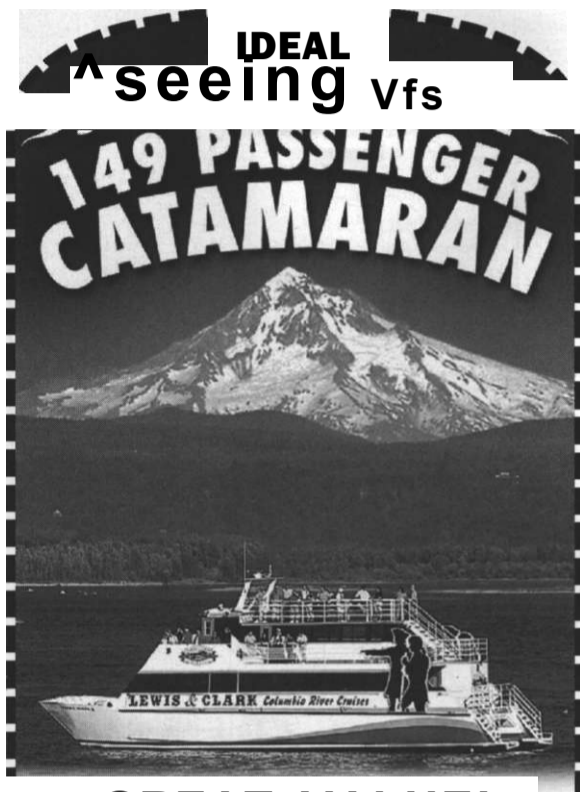
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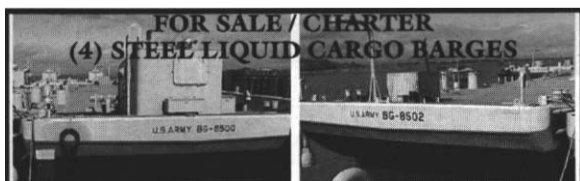
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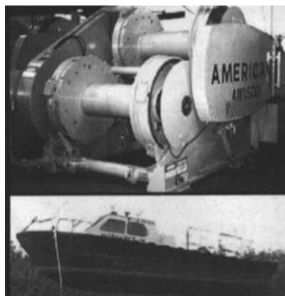


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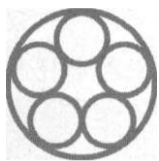
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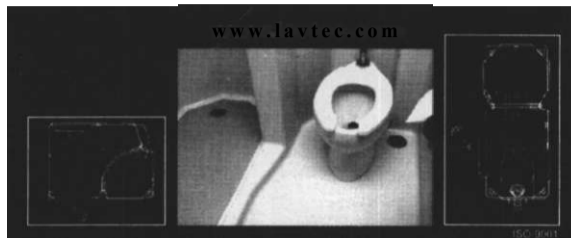
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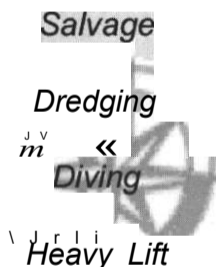


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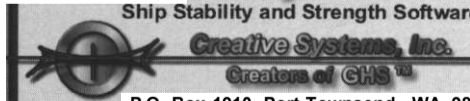
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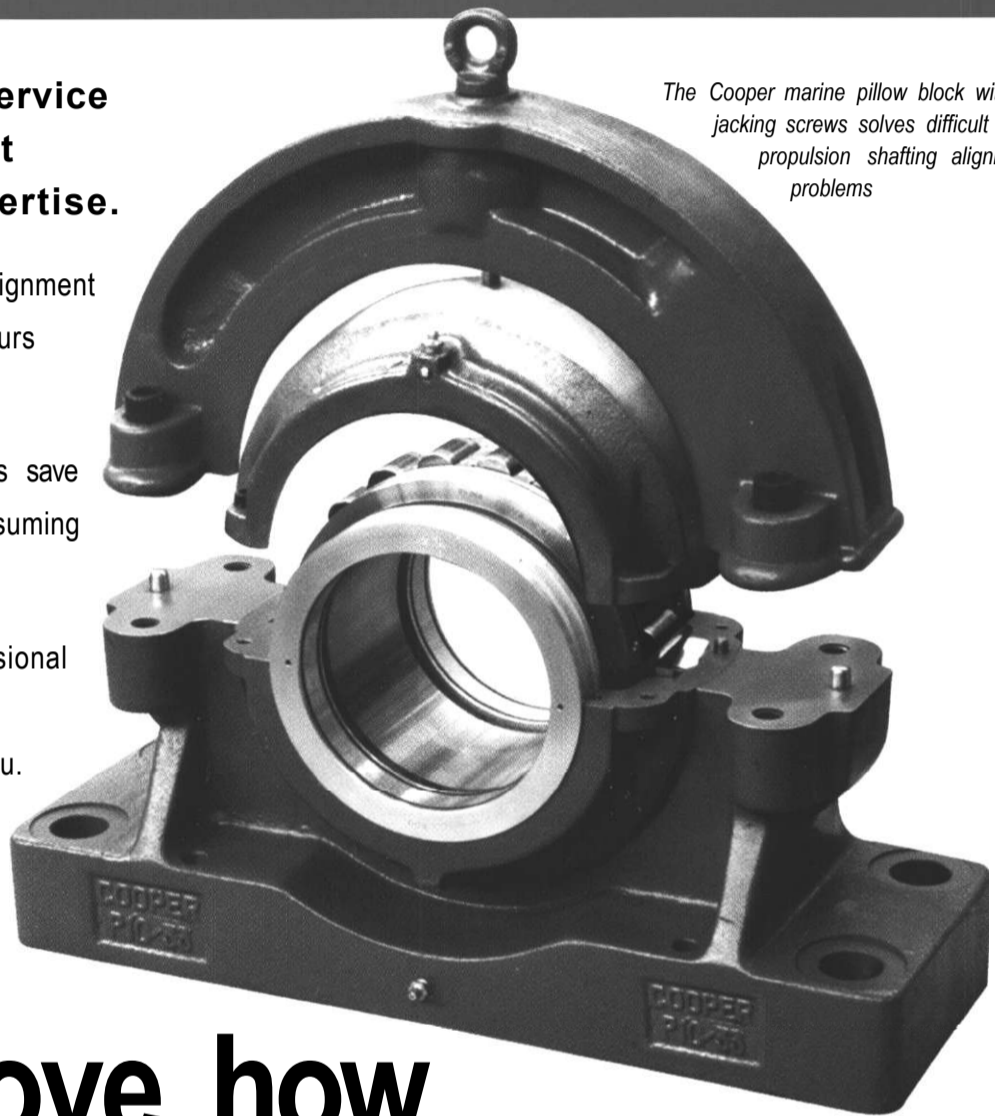
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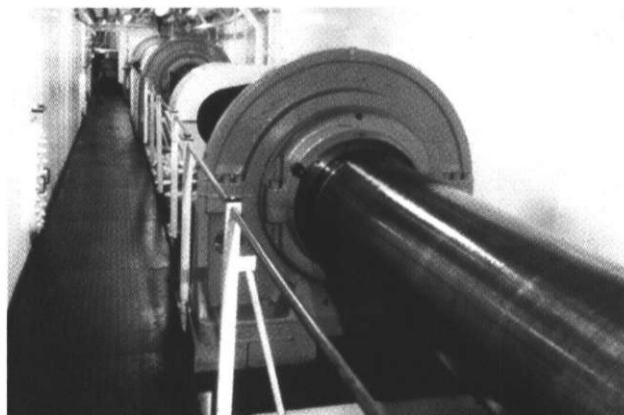


