February 2005

MARITIME REPORTER AND ENGINEERING NEWS

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Government Update

Tuns, Tons & Tonnage

Tanker Technology

Dawning of New LNG Era

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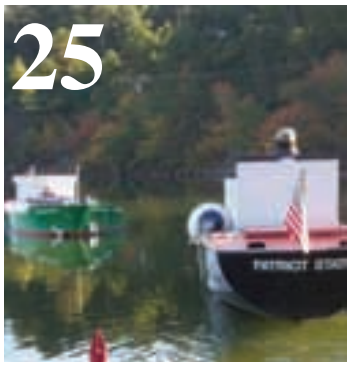

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Maritime Meanings

Blood Money

Originally money paid to an agent, such as the keeper of an inn or boardinghouse, for the procurement of men to fill vacancies in a ship's crew. The expression has gained a number of wider meanings in colloquial speech: a fee paid to a hired murderer; compensation paid to the relative of a slain man; and small remuneration earned by great effort, as in the old days of sweated labor in factories. The expresson is also said to derive from the bounty paid by the British Admiralty for the capture of smugglers and their boats in the nineteenth century. The payment was 20 pounds for each smuggler captured and convicted.

***Source**: An Ocean of Words: A Dictionary of Nautical Words and Phrases, by Peter D. Jeans; Birch Lane Press , 1998*

5 Ships, One Weekend = $12 Million

The maritime industry was a key factor in Jacksonville, Fla.'s bid to host the 2005 Superbowl. As the city was 20% short of the 17,500 "quality hotel rooms" required by the National Football League to host the event, the city chartered five cruise ships for $12 million to fill the requirement.

Source: The Wall Street Journal, Monday, January 31, 2005, pg. B1

Correction

In the story "W&O: An Engineered Ascension" (January 2005, page 18) The number of W&O supplied valves on certain projects were mistated. For the TOTE project there were 107 actuated valves; 67 on BP; and 281 on TAKE, that are tied into the digital control network.

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Editor's Note

Innovation is the hallmark of any industry, none more so than the marine industry, which is often erroneously tagged with the label "conservative" in such matters.

Simply stated, today's emerging fleet of ships and boats on both the commercial and military side are truly modern marvels, housing systems and technologies that are required to operate — without fail — in an ever-changing, always challenging and sometimes volatile environment.

This is painstakingly apparent in this edition, which offers three feature articles highlighting the tremendous strides in building increasingly larger, more fuel-efficient and safe vessels. As many of you know, the Liquefied Natural Gas (LNG) carrier market is embarked upon a historic growth curve. Depending upon which statistics you receive and believe, ordering activity for LNG ships is expected to grow 9% annually through 2010. Much attention has been paid to making these high-value ships larger and more efficient, and much work has been invested in new propulsion and cargo containment solutions. **David Tinsley's** article starting on page 18, "Dawn of a New Era," and much of this month's "Tanker Technology" coverage is dedicated to these advances.

"I haven't failed, I've found 10,000 ways that don't work."
— Benjamin Franklin

In a profile of ABS' new Chief Technology Officer **Chris Wiernicki**, we found a concise explanation of many matters you face every day: the design, construction and operation of safe vessels as they grow larger and more complex — often growing beyond established scientific and technical parameters — with less design time. Mr. Wiernicki addresses "Applying Advanced Technology to Redefine Safety" starting on page 24.

Finally, Royal Caribbean International's implementation of identical bridge layout and bridge operating procedures — i.e. the "marine cockpit" — fleetwide is impressive, as it melds a progressive shipowner determined to operate a safe and efficient fleet, with modern marine electronics and training and education. **Captain William Wright**, RCI's senior vice president of marine operations, helps explain the process.

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On the Cover

Pictured on this month's cover is an inspection of a ship's ballast tanks. Coatings and Corrosion Control starts on page 28

(Photo Credit: Honeywell)

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New German Shipyard is Underway

As of January 5, 2005, the marriage between ThyssenKrupp Werften and HDW has been formally consummated. This date also marks the official inception of ThyssenKrupp Marine Systems, the new group parent headquartered in Hamburg. Essentially, ThyssenKrupp Marine Systems comprises the following subsidiaries: Howaldtswerke-Deutsche Werft GmbH, Kiel; HDW-Nobiskrug GmbH, Rendsburg; Blohm + Voss GmbH und Blohm + Voss Repair GmbH, Hamburg; Nordseewerke GmbH, Emden; as well as Kockums AB, Sweden, and Hellenic Shipyards S.A., Greece. ThyssenKrupp Marine Systems represents a sales volume of around €2.2 billion and employs a workforce of 9,300. Dr. **Klaus Borgschulte** chairs the new company as CEO. **Ulrich Ziolkowski** is its CFO, while **Reinhard Kuhlmann** heads Human Resources. Other Executive Board members are **Walter Freitag**, chairman of the Submarines division, and **Gerhard Kempf**, chairman of the Surface Vessels division. The new shipyard enterprise focuses on the four product groups of Submarines, Naval Ships, Nonnaval Ships, and Repair and maintains all previous production locations.

The Hamburg, Emden and Kiel locations will graduate into competence centers with clearly demarcated product responsibilities. The purpose behind this product- and customer-focused organization is to respond rapidly and resultfully to market needs.

Circle 18 on Reader Service Card

MTU Detroit Diesel Formed

MTU Friedrichshafen (Germany) and Detroit Diesel Corporation (USA) announced the formation of a new division for Off-Highway engine activities, MTU Detroit Diesel. The group will continue to be headquartered in Detroit, Mich., and it will be a separate division of Detroit Diesel Corporation, an integral part of DaimlerChrysler Off-Highway. MTU Detroit Diesel will have responsibility for the application engineering, manufacturing, sale and service for off-highway engine products in marine, construction, industrial, power generation, petroleum and defense markets in the United States, Canada and Mexico.

Circle 17 on Reader Service Card

SeaWave Releases Suite of IT Applications

SeaWave builds on the functionality of the Integrator 3.0 product line with its latest advancement in marine communications - the Remote Management Suite (RMS). RMS is a portfolio of IT tools which allow shore-side administration of vessel operations with near-zero ship-based intervention. These IT tools streamline vessel operations by transferring IT responsibilities to land-based IT personnel.

RMS all but eliminates crew and shore personnel spending hours on a satellite phone troubleshooting and/or updating PCs while underway. The end result is greater productivity - timely reporting and superior systems control.

Circle 20 on Reader Service Card

LPD-19 — Mesa Verde — Christened

The amphibious transport dock ship LPD 19 was christened Mesa Verde. LPD 19 is the third San Antonio (LPD 17)-class ship being built by Northrop Grumman Corporation for the U.S. Navy/Marine Corps team.

The name Mesa Verde honors Mesa Verde National Park in southwestern Colorado. The park was established in 1906 to preserve sites built by Native Americans on mesa tops and in canyon alcoves. **Peter Pino**, Zia Pueblo tribal administrator, offered a traditional Pueblo prayer and blessed the ship with sacred waters carried from Mesa Verde. Ship's sponsor **Linda Campbell**, wife of U.S. Sen. **Ben Nighthorse Campbell** (Ret.) of Colorado, followed the blessing by officially christening the ship Mesa Verde, exclaiming, "Bless this ship and all who sail in her."

Displacing nearly 25,000 tons, the San Antonio-class amphibious transport dock ships will be the second-largest ships in the Navy's 21st-Century Expeditionary Strike Groups. Mesa Verde will have a crew of 360 sailors and three Marines and can carry up to 699 troops with a surge capability of up to 800. The ships are 684 ft. (208.5 m) long and 105 ft. (31.9 m) wide and will replace the functions of four classes of older amphibious ships. This new class of ship affords the Navy's Expeditionary Strike Group with the technology and flexibility to launch and recover amphibious landing craft such as the Landing Craft, Air Cushion, operate an array of rotary-wing aircraft, as well as the ability to carry and launch the Marine Corp's Expeditionary FightingVehicle.

Circle 38 on Reader Service Card

Historic Side-wheeler to Operate on Yukon River

Elliott Bay Design Group of Seattle recently completed stability tests and calculations for the Klondike Spirit, an all-steel side-wheeler recently built on the Yukon River in Alaska. The vessel, which can carry up to 120 passengers, will be used to take tourists on daytrips through the scenic Yukon canyons downriver of Dawson (Yukon, Canada) when it begins operation in June 2005.

Built in Eagle City, Alaska, by **Nick Turner** and **Charlie House**, the vessel offers three passenger decks, a food service galley and two staterooms for crews.

The Klondike Spirit is the first side-wheeler to be built on the Yukon in decades. Historically, side-wheelers were used to navigate rivers because their configuration made them extremely maneuverable. However, the location of the paddles along both sides of the boats made them vulnerable to damage, and their popularity faded. The Klondike Spirit brings back a piece of nostalgia that complements Dawson's "Gold Rush" tourist theme.

The side-wheeler is 88 ft. long with an 18 ft. beam and a 4 ft. hull depth. Maximum draft is 30 in. The hull was fabricated by Eagle Boat Company and the Northern Lights 20 kW generator was furnished by Alaska Diesel Electric. The main engine is a 400 hp Cat 3406 that drives Denison hydraulic pumps. Hydraulic motors power each side wheel through a separate Brevini gearbox and 3:1 chain reduction drive. The paddle wheel speed is 40 rpm.

Elliott Bay Design Group's contributions included structural calculations and scantling determinations for U.S. Coast Guard approval. The firm also performed tonnage analysis, designed the tonnage plan, and performed the admeasurement survey on behalf of Germanischer Lloyd. Currents in the Yukon River and the absence of a dock made performing stability tests a challenge. Typically, such tests are executed in protected water with the vessel tethered to a dock with no outside forces affecting the boat. Because that wasn't an option, Elliott Bay Design Group engineers tied the Klondike Spirit to trees on the river's shore, and then floated the boat onto an eddy. Currents flowing down one side of the boat at four knots and up the other side at two knots kept the side-wheeler steady and the mooring lines slack for the duration of the test.

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Rodriquez Cantieri Delivers Brazilian Cat

Rodriquez Cantieri Navali do Brasil SpA, the Brazilian yard of the Rodriquez Group, delivered the all-aluminum Zeus 1°, the first of 10 catamarans under construction for Barcas SA Shipping Company in Rio De Janeiro. Zeus 1° is the first of three 89 ft. (29 m) CityCats under construction, and it will operate on the Rio de Janeiro-Charitas route. Zeus 1° has a maximum capacity of 230 passengers and is powered by 2 MTU 16V 2000 M70 (1,050 kW each). During the see trials it reached a cruising speed and maximum speed respectively of about 25 and 27.4 knots.

The other seven vessels (named CityCat 52DE) 170.6 ft. (52 m), 18 knots and 900 seats and 300 standing passengers.

Circle 37 on Reader Service Card

Zeus 1° Main Particulars

Hull & Superstructure	Aluminium
Length, o.a.	89 ft. (29.2 m)
Length, b.p.	84 ft. (25.6)
Beam	31.5 ft. (9.6 m)
Draft (loaded)	4.7 ft. (1.44 m)
Passengers	200
DWT	25
Displacement, fully loaded, tons	98
Class	RiNA
Performance	
Speed, max	28 knots
Speed, cruise	25 knots
Engines	2 x MTU 16V 2000 M70
Power	2 x 1,050 kW at 2,100 rpm

Harvey Gulf Diversifies Offshore Offerings

Harvey Gulf International Marine, an established leader in the Offshore Rig Moving and Offshore Supply Vessel Markets, has diversified into the Offshore Vessel Construction Market. The company signed a contract with Eastern Shipbuilding in Panama City, Fla., for the construction of a new 265 x 58-ft. Dynamically Position Class 2, Dive Support/Well Intervention Vessel. M/V Harvey Discovery will be outfitted with a number of enhanced features, including: a Moon Pool; a 75 Ton Crane; a Stern A-Frame & 100 Ton Stern Roller; a ROV and associated support equipment; a accommodations for 50 onboard personnel; a Gymnasium with Cardio Vascular equipment; a Movie Theater with Plasma Television Theater Seating; Deck Winches for Construction and Subsea work; an Onboard Hospital; and Lockers & Change room for Construction Crew.

It is designed and will be built with flexibility in mind, able to perform: Subsea Construction & Diving Support; Well Intervention Services; Flying Lead and Umbilical Installations; Trenching of Fiber-optic, power Cables & Flow-lines; ROV Surveys for Pipeline and Cable routes, Touch-down Monitoring for Pipe laying and platform & pipeline inspections; Subsea Field Development which includes the installation of Manifolds, Trees and jumpers.

M/V Harvey Discovery

Liquid Mud Capacity	9,000 Barrels
Dry Bulk Capacity	8,000 cu. ft.
Methanol Capacity	2,400 Barrels
Clear Deck Space	180 x 50 ft.
Deck Cargo Capacity	2,300 tons
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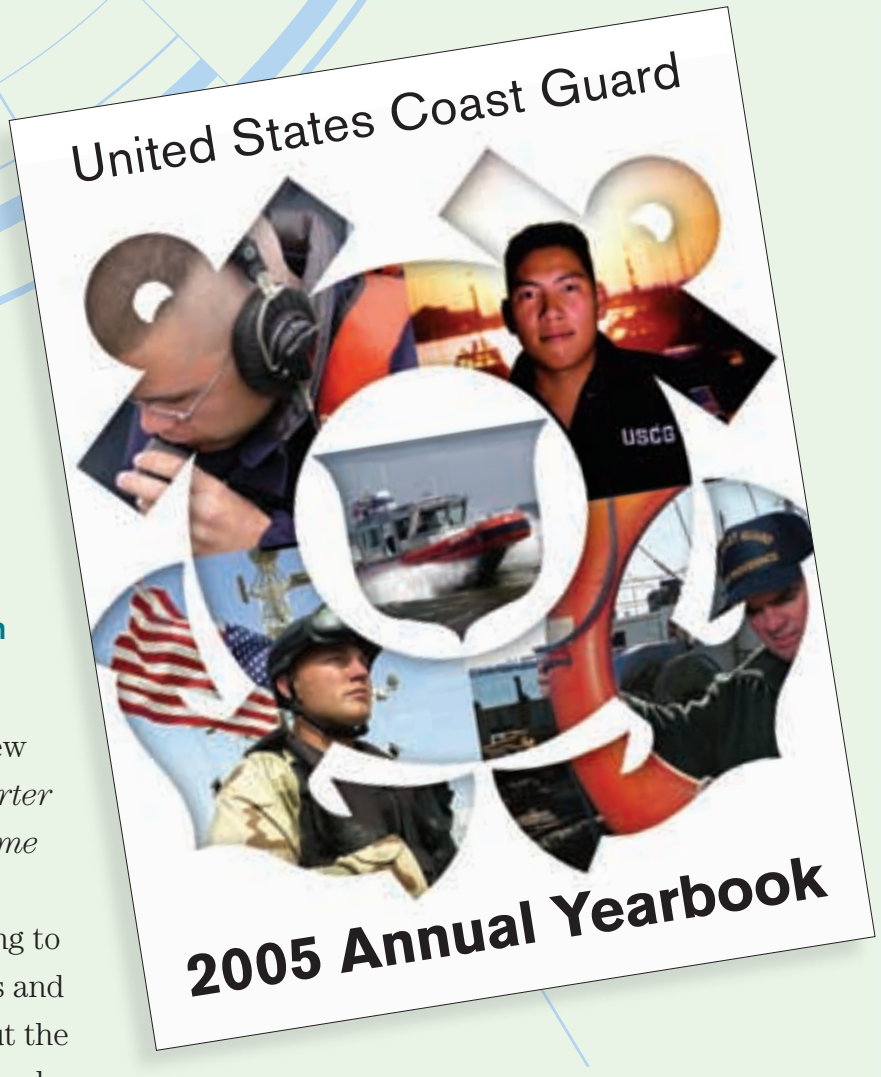

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Pride Onboard New Seahorse Supply Boat

(Photo Credit: Seahorse Marine)

Nothing speaks to the quality of a boat more strongly than her skipper's pride of command. That pride is clearly evident when Capt. **Philip Gaudet** shows a guest through the M/V Capt. Rudy an immaculate new boat from Bollinger Shipyards' Lockport Louisiana facility. At 165 x 36-ft. with an 12-ft. molded depth, this is an expanded version of Bollinger's successful 145-ft. mini supply boat with the greater part of its length aft of the three story deck house. However entering the galley from the 110 x 30-ft. cargo deck one finds oneself in an ample but cozy galley and mess area.

Down from there takes one to the engine room where the boats main engines, a pair of 1,000 hp Cummins KTA38 M0 delivering a combined 2,000 hp at 1,800 rpm hold the central place in an equally immaculate and well laid out engine room. Forward of the main engines a Cummins N14 drives a 270 bhp Schottel bow thruster. Electrical power is provided by a pair of Cummins 6CTA-powered 99 kW generators. A walkway leads aft between the liquid mud tanks with combined capacity of 1,250 barrels. Tankage is built in for 57,200 gallons of fuel, 64,200 gallons of potable water and 44,000 gallons of methanol or jet fuel. The deck can accommodate 506 long tons of cargo.

Taking his guest up to the spacious wheelhouse, further reason for Capt. Gaudet's pride is apparent in the spacious pilot house with well laid out DP-linked fore and aft controls. From the aft controls the visibility aft to the stern is clear and unobstructed. Designated a mega-mini supply boat, the craft is named for Capt. Rudy Lefort who captained the first Bollinger 145-foot mini supply boats.

Capt. Rudy Main Particulars

Builder	Bollinger Shipyard
Length	165 ft. ()
Breadth	36 ft. ()
Depth	12 ft. ()
Maine engines	2 x Cummins KTA38 M0
Power	2,000 hp
Speed	1,800 rpm
Bowthruster	Schottel

ECO Wins $241.5M Navy Contract

Edison Chouest Offshore (ECO), Galliano, La., is being awarded a $26,616,165 firm fixed price contract with additional reimbursables for the time charter of one Offshore Petroleum Discharge System (OPDS). The OPDS system provides rapid, mobile transfer of fuel from offshore tankers to U.S. military fuel storage facilities ashore when conventional fuel transfer facilities are unavailable. Each OPDS system includes one new-build support vessel and one tender. The vessels covered under this contract are to be named in the future. This contract contains options, which if exercised, would bring the cumulative value of this contract to a total of $241,457,294. Work will be performed in the Guam/Saipan area, but are deployable worldwide, and is expected to be October 2006. Contract funds will not expire at the end of the current fiscal year. The U.S. Navy's Military Sealift Command, Washington, D.C., is the contracting authority.

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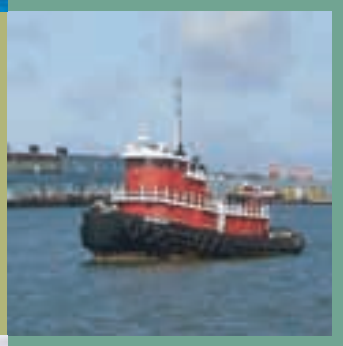

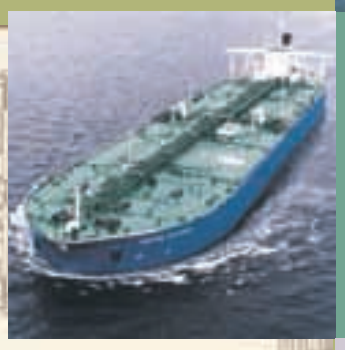

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Tuns, Tons, and Tonnage

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

Some say that we owe our modern system of measuring ships, at least in part, to Julius Caesar and the natural thirst of the British peoples. Through efforts initiated by Julius Caesar in 54 B.C., portions of the British Isles were integrated with the European mainland. Regular trade developed. One of the products produced on the European mainland that was in short supply in Britain was wine. The British peoples gradually developed a prodigious thirst for wine and it came to be imported in large quantity. The usual means for shipping wine was in wooden casks called "tuns". A tun was basically a barrel, but was much smaller in circumference than is common nowadays. The tun was relatively easy for one person to handle and was easy to stow in the hold of ships of the day. Gradually, ships began to be graded by how many tuns they could carry. Somewhere in this evolution, the spelling - as applied to the capacity of ships - changed to "tons". Also, as transport became more sophisticated and mechanized and as ships became larger, the old-fashioned wine cask or tun fell out of use. As a matter of interest, the original barrels used to transport oil were built to hold 42 U.S. gallons (they were actually constructed to hold whiskey). They, too, have fallen into disuse, replaced by the 55-gallon drum, but the measurement unit survives. Now, "ton" is used by the maritime community to measure both cubic capacity and weight. The ton as a unit of weight developed independently of the ton as a unit of capacity and originated ashore. As a unit of cubic capacity, a ton is equivalent to 100 cubic feet. The two most common tonnage measurements for ships with regard to capacity are gross tonnage and net tonnage. Gross tonnage (GT) is the carrying capacity of the ship's hull (generally below the upper deck). Net tonnage (NT) is the gross tonnage with subtractions made for non-cargo spaces, such as crew's quarters, ships' stores, engine rooms, bunkers, etc. The net tonnage is a measurement of the earning capacity of the ship. The terms "gross register tonnage" and "net register tonnage" refer to the respective tonnages as shown on the ship's official government certificate of registry. As a unit of weight, a ton is usually denominated as a long ton (2,240 pounds) or a metric ton (1,000 kilograms or 2,204.6 pounds). The short ton (2,000 pounds) is less frequently used in the maritime industry. The most common tonnage measurement utilized for ships with regard to weight is deadweight tonnage (DWT). Deadweight tonnage is the weight of water displaced by the hull of the ship. Governments soon latched on to tonnage as a means of

calculating the tax or duty to be assessed against ships calling in their ports. When the United States Government was established, the Constitution specifically provided that Congress had the power to lay and collect taxes, duties, imposts, and excises. Further, the Constitution specifically prohibited the various states (without the consent of Congress) from laying "any Duty of Tonnage". The Customs Service (now called Customs and Border Protection) is charged with assessment and collection of tonnage taxes and light duties. Both the tonnage tax and light duty (or light money) are assessed based on the ship's net tonnage, as well as its registration and the location from which it arrives. Exemptions are provided for ships registered in nations that grant reciprocal exemptions for U.S. ships. Nations and at least two international waterways (the Suez and Panama Canals) developed over time different methods for computing tonnage as a measurement of capacity. After all, you could hardly go through the exercise of stuffing tuns into every newly-built ship to determine its tonnage. The methods became very complex (sometimes called fantastical) and were only understood by specialists called admeasurers. In an effort toward uniformity, the International Convention on Tonnage Measurement of Ships, 1969 was developed under the auspices of the International Maritime Organization (IMO). The Tonnage Convention established uniform principles and rules with respect to determination of tonnage on ships engaged on international voyages. The Convention is generally forward-looking. Thus, ships predating adoption of the Convention are allowed to retain their old tonnage measurements for twelve years in the absence of a major rebuild. Even after twelve years, pre-existing ships may retain their old tonnage measurements for the purpose of application to them of relevant requirements under other existing international conventions. The U.S. legislation and regulations adopting the Tonnage Convention for ships of the United States provide details on whether the new convention tonnage measurement or the old regulatory tonnage measurement is to be utilized by pre-existing U.S. ships to determine application of various international conventions and U.S. laws. The matter can quickly get very complicated, particularly with regard to such things as the International Safety Management (ISM) Code and the Global Maritime Distress Safety System (GMDSS). Technically, both are part of the Safety of Life at Sea (SOLAS) Convention, but they are treated as new requirements for purposes of application of the Tonnage Convention.

