September 2003

MARITIME REPORTER AND ENGINEERING NEWS

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SNAME & the World Maritime Technology Conference

Setting Up in San Francisco

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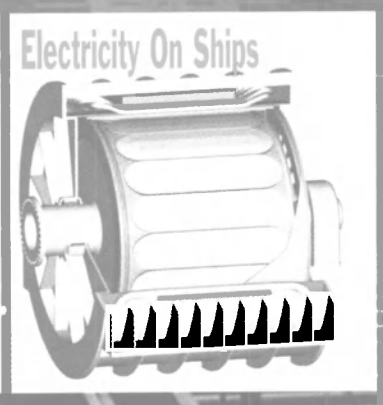

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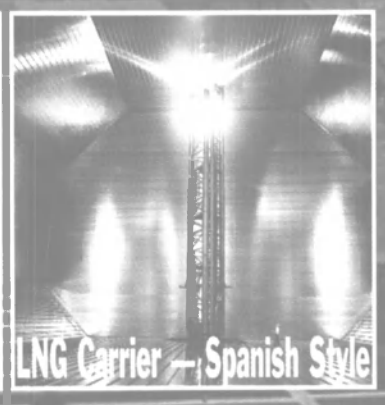

LNG Carrier — Spanish Style

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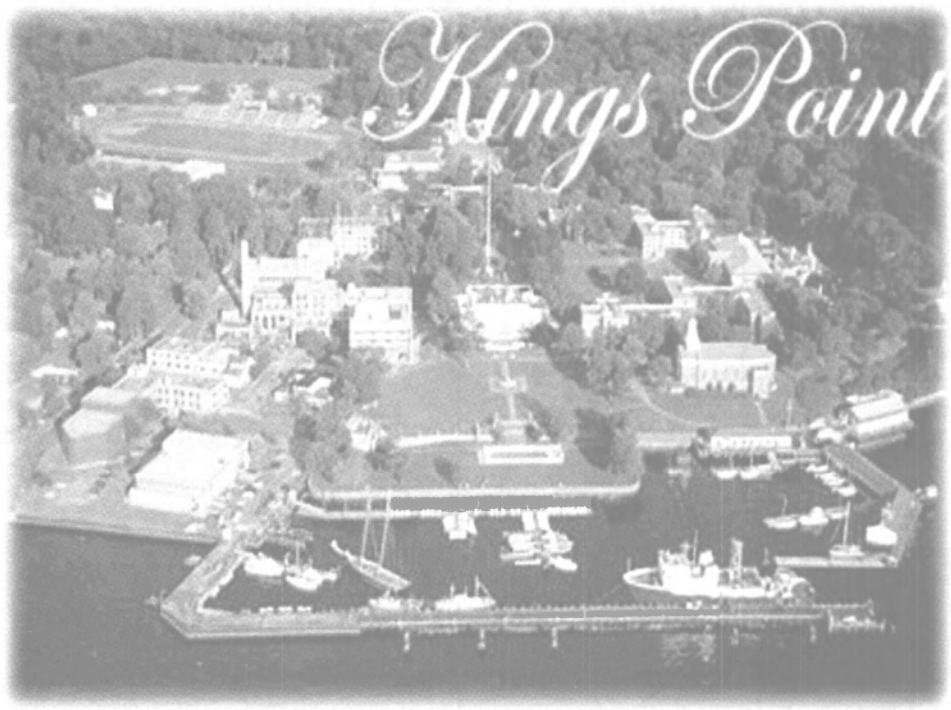

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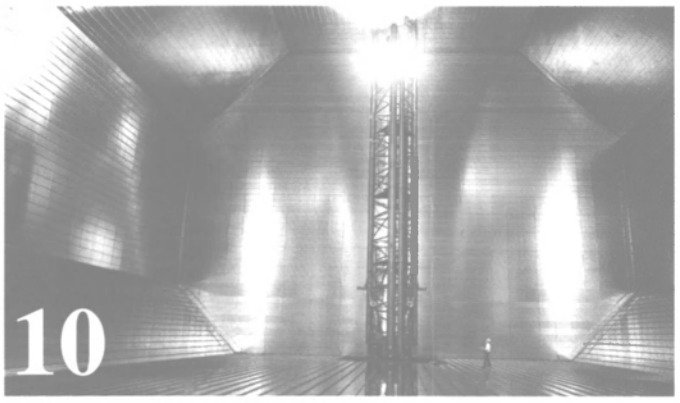

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But ... is she Blackout Proof?

That famous maker of iced teas and other fruity drinks, Snapple, has again supplied us with another little-known marine-related fact, which may lead many to believe if the employees of this soft drink company might possibly be retired captains?

From the Snapple "Real Fact" bottle cap series:

"The first lighthouse to use electricity was the statue of liberty in 1886."

(Photo Credit: PA2 Tom Sperduto, USCG)

Maritime Meanings

SOS The internationally agreed distress call made by a ship requiring assistance; it was adopted in 1908. These three letters were chosen because in Morse Code they were easy to read and transmit - three dots, three dashes, three dots. Contrary to popular belief, these letters do not stand for "save our souls" or save our ship." The expression now means any call for help.