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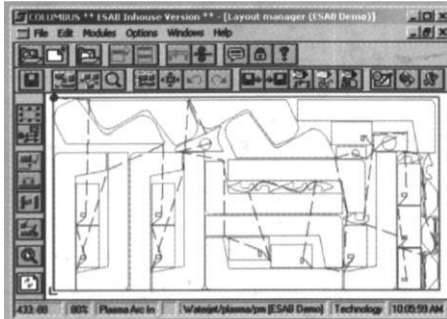


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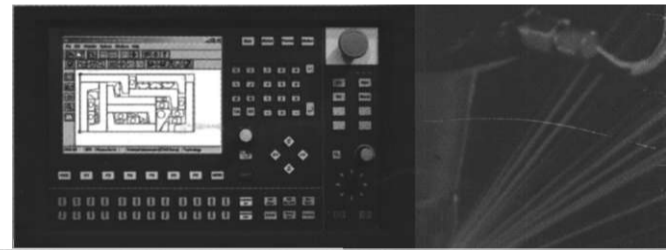


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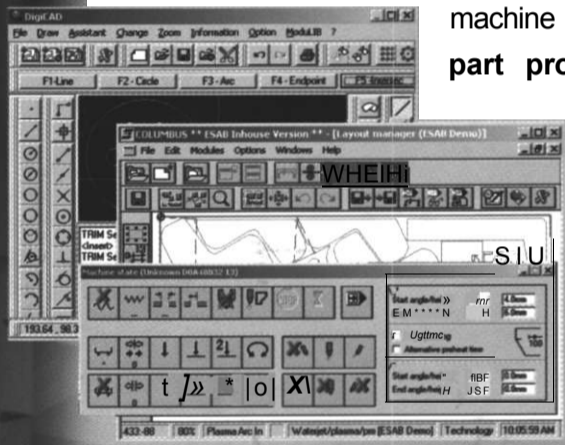
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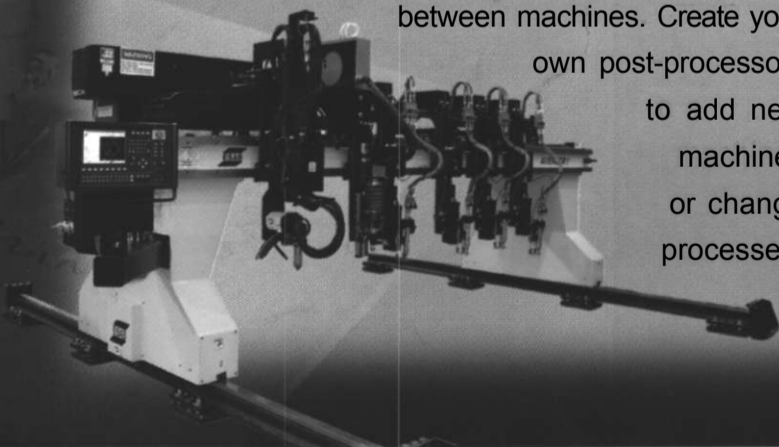


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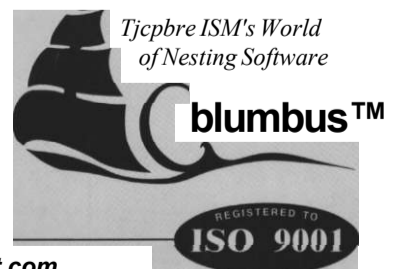


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