The United States now has four systems for measuring tonnage of ships. In addition to convention tonnage, a ship of the United States may be eligible for measurement under the regulatory system, the dual tonnage system, or the simplified measurement system. The dual tonnage system is basically a grandfather clause for U.S. ships built before September 29, 1965, when the regulatory system became controlling for most domestic purposes. The simplified measurement system is available to vessels that are either not self-propelled, under 79 feet in length, or operated for pleasure only. The drinking habits of the British peoples have thus laid the basis for an extremely complex system or systems of maritime regulation that no one person (clearly not this writer) fully understands.

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(Photo: Courtesy of Wärtsilä)

Dawn of a New Era

By David Tinsley, Technical Editor

As the final bastion of steam turbine propulsion in mercantile shipping, the boom in the LNG carrier sector has not only given a fillip to the Japanese producers of such specialist plant, but has also sparked the uptake of alternative powering solutions. The recent entry into service of the first LNG tanker installed with a dual-fuel electric propulsion system, and the nomination of the concept for a clutch of subsequently-contracted, larger gas carriers, are likely to have forever altered the established order in deepsea LNG carrier powering.

Furthermore, the planned adoption of electronically-controlled, two-stroke diesel engines and onboard reliquefaction plant for a series of newbuilds in the 210,000/215,000-cu. m. range, the largest LNG tankers booked to date, has given added dimension to the industry's shift from traditional powering arrangements.

Whether or not the gas turbine will find favor in future LNGC projects, either in gas turbo-electric or mechanical drive layouts, or in a combined system akin to that used on a number of cruise ships, remains to be seen. The present climate of change and opportunity, and a new willingness to embrace innovative technology that can yield long-run efficiency and operational benefits, must have increased the chances of a market breakthrough.

Steam turbine systems have monopolized large, single-screw LNG carrier propulsion over the past four decades due to factors of reliability, familiarity and the ease with which the boilers in such installations can use the gas boil-off which continuously emanates from the LNG cargo. Mitsubishi and Kawasaki have both augmented their offering with steam turbines suited to a new generation of higher capacity LNGCs. However, technological advances in main engines and innovation in propulsion systems, coupled with growing ship size and evolving trade requirements, draught limitation implications for hull and propeller design, and heightened expectations as to unit cost efficiency and operating flexibility, have prompted shipowners to consider new options.

The 74,000-cu. m. Gaz de France energy, which was recently completed by Chantiers de l'Atlantique and phased into service carrying Algerian gas to France, has opened a new technical chapter in LNG marine transportation. She is the first LNGC to incorporate dual-fuel reciprocating engine, electric-drive system, and has also given form to GTT's CS1 membrane cargo containment technique, offering improved qualities and operating advantages and reduced costs compared with earlier systems.

Both the propulsion concept and CSI cargo system have also been specified for two vessels of 153,500-cu. m. ordered from Chantiers de l'Atlantique. Gaz de France energy is equipped with four six-cylinder Wärtsilä 50DF dual-fuel engines, giving a total power output of 22.8-MW, and driving gensets delivering electrical energy to a pair of Alstom propulsion motors and all other shipboard consumers. The follow-on, larger newbuilds, Provalys and Gaselys, will each have three 12-cylinder 50DF dual-fuel engines plus one six-cylinder model, giving a power concentration of 39.9-MW.

Expansion-minded BP Shipping of the U.K. has also endorsed the dual-fuel electric drive approach in its latest stage of LNGC fleet development, entailing four 155,000-cu. m. ships from Hyundai, with options on four further vessels of the class. Two 12-cylinder and two nine-cylinder Wärtsilä 50DF engines will provide a primary power base of 39.9-MW in each vessel. The configuration will enable various operating modes to be matched in the most efficient way, catering to fully-laden powering needs, in-harbor loads, and in-ballast voyaging. The machinery maker's recent adaptation of its dual fuel technology to allow heavy fuel oil to be used in the engine's diesel mode has further enhanced fuel flexibility, and improved operators' control over running costs in the face of fluctuating gas and liquid fuel prices.

The chosen design and powering arrangements promise the requisite economy and effectiveness in handling various deployments within the Atlantic basin trading sphere at service speeds up to 20-knots, and including Trinidad and Tobago's Atlantic LNG project, and the U.S., U.K. and Spanish traffic.

A program of eight ships of unprecedented size to serve planned long-term shipments of gas from Qatar to the U.K. will bring direct-drive, low-speed diesel machinery, in combination with onboard reliquefaction plant technology, to bear on the LNGC market. Construction contracts for a quartet of 215,000-cu. m. carriers have been split between Hyundai and Samsung, while four 210,000-cu. m. vessels are slated from Daewoo Shipbuilding & Marine Engineering. The fleet will be owned by two international consortia, both involving Qatar Gas Transport Co, and the investment in new capacity arises from the Qatargas II LNG project of Qatar Petroleum and ExxonMobil.

MAN B&W has confirmed that each of the Daewoo vessels will be equipped with two 6S70ME-C electronically-controlled engines, driving a pair of fixed

pitch propellers. UK-based engineering group Hamworthy, meanwhile, has reported that all eight envisioned newbuilds will be provided with reliquefaction systems. The patented process reliquefies cargo boil-off gas during the voyage, and returns LNG back into the cargo tanks.

The arrangements will enable the vessels to be operated wholly on marine bunker fuel, and ensure that the loaded cargo volume will arrive in its entirety at the destination point, rather than an amount being lost in boil-off subsequently ingested by the ship's main machinery. Although steam turbine plant can utilize boil-off gas very easily, efficiency losses in the boilers, high-speed reduction gear, shafting, and the steam turbine itself bring overall efficiency of the installation to a level of approximately 30 percent at full load. A substantial amount of heavy fuel oil is needed to complement the available boil-off gas in laden condition, and more so when the ship is in a ballast state. By comparison, the latest low-speed diesel machinery offers thermal efficiency factors up to around 50-percent, resulting in lower energy consumption and operating costs.

Norway Fosters Gas-fueled Fleet

A Norwegian government-inspired project for five gas-powered, double-ended ferries to serve fjord routes connecting the coastal highway network had reached the letter of intent stage at the time of writing. The agreement between Aker Yards and Fjord1, a transport group owned by the western Norwegian counties of Sogn og Fjordane and More og Romsdal, foresees deliveries in the second half of 2006 of a new LNG-fuelled generation of vessels. The hulls will be built at the Aker Tulcea yard in Romania, and fitted out at Aker Brattvaag's premises on the Norwegian west coast.

Measuring 129.5-metres length by 19.2-metres width, and designed by LMG Marin of Bergen to carry passengers, cars and commercial vehicles on services in Hordaland and Rogaland, the ferries promise enhanced environmental compatibility along with improved route productivity. Using LNG, for which Norway is rapidly developing a supply infrastructure in support of marine users and riparian industry, instead of diesel oil promises a major cut in oxide of nitrogen(NOx) emissions relative to existing ferries. The scheme has been prompted by shipping's proportionally considerable contribution to Norwegian air pollution, whereby some 40% of total Nox emissions are attributable to domestic sea transport and fishing vessels, and by the country's undertakings as regards the Kyoto Agreement regarding CO2(carbon dioxide) and other emissions. The Aker group put down a marker for the industry in 2000 when its Langsten yard completed the 95-m, gas-electric fjord ferry Glutra.

LNG: Fleet Could Expand 80% by 2010

According to R.S. Platou Shipbrokers of Norway, some 60 new LNG carriers will have been ordered during this year and, by the end of November, the orderbook consisted of 104 vessels equivalent to about 80 percent of the existing fleet. "By taking some scrapping into account, the world LNG fleet is therefore set to grow by 9 percent annually in the period to 2010," the broker estimates. However, still more LNG carriers are likely to be ordered in the months ahead, and the pace of fleet expansion could become even faster, perhaps hitting 12 percent by the end of 2010. Platou believes that LNG builders could be turning out as many as 40 new ships per year by 2010 and questions whether the number of new projects will be sufficient to absorb that scale of extra tonnage. Over the last decade, Platou said, the annual increase in LNG shipping demand has averaged 9 percent but is likely to rise significantly in the future. "Long term contracts already signed between suppliers and buyers indicate that trade volumes will grow by 8.5 percent per annum and are currently set to peak in 2007," the broker said.

The Birth of the Large LNG Carrier

LNG carriers have leapt in size to break the 200,000 cu. m. barrier - what are the primary technical factors involved in making this jump?

Qatargas' recently contracted 209,000 cu. m. and 216,000 cu. m. LNG carriers from three Korean yards have seen gas ships take a major step forward in size. The increasing demand for LNG, especially in the U.S. and Europe, and the need to reduce long haul transport costs from the Middle East to the U.S. is driving the increase in ship size, although whether we will see a trend of ever larger ships for general trades is questionable, as LNG carriers are restricted to an upper limit of around 155,000 cu. m. by existing port facilities. The bigger sizes are therefore limited to specific projects which involve either the construction of new terminals specially designed to handle these carriers, or the construction of cargo tanks for LNG offshore floating units.

Tank Size and Configuration

There are several technical factors to be considered during the design, construction and operation of large LNG carriers, primarily impacting tank size and configuration and propulsion.

Tank size becomes important in light of the increased beam for larger ships and overall tank length needs to be considered from the point of view of pressure loads due to fluid motion in a laden tank. There are two options for a larger ship - five tanks of conventional size, or four larger tanks. The fivetank configuration is inherently less 'risky', as knowledge of the ability of a containment membrane to withstand sloshing loads is based on tanks of conventional size. Further, model testing demonstrates that the highest fluid pressures are associated with diagonal tank motion - lengthening the tank and hence the diagonal could result in more pressure on the tank membrane. However, shipyards have been looking into the issue of tank configuration for a number of years in anticipation of the ordering of large LNG carriers. Daewoo Shipbuilding and Marine Engineering (DSME), for instance, has carried out a number of studies to validate bigger tanks, including:

- LNG tank sloshing studies at MARINTEK in Norway as part of a joint development project with Lloyd's Register
- cargo containment system capability testing by dry-drop tests carried out at the Korea Institute of Metals and Machinery
- dynamic hydro-elasticity properties of cargo containment systems by both numerical analysis and experiments at the University of Illinois in the U.S.

New Propulsion Options

For the larger ship sizes, propulsion has become a major issue. The sheer size of the vessels has led to the development of a twin-skeg, twin-screw arrangement as a means of maintaining normal trading speeds. Further, the draft limitation imposed on the new generation of LNG tankers makes it difficult to design an efficient propeller or hull form for a single-screw vessel.

This in turn has prompted the industry to turn away from the traditional steam turbine propulsion utilised by the vast majority of the world's LNG fleet. The overall complexity and cost of a twin-screw steam turbine arrangement would involve a multi-input gearbox and very large steam-raising plants, making twin-screw steam turbine propulsion cumbersome and expensive.

The industry has therefore turned towards a number of new propulsion options. These are:

- dual-fuel diesel electric
- twin slow speed diesel with reliquefaction
- gas turbine.

The recently ordered Qatargas ships, for instance, will use slow speed diesel propulsion with reliquefaction. These advances in propulsion have implications for conventional size ships as well, as all of the new options provide the main advantage of a shorter engine room and therefore more cargo carrying capacity. The 155,000 cu. m. LNG carriers recently ordered by BP Shipping, for instance, achieved this capacity increase by opting for dual-fuel diesel electric propulsion.

Validating the Technology

As with any new technology, the risks need to be assessed. Lloyd's Register, in its work with DSME during the process of the yard's development of a workable large LNG carrier design, carried out a number of assessments using a typical 'safety case' methodology. This method involves two key elements: a hazard identification study (HAZID), which identifies critical issues and looks at engine room arrangements and layout, and a hazard operability study (HAZOP), which looks at detailed piping and instrumentation diagrams from a safety and operability point of view. Lloyd's Register Asia's Busan Office faciliated a number of safety cases for DSME, with input from other Lloyd's Register Group offices around the world. "Both types of studies were carried out using a prescribed format of capturing data in a workshop environment with the designers, engine manufacturers, component suppliers, classification and the intended operator," says **Thanos Koliopulos**, Special Projects Manager for Lloyds Register's Oil and Gas Division. "The key benefits of this approach are that it gives the necessary confidence to all parties involved and deals with all the technical issues on the table." One of the first HAZIDs Lloyd's Register Asia carried out for DSME assessed the safety, operability and maintainability of dual-fuel propulsion. A key output of this first HAZID, says Koliopulos, was the adoption of double-wall gas supply pipework instead of the conventional single-wall arrangement. This finding made dual-fuel a more viable arrangement from the safety and operability point of view and enormously improved the engine room layout.

"Using the safety case methodology, we were able to arrive at a workable technical solution which addressed all the identified risks," says Koliopulos. "This method of validating new technology has proved to be invaluable, both for Lloyd's Register and for DSME, which has now decided to apply this approach to qualify other propulsion options."

Source: *Lloyd's Register, Horizons, Issue 10, December 2004. For more information contact Thanos Koliopulos, Special Projects Manager, Lloyd's Register Oil and Gas at thanos.koliopulos@lr.org*

Tanker Market Snapshot • Suezmax

Newbuilding & Secondhand Sales

The Suezmax newbuilding market has seen an impressive jump in prices this year. The average newbuilding price for 2003 was $48M, this year the average price was $63M, the highest average price over the last 10 years. Top Tankers lead the buyers market for Suezmaxes this quarter, purchasing five tankers from Essar Shipping for $256.5M. All the vessels are early 1990's built and scheduled to be delivered to Top Tankers during the first quarter of 2005. Thenamaris sold the 1988 built Seavoyager (148,349 Dwt) to Mercator for $37.5M. Thenamaris also sold the 1989 built Matilda (147,500 Dwt) to Berlian Laju Tankers for $31M. Nordic American Tanker Shipping purchased the 1996 built Wilma Yangtze (149,000 Dwt) from Wilhelmsen Marine for $66M. Wah Kwong purchased a Geden Lines newbuilding (159,000 Dwt) scheduled to deliver in 2007 for $70.5M. There were no new confirmed orders for Suezmaxes during the fourth quarter.

Fleet Additions & Deletions

The demolition market was quiet this quarter for Suezmaxes, owners were taking advantage of the spot market instead of selling their vessels for scrap. Scrappings for 2004 stayed consistent with the number of vessels scrapped in 2003 with 14 vessels deleted from the trading fleet. According to the new EU phase-out schedule, over the next three years the numbers of vessels set to exit the fleet gradually decreases with very little activity expected in the demolition market. Suezmaxes ended the year with the second highest number of deliveries in 10 years, second only to last year. The next four years show little change with about 30 vessels expected each year. Only five vessels were delivered during the fourth quarter bringing the total number of Suezmaxes delivered to 25. BP took delivery of the second ship scheduled to deliver in 2004, the Alaskan Explorer (185,000 Dwt). The Aegean Dignity (159,200 Dwt) was delivered to Arcadia, the second of two sisterships scheduled to deliver from Hyundai Shipyard. Naviara Tapias took delivery of the Teide Spirit (159,000 Dwt), the first of three expected over the next year. The trading inventory ended the year with 320 vessels.

Tanker Market Snapshot • VLCC

Spot Market

Summer came to a close and rates were expected to drop before winter blew in with full force. Rates instead began to increase quickly, slowing for a bit in October then gaining momentum in November. Rates hit a yearly high when the Sunlight Jewel (1993 built 280,000 DWT) was reportedly fixed by Marathon in November for WS 240 ($177,000/day). The average earnings per day in November for an AG/USG Route was $153,000/day, tripling November's average from 2003. But what goes up must eventually come down, rates began dropping in December , as cargoes thinned out and hesitation for what 2005 may bring began to stir, Marathon fixed the Safwa (2002 built 303,000 DWT) for WS 130 (89,000/day). Vessels going East also saw a dramatic jump in rates the fourth quarter. Rates peaked in the low WS300's, ExxonMobil fixed the Arosa (1993 built 291,000 Dwt) for WS 315 ($226,000/day). As each week passed in December rates dropped lower and lower, averaging for the month at about WS 150. West Africa rates also spiked in November with rates over WS300, but rates dropped off quickly in December to WS 160. Koch fixed the Astipalia (2001 built 306,000 Dwt) for WS 165 ($107,000/day).

Newbuilding & Secondhand Sales

In 2004 the newbuilding market prices continued their upward climb, hurdling over the $100M mark in the third quarter and closing at an average $110M for the fourth quarter. Since the close of 2003 the newbuilding sales price has increased over 40%. Two of the record second-hand sales included Metrostar's purchase of the 2002 built Oriental Topaz (319,430 Dwt) for $116 million and the 2003 built Violando (309,234 Dwt) from Goulandris for $122.5M. Dr. Peters jumped right into the action with the purchase of two sister ships from Pacific Star, the 1998 built Neptune Glory (299,127 Dwt) and the Saturn Glory (299,127 Dwt) for $88.5M each included a charter back to seller for 7 years at $41,760/day. Arlington Tankers, a new public tanker company set up by Stena acquired 2 Concordia V-Max tankers for $120M each, the 2001 built Stena Vision and Stena Victory (314,000 DWT). The Clipper Group and Fred Cheng's Shinyo International have created a joint venture called Van-Clipper, which has already agreed to purchase two vessels the 1988 built Seryna (240,000 Dwt) and 1992 built Astro Lynx (244,000 Dwt).

Fleet Additions & Deletions

The VLCC demolition market came to a complete standstill during the third quarter spilling over into the fourth quarter with increasing spot rates enticing owners to hold onto their vessels. Even with high available scrap prices owners chose to stay in the spot market. The demolition market has steadily decreased over the last three years. In 2002 a record 44 VLCC vessels were scrapped, decreasing to 29 in 2003. In 2004 a mere 12 VLCC vessels were scrapped, down nearly half since 2003. Although the demolition market quieted down the last quarter the VLCC deliveries remained steady with 7 VLCC vessels delivered the fourth quarter bringing the total deliveries to 30. The Delos (306,000 Dwt) delivered this month and was also sold this quarter to Ghandour by Aeolos for $125M. With 30 vessels delivered and 12 vessels departed, the net trading inventory of VLCC's increased by 18 vessels to 444. Going forward, a substantial orderbook exists and minimal mandated scrapping under IMO 13G promises a similar fleet build in 2005.

Source: McQuilling Services, LLC is a business consulting enterprise formed to provide services to clients in the oil and marine transportation industries. The primary focus of McQuilling Services, LLC is to provide commercial consulting services to clients transporting bulk commodities internationally. Through McQuilling Services, LLC, we offer clients business consulting and commercial advisory services in the areas of management consulting; market research and analysis; marine systems and transportation logistics analysis; project analysis; Information technology application; shipbuilding technology transfer; and, personnel training. McQuilling Services, LLC, Tel: (516) 227-5700; Email: services@mcquilling.com; www.mcqservices.com

An Electronic Charting "Engine" Guiding a Fleet of Supertankers

On any given day, a fleet of four giant tankers operated by Alaska Tanker Company (ATC) — each capable of carrying from 800,000 to1.3 million barrels of North Slope Alaskan Crude — can be found navigating from Valdez, Alaska, through the waters of Prince William Sound on their way to deliver their vital cargo to ports up and down the West Coast.

Important among the advanced technologies is providing the latest in electronic navigation — a necessity to guide these ships safely along.

ATC tankers — Tonsina, Kenai and Prince William Sound — are outfitted with bridge navigation electronics featuring the advanced Raytheon Pathfinder system running C-MAP's CM-93 professional electronic chart database. A fourth ATC tanker, the Alaskan Frontier, is outfitted with the latest in marine technologies including twin screws, medium speed electric diesel propulsion and advanced machinery and cargo control systems. The Alaskan Frontier also features C-MAP CM-93 at the heart of her integrated electronic navigation system.

"C-MAP's electronic chart database, with its comprehensive portfolio of vector charts in the CM-93 format, is very important to our safe navigation," said **John A. Miller**, Electronics Engineer for the ATC fleet. "The quality of the CM-93 data and its accuracy in terms of content and structure offer our ships' deck officers a high level of confidence in C-MAP as an aid to navigation," Miller said. Integrated with radar overlay, ARPA and AIS, C-MAP electronic charts provide deck officers with a

wealth of information and help them stay on top of navigational situations which change from minute to minute.

"With the recent implementation of AIS equipment in each tanker's electronic suite, we have an even higher level of reliable ship data integrated with the already powerful CM-93 charts, providing real time ship information and traffic overlays," Miller added.

ATC bridge crews can't overemphasize the importance of accurate, up-to-date electronic charts to meeting the specific challenges of piloting an oil-laden tanker through dangerous waters. "The charts' safety contours assist in defining for us the vessel's "no go" areas (shoals, reefs, bars and other shallow/hazardous conditions). At the same time, docking evolutions are better visualized by our crew with the vector information displayed as to the ship's actual movements," Miller said.

In evaluating the usefulness and performance of their vessel's electronic charts, ATC representatives added that harbor pilots especially rely on the ship's ECS (Electronic Charting System), due to its location near the 10 cm radar. This ECS display helps them keep a close watch on Speed Over Ground, Course Over Ground and Speed Through Water, all vital statistics, when piloting a large, heavy vessel in crowded waters and restricted space.

Circle 28 on Reader Service Card

New LNG Containment System Gets ABS Approval

The American Bureau of Shipping (ABS) has issued Approval In Principle (AIP) to a new liquefied natural gas (LNG) tank containment system and carrier design developed by Houston-based Ocean LNG Inc. The tank design consists of a cylindrical tank with spherical dished ends. The 180,000 cu. m. carrier design features five of these large 36 m diameter and 40 m high cylinder tanks each holding a volume of 36,000 cu. m. of LNG.

Ocean LNG claims that the design maximizes the void spaces in the ship's hull, yet still provides full access around the tank for inspections of both the insulation and tank structure. Compared to the traditional spherical LNG tank containment system, the Ocean LNG tank system is expected to increase cargo capacity within the same main hull dimensions by an estimated 25 percent compared to spherical LNG tank systems. The Ocean LNG proprietary tank design is fashioned according to IMO Type B independent tank design and based on the leak before failure principle. The tanks are designed to minimize filling restrictions due to sloshing effects. A detailed sloshing analysis of the tank and pump tower designs was recently been completed by ABS.

"The marine and offshore industries frequently develop novel applications in response to industry and market demands," said **Philip Rynn**, Senior Staff Consultant, Engineering, ABS. Rynn certified the design principles of Ocean LNG's tank containment system and carrier design.

Circle 30 on Reader Service Card

Left: Ocean LNG Inc. tank containment system and carrier design was awarded ABS Approval In Principle (AIP). The tank design consists of a cylindrical tank with spherical dished ends. The 180,000 cu. m. carrier design features five of these large 36m in diameter and 40m high cylinder tanks each holding a volume of 36,000 cu. m. of LNG.

Applying Advanced Technology to Redefine Safety

ABS' new Chief Technology Officer sees class entering an exciting era in which advanced computing power and the scientific application of risk methodologies will redefine the manner through which appropriate safety standards are established.

"The marine industry is looking for a more explicit understanding of safety," says **Chris Wiernicki**, the newly appointed Executive Vice President and Chief Technology Officer at ABS. "Safety has always been implied in classification Rules, because the Rules were based on safe practice. With boundary-pushing projects, safety can no longer be implied, it must be understood," he says emphatically.

"Marine structures are growing to unprecedented size and complexity. They are beginning to fall outside the boundaries of traditional class Rules - the scientific or technical limits within which the Rules have been defined," he explains. "You see this happening with ultra-large containerships, with the newest generation of large, membrane-type LNG carriers, with high-speed vessels, and in offshore energy exploration and development. Compounding the challenge to class societies, the increase in vessel size and complexity has been accompanied by a decrease in design time," he adds.

As a consequence, "class societies are fielding a growing number of questions from the industry that can best be summarized as, 'Will this novel structure we propose not only be fit for its intended purpose but will it be as safe as a traditional one?'"

Despite a reputation for conservatism, the international marine industry has always responded to each wave of new challenges, from the development of ULCCs to SWATH vessels. "In the past, class tended to be reactive to industry developments, often extrapolating its existing prescriptive standards to meet the new challenges," says Wiernicki. "Today," he continues, "advances in technology are reshaping not just marine classification but the marine industry itself with class often providing the technical leadership to effect those changes." He cites ABS' development of the Dynamic Loading Approach and recent research conducted into sloshing in membrane-type LNG containment systems as examples.

Thinking back over the period from the early 1990s, Wiernicki reflects that "there has been an exponential expansion of understanding in nearly every field of maritime technical knowledge, and in the computing power that can be applied to the consideration of these issues." The process, he says, builds on its own momentum. "This evolution has brought a stream of new ideas and technologies that raise their own technical issues, which, in their turn, require class to stretch its capabilities into yet other areas, so that it can develop new ways of rationally assessing the safety of unprecedented designs."

"Technology is a tool that helps us to deliver classification products and services to our customers that are designed to assist them conduct their business more efficiently and more safely. Technology is a tool that helps us improve our products and deliver better service. It is really that simple. At the end of the day, success to us is a product that is practical and can be applied."

In this technical evolution, he says, progress occurs not only in the familiar pattern of incremental steps based on empirical experience, but also in great leaps that take the scientists, engineers and naval architects within a classification society's research department to a point where they can evaluate design precedents that embody many unknowns.

Such rapid advances challenge all class societies to "break through their own technological barriers if they are to protect and extend the safety frontier, the frontier where advanced technology meets the basic mission of class - to protect the safety of life, property and the marine environment."

Another factor he points to is a growing need for safety equivalency - demonstrating that a design without precedent is "as safe as" previous designs. This need challenges class societies to provide a more flexible approach to the Rule-making process without compromising their mission.

"Fortunately there is a tried and trusted methodology to address this," says Wiernicki. "Risk assessment was pioneered by the nuclear industry and has been adopted by many other sectors but it is really only now that a concerted effort has been made to introduce a rational consideration of risk into the establishment of marine safety standards."

ABS has introduced probabilistic risk technologies into its Rule-making process to more explicitly quantify risk in terms of frequency and severity. "The goal is to achieve a more explicit understanding of safety, from identifying the hazards to developing effective risk management and mitigation approaches that allow us to consider quite different methods to those contained in the traditional Rules," he says. For ABS it is part of a technological evolution that began some 15 years ago.

"We are building on our technological advances of the recent past, to prepare for the industry's advances of the future. In the early 1990s, we used the rapid increases in accessible computing power to develop a scientifically correct engineering basis for the Rules - what we called a first-principles approach - in which we looked at structural designs based not only on past performance, but also on a consideration of how things happen.

"We were the first, and are still the only, class society to thoroughly consider the dynamics of a ship at sea. This led to DLA, the Dynamic Loading Approach, and then to SafeHull - two programs without precedent and without equal. Now, we are looking to take that knowledge to the next level, combining it with risk technologies to develop Rules based not only on past performance and on how things actually happen, but also based on how things interact.

"This is the latest development in an ongoing research and development program that addresses integrated risk management," he explains.

"Through this IRM project, we have been able to marry emerging risk technologies with our vast practical experience. In the process, we produced several pioneering risk-based guidance documents for the industry: a Guide for risk evaluation for the classification of marine facilities; guidance notes on the review and approval of novel concepts and emerging technologies; and Guides for performing surveys using risk-based inspection and reliability-centered maintenance."

This internal evolution has also concentrated ABS' efforts to improve the manner in which safety standards are applied and maintained throughout a vessel or offshore structure's operational life. "Life cycle management and operational performance are two key items that are impacted by how various systems or components interact," Wiernicki says. "They require a systems approach to the ship or offshore unit, tying together technical capabilities - structures, machinery and dynamic load-and-response behavior - with risk-based approaches to determine how design, maintenance and operations interact to affect a vessel over the course of its life.

"As vessel designs advance, and virtually everything about their operation grows more complex and more challenging, the question for owners and operators becomes, 'What information from the classification process regarding hull and mechanical integrity also has an impact on vessel performance?' In considering operational safety, our efforts are focused on how that question can be most effectively answered, and determining what information can be relayed to the master, while operating the ship, that can help the vessel avoid previously identified operational or structural hazards."

ABS has a rich history of technological leadership marked by numerous industry firsts from the first Rules for all welded vessels to developing the first standards for the carriage of LNG to approving the designs for a succession of containerships, from the advent of containerization until the present, each recognized as being the largest of its time. In the offshore sector ABS established the first MODU Rules and classed the first TLP and the first spar among many other industry firsts.

This technology leadership, he notes, is also reflected in ABS' impact on the joint effort of ABS, DNV and LR to develop Common Rules for tankers which is nearing completion.

"In the JTP (Joint Tanker Project) or Common Structural Rules (CSR) project, the three societies sought to eliminate the growing external pressures being exerted on all class societies to compete on steelweight," he explains. "Under the Common Rules, we have jointly agreed to raise the bar in terms of structural integrity, at the same time shifting competition from steelweight to service delivery and added value."

Key elements of the approach adopted by the JTP are the application of dynamic loads to the net ship scantlings and the formal consideration of fatigue. "This is the same approach that was pioneered through ABS SafeHull more than 10 years ago," says Wiernicki. "It is applying a rational assessment to the structure based on fundamental engineering principles that will result in more robust ships in the future."

In doing so, the Common Rules address one of the most cited weaknesses in the current approach to classification Rule-making.

(Continued on page 36)

Time Flies When Well Spent

The rudder and engine commands came rapidly, as the cumbersome tanker wended its way ponderously but purposefully through the hairpin turns of Hartford Channel. A large but nimble container ship approached at the next bend, sounding one blast of the whistle. Meeting head to head on such a tight turn is not usually recommended but the captain decided to try it just to see how it worked. He replied with one blast. The 90 degree turn was negotiated safely as the containership Patriot State passed inches away.

An hour later the anchor tore noisily out of the hawse pipe of the containership Bay State as the pilot shouted "full astern". Was he in time to keep the stem from plowing into the rapidly approaching dock? The wind was not helping, as the ship set rapidly down on the pier. It would have been more comforting to have a stout tugboat laying off to assist, but this was infinitely more interesting.

No, this was not the set of a maritime version of "survivor" where pilots and captains try to outdo each other with foolhardy bravado. This was just another day in Massachusetts Maritime Academy's Advanced Shiphandling course. The ships were manned models, navigating the waters of Great Herring Pond on scenic Cape Cod. This course is offered through the Academy's Center for Commercial Maritime Training. The MMA program offers the only manned model advanced shiphandling course in North America. It is also the world's only manned model course with United States Coast Guard approval. This five day course satisfies the entire advanced shiphandling training requirement for mariners wishing to proceed to a management level license (chief mate/master) and makes efficient use of the mariners' precious time ashore.

This past autumn pilots from the Saint Johns River in Florida, the Columbia River Bar and the port of Los Angeles, as well as captains and mates from companies such as Global Santa-Fe, SeaRiver Maritime, Military Sealift Command and others were in attendance at Massachusetts Maritime

At present the school is utilizing three models, the Patriot State and Bay State, of 16,070 tons displacement, and the Massachusetts, of 196,000 tons displacement. The former were purchased from the Navy in 1997 when they discontinued their manned model program at the Little Creek, Va., facility. The Massachusetts was custom built in 2001, from plans of the laid-up tanker Atigun Pass. All of the models are about 37 feet in length with the two dry cargo ships built at a scale of 16:1 and the tanker at 25:1. When you first approach the models lying at their berths at the Academy's Keith Hartford Sailing Center they look like toys. This notion is dispelled very quickly when the lines are cast off and the first rudder and engine orders are given. Then you realize that they handle just like the ships they are duplicating. To quote Captain **Jim Nolan**, retired San Francisco Bar pilot " I know these ships from real-life experience. These models are incredibly realistic".

Massachusetts Maritime Academy's Advanced Shiphandling course uses manned models to teach.

As important as the models and the facilities is the team of instructors assembled by Captain **Peg Brandon**, the Director of Commercial Maritime Training. The most senior of the facilitators are Captain **Jim Nolan**, retired pilot and "spark-plug" of the original program and Captain **Richard "Red" Shannon**, who, among his other accomplishments, is a master of both power driven and sailing vessels of any gross tons and former master of the sailing passenger ship Sea Cloud. Complementing these two are Captain **Kerry Fitzpatrick**, retired containership master, Captain **Ron Mason**, retired Boston docking-master, Captain **Craig Dalton**, retired tanker captain, and Captain **Pat Crane**, who is a current ITB master. The shared background and experience of these instructors guarantees a rewarding experience for course participants. Among the many skills taught as part of the syllabus are some that are nearly forgotten, such as the use of an anchor in a narrow channel, the use of the anchor while docking, and Mediterranean mooring with both anchors. In years past the anchor was referred to as the "poor man's tug." It is still used this way in some parts of the world where, due to economic or mechanical constraints, tugs are not available. Because tugs are readily available most places however, this skill is being lost. The captain or pilot who must proceed without a tug for one reason or another may not be readily familiar with this anchoring technique. It is a difficult skill to learn on your own, on the job, but easy to address with the manned models.

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(For more Training & Education News, turn to page 36)

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WÄRTSILÄ

Seeing Things in a Different Light

Anyone in the marine business knows the difficulty of maintaining a properly coated ballast tank environment. The ballast tank of an ocean-going ship endures some of the harshest environments in the world, with thousands of gallons of seawater pumped into and out of the tanks, creating an extremely corrosive environment. Repairing corroded ballast tanks through traditional methods can cost between $50 to $100 per sq. m. With a ballast tank area of 250,000 sq. m., this could mean an expense of $1.2 million for a complete overhaul.

While protective coatings have traditionally been applied to slow the corrosion process, the ballast tank areas are notoriously difficult to access for application and inspection, and oftentimes a missed or incorrectly applied spot can lead to rapid corrosion. A team of companies has come forward with a solution: a coating complete with Lumilux luminescent pigments from Honeywell that allows for quick and accurate inspection using ultra-violet light. Luminous Technologies Ltd., a U.K. manufacturer of colored luminous pastes and concentrates for use in paints and coatings, fabrics and plastics, invented the Optically Active Additive (OAA). A key ingredient in OAA is Honeywell's Lumilux pigments — compounds that absorb energy and emit it as visible light or, in special cases, as infrared or long-wave ultra-violet radiation. "Selecting Lumilux was an easy task since no other pigment worked as effectively with the various forms of paint we utilized at the time," said **Bill Cooper**, managing director, Luminous Technologies. When these pigments are added to coatings for application, workers using an ultraviolet light can rapidly inspect the coating for coverage. Areas where the coating glows brighter means it is too thick, which wastes materials. Areas that do not glow or glow less brightly indicate where the coating is too thin or not applied, leaving the tank vulnerable to corrosion. The same ultra-violet detection method can be used for periodic inspection and maintenance to quickly determine if the coating has cracked or otherwise failed.


A poorly applied system.

Standing the Test of Time

Having researched OAA from Luminous Technologies, a marine technical consultant alerted the Jotun Group, a leading marine coatings, of the new additive. Jotun immediately developed its Balloxy HB Lumi coating system which combines OAA with its own paint formulations. Jotun quickly launched a one-year test cycle and discovered that the Balloxy HB Lumi system offered a variety of benefits compared to traditional maintenance procedures, including:

- A 50 percent reduction in inspection time since personnel could inspect large areas more quickly with ultra-violet light;
- Improved quality of first application, which can be inspected quickly before a second coat is applied;
- Substantial materials savings as the system detected areas where too much coating material was being applied;
- Easier inspection of the coating over its lifespan;
- Better record-keeping as inspection images can be captured digitally.

"Balloxy HB Lumi is the future of ballast tank protection," said **Miles Buckhurst**, product manager, Jotun. "The long-term benefits are clear, Balloxy HB Lumi protects against damage caused by corrosion, improves the standard of inspection while providing considerable savings in time and materials." Jotun officially launched its product in March, 2004, making a major splash in the maritime industry. Balloxy HB Lumi has attracted interest from shipping companies worldwide and is now in use with several of the world's largest shipping companies.

Circle 15 on Reader Service Card

Sigma Adds to its Coatings Line

Sigma Coatings added another product to its assortment that already includes Sigma Phenguard and Sigmaguard CSF. After use in non-marine applications such as land based storage tanks, Sigma Coatings launched the solvent free epoxy phenolic tank coating Sigma Novaguard for marine applications.

Sigma Novaguard is designed to offer increased chemical resistance versus other coatings on the market, while possessing the same flow and edge coverage properties of the Sigma solvent free product range. The solvent free nature of Sigma Novaguard means that it is more environmentally friendly than solvent based products both in terms of VOC emission and health and safety, with the solvent free nature of Sigma Novaguard improving the working conditions for the applicator as well as reducing the explosion hazard. Application can be carried out by brush or roller for small areas and cold single feed airless spray for large areas. Sigma Novaguard can be applied to a dry film thicknesses to 150 microns, enabling a two coat system of

Circle 221 on Reader Service Card

Polyurea Coatings for Commercial Marine Apps

Alaska Oceans Seafood's Alaska Ocean, at 376 ft., is one of the largest fishing vessel's in the U.S., with the capacity to harvest and process more than 500 metric tons of fish per day during each of the approximately 220 days per year she spends at sea. Completely rebuilt more than 12 years ago in Norway and converted into the trawler/processor it is today, Alaska Ocean represents an initial investment of more than $60 million. The ship relies on a plethora of high-tech marine equipment to keep it out to sea and working nearly 220 days per year, including an advanced coatings system to protect it from the harsh environs within which it works. To this end, Alaska Oceans Seafood took a pioneering step in considering polyurea coatings for high-impact deck areas. Pure, 100-percent polyurea coatings, made possible by relatively recent advances in coatings technology, offer ultra-high film build plus outstanding abrasion, chemical and corrosion resistance. They also dry in as little as 30 seconds. Polyurea coatings are coming into wider use across many industries, and the marine market is no exception. Above the water line - and currently being evaluated for surfaces below the water line - these coatings are proving to be very effective in protecting steel, aluminum and fiberglass for areas ranging from decks to fish hold liners and bilge liners. The ship underwent a two-month dry dock at Todd Pacific Shipyards in Seattle in the spring of 2004, specifically for inspections of its rudder and tailshaft, but the time was used for much more. Fishing gear, fish-finding equipment and factory process systems were all upgraded, and routine maintenance on engines were performed. Planning ahead, it was arranged for a test area of Sherwin-Williams EnviroLastic Polyurea to be applied and tested on the trawler for one fishing season. EnviroLastic AL 450 SS polyurea was applied to approximately 7,100 sq. ft. of the railings and steel decks of the Alaska Ocean. One of the benefits of the 100-percent solids, aliphatic polyurea coating system is its relatively slow gel time that enables smooth applications at thicknesses ranging from 30 to 250 mils, while providing a seamless, flexible and waterproof coating solution that can bridge cracks to 1/8-in. Also, it drys to the touch in 30 seconds, and can be safely walked on in just five minutes. The polyurea was applied to decks where fishing and offloading activities occur and frequently take a beating from crane hooks, steel blocks, shackles and huge, heavy nets, as well as trawl doors weighing several tons apiece that mar the deck's surface. The crew used a Gusmer SPI 18/18 proportioning unit, D type spray gun, and 16 KW generator to power the heating units (pump and line) to maintain the 160 degrees F material application temperature. **Circle 27 on Reader Service Card**

The preceding was excerpted from "Coatings Solutions", Spring 2004 edition.

total 300 microns to be specified. Previously the minimum application film thickness for a single coat solvent free tank coating was in the order of 300 microns making the cost of coating complex structures, which required two coats to ensure good coverage, was in some cases prohibitive.

The flow, wetting of the steel and resistance to cracking at high film thicknesses mean that it is suited for application to pitted steel where a high degree of chemical resistance is required. Sigma Novaguard is a solution for vessels such as product carriers where tanktop pitting can be a problem or FPSO's (newbuilding or conversion) where a relatively high degree of chemical resistance is essential combined with a long term performance requirements, as these vessels can typically be on station for 10 to 20 years with little or no possibility for maintenance.

Supply vessels are another potential niche market, as these vessel's could use Sigma Novaguard's resistance to the many and varied cargoes carried on these vessels such as drilling brines, fuel oils, lubricating oil etc. The tanks on board these vessels are typically small, complex and difficult to coat. Use of a solvent free system reduces health and safety risk as well as improving the working environment. The solvent free nature of Sigma Novaguard means that the coating is tolerant to over-application, an unavoidable problem in these small complex tanks.

Circle 16 on Reader Service Card

Jotun Debuts SeaForce

Jotun Coatings introduced the SeaForce line, consisting of three new, cost-effective TBT-free antifoulings: SeaForce 30; SeaForce 60; and SeaForce 90. Complementing SeaQuantum, the SeaForce-range is targeting the cost-sensitive market, offering a high solid self-polishing

antifouling with a life span between 36 months for SeaForce 30 and 60 months for SeaForce 60 and SeaForce 90. Main benefits for the SeaForce series is linear polishing rate, high antifouling performance predictability, reduced leached layer thickness as well as high volume solids (58%).

The new unique features of SeaForce has been made possible thanks to Jotun's new patent pending technology called Polymer Plasticiser Technology (PPT). Since SeaQuantum is based on a silyl polymer, incorporating environmentally acceptable active ingredients with flexible hydrolyzing acrylic polymers, SeaQuantum is not in the same need for a film modifier. Most other types of antifoulings, however suffer from eventually becoming hard and brittle and are thus in the need for a film modifier.

Circle 26 on Reader Service Card

New Coating Thickness Gauge

The PosiTector 6000 gauges by DeFelsko are designed to measure coating thickness on both ferrous and non-ferrous metals, quickly and accurately. Two-button operation and no calibration required for most applications are designed to allow the user to take basic measurements or perform advanced functions easily. Specialty features including average zero (for rough substrates), automatic substrate recognition, flip display and PA2 capabilities.

Circle 8 on Reader Service Card

Handheld Ultrasonic Corrosion Gauges

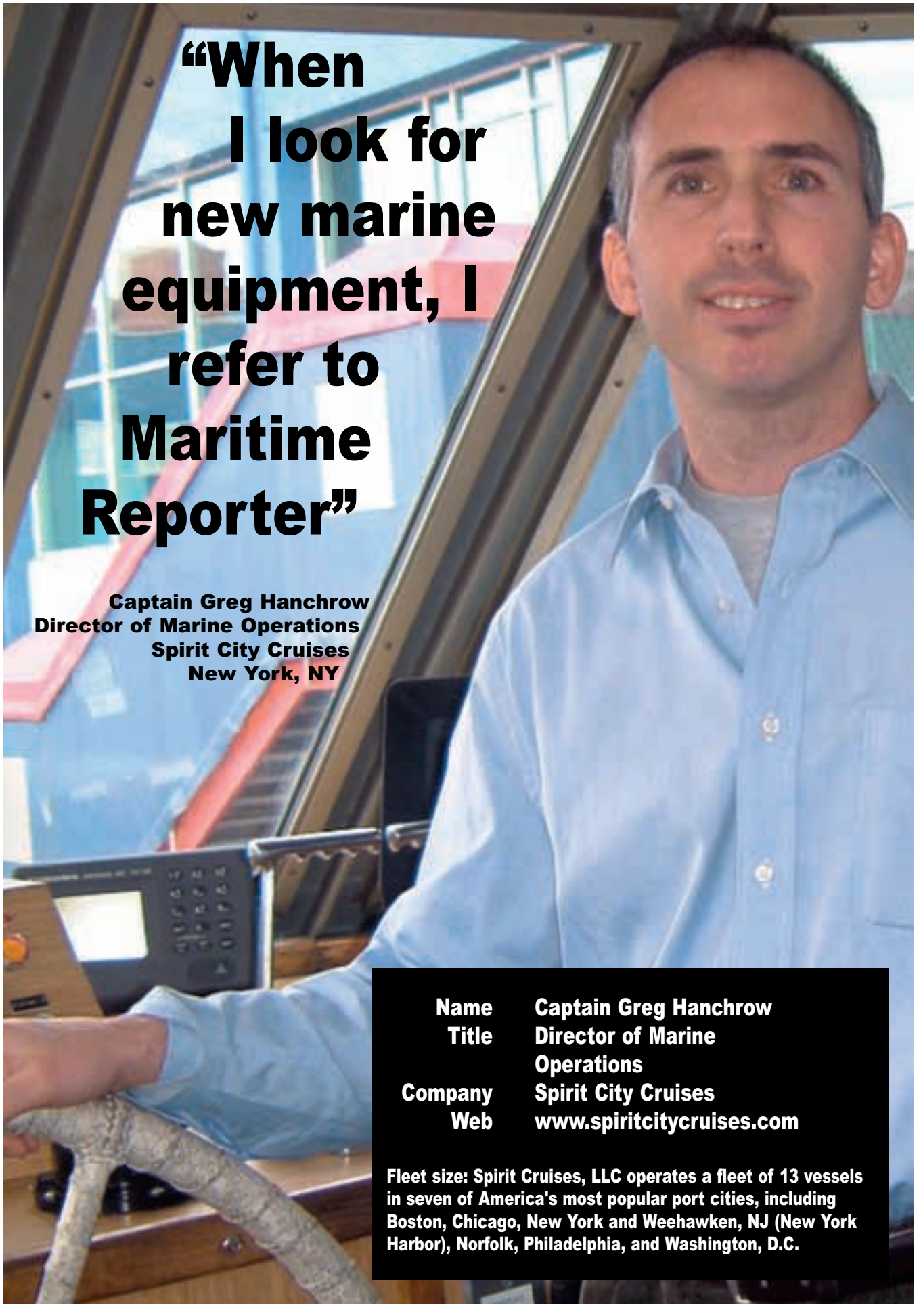
Panametrics-NDT, a business of R/D Tech Instruments Inc. offers the new MG2-XT and MG2-DL Ultrasonic Thickness gages, primarily designed for inspectors and maintenance engineers responsible for measuring the remaining thickness of internally corroded pipes, tanks, and ship hulls. The gauges offer two time-saving features: Thru-Coat and Echo-to-Echo, both of which eliminate the need to remove a paint or coating. The patented Thru-Coat technology uses a single backwall echo to measure and separately display the thickness of the coating and the remaining metal, each adjusted for their correct material sound velocity. The Echo-to-Echo feature uses multiple backwall echoes to measure true metal thickness.

Each unit is compatible with a complete line of easily interchangeable dual element transducers that vary in frequencies, diameters, and temperature capabilities.

Large numerals on the electroluminescent backlit display make it easy to read thickness measurements from total darkness to bright sunshine.

The splash proof, impact-resistant case with sealed keypad makes these gages durable tools in the harshest conditions.

Circle 9 on Reader Service Card



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Descr: Manufacturers of real-time 3D forward looking sonar for navigation, obstacle avoidance, security applications, and shallow water surveys.
Products: 3D Forward Looking Sonars for Navigation, Obstacle Avoidance, Security Applications, and Shallow Water Surveys, including the FS-3 and FS-3DT systems.

First Choice Armor and Equipment, Inc.
www.firstchoicearmor.com
Chrissy Piper
tel: 508-559-0777; fax: 508-941-6841
email:sales@firstchoicearmor.com
Products: Concealable, Tactical, Body Armor; Float collar Attachments for Body Armor

Global Security Management (GSM) Ltd
kaminco.com/gsm
Sotirios Kaminis
tel: +30 210 45 28 240; fax: +30 210 42 94 887
email:gsm@kaminco.com
Products: Hernis Security Cameras, Login products, Security Surveys, Threat Assesment, Security Plan Design & Implementation, Electronic Counter - Measures, Maritime Security Training

Guardian Wireless Inc.
www.Guardianwirless.com
Dan Kaderabek
tel: 800-330-7413; fax: 920-686-1998
email:Sales@Guardianwireless.com
Products: Marine Guardian, Yacht Guardian, Bilge Guardian

Hydroid, Inc.
www.hydroidinc.com
Kevin McCarthy
tel: 508-563-6565; fax: 508-563-3445
email:sales@hydroidinc.com
Products: REMUS Autonomous Underwater Vehicle (AUV)

ICAN
www.icanmarine.com
Jacquelyn Holden
tel: 709-754-0400; fax: 709-754-0419
email:sales@icanmarine.com
Products: Aldebaran II, Regulus II, DataSwitch, Horizon, Horizon LE, FINS

Ingersoll-Rand Maritime Solutions
www.maritime.irco.com
Jim Ligotti
tel: (860) 314-5351; fax: (860) 582-8304
email:maritimesolutions@irco.com
Products: Products and services include site analysis and planning, employee scheduling, time-and-attendance, closed-circuit television monitoring, electronic and biometric access-contr

Inmarsat Limited
www.inmarsat.com
Inmarsat Customer Care
tel: +44 - (0)207 - 728 - 1020
email:customer_care@inmarsat.com
Descr: Satellite Communications - Maritime, Enterprise & Aero Markets

John Sabella & Associates, Inc.
www.johnsabella.com
Elizabeth Bowman
tel: (206) 281 8626; fax: (206) 217-0899
email:info@johnsabella.com
Products: Maritime Security Series, Onboard Basic Safety Training Program, Maritime Medical Emergencies Training, Onboard First Aid Training, Marine Survival Equipment Training

JW Fishers Mfg. Inc.
www.jwfishers.com
Chris Combs
tel: 800-822-4744; fax: 508-880-8949
email: info@jwfishers.com
Descr: Underwater search equipment manufacturers
Products: Side Scan Sonars, Underwater Camera Systems, Underwater Metal Detectors, Marine Magnetometers, ROVS, Pingers, and Cable Tracking Systems

KVH Industries, Inc.
www.kvh.com
KVH Sales Department
tel: (401) 847-3327; fax: (401) 849-0045
email:info@kvh.com
Descr: KVH is the leading manufacturer of marine satellite TV, communications, and Internet systems for commercial, military, and recreational vessels.
Products: TracVision satellite TV, Tracphone satellite communications, TracNet, eTrac Ships Security Alert System (SSAS)

L_3 Communications
www.L-3com.com
Nick Caruso
tel: 941-379-1630; fax: 941-377-5591
email:nick.caruso@L-3com.com
Descr: Marine Electronics Manufacturer
Products: AIS, VDR, VHF

L-3 Communications Klein Associates, Inc.
www.L-3Klein.com
Richard Wetmore
tel: 603-890-1304; fax: 603-890-9796
email:rick.wetmore@L-3Com.com
Products: Small Target Detection Radar for Port & Security Solutions, Side Scan Sonar, Multibeam Survey, Integrated Bridge Systems, Navigation & Communications Equipment

L-3 Communications Security and Detection Systems
www.L-3com.com/xray
Nancy Norton
tel: 781.939.3812; fax: 781.939.3993
email:nancy.norton@L-3com.com
Products: X-ray security screening products

Maine Maritime Academy
http://conted.mainemaritime.edu/
Victoria Stearns
tel: 207 326-2211
fax: 207 326-2218
email:continuinged@mma.edu
Descr: Maritime Academy Continuing Education Division
Products: CSO/SSO/PFSO certification, Security Plan Drills and Exercise training/evaluation, Crew Familiarization, Security Crisis Management Training, Response Craft OPS classes

Maritime Protective Services, Inc.
www.mpsint.com
Adonis N. Balbuena
tel: 954-428-6880
fax: 954-481-3524
email:info@mpsint.com
Products: Asset Monitoring, Drils and Exercises, Training, Assessments, Plans

Maritime Telecommunications Network
www.mtnsat.com
Nancy Cornelius
tel: 954.538.4017; fax: 954.431.4077
email:nancy.cornelius@mtnsat.com
Descr: Satellite Communications Provider
Products: VSAT - stabilized and transportable

Metorex Security Products, Inc.
www.metorexsecurity.com
Andrea Forconi
tel: 609-406-9000 x 115; fax: 609-530-0842
email:aforconi@metorexsecurity.com
Products: Metal Detectors

Mi-Jack Products, Inc.
www.mi-jack.com
John Wepfer
tel: 708-596-5200; fax: 708-225-2312
email:JWepfer@mi-jack.com
Products: Power In-Lock

Mission Marine, Ltd.
www.missionmarine.com
Robb Thomson
tel: 419-625-0123
fax: 419-625-4313
email:sales@missionmarine.com
Products: Range in 20` - 45` length, in narrow or wide beam.

Nautronix plc
www.nautronix.com
Mark Patterson - COE
tel: 01224 775700
fax: 01224 775800
email:info@nautronix.co.uk
Products: Nautronix specialize in the delivery of complete marine technology solutions for customer needs in underwater communications, positioning, fixed and portable submarine range a

Night Vision Technologies, Inc.
www.nvti-usa.com
Todd Moore
tel: 972-554-3977; fax: 972-554-3939
email:tmoore@nightnav.com
Products: Multiple camera vision systems which include Thermal, Night Vision, Low-light, and Color cameras.

Nobeltec
www.nobeltec.com
Sales Department
tel: 503-579-1414; fax: 503-579-1304
email:info@nobeltec.com
Products: Navigation Software, Electronic Charts, Radars, Depth Sounders and Accessories

North American CLS
www.shiploc.com
Andrew Peters
tel: 206-855-2880
email:apeters@nacls.com
Products: ShipLoc, the Ship Security System

North American Video
www.navcctv.com
Cynthia Freschi
tel: (732) 477-0686; fax: (732) 477-0886
email:info@navcctv.com
Descr: North American Video is one of the premier security systems integrators in the country
Products: From system design through equipment installation and training, North American Video provides the highest levels of customer service, support. and branded products.

Nova Ray, Inc.
www.novaray.com
Nova Ray, Inc.
tel: 425-825-0654; fax: 425-825-9364
email:info@novaray.com
Products: Patented Nova Ray Remotely Operated Vehicles

ObjectVideo(tm)
www.objectvideo.com
Melchior Baltazar
tel: 703-654-9300; fax: 703-654-9399
email:MBaltazar@ObjectVideo.com
Products: ObjectVideo VEW(tm) and ObjectVideo Forensics(tm)

Oregon Camera Systems, LLC
www.OregonCameraSystems.com
Frank Frysiek
tel: 703-777-7929; fax: 703-771-3052
email:govsales@oregoncamerasystems.com
Products: Opto-electronic camera systems that provide Tactical Surveillance Solutions.

Panasonic System Solutions Company of America
www.panasonic.com/security
Frank DeFina
tel: 866-726-2288; fax: (201) 348-7372
email:cctvsupport@panasonic.com
Descr: Panasonic Security Systems is a world leader in camera and video surveillance technology
Products: Cameras and dome systems, digital video recorders, matrix and sequential switching systems, control software, plasma displays, monitors, lenses, iris reader & more.

Phoenix Products Company, Inc
www.phoenixproducts.com
Bob Gueldenzopf
tel: 414-973-3300; fax: 414-973-3210
email:marketing@phoenixproducts.com
Products: Lighting Products

ProCurve Glass Technology, LLC
www.procurveglass.com
Marlene Musso
tel: 215-441-9101; fax: 215-441-9190
email:procurveglass@nni.com
Products: Windows, Windshields, Curved and Flat Glass, Bullet Resistant, Heated Glass,

RAE Systems
www.raesystems.com
Amanda Leet
tel: 877-723-2878; fax: 408-752-0724
email:raesales@raesystems.com
Products: Wireless and portable gas and radiation detection equipment.

Saab TransponderTech AB

P O Box 4113, SE-171 04 Solna, Sweden
Tel: +46 13 18 80 00
Fax: +46 8 627 49 49
Contact name: Holger Ericsson
E-mail address: holger.ericsson@transpondertech.se
Web address: www.transpondertech.se

Company Description:

Saab TransponderTech is specialized in development and maintenance of marine information-, sensor-, and communication systems for both Vessel Traffic Management Systems and port- and costal security. Our long experiences in the field have placed us as one of the major players in the market.

Recon Training Concepts
www.ReconTraining.com
Duke Speed
tel: 803.396.0202; fax: 803.396.0202
email:reconfit@comporium.net
Products: training manuals, resources

Rutter Technologies Inc.
www.ruttertech.com
Gerald F. Olscamp, P.Eng.
tel: +1-709-386-4213; fax: +1-709-368-1337
email:golscamp@ruttertech.com
Descr: Manufacturers of the worlds most advanced Voyage Data Recorders(VDR) and the Sigma S6 line of high rsolution radar processors and recorders
Products: Voyage Data Recorders, Sigma S6 High Resolution Radar Processing and Recording, Personal Locator lights

SeaArk Marine, Inc.
Phone: (870)367-9755; Fax: (870)367-2120
Contact: Ken McFalls, Vice President of Sales
E-Mail Address: sales@seaark.com
Web Address: www.seaark.com
SeaArk Marine designs and builds boats in a variety of models and sizes to best suit the boat's application and mission requirements. Specializing in military, governmental and commercial areas including patrol, security, fire and search and rescue, SeaArk has earned and maintained its reputation as the premier builder of small and midsize all-welded aluminum boats.

Seaproof Solutions
www.seaproof.com
Henrik Bang-Andreasen
tel: +47 55 33 20 50; fax: +47 55 33 20 51
email:henrik@seaproof.com
Descr: Underwater solutions
Products: Seabed magnetic sensor coil for passive detection of divers, submarire and surface vessels

Senstar-Stellar Corporation
www.senstarstellar.com
Ron Reddick
tel: 613-839-5572; fax: 613-839-5830
email:info@senstarstellar.com
Descr: Outdoor Perimeter Security Specialists
Products: Perimitrax, Intelli-FLEX, Intelli-Field

Servowatch Systems Ltd
www.servowatch.com
Ian Messenger
tel: +44 1621 862 145; fax: +44 1621 862 146
email:sales@servowatch.com
Descr: Manufacturers and suppliers of Marine Alarm and Monitoring Systems, with offices in UK and USA and agents worldwide.
Products: Marine Security Systems. Marinised CCTV and Thermal Imaging Camera Systems, Millimetre Wavelength Radar for close-in Surveillance. Engine and Machinery Monitoring Systems.

Telenor Satellite Services
www.telenor.com/satellite
Stefan Tillard
tel: +1 301 838 7814; fax: +1 301 838 7832
email:stefan.tillard@telenor-usa.com
Descr: Satellite communications - data, voice and secure.
Products: Securable broadband data & voice communications for the maritime industry offering a full array of products and services via multiple satellite systems

Texas A&M University System Fire School
www.teex.com
Mike Wisby
tel: 866-878-8900; fax: 979-847-9304
email:esti@teexmail.tamu.edu
Descr: The Marine Program along with the Center for Marine Training and Safety (CMTS) offer a full spectrum of marine firefighting, rescue, safety, and prevention courses, as well as a full suite of oil/hazardous substance spill training courses.

The Deltic Group Inc.
www.delticgroup.com
Sales Department
tel: 1-866-733-5842; fax: 1-866-733-5843
email:contactus@delticgroup.com
Descr: The Deltic Group supplies specialty security equipment for vessels and shore facilities.
Products: Ship Security Alert Systems, Automatic Identification Systems (AIS), Metal Detectors, Electrified/Alarmed Security Railing for Vessels, Electrified/Alarmed Fencing for Ports

The Global Maritime and Transportation School
www.usmma.edu/gmats
Angela Bobrowski
tel: (516) 773-5165; fax: (516) 773-5353
email:tlm@usmma.edu
Descr: A continuing education institution that prepares private sector, government, and military professionals to be global leaders and innovators in transportation security, maritime operations, and intermodal systems.
Products: Security Courses Available: Facility Security Officer; Vessel Security Officer; Company Security Officer; Supply Chain Integrity Program

Threat Thwart
www.marshallwilson.net
Marshall Wilson
tel: 713 526.6666; fax: 713 526.7666
email:whereto@swbell.net
Descr: intermodal all threat detector delivery system
Products: World`s only all threat detector system for intermodal containers

Transas
www.transas.com
PR & Marketing Support Department
tel: +353 (0) 21 4 710 400; fax: +353 (0) 21 4 710 410
email:info@transas.com
Descr: Transas is a world-leading developer and supplier of a wide range of software and integrated solutions for the transportation industry.
Products: onboard navigation systems and equipment, a broad range of maritime simulators, Vessel Traffic Service systems including AIS, and fleet/ship management solutions.

Tyco Fire and Security
Unit 4A, Beechwood, Chineham Business Park
Basingstoke, Hants RG24 8WA UK
www.tycomarine.com
Brian Rodricks
tel: +44 1256 336 777; fax: +44 1753 702 365
email:tyco.marine@tycoint.com
Descr: Fire, Security and Safety Systems and Services

USMMA GMATS
300 Steamboat Rd
Kings Point, NY 11024
www.usmma.edu/gmats
Stephen Frangos
tel: 516-773-5149; fax: 516-773-5353
email:frangoss@usmma.edu
Descr: Maritime Education & Training
Products: Maritime Education & Training

VideoRay
400 Eagleview Blvd
Exton, PA 19341
www.videoray.com
Erick Estrada
tel: (610) 458-3000; fax: (610) 458-3010
email:erick.estrada@videoray.com
Descr: VideoRay's product line redefines the performance/price paradigm for submersible micro ROVs. All models are dive ready, yet adaptable to specialized requirements using standard accessories, or serve as a delivery platform for customizable integration
Products: Micro-ROV

VingCard Marine
Rabekkgaten 5
MOSS, 1522 Norway
www.vingcardmarine.com
Karen E.R. Mathisen
tel: +47 69 24 54 02; fax: +47 69 24 54 50
email:marine@vingcard.com
Descr: Supplier of marine locks and security access control systems.
Products: Marine Locks, Keys & Cylinders, Card operated locks, Access control systems

Ward Leonard Electric Company Inc.
401 Watertown Road
Thomaston, CT 06787
www.wardleonard.com
Jim O'Day
tel: 860-283-5801, ext. 108; fax: 860-283-5777
email:joday@wardleonard.com
Descr: Developer and producer of electronic equipment for seagoing vessels.
Products: Electronic devices, controllers, network controllers, instruments for ships.

Zistos Corporation
55A Kennedy Drive
Hauppauge, NY 11788
www.zistos.com
Bob Levine
tel: 631-434-1370; fax: 631-434-9104
email:blevine@zistos.com
Descr: Manufacturer of portable, submersible, video search systems

Zodiac of North America
540 Thompson Creek Road
Stevensville, MD 21666
www.zodiacacademy.com
Rick Scriven
tel: 410-643-4141 ext. 3008; fax: 410-604-0161
email:rscriven@zna.zodiac.com
Descr: Zodiac leads the world for variety and innovation in inflatable boats and rigid inflatable boats (RIBs) and other utility craft for maritime users.
Products: Inflatable Boats, Sea RIB Open (SRO), Sea RIB Marine and Navy (SRMN), Zodiac Hurricane RIBs-Outboard/Inboard/Cabin Models

Circle 239 on Reader Service Card

RCCL Builds the Bridge of the Future

With a commitment to safe and efficient navigation for its burgeoning fleet of high-value ships, Royal Caribbean International started the process nearly six years ago to outfit all of its vessels with identical bridge layout and bridge operating procedure.

— by ***Greg Trauthwein***

Captain William Wright senior vice president, Marine Operations, for Royal Caribbean International is a self-described anamoly: an American cruise ship captain. He stands out in the high-profile cruise niche, though, for reasons beyond his nationality. Capt. Wright was largely responsible for driving through the idea that all Royal Caribbean International ships — a fleet that will number 20 with a delivery in May 2006 — should be outfitted with identical integrated bridge layout and operating procedure. While the notion that shipping would benefit from installing identical bridge systems, akin to the airline industry, the idea has little if any real possibility to take hold as ships are built in much smaller production runs, than say a Boeing 777. Equally important is the ownership profile found in shipping: a diverse, wide-spread international lot, dominated by a few corporate giants yet sustained by thousands of small, private companies. RCI, of course, is one of the three major players remaining in the international big ship cruise segment, and the company has been steadfast in its mandate to raise the technological bar, both in the traditional marine engineering as well as the accommodation space. Royal Caribbean and its sister-brand Celebrity have garnered accolades for helping to bring technologies as gas turbines and azipod propulsion in the machinery space to the cruise sector, and for installing the first rock climbing wall and ice skating rink ever to set sail to sea. In reality it was the development of the Voyager class of ships — the largest cruise ships ever built when the first, Voyager of the Seas, was delivered in November 1999 — that ultimately led the company to mandate Sperry Vision IBS. It really started in 1998, and had a bit to do with the development of the Voyager class" said Capt. Wright. "With (the ship's) unprecedented size and operations scope, we had to give them the best tools available to help them navigate the ship safely."

At the same time, RCI and the entire cruise shipping industry in fact, were embarked on unprecedented growth, with newer, larger and more technologically advanced ships coming on-line and, at the same time, training and education mandates for ship officers grew ever more rigid. "As we brought in new officers, we found that with different navigation systems and bridges, bridge resource management was a real problem," Capt. Wright said. "It is important, of course, for them to understand not only the capabilities but the limitation of the systems on the bridge. At the same time, we had a variety of products and systems, and it was simply decided that standardization made perfect sense." In fact, Captain Wright counts the training as one of, if not the, biggest advantage. "The major benefit is from a training perspective, as the crews must learn to use very advanced systems, and it takes time and practice."

Development of the Aker Kvaerner Masa Yards-built Voyager class — at the time the world's largest cruise ship — was an impetus to develop and install similar integrated bridge systems aboard the entire Royal Caribbean International fleet. Pictured left is the Sperry Vision FT IBS.

Enter Sperry Marine and STAR Center. At the time, by Capt. Wright's estimation, Sperry Marine was ahead of the IBS technological curve.

"We already had many Sperry systems on board, and they have a very strong reputation and are one of the major suppliers of marine equipment around the world," Capt. Wright said.

Together both RCI, Sperry and STAR Center partnered for the development of one of the world's first ship specific simulators. "The main mission simulator at Star Center is an exact replica of our Voyager and Radiance Bridge: radars, azipod controls, etc. When our officers are training there, they are training on what they will basically find onboard our ships. If we didn't have the training component, we wouldn't have had a very complete package"

The feel aboard all Royal Caribbean bridges is that of a cockpit, rather than following the traditional notion that the bridges were designed to "keep the officer walking." Instead of walking about the bridge to collect and process data, the officer is comfortably seated with information and controls at their fingertips. "The idea of officers sitting down was pretty radical at the time," Capt. Wright admitted, "but we felt we needed to surround them with the information that they needed in a comfortable environment, and it has proven to be very successful."

Another major technological advantage is that found in the Dynamic Positioning System, as Capt. Wright explains: "The system takes ship handling to the next level as your situational awareness is dramatically increased. I think its something about the way in which our brains are wired, but when our 'hands go on the sticks' much of the focus is on that. When using DP, captains are able to step back a bit and get a bigger picture."

We are also able to change the transit strategy on in difficult ports by utilizing DP. A channel transit that might require 12 knots and a couple of degrees of crab angle with conventional ship handling can be executed with DP at 4 knots, right on the ranges and zero crab angle with full utilization of thrusters and azipods."

The Vision FT IBS

The latest RCI cruise ship with the Sperry system is for the next-generation Ultra Voyager cruise ship, which is being built at Kvaerner Masa-Yards in Finland. When completed in 2006, the Ultra Voyager will be the world's largest cruise ship, roughly 15 percent larger than the five previous Voyager-class vessels, and will carry up to 3,600 guests and 1,400 crew. The Ultra Voyager installation will be based on the new-generation Sperry Marine Vision FT integrated bridge system. Vision FT features large, high-resolution flat-screen displays, convenient console layouts, ergonomic controls and new operating software.

The bridge layout will, of course, be identical to those on other Royal Caribbean ships. All displays and consoles will be arranged in a U-shaped configuration. The systems can be controlled with trackball devices built into the pilot chairs' armrests. All critical components are duplicated, providing total redundancy and continuous safe operation in case of any failure or malfunction. Sperry introduced its next-generation integrated bridge system — Vision FT — early in 2004, a system designed to incorporate the latest advances in marine navigation technology and combines all of the ship's navigation sensors and systems -- including radars, electronic chart display and information system, gyrocompass, depth sounder, speed log, differential global positioning satellite (GPS) receivers and autopilot — into a completely integrated package.

The centerpiece of the system is Sperry Marine's Voyage Management System (VMS) software, which is designed to provide easy and precise route planning and gives a clear real-time picture of the ship's precise position and movement, along with radar targets and automatic identification system data, on an electronic chart display and information system. "The Sperry Marine system enhances safety and navigation efficiency by improving situational awareness for the ship's bridge watch officers," said **Frank Soccoli**, director of marketing for Sperry Marine. "With the Vision FT system, we have incorporated the best proven features from our existing integrated bridge system (IBS) technology and added important improvements to take advantage of current and future technologies to meet customer requirements."

MarAd's Schubert Resigns

Captain **William G. Schubert** resigned effective February 12, 2005, as Maritime Administrator of the Maritime Administration. The Deputy Administrator of the Maritime Administration, **John Jamian**, will assume the role of Acting Maritime Administrator.

Admiral Olsen Tapped to Lead Webb

Charles Visconti, Chairman of the Webb Institute Board of Trustees, announced that Rear Admiral **Robert C. Olsen, Jr**., the current Superintendent of the U.S. Coast Guard Academy in New London, Conn., was selected to succeed **Ronald K. Kiss** on July 1, 2005 as President of Webb Institute. Admiral Olsen, born in Brooklyn, grew up in New London, where he graduated from the United States Coast Guard Academy in 1969. He later earned an M.S. in Administration from the U.S. Naval Post Graduate School in Monterrey, Ca., and an M.S. in National Security and Strategic Studies form the Naval War College.

Rigdon Christens M/V Bienville

Larry Rigdon, President and CEO of Rigdon Marine, announced that Mrs. **Janie Babin**, wife of Michael Babin, Vice President of Administration, christened the M/V Bienville in Mobile, Ala., the sixth of 10 contracted GPA-640 platform supply vessels to be christened. The vessel joins its sister fleet of 210 x 54 x 19-ft. diesel-electric and dynamic positioning ABS-classed platform supply vessels that are currently operating in the Gulf of Mexico. It was immediately deployed to work.

DHS Names Maritime Security Advisory Committee Members

The U.S. Department of Homeland Security announced the appointment of the following individuals to serve on the National Maritime Security Advisory Committee.

The advisory committee has been established to provide advice to the Department of Homeland Security via the U.S. Coast Guard on matters such as national maritime security strategy and policy, actions required to meet current and future security threats, international cooperation on security issues, and security concerns of the maritime transportation industry as mandated by the Maritime Transportation Security Act of 2002.

- Christopher Louis Koch, president & CEO, World Shipping Council
- Joseph H. Langjahr, vice president and general counsel, Foss Maritime Company
- Thomas E. Thompson, executive vice president, International Council of Cruise Lines
- John C. Dragone, vice president, operating division, Maritrans Operating Company, L.P.
- Mary Frances Culnane, manager, San Francisco Bay Area Water Transit Authority
- Basil Maher, president and chief operating officer, Maher Terminals
- Charles Raymond, chairman, president, and CEO, Horizon Lines
- Alice K. Johnson, senior supervisor, PPG Industries, Inc.
- Timothy J. Scott, global director, emergency services and security, The Dow Chemical Company
- Mark Witten, senior regulatory advisor, Gulf of Mexico Deepwater Business Unit, ChevronTexaco
- Robert R. Merhige, III, deputy executive director, Virginia Port Authority
- Jeffery Wayne Monroe, director of ports and transportation, Portland, Maine
- Lisa Himber, vice president, Maritime Exchange for the Delaware River And Bay
- Wade M. Battles, managing director, Port of Houston Authority
- John Hyde, security and compliance director, Maersk Sealand Inc.
- William Eglinton, director of training, Seafarers International Union of North America, AFL CIO
- James Stolpinski, president, Local 920, International Longshoremen's Association
- David Halstead, chief, Florida Domestic Security Preparedness, Florida Department of Law Enforcement
- Theodore Louis Mar, chief, marine safety branch, California Department of Fish and Game
- Victor Zaloom, professor and chair of industrial engineering and director, engineering graduate programs and Center for Ports and Waterways, Lamar University

"Training & Education continued from page 26)

PMI Offers FCC Prep Course for GMDSS

Pacific Maritime Institute (PMI), announced its new Federal Communications Commission (FCC) three-day license preparation course for the Global Maritime Distress and Safety Systems (GMDSS) Radio Operators license. The National GMDSS Task Force has recently said that fishing vessels over 300 tons are considered SOLAS vessels and require GMDSS equipment, however, GMDSS mandated training by STCW is not required. Additionally, the FCC has required that all fishing vessels with designated GMDSS equipment must have at least two individuals onboard with GMDSS licenses when operating in U.S. coastal waters. "Currently, there is considerable confusion about how GMDSS, STCW, and FCC Radio Regulations effect the fishing industry, as well as many other smaller vessels," said **Gregg Trunnell**, Director of PMI. "

Circle 32 on Reader Service Card

SUNY Maritime: Learning On-Line

The constraints of time, distance and money can make maintaining a license or professional certification difficult. One answer to the challenges of time and cost is distance learning. Although not a new concept, distance learning has taken on a whole new look and capability with the advent of web-hosting. In the past, distance learning consisted mainly of dry video tapes or reading assignments with very little student-instructor interaction. Today's internet based programs not only allow student and instructor to communicate in real-time but has also allowed for group interaction and joint assignments. Web-based distance learning courses are now able to provide continuous support and instructional resources that technically weren't possible just a few years ago. Easy access and a flexible learning environment have brought web-based education into the main stream.

The SUNY Maritime College, a unit of the State University of New York offers maritime industry training on-line as part of the university system's SUNY Learning Network (http://sln.suny.edu/). The SUNY Learning Network offers 80 complete on-line degree or certificate programs to over 70,000 enrolled students making it the largest and most successful distance learning platform in the world.

Circle 33 on Reader Service Card

MITAGS Develops Bermuda Simulation Project

MITAGS developed a port simulation project to assist Bermuda's Department of Marine and Port Services in managing vessels within its port and channel configurations.

"We have finished the first phase of the Bermuda port simulation project," said **Glen Paine**, Executive Director of MITAGS. "The new database has been uploaded into our STN Atlas simulation system. Now the Bermuda Port Authority and its harbor pilots can independently assess the handling characteristics of vessels before they call on the port. The database will also be used in the future to evaluate the feasibility of changes to channels and port configurations from an operational perspective."

Circle 34 on Reader Service Card

Profile: Chris Wiernicki

(Continued from page 25)

It is being pioneered with new tanker Rules, to be quickly followed with new Common Rules for bulk carriers and is then expected to be extended to other ships types, particularly containerships.

"In the past, a lot of a class society's technical research was focused on more non-conventional vessels and structures," says Wiernicki. "The Common Rules approach is a perfect example of how advanced technology can now be used to improve relatively simple structures. As an illustration, Wiernicki points to the extensive research that ABS has undertaken over the last several years into hydrodynamics. "We are fortunate to have one of the leading hydrodynamicists in the world on staff at ABS," he notes. "He has undertaken ground-breaking research into large amplitude motions of fine-bodied ships, such as large containerships in heavy seas, that have given us a better understanding of issues such as fore-body slamming. Most recently his team has conducted the most advanced research yet undertaken anywhere into the sloshing impacts of partially-filled membrane LNG containment systems. The results of that research are being used by the designers and operators of the pending next generation of ultra large LNG carriers, in excess of 200,00 m3, to address one of the critical elements in these next generation designs. "We are considered the industry leader in this particular area, mainly because we have not only been able to think outside the box of traditional Rules, but also to perform outside the box. We've actually simulated what happens in an LNG containment system based on the overall ship response and its trade route, to assess the impact of the wave environment and ship motion on the sloshing loads within the tank. And yet we consider this just part of our focus on the technical challenges faced by the entire LNG transportation chain, including the ships, the proposed new offshore terminals, and the ship-terminal interface."

Circle 213 on Reader Service Card

Technology is the Key

Wiernicki stresses that all of this research has been, and will continue to be undertaken within a very simple, clear philosophical environment. "Technology is a tool that helps us to deliver classification products and services to our customers that are designed to assist them conduct their business more efficiently and more safely. Technology is a tool that helps us improve our products and deliver better service. It is really that simple. At the end of the day, success to us is a product that is practical and can be applied."

Looking ahead Wiernicki foresees a technology strategy that will be based on those areas that will further improve the integration of classification into both the design process and operational performance while addressing safety equivalencies through greater emphasis on risk and reliability methods.

It is an approach that weaves together the threads from his own professional life. Whether as President of Designers and Planners, a recognized naval architecture company, or President of ABSG Consulting, the largest risk management and consulting company in the United States, he has been using technology to help create and maximize value. "My professional experience has put me into a position to lead ABS technology efforts as we constantly seek improved methods of helping our clients to adapt to changing operational and commercial influences," he says simply. "Our challenge is to do that while never wavering from our ultimate mission of protecting life, property and the environment. It is a great challenge, an exciting challenge and a very satisfying professional calling."

The preceding was reprinted, with permission, from the Fall 2004 Edition of ABS' Surveyor magazine.

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 Mark O'Malley at momalley@marinelink.com

AIR CONDITIONING & REFRIGERATION

Adrick Marine Corp. , P.O. Box 1549 , N.Massapequa, NY 11758, 631-491-9475, 631-491-9478, adrick1976@aol.com

Bailey Refrigeration, 4986-1 Euclid Road, Virginia Beach, VA 23462

Cospolich Refrigeration, 14695 Highway 61, Norco, LA 70079

Stork Bronswerk Inc., 3755 C Boul. Matte, Brossard, Quebec J4Y 2P4, Canada

AIRHORNS/SIGNALING EQUIPMENT

Airchime Manufacturing Co., 5478 267th St., Gloucester Industrial Estate,, Langley, BC V4W 3S8, Canada

Kahlenberg Brothers Co., P.O. Box 358, Two Rivers, WI 54241

ALARMS, FACTORY-MUTUAL APPROVED

NREC Power Systems, 5222 Hwy 311, Houma, LA 70360

Selco USA Inc., 2508 Lakebrook Ct, Atlanta, GA 30360-1715

ALUMINUM BOATS

Island Boats, 6806 Highway 90 East, New Iberia, LA 70560

Metal Craft Marine Inc., 347 Wellington St., Kingston, Ontario K7K 6N7, Canada

Sea Ark Marine, P.O. Box 210, Monticello, AR 71655-0210

William E. Munson Co., 18130 Sunset Way, Edmonds, WA 98026

ANCHORS & CHAINS

GJ Wortelboer Jr. B.V., P.O. Box 5003 , 3008 AA Rotterdam, Netherlands

ANTIFOULING

Hempel Coatings , 600 Conroe Park N. Dr, Conroe, TX 77303

ATTORNEYS

Gordon & Elias LP, 5821 SW Freeway Suite 422, Houston, TX 77057

AUCTIONEERS

Henderson Auctions, 13340 Florida Blvd., Livingston, LA 70754

Tranzon Venuebid, 908 Town and Country Blvd. Suite 120, Houston, TX 77024

AUTOPILOT SYSTEMS

ComNav Marine Ltd., 13511 Crestwood Pl., Ste 15 15, Richmond, BC V6V 2G1, Canada

Mackay Communications, 2721 Discovery Dr., Raleigh, NC 27616-1851

BALLAST

Ballast Technologies, 4620 S. Coach Dr., Tuscan , AZ 85714

Redland Genstar Inc., Executive Plaza IV, Hunt Valley, MD 10912-1031

BEARING- RUBBER, METALLIC, NON-METALLIC

Cooper Bearing, 5795 Thurston Ave., Virginia Beach, VA 23455

Craft Bearing, 5000 Chestnut Ave., Newport News, VA 23605

Duramax Marine LLC, 17990 Great Lakes Parkway, Hiram, OH 44234, 440-834-5400, 440-834-4950, Contact: Richard Spangler

Thordon Bearings Inc., 3225 Mainway, Burlington, Ontario L7M 1A6, Canada

BILGE SYSTEMS

Coffin World Water Systems, 326 S. Dean Street, Englewood, NJ 07631

BOATBUILDER

Gladding Hearn, 1 Riverside Ave., Somerset , MA 02725

Kvichak Marine, 469 NW Bowdoin Place, Seattle, WA 98107

Sea Ark Marine, P.O. Box 210, Monticello, AR 71655-0210

Washburn Doughty, P.O. Box 296, E. Boothbay, ME 04544

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

BOLLARDS

Maritime International, Inc., 204 Ida Rd., Broussard, LA 70518

BRIDGE SUNSCREENS

Martek Marine Blinds, Unit 46, Century Business Centre, Maversway, Rotherham, South Yorkshire S63 5DA, UK

BROKERS

Merrill Marine Marketing & Capital Group, 7909 Big Bend Blvd., Webster Groves, MO 63119

BULKHEAD SEALS/PANELS

CSD North America, 880 Candia Rd., Unit 10, Manchester, NH 03109

Thermax, 3115 Range Rd, Temple, TX 76501

CAD/CAM SYSTEMS

Cadmatic , Ostra Strandgatan 72 (Vita Huset), FI-20810 Turku, Finland

Creative Systems Inc., P.O. Box 1910, Port Townsend, WA 98368

ShipContructor, 304-3960 Quadra St., Victoria,B.C. V8X 4A3, Canada, 888-210-7420/250 479-3638, 250 479-0868, Info@ShipConstructor.com, Contact: Silke Sommerfeld, www.ShipConstructor.com

CAPSTANS

Coastal Marine Equipment, Bldg 9114 MISAAP Ind. Complex, Stennis Space Center, MS 39529

McElroy/Catchot Winch Company, Inc., P.O. Box 4632, Biloxi, MS 39535-4632, 228-875-6327, 228-872-7880, hcatchot@bellsouth.net, Contact: Harold Catchot, www.mcelroycatchotwinch.com

Superior Lidgerwood Mundy, 1101 John Ave., Superior , WI 54880

CARGO MONITORING & CONTROL SYSTEM

Hermatic Inc., 4522 Center St., Deerpark, TX 77536

CARGO SECURING SYSTEM

Peck and Hale, 180 Division Street, W.Sayville, NY 11796

CAST IRON REPAIR

In-Place Machining, 3811 N. Holton St., Milwaukee, WI 53212

CHAINS

G.J. Wortelboer, Postbus 5003, 3008 AA Rotterdam, Netherlands

CLASSIFICATION SOCIETY

American Bureau of Shipping, 16855 N. Chase Drive, Houston, TX 77060

Lloyds Register Americas, Inc., 1401 Enclave Pkwy.,Ste.200, Houston, TX 77077

CLOSED CIRCUIT TELEVISION

Hernis Scan Systems A/S, Postboks 619, NO_4809 Arendal, Norway

CNC PLATE CUTTING

Advanced Fabricating Inc, PO Box 3721, Galveston, TX 77552

COATINGS/ CORROSION CONTROL/ PAINT

Chugoku Marine Paints, P.O. Box 73, , 4793 , Netherlands

Ferro Corp., 1301 North Flora St., Plymouth, IN 46563

Flow International Corp., 23500 64th Ave., South Kent, WA 98059

Mr.Longarm, Inc., P.O.BOX 377, Greenwood, MO 64034-0377

Sherwin Williams, 101 Prospect Ave., Cleveland, OH 44115

Sigma USA, P.O. Box 816, Harvey, LA 70059

COMMUNICATIONS

Inmarsat Ltd, 99 City Rd., London EUY 1AX, UK

L-3 Communications, 6000 Fruitville Road, Sarasota, FL 34232

Mackay Communications, 2721 Discovery Dr., Raleigh, NC 27616-1851

World-Link Communications, 74 Main St., Framingham, MA 01701

COMPOSITE SHAFTS

American Vulkan, 2525 Dundee Rd, Winter Haven, FL 33884

COMPUTER/ COMPUTER SOFTWARE

Creative Systems Inc., P.O. Box 1910, Port Townsend, WA 98368

ShipConstructor, 304-3960 Quadra Street, Victoria, BC V8X 4A3, Canada

Spec Tec , Professor Koth's Vey, 1366 Lysaker, Norway

CONSOLE- GMDSS

Mackay Communications, 2721 Discovery Dr., Raleigh, NC 27616-1851

CONSULTANTS

Captain R.J. Underhill & Associates, P.O. Box 1030, Groves, TX 77619

Elliot Bay Design Group, 5301 Shishole Ave. NW, Ste. 200, Seattle, WA 98107

Hornblower Marine Services, P.O. Box 112476, Campbell, CA 95011-2476

CONTROL SYSTEM-MONITORING/STEERING

Alma Impex, Inc., 4000 Brodertown Ave.,Suite 15, Sayreville, NJ 08872

Electronic Marine Systems, 800 Ferndale Pl., Rahway, NJ 07065

Electrowave U.S.A., 6125 W. Sam Houston Pkwy., Ste 406, Houston, TX 77041

G.R. Bowler, 2261 Lake Rd., Ontario, NY 14519

Industrial Power Systems, 3010 Powers Avenue Unit 16, Jacksonville, FL 32207, 904 731-8844, 904 731-0188, marine@ipsjax.com

Kobelt Manufacturing Co., Ltd., 8238-129 Street, Surrey, BC V3W0A6, Canada

MMC International, 60 Inip Dr, Inwood, NY 11096

Prime Mover Controls, 3600 Gilmore Way, Burnaby, BC V5G 4R8, Canada

Seastate Pty.Ltd., 2 Egmont Road, Henderson WA 6166, Australia

CORROSION CONTROL

Apex Engineering Products, 1241 Shoreline Dr., Aurora, IL 60504

Furuno USA Inc., 4400 NW Pacific Rim Blvd, Camas, WA 98607

Ultra Strip, 3515 SE Lionel Terrace , Stuart, FL 34996

COUPLERS- TUG & BARGE

Intercontinental Engineering , PO Box 9055 , Kansas City, MO 64168

COUPLINGS

American Vulkan, 2525 Dundee Rd, Winter Haven, FL 33884

Centa Corp., 815 Black Hawk Drive, Westmont, IL 60559

Mapeco Products, 91 Willenbrock Rd., Unit B, Oxford, CT 06478

MMC International, 60 Inip Dr, Inwood, NY 11096

CRANE - HOIST - DERRICK - WHIRLEYS

DMW Marine, LLC, 1123 Street Matthews Road, Chester Springs, PA 19425

E. Crane, 241 Executive Dr., #3, Marion, OH 43302

CRANKSHAFT REPAIR

In-Place Machining, 3811 N. Holton St., Milwaukee, WI 53212

Waltz & Krezner, 91 Willenbrock Rd., Oxford, CT 06478

CUTTING & WELDING MACHINES

Bug-O-Systems, 3001 W. Carson St., Pittsburgh, PA 15204

ESAB Cutting Systems, 411 South Ebenezer Road, Florence, SC 29501

DECK MACHINERY- CARGO HANDLING EQUIPMENT

Allied Shipbuilders Ltd., 1870 Harbour Road, Vancouver V7H 1A1, Canada

Burrard Iron Works Ltd., 220 Alexander Street, Vancouver, BC V6A 1C1, Canada, 604-684-2491, 604684-0458, sales@burrardironworks.com

Coastal Marine Equipment, Bldg 9114 MISAAP Ind. Complex, Stennis Space Center, MS 39529

DMW Marine, LLC, 1123 Street Matthews Road, Chester Springs, PA 19425

Hyde Marine Inc, 28045 Ranney Parkway G, Cleveland, OH 44145-1144

Intercontinental Engineering , PO Box 9055 , Kansas City, MO 64168

Markey Machinery, P.O. Box 24788, Seattle, WA 98124

McElroy/Catchot Winch Company, Inc., P.O. Box 4632, Biloxi, MS 39535-4632, 228-875-6327, 228-872-7880, hcatchot@bellsouth.net, Contact: Harold Catchot, www.mcelroycatchotwinch.com

Norwegian Maritime Equipment AS, BOX 244, NO-5480 HUSNES, Norway

Rapp Hydema, 4433 27th Ave. West, Seattle, WA 98199, (206) 286-8162, (206) 286-3084, scotta@rappus.com

Skookum , P.O. Box 280, Hubbard, OR 97032

Smith Berger Marine, 7915 10th Ave. S., Seattle, WA 98108

Superior Lidgerwood Mundy, 1101 John Ave., Superior , WI 54880

DEEPWELL PUMPS

Marflex Deepwell Pumps, Louis Pasteurstraat 12, 3261 LZ Oud-Beijerland, Netherlands

DESALINATION - REVERSE OSMOSIS

Exstar International, 6709-B Netherlands Drive, Wilmington, NC 28405

Reverse Osmosis of South Florida, Inc., 150 S.E. 29th St., Fort Lauderdale, FL 33316

DESIGN PUBLICATIONS

SNAME, 601 Pavonia Ave, Jersey City, NJ 07306

DETECTOR DOG TEAMS

American Detection Technologies, Inc., 415 Main St. (3rd flr), Worcester, MA 01608

DIESEL CYLINDER INDICATORS

General Thermodynamics Corp., PO BOX 642, Hampton Falls, NH 03844

Kiene Diesel, 325 S. Fairbanks St., Addison, IL 60101

DIESEL ENGINE OVERHAUL

Detroit Diesel Corporation, 13400 Outer Drive West, Detroit, MI 48329-4001

Motor-Services Hugo Stamp, 3101 S.W. 3rd Ave., Ft. Lauderdale, FL 33315

DIESEL ENGINE- SPARE PARTS & REPAIR

Alma Impex, Inc., 4000 Brodertown Ave.,Suite 15, Sayreville, NJ 08872

Caterpillar, Inc., P.O. Box 610, Mossville, IL 61552-0610

Chris Marine AB, Box 9025, 200 39 Malmo, Sweden

Cummins Marine, 4500 Leeds Ave., Ste 301, Charleston, SC 29405

Man B&W Diesel, 17 State St., NY, NY 10004

Man B&W Diesel A/S, Telglholmsgade 41, Copenhagen SV DK-2450, Denmark

Man B&W Diesel AG, Stadtbachstrasse 1, Augsberg D-86153, Germany

Marine Exhaust Systems of Alabama, P.O. Box 698, 757 Nichols Ave., Fairhope, AL 36533

Marine Turbo & Diesel Inc., 1090 7th St., Richmond, CA 94801

Mariso USA, Inc., 100 Davidson Ave., Somerset, NJ 08873

Motor-Services AB, Box 2115 , Ronninge S- 144 04, Sweden

Motor-Services Hugo Stamp, 3101 S.W. 3rd Ave., Ft. Lauderdale, FL 33315

Scardana Americas Bkg., 502 Empire St. , Greenfield Park J4V 1V7, Canada

Wartsila Diesel, 201 Defense Hwy, Annapolis , MD 21401

Wärtsilä North America, Inc., 16330 Air Center Boulevard, Houston, TX 77032

DIESEL FUEL DECONTAMINATION

Algae X International, P.O. Box 4011, Fort Myers Beach, FL 33932

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Instruments, Computers & Controls, 78 Londonderry Tpke, Hookset, NH 03106

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DOORS- MARINE & INDUSTRIAL

Joiner Systems, 1925 52nd Avenue, Lacine, Quebec H8T 3C3, Canada

Juniper International, 72-15 Metropolitan Ave., Middle Village, NY 11379

Manly Marine, P.O. Box 86788, N. Vancouver, BC V7L 4L3, Canada

Mapeco Products, 91 Willenbrock Rd., Unit B, Oxford, CT 06478

Nabrico Marine Products, 1050 Trinity Road, Ashland City, TN 37016

Pacific Coast Marine, 4314 Russell Road, Mukiteo, WA 98275

USA Sliding Doors, Inc., 801 Hosmer Road, Churchville, NY 14428, 585-538-4160, 585-538-2806, info@usaslidingdoors.com, Contact: Mr. Robert Weiland, www.usaslidingdoors.com

Waltz & Krezner, 91 Willenbrock Rd., Oxford, CT 06478

DRAFT INDICATORS

King Engineering, PO BOX 1228, Ann Arbor, MI 48108-1625, 734-662-5691, 734-662-6652, marine@king-gage.com, Contact: Mike Welch, www.king-gage.com

DRIVES

Allied Systems, 2300 Oregon St., Sherwood, OR

DRIVESHAFTS

The Cline Company, 600 Buncombe St., Greenville, SC 29602

DRUG TEST KITS

Sun State Specialty K-9s, 1500 Beville Road, Daytona Beach, FL 32114

DRY DOCKS- DESIGN

Heger Dry Dock, Inc., 13 Water St., Holliston, MA 01746

EDUCATION

Massachusetts Maritime Academy, 101 Academy Drive, Buzzards Bay, MA 02532

ELECTRIC MOTORS

Ward Leonard, 401 Watertown Rd, Thomaston, CT 06767

ELECTRICAL EQUIPMENT

MMC International, 60 Inip Dr, Inwood, NY 11096

ELECTRONIC CHARTS

C- Map Commercial, 133 Falmouth Rd, Mashpee, MA 02649

EMERGENCY DISTRESS SIGNAL

Greatland Laser, LLC., 4001 West International Airport RD, Anchorage, AK 99502, 907-245-4475, 907-245-4599, laser@alaska.net, Contact: Jim O' Meara, www.greatlandlaser.com

EMPLOYMENT

All American Marine, P.O. Box 191237, Tillman's Corner, AL 33619

ENGINEERING PUBLICATIONS

SNAME, 601 Pavonia Ave, Jersey City, NJ 07306

ENGINES

Dynamold, Inc., 2905 Shamrock Ave., Fort Worth, TX 76107

FDGM, Inc., 800 Principal Court, Suite C, Chesapeake, VA 23320

Giro Engineering Limited, Talisman, Duncan Road, Park Gate, Southampton, Hants SO31 7GA, UK

Markisches Werk Halver Gmbh, Box 1355, Halver D-58543, Germany

ENVIRONMENTAL SOLUTIONS

Hyde Marine, 28045 Ranney Parkway G, Cleveland, OH 44145-1144

EVAPORATORS

Alfa -Laval Separation, Inc., 955 Mearns Rd., Warminster, PA 18974

Sasakura Engineering , 7-32 Takeshima, 4-Chome, Nishiyodogoaw KY Osaka555, Japan

EXHAUST

American Vulkan, 2525 Dundee Rd, Winter Haven, FL 33884

Applegate Industrial Materials, P.O.BOX 428, Baton Rouge, LA 70821-0428

Marine Exhaust Systems of Alabama, P.O. Box 698, 757 Nichols Ave., Fairhope, AL 36533

EXPANSION JOINTS

Applegate Industrial Materials, P.O.BOX 428, Baton Rouge, LA 70821-0428

Silex Inc., 6659 Ordan Dr., Mississauga, ON L5T 1K6, Canada

EXTRUDED RUBBER PRODUCTS

Clean Seal Inc., PO Box 2919, South Bend, IN 46880

FASTNERS

Superbolt, PO Box 683, Carnegie, PA 15106

FENDERING SYSTEMS/ BUOYS - DOCK & VESSEL

Duramax Marine LLC, 17990 Great Lakes Parkway, Hiram, OH 44234, 440-834-5400, 440-834-4950, Contact: Richard Spangler

Marine Fenders International, Inc., 909 Mahar Avenue, Wilmington, CA 90744, 310-834-7037, 310-834-7825, jerry.thermos@mpowercom.com, Contact: Jerry Thermos

Maritime International, Inc., 204 Ida Rd., Broussard, LA 70518

Schuyler Rubber Co., 16901 Woodred Rd., Woodinville, WA 98072

Trelleborg Engineered Products, P.O. Box 98, Clearbrook, VA 22624

Urethane Products, 9076 Rosecrans Ave, Bellflower, CA 90706

Viking Fender Co., 1160 State St., Perth Amboy, NJ 08861

FILTERS/FILTER SYSTEMS

Alfa Laval Tumba AB, 147 80, TUMBA, Sweden

Algae X International, P.O. Box 4011, Fort Myers Beach, FL 33932

Boll Filter, 9822 General Drive. Ste. 180, Plymouth, MI 48170

Hellan Strainer, 3249 East 80th St., Cleveland, OH 44104

US Filter , 2 Milltown Ct., Union , NJ 07083

FIRE & SAFETY PRODUCTS

Brookdale International, 1--8755 Ash St., Vancouver, BC V6P 6T3, Canada

DBC Marine Safety Systems, 101-3760 Jacombs Rd., Richmond, BC V6V 6T3, Canada

IFSTA/Fire Services Program, 9030 N. Willis, Stillwater , OK 74078-8045

IMSSCO Corporation, 2040 Harbor Island Drive, Ste. 201 A, San Diego, CA 92101

FLANGES

Jesse Engineering, 5225 7th St., E. Tacoma, WA 98424

FLOW CONTROLS

EIM Controls, 13840 Pike Road, Missouri City, TX 77489

FUEL INJECTORS

Interstate Diesel, 4901 Lakeside Avenue, Cleveland, OH 44114-3996

GALLEY EQUIPMENT

AR Larsen Co., 15040 NE 95th St., Redmond, WA 98052

Cospolich Refrigeration, 14695 Highway 61, Norco, LA 70079

Jamestown Metal Marine Sales, Inc., 4710 Northwest 2nd Ave. , Boca Raton, FL 33431

GANGING & SAMPLING

Hermatic Inc., 4522 Center St., Deerpark, TX 77536

GAS GENERATION SYSTEMS

Air Products AS, Box 8100, Vagsbygd, NO-4675 Kristiansand S, Norway

GEARS & GEAR REPAIR

Karl Senner Inc., 25 W Third, Kenner, LA 70062

GENERATOR CONTROLS

Detroit Diesel Corporation, 13400 Outer Drive West, Detroit, MI 48329-4001

Governor Control Systems, 3101 SW 3rd Avenue, Ft. Lauderdale, FL 33315

GENERATOR PARALLELING EQUIPMENT

GLASS

Garibaldi Glass, 7344 Winston Street, Burnaby, British Columbia V5A 2G9, Canada

ProCurve Glass Technology, LLC, 3535 Davisville Rd., Hatboro, PA 19040

GOVERNORS

Governor Control Systems, 3101 SW 3rd Avenue, Ft. Lauderdale, FL 33315

GPS

MX Marine, 23868 Hawthorne Blvd., Torrance, CA 90505

GROUNDINGS

Sohre Turbomachinery, 132 Gilbertville Rd., P.O. Box 889, Ware, MA 01082-0889

HATCHES & DOORS

Juniper International, 72-15 Metropolitan Ave., Middle Village, NY 11379

Manly Marine, P.O. Box 86788, N. Vancouver, BC V7L 4L3, Canada

HEAT EXCHANGERS

Alfa -Laval Separation, Inc., 955 Mearns Rd., Warminster, PA 18974

Alfa Laval Tumba AB, 147 80, TUMBA, Sweden

Duramax Marine LLC, 17990 Great Lakes Parkway, Hiram, OH 44234, 440-834-5400, 440-834-4950, Contact: Richard Spangler

Tranter PHE, Inc, PO Box 2289, Wichita Falls, TX 76307

Tranter, Inc., P.O. Box 2289, Witchita Falls, TX 76307, 940-723-7125, 940-723-1131, www.tranterphe.com

HEAT TREATING SERVICES & SUPPLIES

Mannings USA, 200 Richards Ave, P.O. Box 896, Dover, NJ 07802-0896, 973-537-1576, 973-537-1581, sales@manningsusa.com, Contact: Daniel Ciarlariello, www.manningsusa.com

HEAVY FUEL TREATMENT

Alfa Laval Tumba AB, 147 80, TUMBA, Sweden

Algae X International, P.O. Box 4011, Fort Myers Beach, FL 33932

HIGH SPEED FERRY BUILDERS

Incat Australia Pty. Ltd, 18 Bender Marine, Hobart 7009, Australia

HMI CONTROLS DISPLAY

Azonix-Dynalco, 3690 NW 53rd St., Ft. Lauderdale, FL 33309

HOISTS

Coastal Marine Equipment, Bldg 9114 MISAAP Ind. Complex, Stennis Space Center, MS 39529

HORNS/WHISTLES

Airchime Manufacturing Co., 5478 267th St., Gloucester Industrial Estate,, Langley, BC V4W 3S8, Canada

Kahlenberg Brothers Co., P.O. Box 358, Two Rivers, WI 54241

HOSES/HOSE FITTINGS

JGB Enterprises, Inc., 115 Metropolitan Dr., Liverpool , NY 13088

HYDRAULIC SYSTEMS

Allied Systems, 2300 Oregon St., Sherwood, OR

Anchor Lamina, 38565 Country Club Drive, Farmington Hills, MI 48331

INFRARED IMAGING EQUIPMENT

Flir Systems, 16505 SW 72ND AVE, Portland, OR 97224

INSPECTION EQUIPMENT
Staveley Instrument, 421 N. Quay St., Kennewick, WA 99336

INSULATION
Mascoat Products, 4310 Campbell Rd, Houston, TX 77041
Shannon Enterprises of W.N.Y.,Inc., 162 Sweeney Street, PO BOX 199, North Tonawanda, NY 14120-0199
Superior Energies Inc., 3115 Main Ave., Groves, TX 77619

INSURANCE SERVICES
WQIS, 80 Broad St., 21st Floor, New York, NY 10004

INTERIORS
Jamestown Metal Marine Sales, Inc., 4710 Northwest 2nd Ave. , Boca Raton, FL 33431
Lit Industries, 516 Costner School Rd., Bessemer City, NC 28016-9801

JOINER PANELS/FURNITURE
Thermax Marine-Panel Specialists, Inc., 3115 Range Rd. , Temple, TX 76501, 254-774-9800, 254-774-7222, thermax@panelspec.com, Contact: John Hutchinson, www.thermaxmarine.com

JOINER- WATERTIGHT DOOR-PANELING-CEILING SYSTEM
Joiner Systems, 1925 52nd Avenue, Lacine, Quebec H8T 3C3, Canada
Waltz & Krezner, 91 Willenbrock Rd., Oxford, CT 06478

K-9 DETECTION
Sun State Specialty K-9s, 1500 Beville Road, Daytona Beach, FL 32114

KEEL COOLERS
Duramax Marine LLC, 17990 Great Lakes Parkway, Hiram, OH 44234, 440-834-5400, 440-834-4950, Contact: Richard Spangler

LASER ALIGNMENT
Ludeca, Inc., 1425 NW 88th Ave, Miami, FL 33172

LEAK REPAIR
Indumar Products Inc., 2500 Tanglewilde, Suite 260, Houston, TX 77063

LIFEBOAT TESTING
Water Weights, Inc., 5139 Brook St., Suite E, Mont Clare, CA 91763

LIFEBOATS/DAVITS
Umoe Schat-Harding, Inc., 912 Hwy 90 East, New Iberia, LA 70560

LIFEBOATS/RAFTS
DBC Marine Safety Systems, 101-3760 Jacombs Rd., Richmond, BC V6V 6T3, Canada
Viking Life Saving Equipment, 1400 NW159th Street Suite 101, Miami, FL 33169
Willard Marine Inc., 1250 N. Grove St., Anaheim, CA 92806
Wolong International, 151 Chin Swee Road #03-14, Manhattan House, 169876, Singapore

LIFESAVING EQUIPMENT
C.M. Hammar AB, August Barks Gatan 15, 421 32 Vastra Frolunda, Sweden
Umoe Schat-Harding, Inc., 912 Hwy 90 East, New Iberia, LA 70560
Viking Life Saving Equipment, 1400 NW159th Street Suite 101, Miami, FL 33169

LIFT EQUIPMENT TESTING
Water Weights, Inc., 5139 Brook St., Suite E, Mont Clare, CA 91763

LIGHTING PRODUCTS
Phoenix Products Co., Inc., 8711 West Port Avenue, Milwaukee, WI 53224

LIGHTING SYSTEMS/ EQUIPMENT
ACR Electronics Inc., 5757 Ravenswood Rd., Ft. Lauderdale , FL 33310-5247
L.C. Doane, P.O. Box 975, Essex, CT 06426

LINE & NET CUTTERS
Spurs Marine, 201 S.W. 33rd St., Ft. Lauderdale, FL 33315

LUBRICANTS/LUBRICATION SYSTEMS
Benjamin R. Vickers & Sons Ltd., Airedale Mills, 6 Clarence Road, Leeds, W. Yorkshire LS10 IND, UK

MACHINERY MAINTENANCE, REPAIR & TESTING
Mackay Communications, 2721 Discovery Dr., Raleigh, NC 27616-1851

MANEUVERING EQUIPMENT
Schottel GMBH & Co. KG, Mainzer Str 99 , D-56322-Spay/Rhine, Germany

MARINE DECKING & FLOORING
Lonseal Flooring, 928 East 238th Street, Carson, CA 90745

MARINE DIESEL ENGINES
Wärtsilä North America, Inc., 16330 Air Center Boulevard, Houston, TX 77032

MARINE ELECTRONICS
ACR Electronics Inc., 5757 Ravenswood Rd., Ft. Lauderdale , FL 33310-5247
Comark Marine, 93 West Street, Medfield, MA 02052, 800-280-8522, 508-359-2267, sales@comarkcorp.com
Hatteland Display, Bogstadveien, 19, , N-0355 Oslo, Norway
Jotron Electronics, Box 85 , NO-328OT Jodalyng Norge, Norway
Marine Electronic Solutions, 1522 Crabapple Cove, Jacksonville, FL 32225
Saab Marine Electronics, Box 13045, 402 5Goteborg, Sweden

MARINE ENGINEERING
Elliot Bay Design Group, 5301 Shishole Ave. NW, Ste. 200, Seattle, WA 98107
Heger Dry Dock, Inc., 13 Water St., Holliston, MA 01746
Ocean Crest, 2 Pidgeon Hill Dr. , Sterling, VA 20165

MARINE EQUIPMENT
Scardana Americas Bkg., 502 Empire St. , Greenfield Park J4V 1V7, Canada
Waterman Supply, P.O. Box 596, Wilmington, CA 90748

MARINE FURNITURE
Deansteel Mfg., 111 Merchant St., San Antonio, TX 78204

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

MARINE HAZARD RESPONSE
Marine Respose Alliance LLC, 1102 SW Massachusetts St., Seattle, WA 98134-1030

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

MARINE POWER PLANT SYSTEMS
Auramarine Ltd., Box 849 , FI-20101 Turku, Finland
Wärtsilä North America, Inc., 16330 Air Center Boulevard, Houston, TX 77032

MARINE SERVICES
International Shipping Agency, Freeport Harbour Complex,Bldg.#2,Ste.#9, Freeport F41109, Bahamas

MARITIME TRAINING & SCHOOLS
Maine Maritime Academy, MMA, Castine, ME 04420-5000
Marine Safety International, Marine Terminal , Laguardia Airport, NY 11371

METALIZING
Climax Portable Machine, 2712 E. 2nd ST,, NEWBERG, OR 97132

MONITORING SYSTEMS
American Vulkan, 2525 Dundee Rd, Winter Haven, FL 33884
Governor Control Systems, 3101 SW 3rd Avenue, Ft. Lauderdale, FL 33315
Mackay Communications, 2721 Discovery Dr., Raleigh, NC 27616-1851
Michael J. Erland, 7001 Flewllyn Rd, Ottawa, Ontario K2S 1B6, Canada
Prime Mover Controls, 3600 Gilmore Way, Burnaby, BC V5G 4R8, Canada

MOORAGE FACILITY
Sea Ark Marine, P.O. Box 210, Monticello, AR 71655-0210

MOTION CONTROL SYSTEMS
Seastate Pty.Ltd., 2 Egmont Road, Henderson WA 6166, Australia

MOTOR PROTECTION
Marine Safe Electonics, 261 Milway Ave. #12, Concord, Ontario L4K 4K9, Canada

NAV/COMM EQUIPMENT
C- Map Commercial, 133 Falmouth Rd, Mashpee, MA 02649
Chartco, New North Road, Hainault, Ilford Esex 166 2UR, UK
Electronic Marine Systems, 800 Ferndale Pl., Rahway, NJ 07065
Furuno USA Inc., 4400 NW Pacific Rim Blvd, Camas, WA 98607
Hose-McCann Telephone Company, 1241 W. Newport Center Drive, Deerfield Beach, FL 33442, 954-429-1110, 954-429-1130, mchip@hosemccann.com
Mackay Communications, 2721 Discovery Dr., Raleigh, NC 27616-1851

NAVAL ARCHITECTS, MARINE ENGINEERS
A.K. Suda, Inc., 3004 19th St., Metairie, LA 70002-4989
Aker Marine, 1818 CORNWALL AVE, VANCOUVER, BC V6J 1C7, Canada
Band, Lavis, & Associates, Inc., 900 Ritchie Hwy, Suite 203, Severna park, MD 21146
Bay Engineering, 253 N. First Ave., Sturgeon Bay, WI 54235
Bristol Harbor Group, Inc., 103 Poppasquash Road, Bristol, RI 02809
C. Baxter & Associates, P.O. Box 9006, Mobile, AL 36609
CDI Marine Co., 9550 Regency Square Blvd, Ste 400, Jacksonville , FL 32222
Computer Sciences Corporation-Advance Marine Center, 1201 M St. SE., Washington , DC 20003
Elliot Bay Design Group, 5301 Shishole Ave. NW, Ste. 200, Seattle, WA 98107
Jamestown Marine Service, 1084 Shennecossett Rd., Groton, CT 06340
John J. McMullen Associates, 4300 King St., Suite 400, Alexander, VA 22302
Kvaerner Masa Marine Inc., 201 Defense Highway, Ste 202, Annapolis, MD 21401
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
MIL Systems, 200-1150 Morrison Drive, Ottawa, Ontario K2H 8S9, Canada
Nautical Designs, Inc., 2101 S. Andrews Ave., Ste 202, Fort Lauderdale, FL 33316
Robert Allan Ltd., 1639 W. 2nd Avenue Ste 230, Vancouver, BC, Canada
The Glosten Associates Inc., 600 Mutual Life Bldg., 605 First Ave., Seattle, WA 98104
VUYK Engineering, P.O. Box 204, , 9700 AE Groningen, Netherlands
Washburn Doughty, P.O. Box 296, E. Boothbay, ME 04544

NAVIGATION
ComNav Marine Ltd., 13511 Crestwood Pl., Ste 15 15, Richmond, BC V6V 2G1, Canada
D & B Technologies, 1458 OCEAN SHORE BLVD #132, ORMOND BEACH, FL 32176-3613
Nauticast AG, Mariahilfer Strasse 50/211, A-1070 Vienna, Austria

OIL SPILL RESPONSE
Donjon Marine, 1250 Liberty Avenue, Hillside, NJ 07205
Marine Spill Response Corporation, 220 Spring Street, Suite 500, Herndon, VA 20170

OIL/WATER SEPARATORS
Alfa -Laval Separation, Inc., 955 Mearns Rd., Warminster, PA 18974
Alfa Laval Tumba AB, 147 80, TUMBA, Sweden
MMC International, 60 Inip Dr, Inwood, NY 11096

PAINT APPLICATOR
Mr.Longarm, Inc., P.O.BOX 377, Greenwood, MO 64034-0377

PAINT MARKERS
Sakura of America, 30780 San Clemente St., Hayward, CA 94544, 800-776-6257, 510-475-0973

PARTS LOCATOR SERVICE
Inventory Locator Service, 8001 Centerview Parkway Suite 400, Memphis, TN 38018, 901-794-5000, 901-794-1760, ppugh@ilsmart.com

PIPE FITTINGS/CUTTINGS/CONNECTING/ SYSTEMS
Jesse Engineering, 5225 7th St., E. Tacoma, WA 98424, 253-922-7433, 253-922-2536, tmorgan@jesse-wallace.com
RAMCO Manufacturing Co., 365 Carnegie Ave., Kenilworth, NJ 07033

PIPE LEAK REPAIR
CSD North America, 880 Candia Rd., Unit 10, Manchester, NH 03109

PLANNED MAINTENANCE SYSTEMS
Design Maintenance Systems, Inc, 340 Brooksbank Ave, Ste.100, North Vancouver,BC VTJ 2C1, Canada

PNEUMATIC LINE THROWERS
Restech Norway A/S, Box 624, NO-8001 BODO, Norway

PORT DEVELOPMENT
Sasakura Engineering , 7-32 Takeshima, 4-Chome, Nishiyodogoaw KY Osaka555, Japan

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

PORTABLE VENTILATORS
Americ Corp, 785 Bonnie Lane, Elk Grove Village, IL 60007

PREVENTATIVE MAINTENANCE
Marine Safe Electonics, 261 Milway Ave. #12, Concord, Ontario L4K 4K9, Canada

PROPELLERS
Rice Propulsion, Av. Rios Espinoza 88, Mazatlan, Sin. 82180, Mexico, 8778396304, 011526699842533, rice@ricepropulsion.com

PROPULSION EQUIPMENT
ABB Turbocharger, Inc., 1460 Livingston Ave., North Brunswick, NJ 08902
Alstom Power Conversion, 3 Ave. Des Trois Chenes, 90018 Belfort Cedex, France
Brunvoll A/S, P.O. Box 370, N-6401 Molde, Norway
Caterpillar, Inc., P.O. Box 610, Mossville, IL 61552-0610
Cummins Marine, 4500 Leeds Ave., Ste 301, Charleston, SC 29405
CWF Hamilton Co., P.O. Box 709 , Christchurch, New Zealand
Fincanteri, Diesel Engine Div., GMT, Bagnoli della, Rosandra 3334 Trieste, Italy
Hagglunds Drives Inc., 2275 International Street, Columbus, OH 43228
Harbormaster Marine, Inc., 31777 Industrial Rd., Livonia, MI 48150
Karl Senner Inc., 25 W Third, Kenner, LA 70062
Kawasaki Heavy Indust., World Trade Center Bldg., 4-1 Hamamastu-cho, 2-chome, Minato-ku Tokyo 105-6116, Japan
LA.ME Srl. Marine Division, Via della Fornace 4, Opera (MI), Italy
Man B&W Diesel, 17 State St., NY, NY 10004
Man B&W Diesel A/S, Telglholmsgade 41, Copenhagen SV DK-2450, Denmark
Man B&W Diesel AG, Stadtbachstrasse 1, Augsberg D-86153, Germany
Mapeco Products, 91 Willenbrock Rd., Unit B, Oxford, CT 06478
Markisches Werk Halver Gmbh, Box 1355, Halver D-58543, Germany
Napier Turbochargers, P.O. Box 1, Waterside , South Lincoln LN5 7FD, UK
Nya Berg Propulsion AB, Box 1005, 430 90 Ockero, Sweden
Philadelphia Resins, P.O. Box 309 , Montgomeryville, PA 18936
Rolls-Royce Commercial Marine, 10255 Richmond Ave., Ste 101, Houston, TX 77042
Schottel GMBH & Co. KG, Mainzer Str 99 , D-56322-Spay/Rhine, Germany
Ultra Dynamics (UltraJet), 1110A Claycraft Road, Columbus, OH 43230
Voith Schiffstechnik GMBH & Co., P.O. Box 2011, 89510 Heidenheim, Germany
Wartsila Corporation, Box 244, FI-65101 Vasa, Finland
Wartsila Lips, 3617 Koppens Way, Chesapeake, VA 23323
Wärtsilä North America, Inc., 16330 Air Center Boulevard, Houston, TX 77032
ZF Marine Group , Ehlerst. 50, 88046 Friedrichshafen, Germany

PROPULSION MONITORING
Azonix-Dynalco, 3690 NW 53rd St., Ft. Lauderdale, FL 33309

PUMP-REPAIR-DRIVES
Scardana Americas Bkg., 502 Empire St. , Greenfield Park J4V 1V7, Canada
Wooster Hydrostatics, 4570 West Old Lincoln Way, Wooster, OH 44691

RADARS-ARPAS
Furuno USA Inc., 4400 NW Pacific Rim Blvd, Camas, WA 98607

REMANUFACTURED PUMPS & MOTORS
Wooster Hydrostatics, 4570 West Old Lincoln Way, Wooster, OH 44691

REMOTELY OPERATED VEHICLES
Seabotix Inc., 1425 Russ Blvd. T112D, San Diego, CA 92101
VideoRay LLC, 415 Engleview Blvd., Exton, PA 19341

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

ROPE-MANILA-NYLON-HAWSERS-FIBERS
Lankhorst Touwfabrieken bv, Maritime Div., P.O.Box 203 , 8600 AE Sneek, Netherlands, T:+31 515 487629, F:+31 515 487669, mar.div@lankhorst-touwfabrieken.nl, www.lankhorst-touwfabrieken.nl
Marlow Ropes, South Road, Halisham, East Sussex BN27 3JS, UK

ROTATING EQUIPMENT
Seatworthy, 22 Main Street, Centerbrook, CT 06409

RUDDER BEARINGS & BUSHES
Duramax Marine LLC, 17990 Great Lakes Parkway, Hiram, OH 44234
Orkot Composites, 2535 Prairie Rd, Unit D., Eugene, OR 97402

SAFETY PRODUCTS
Brookdale International, 1--8755 Ash St., Vancouver, BC V6P 6T3, Canada
D & B Technologies, 1458 OCEAN SHORE BLVD #132, ORMOND BEACH, FL 32176-3613, 407-647-7500, 407-647-7505, HOTEYE@HOTEYENOW.COM
DBC Marine Safety Systems, 101-3760 Jacombs Rd., Richmond, BC V6V 6T3, Canada
Lalizas SA, 21 Haidariou St., 545 Piraeus, Greece
Norwegian Maritime Equipment AS, BOX 244, NO-5480 HUSNES, Norway
Stearns Mfg. Co., PO Box 1498, St. Cloud, GA 56302-1498
Thordon Bearings Inc., 3225 Mainway, Burlington, Ontario L7M 1A6, Canada
Viking Life Saving Equipment, 1400 NW159th Street Suite 101, Miami, FL 33169
Walport USA , 39-5A Dover Rd South, Toms River, NJ 08757

SALVAGE
Donjon Marine, 1250 Liberty Avenue, Hillside, NJ 07205
Titan Maritime Industries Inc., P.O. Box 350485, Ft. Lauderdale, FL 33004

SANITATION DEVICE- POLLUTION CONTROL
Envirovac Inc, 1260 Turret Dr., Rockford , IL 61111
EVAC Environmental Solutions, 1260 Turret Dr., Rockford , IL 61111

FAST®Systems, 8229 Brentwood Industrial Drive, Brentwood, MO 63144, 314-645-6540, 314-645-6131, solutions@marinefast.com, Contact: Alan Fleischer, www.marinefast.com
Headhunter Inc., 3380 SW 11th Ave., Ft. Lauderdale, FL 33315
Hydroxl Systems, 9800 McDonald Park Rd, Sidney, BC V8L 3S8, Canada
Microphor, 452 E. Hill Rd., Willits, CA 95490

SATELLITE COMMUNICATIONS
EMS Satcom, Green Lane, Tewkesbury, Gloucestershire GL20 8HD, UK
Eurocom Industries AB, Box 7071, DK-9200 Aalborg SV, Denmark
France Telecom Mobile Satellite Communications, 16,bvd du Mont d'Est-BP 14-93161, Noisy le Grand, France, +33556223231, mobilesat@francetelecom-mobilesat.com, Contact: unknown, www.francetelecom-mobilesat.com
Furuno USA Inc., 4400 NW Pacific Rim Blvd, Camas, WA 98607
KVH Industries Inc., 50 Enterprise Center, Middletown , RI 02842
Land Sea Systems, 509 Viking Drive, Suites K,L,M, Virginia Beach, VA 23452
MX Marine, 23868 Hawthorne Blvd., Torrance, CA 90505
Nera Satcom AS, Box 91, NO-1375 Billingstad, Norway
Petrocom, 5300 West Sam Houston Parkway North, Houston, TX 77041, 1-800-PETROCOM, 713-580-4150, sales@petrocom.com
Seawave, 76 Hammarlund Way (Tech 3), Middletown, RI 02842, 401-846-8403, 401-846-9012, TFalvo@seawave.com
Stratos , 1501 Metcalfe St. Ste 1900, Ottawa, Ontario K2P 1P1, Canada
Telenor Satellite Services-Marlink, NO-1331, Fornebu, Norway
Thrane & Thrane A/S, Lundtoftegardsvej 93D, DK-2800 Lyngby, Denmark

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

SEALS
Duramax Marine LLC, 17990 Great Lakes Parkway, Hiram, OH 44234
Kobelco Eagle Marine, Inc., 366 Fifth Avenue, Suite 312, NY, NY 10017, 212-967-5575, 212-967-6966, hawkins@kobelco-eagle.com
Orkot Composites, 2535 Prairie Rd, Unit D., Eugene, OR 97402

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

SECURITY
GE Ion Track, 205 Lowell Street, Wilmington, MA 01887
Loronix Video Solutions, 1120 W. 122nd Ave.Suite 200, Denver, CO 80234
Pole Star Space Applications Limited, Suite 301-303 Whiteleys Centre, Queensway London W2 4YN, UK
Smiths Detection, 30 Hook Mountain Road PO Box 410, Pine Brook, NJ 07058, 973 830-2131, 973-830-2200, susan.cooper@smithsdetection.com, Contact: Susan Cooper, www.smithsdetection.com
Vingcard Marine, Bryan Oaks Business Park 1500 N.W. 1st Street, Dania, FL 33004

SECURITY BARRIERS
Seacor Environmental Products, P.O. Box 3535, Seattle, WA 98124

SENSORS
Electronic Marine Systems, 800 Ferndale Pl., Rahway, NJ 07065

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

SHAFTS
American Vulkan, 2525 Dundee Rd, Winter Haven, FL 33884
Centa Corp., 815 Black Hawk Drive, Westmont, IL 60559

SHIP DELIVERY
Redwise Maritime Services BV, P.O. Box 20, 3740 AA Baarn, Holland Eemweg 8, Netherlands, +31 (0)35 54 80 500, +31 (0)35 54 80 511, info@redwise.nl

SHIP MANAGEMENT
Crowley Maritime, 9487 Regency Sq Blvd, Jacksonville, FL 32225
Eurasia Group , 22A Floor Chinachem Exchange Sq., , 1 Hoi Wan St., Quarry Bay, Hong Kong

SHIP REPAIR
R&R Maintenance Inc., 5700 Proctor St. Extension, Port Arthur, TX 77642
United Marine Enterprises Inc., P.O. Box 22077, Beaumont, TX 77720

SHIP SIMULATORS
Kongsberg Maritime AS, PO Box 1009, 3194 Horten, Norway

SHIPBUILDING-REPAIRS, MAINTENANCE, DRYDOCKING
Atlantic Marine, Inc., P.O. Box 3202 , mobile, AL 36652
Austal USA, 100 Dunlap Dr., Mobile, AL 36633
Bayonne Drydock, PO Box 240, Bayonne, NJ 07002-0240
Blohm & Voss, P.O. Box 10 07 20, D-20005 Hamburg, Germany
Blount Marine, 461 Water St., Warren, RI 02885
Bollinger Lockport & Larose, P.O.Box 250, Lockport, LA 70374
Curacao Drydock Co., Box 3012 , Wilmestad, Curacao, Netherlands Antilles
Damen Shipyards, P.O. Box 1 Gorinchem, 4200AA Holland, Netherlands
Fincantieri Canterieri Navali Italiani Spa, Merchant Shipbuilding Div., 34123 Trieste, Italy
In-Place Machining, 3811 N. Holton St., Milwaukee, WI 53212
Leevac Industries, LLC, P.O. Box 1190, Jennings, LA 70546
Motor-Services AB, Box 2115 , Ronninge S- 144 04, Sweden
Newport News Shipbuilding, 4101 Washington Ave., Newport News , VA 23607
Signal International LLC, 1011 S.Hwy 6, Ste 108, Houston, TX 77077
United Defense, 1525 Wilson Blvd., Ste 700, Arlington, VA 22209-2444
United Marine Enterprises Inc., P.O. Box 22077, Beaumont, TX 77720
VT Halter, PO Box 3029, Gulfport, MS 39505
Washburn Doughty, P.O. Box 296, E. Boothbay, ME 04544

SHIPYARDS
Alabama Shipyard, P.O. Box 3202, Mobile, AL 36652
Atlantic Marine, Inc., P.O. Box 3202 , mobile, AL 36652

Derecktor Shipyard, 311 E. Boston Post Rd., Mamaroneck, NY 10543
Jeffboat, 1030 E.MARKET STREET, JEFFERSONVILLE, IN 47130
Kvaerner Masa-Yards Oy, BOX 132, FI-00151, Helsinki, Finland
Leevac Industries, LLC, P.O. Box 1190, Jennings, LA 70546
Offshore Inland, 3521 Brookdale Dr. S., Mobile, AL 36618
R&R Maintenance Inc., 5700 Proctor St. Extension, Port Arthur, TX 77642
United Defense, 1525 Wilson Blvd., Ste 700, Arlington, VA 22209-2444

SILENCERS
Silex Inc., 6659 Ordan Dr., Mississauga, ON L5T 1K6, Canada

SIMULATION TRAINING
Marine Safety International, Marine Terminal , Laguardia Airport, NY 11371
Maritime Institute of Technology, 5700 Hammonds Ferry Rd., Linthicum Heights, MD 21090
Poseidon Simulation AS, Box 89, NO-8370 Leknes, Norway
Transas Marine Overseas Ltd., 12 Obukhovskoy, Oboroni, St. Petersburg 193019, Russian Federation

SLIDING DOORS
Waltz & Krezner, 91 Willenbrock Rd., Oxford, CT 06478

SOFTWARE
Creative Systems Inc., P.O. Box 1910, Port Townsend, WA 98368
Design Maintenance Systems, Inc, 340 Brooksbank Ave, Ste.100, North Vancouver,BC VTJ 2C1, Canada
Loadmaster International , St. Varvsgarten 11B SE, 211 19 Malme, Sweden
Resergence Software Inc. ., 2021 Lakeshore Dr., Ste 21D, New Orleans, LA 70122

STEERING GEARS/ STEERING SYSTEMS
Kobelt Manufacturing Co., Ltd., 8238-129 Street, Surrey, BC V3W0A6, Canada
Offshore Inland, 3521 Brookdale Dr. S., Mobile, AL 36618

STERN TUBE BEARINGS/ BUSHES
Duramax Marine LLC, 17990 Great Lakes Parkway, Hiram, OH 44234, 440-834-5400, 440-834-4950, Contact: Richard Spangler
Orkot Composites, 2535 Prairie Rd, Unit D., Eugene, OR 97402
Thordon Bearings Inc., 3225 Mainway, Burlington, Ontario L7M 1A6, Canada

STERN TUBE SEALS
Superbolt, PO Box 683, Carnegie, PA 15106

STRAINERS
Hellan Strainer, 3249 East 80th St., Cleveland, OH 44104

SURFACE PREP TOOLS
Aurand Mfg., 1210 Ellis St., Cincinnati, OH 45223
Dalseide Shipping Services, NO-5397, BEKKJARVIK, Norway
Flow International Corp., 23500 64th Ave., South Kent, WA 98059

SURVEYORS
Merrill Marine Marketing & Capital Group, 7909 Big Bend Blvd., Webster Groves, MO 63119

SURVIVAL EQUIPMENT
Brookdale International, 1--8755 Ash St., Vancouver, BC V6P 6T3, Canada

SWITCHBOARDS
Industrial Power Systems, 3010 Powers Avenue Unit 16, Jacksonville, FL 32207, 904 731-8844, 904 731-0188, marine@ipsjax.com

TANK LEVELING INDICATORS
Ian Conrad Bergan, 3119 North Davis Highway, Pensacola, FL 32503, 850-434-1286, 850-434-1246, sales@icbergan.com, Contact: Ron Monell, www.icbergan.com
King Engineering Co, PO Box 1228, Ann Arbor, MI 48106
Saab Marine Electronics, Box 13045, 402 5Goteborg, Sweden
Technical Marine Services, 6040 North Cutter Circle, Portland, OR 97217

TESTING SERVICES
Wyle Laboratories, 7800 Govern's Dr. S.W., Huntsville , AL 35807

THRUSTER SYSTEMS
Omnithruster , 30555 Solon Industrial Parkway, Cleveland, OH 44139, 440 542-9260, 440 542-9265, widmer@omnithruster.com, Contact: Kurt Widmer, www.omnithruster.com

TOWING EQUIPMENT
Allied Shipbuilders Ltd., 1870 Harbour Road, Vancouver V7H 1A1, Canada

TRAINING
International Maritime Training, 910 SE 17th St., Ste 200, Fort Lauderdale, FL 33316
Massachusetts Maritime Academy, 101 Academy Drive, Buzzards Bay, MA 02532
SUNY Maritime College, 6 Pennyfield Ave, Bronx, NY 10465-4198
USMMA- Global Maritime and Transportation School, 300 Steamboat Rd., Kings Point, NY 11024

TRAINING VIDEOS
Coastal Training Technologies Corp., 500 Studio Drive, Virginia Beach, VA 23452
Moxie Media, PO Box 10203, New Orleans, LA 70181

TRANSMISSIONS
Karl Senner Inc., 25 W Third, Kenner, LA 70062

TRAVEL SERVICES
MarineTravel Services, 200 Golden Oak Court, Suite 120, Virginia Beach, VA 23452

TURBOCHARGERS
ABB Turbo Systems AG, CH 5401, Baden, Switzerland

TURBOCHARGERS- REPAIRS
Motor-Services Hugo Stamp, 3101 S.W. 3rd Ave., Ft. Lauderdale, FL 33315
Napier Turbochargers, P.O. Box 1, Waterside , South Lincoln LN5 7FD, UK

ULTRASONIC TESTING
M.A.C.E, 5910 NE 15th Ave., Fort Lauderdale, FL 33331

UNDERWATER SURVEILLANCE SONAR
C-Tech LTD, P.O.Box 1960, Cornwall Ontario K6H6N7, Canada

VACUUM EQUIPMENT
Industrial Vacuum Equipment Corporation, N8091 Maple Street, Ixonia, WI 53036, 800-331-4832, 920-261-7117, randy@industrialvacuum.com

VACUUM TOILET SYSTEM
Envirovac Inc, 1260 Turret Dr., Rockford , IL 61111
Jets Vacum Sewage System, P.O. Box 14, N-6060 Hareid, Norway

VALVES & FITTINGS
Leslie Controls, 12501 Telecom Dr., Tampa, FL 33637

VENTILATION SYSTEMS / PRODUCTS
Delta T Systems, 858 West 13th Court, Riviera Beach, FL 33404
Dry Air Technology, 313 North Oak St., Burlington, VA 88233

VIBRATION ANALYSIS
Ludeca, Inc., 1425 NW 88th Ave, Miami, FL 33172
Maritech, LLC, 100 Powermill Rd., Acton, MA 01725

VISCOMETERS
Cambridge Applied System, 196 Boston Ave. , Medford, MA 02155

VOYAGE DATA RECORDERS
Rutter Technologies Inc., 22 Pearl Place, P.O.BOX 427, St. John's NL A1C 5N8, Canada

WASTE WATER TREATMENT
FAST®Systems, 8229 Brentwood Industrial Drive, Brentwood, MO 63144, 314-645-6540, 314-645-6131, solutions@marinefast.com, Contact: Alan Fleischer, www.marinefast.com
RWO , Leerkampe 3, D- 28259 Bremen, Germany

WATER JET CLEANING
Flow International Corp., 23500 64th Ave., South Kent, WA 98059
Gardner Denver Water Jetting Systems, 12300 N. Houston Rosslyn Road, Houston, TX 77086

WATER PURIFIERS
Alfa -Laval Separation, Inc., 955 Mearns Rd., Warminster, PA 18974
Everpure, 502 Indiana Avenue, Sheboygan, WI 53081, 866-873-7506, 866-203-7361, customerservice@plymouthwater.com, Contact: Jerry Letcher, www.everpure.com
Gardner Denver Water Jetting Systems, 12300 N. Houston Rosslyn Road, Houston, TX 77086
Reverse Osmosis of South Florida, Inc., 150 S.E. 29th St., Fort Lauderdale, FL 33316

WATERTIGHT CLOSURES
Waltz & Krezner, 91 Willenbrock Rd., Oxford, CT 06478

WINCHES & FAIRLEADS
Burrard Iron Works Ltd., 220 Alexander Street, Vancouver, BC V6A 1C1, Canada, 604-684-2491, 604684-0458, sales@burrardironworks.com
Coastal Marine Equipment, Bldg 9114 MISAAP Ind. Complex, Stennis Space Center, MS 39529
Intercontinental Engineering , PO Box 9055 , Kansas City, MO 64168
Jeamar Winches, 1051 Clinton St., Buffalo, NY 14206
Markey Machinery, P.O. Box 24788, Seattle, WA 98124
McElroy/Catchot Winch Company, Inc., P.O. Box 4632, Biloxi, MS 39535-4632, 228-875-6327, 228-872-7880, hcatchot@bellsouth.net, Contact: Harold Catchot, www.mcelroycatchotwinch.com
MMC International, 60 Inip Dr, Inwood, NY 11096
Nabrico Marine Products, 1050 Trinity Road, Ashland City, TN 37016
Rapp Hydema, 4433 27th Ave. West, Seattle, WA 98199, (206) 286-8162, (206) 286-3084, scotta@rappus.com
Skookum , P.O. Box 280, Hubbard, OR 97032
Smith Berger Marine, 7915 10th Ave. S., Seattle, WA 98108
Superior Lidgerwood Mundy, 1101 John Ave., Superior , WI 54880
Timberland Equipment Ltd & Almon Johnson, 459 Industrial Ave., Woodstock, ON N4S 7Z2, Canada

WINDLASSES (ANCHORS)
Coastal Marine Equipment, Bldg 9114 MISAAP Ind. Complex, Stennis Space Center, MS 39529
Coastal Marine Equipment Inc., BLDG. 9114 MISAAP Industrial Complex, Stennis Space CTR., MS 39529, 228-813-1700, 228-813-1709, sales@coastalmarineequipment.com, Contact: Ralph Waguespack, www.coastalmarineequipment.com
McElroy/Catchot Winch Company, Inc., P.O. Box 4632, Biloxi, MS 39535-4632, 228-875-6327, 228-872-7880, hcatchot@bellsouth.net, Contact: Harold Catchot, www.mcelroycatchotwinch.com
Rapp Hydema, 4433 27th Ave. West, Seattle, WA 98199, (206) 286-8162, (206) 286-3084, scotta@rappus.com

WINDOWS
Deansteel Mfg., 111 Merchant St., San Antonio, TX 78204
Garibaldi Glass, 7344 Winston Street, Burnaby, British Columbia V5A 2G9, Canada

WINDSCREEN & WINDOW WIPERS
Bae Systems, 550 South Fulton St., Mt. Vernon, NJ 10550
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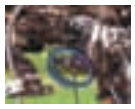
Products

Autoship
Autoship Systems Corporation has developed a hull design and surface modeling software money can buy! Autoship Pro combines the graphical user interface of Windows with the dexterity of NURBS mathematics, the high-end CAD standard for surface modeling. Quickly and efficiently create any hull shape from a racing yacht to a super tanker, including the superstructure, appendages and foils.
Circle 101

ACR
Since the 1950s, ACR Electronics has been designing and manufacturing safety and survival technologies and with this new threat to security they have responded with a range of electronics that meet all agency and legislative requirements. Their new Electronics Catalog highlights ACR's commercial navigation and security products.
Circle 102

Cummins
Cummins MerCruiser Diesel is a joint venture between Cummins Incorporated and Mercury Marine. The Quantum Series (QSB, QSC, QSL) is the high-pressure common rail fuel system providing better power-to-weigh ratios, cleaners starting, less noise an virtually eliminating smoke and odor traditionally associated with diesel engines.
Circle 103

Caterpillar
Caterpillar's 3500C HD marine engine offers high power density for continuous applications with ratings at 1800 rpm. The 12 and 16 cylinder engines offer up to 20 percent more power. Its electronic control system provides improved engine monitoring, communication, and display capabilities.
Circle 104



Kistler
Over 2,000 Kistler cylinder pressure sensors for online monitoring have now been installed on a wide variety of engines. Some of these sensors have already been in continuous use for over three years. The Type 6613CA sensor with integral amplifier for continuous measurement of cylinder pressures offers longevity and constant sensitivity.
Circle No. 105

IPS
Industrial Power Systems offers a full line of marine switchboards for any application. All are custom built to your design and in conformance with any required regulatory body rules. American quality and craftsmanship since 1981.
Circle 106

Jotun
Jotun's SeaQueen provides the benefits of selfsmoothing antifouling performance to the most critical area for fouling prevention - the vertical sides of the hull. SeaQueen on the flat bottom provides a highly efficient prevention of fouling of flat bottoms where light, upon which most fouling organisms thrive, is absent.
Circle 107

Magnatrol
Bronze or Stainless Steel, control flow of water, oil, gas, steam, brine, solvents, cryogenics and oxygen. Packless construction with continuous duty coils for all voltages, no differential pressure required to open, pressure to 500 PSIG, temp. to 400 degrees, available normally open or normally closed. Special applications/alloys and custom engineering available.
Circle 108

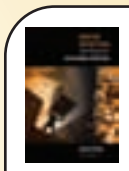
MSHS
(MSHS) was founded in 1983. MSHS specializes in the repair, maintenance, and testing of diesel engines and turbochargers. Their 30,000 sq. ft. facility is located in Fort Lauderdale, Fla.. It includes a state-of-the-art machine shop that is fully equipped with the latest in repair and test equipment. They are an authorized distributor and service center for major diesel engine and turbocharger manufacturers.
Circle 109

Procurve
ProCurve Glass Technology offers the industry the fabrication of specialty curved glass. Marine Glass resists breakage from rough water or flying objects. Consisting of two pieces of strengthened bent glass permanently bonded together with a tough interlayer, it resists moisture and water vapor, chemical attack and ultraviolet radiation.
Circle 110

Apex
Apex Engineering Products Corporation introduces Iwaki Walchem seal-less magnetic drive pumps and Yamada's high performance air-powered double diaphragm pumps. These Rydlyme Marine pumping systems are specifically designed to offer chemical handling equipment available to aid in maintenance.
Circle 111

SAM Electronics
SAM Electronics offers specialized capabilities in the design and development of specific maritime equipment technologies, including advanced diesel-electric propulsion systems, shaft alternators for economic power generation, shipborne automated monitoring and control systems, navaids, integrated navigation and bridge configurations, as well as communication technologies.
Circle 112

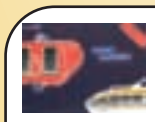
ShipNet
ShipNet AS is an international maritime IT solution provider. They develop, implement and support a complete range of vessel and shore maritime software, including financial, fleet, commercial and liner management solutions. ShipNet was established 1991 from their predecessor DataShip with the vision to deliver the Ultimate Computing Concepts.
Circle 113



Smiths Detection
Smiths Detection offers security solutions through trace detection equipment and Smiths Heimann x-ray systems. In both areas we are world-leaders. Their combination of technologies results in products & services no other company is capable of supplying, to protect our freedom.
Circle 114

Ocean Safety
Ocean Safety has added the AQ180 SOLAS/ Shipswheel Approved Lifebuoy Light to its range of AquaSpec life-saving light products. The AQ180 combines a compact casing with an innovative extra-large dome that projects the light over a wide area, which enhances visibility.
Circle 115

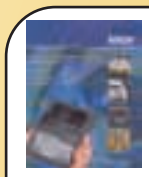
Coastal Marine
Coastal Marine Equipment's Anchor Windlasses are supplied with catheads, lever operated jaw clutches and hand wheel operated band brakes. All Anchor Windlasses are available in electric or hydraulic drive and can be supplied constant speed, multi-speed and variable speed. Hydraulic drives operate off central hydraulic system or dedicated system supplied with unit.
Circle 116



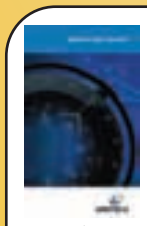
Schat-Harding
Schat-Harding evolved from a merger of three companies in the survival craft and davit business-Watercraft International, Harding Safety and Schat Davit Company-each of which served the requirements of the offshore industry for decades. Each had different ranges of equipment for the offshore sector.
Circle 117

Sonardyne
Sonardyne has introduced Fusion, a concept of flexible and integrated navigation solutions coupled with the coordinated development of software and hardware. It has developed into a family of acoustic hardware and software products that can be configured to offer accuracy subsea navigation, adaptable for all offshore survey, construction and drilling applications.
Circle 118

Hammar
C.M.Hammar AB has launched a new electronic remote release system (ERRS) for life rafts, evacuation systems or other lifesaving appliances. The new electrical ERRS is designed for quick and efficient evacuation of passengers. It is operated via an electronic control panel that activates one or several electric Hammar H20 Remote Release Units.
Circle 119



Kroy
Kroy has introduced the new K4100 desktop label printer which features auto sizing, quick response and fast print speeds, scaleable and downloadable fonts, enhanced memory and a print resolution of 300 dpi. The K4100 can be connected to a PC for customized label, wire wrap and shrink tube applications.
Circle 120

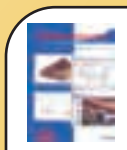


Wärtsilä
Wärtsilä is a supplier of marine engines and propulsion systems for all types of vessels and offshore applications. As The Ship Power Supplier Wärtsilä is committed to serving the marine market with reliable, cost effective and environmentally sound marine power systems.
Circle 121

Marine Propulsion Research
Marine Propulsion Research Inc. in Bradenton, FL, patented a sea chest that provides an abundant supply of water for engines, generators and air conditioning at speed. There is no cavitation or drag. This design makes it possible for easier and reduced plumbing throughout the craft.
Circle 122

Color Light
Color Light's latest technology regarding Halogen/HMI in combination with specifically designed parabolic reflectors with myriad angled steps, similar to Fresnel lens. The result Is probably the sharpest white light available in the market for marine applications. The searchlight can be equipped with two white lights, one white light in combination with black light or two black lights.
Circle 123

Viking
Offering specifications, certificates of approval and technical drawings of life-saving equipment, www.vikingsafetyshop.com is a valuable online tool for customers. The site provides detailed information about all of the products Viking Life-Saving Equipment manufactures and distributes worldwide in a user-friendly format.
Circle 124



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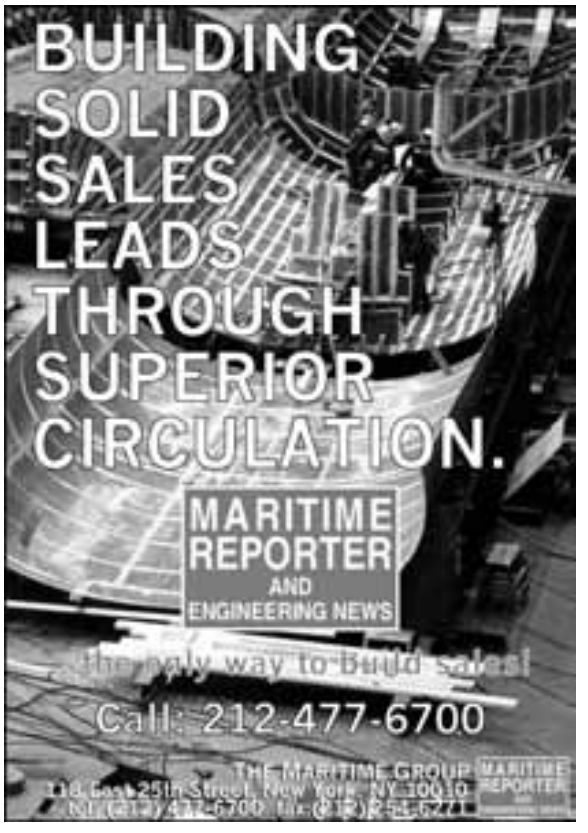

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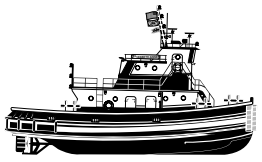

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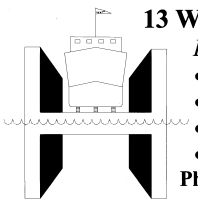

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