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

Cartoon

It was the height of WWII, the heyday of American shipbuilding and the maritime industry was cranking out ships at break-neck speed. Shown here is a photo that appeared on the front page of the January 7, 1943 issue of this publication, which was then published weekly and known as *Maritime Activity Reports*. President **Franklin Delano Roosevelt** (pictured), accepts on behalf of the workers of California Shipbuilding Corporation in Wilmington, Calif., a six-ft. scale model of the Liberty Ship John Bidwell. The vessel was the 109th Liberty Ship to be delivered into active service by the California yard. Standing behind FDR, (l to R): Rear Admiral **Howard L. Vickery**, vice chairman of MarAd; **Jack Adams**, California Shipbuilding Corp.; **Graham Spickard**, Calship Washington Representative; and **John A. McCone**, Executive V.P. of Calship.

Editor's Note

I talk a lot.

Perhaps too much.

But it is an inherent element of my professsion in the timely collection and dissemination of information.

More importantly, though, is that I know when to shut up and listen. No matter how many hours I spend on the phone or in myriad meetings during a given year, there is always one conversation that stands out; one conversation that conveys more than the others combined. I had the pleasure of that conversation last month in a conference call with Admiral **Robert E. Kramek**, (USCG retired), President and COO, ABS Americas, and co-chairman of the conference's technical committee, and Dr. **Henry S. Marcus**, Professor of Marine Systems in the Ocean Engineering Department at the Massachusetts Institute of Technology. Ostensibly arranged to discuss the forthcoming World Maritime Technology Conference (WMTC), the name for this year's conference portion of the SNAME 2003 Annual Meeting and Exhibition scheduled for October 17-20 in San Francisco, I was pleased to receive information and insights that transcended a simple question and answer session, allowing me to tap the considerable fount of knowledge and decades of experience before me. For the record, WMTC is an ambitious endeavour to bring the world together in San Francisco to discuss the many challenges, present and future, that will shape the maritime industry. Adm. Kramek and Dr. Marcus, co-chairment of the WMTC technical committee, have helped to amass arguably the most impressive and most extensive base of marine expertise under one roof. Read the overview of the program, starting on page 34, or visit **www.worldmaritimetechnology.org** for complete details. *Off-the-record*, they provided to me opinions and insights on pressing technical issues, such as ...

... I guess I can't share that here, remember, I also know when to shut up. Maybe they'll provide more exclusive insights in San Francisco.

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On the Cover

Pictured is an architectural gem, the San Francisco ferry terminal. The World Maritime Technology Conference is set to take place in San Francisco in mid-October, and the stage has been set for a truly international program. For an overview of the conference, please turn to page 34. (Photo credit: Tom Paiva). ALSO on the cover, bottom, from left: Floating Production System onalysis (p. 52); Richard Fain, Whoopi Goldberg and Capt. Nikolaos ("Nick") Antalis celebrate the new Serenade of the Seas (p. 57); American Superconductor works to get electric on ships (p. 26); and Izar delivers a spectacular new LNG carrier (p. 10)

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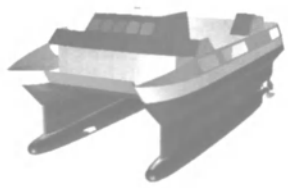
New SWATH From ACMA

Alan C. McClure Associates (ACMA) has completed the design development of a new SWATH (Small Waterplane Area, Twin Hull) vessel that will be completed with a variety of operations options. The proposed vessel will be 92 ft. (28 m) with a beam of 47 ft. (14.3 m) and displacement of 240 LT. It is based on a variation of the technology used by ACMA's in the development of the 120-ft. Stillwater River, a SWATH crewboat built for Trico Marine Operators, Inc.



The speed of ACMA's new SWATH has been reduced from 28+ knots to 20 - 25 knots to accommodate a variety of propulsion system combinations (diesel/reduction-gear w/CP or FP wheels). The flexibility of this design will allow the vessel to perform a variety of missions including offshore personnel transport, harbor ferry, oceanographic, dinner cruise/excursion, rescue and light cargo/emergency equipment transportation. Designed to meet the latest USCG, IMO, SOLAS and other class and flag rules, the vessel can be configured with crew accommodations for six, with a functional galley and a full HVAC system for the comfort of the crew and passengers.

Circle 32 on Reader Service Card

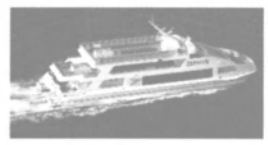
Keppel Singmarine Delivers Tractor Tug

Keppel Singmarine Pte Ltd. delivered one of the world's largest tractor tug to Maju Maritime Pte Ltd. Measuring 111.5 ft. (34 m) with bollard pull in excess of 64 tons, Pisces 53 is on a long term charter through Briny Marine Services Sdn Bhd to support Brunei Shell Petroleum Co Sdn Bhd's exploration and production activities.

Following its naming, Pisces 53 will join its sister vessel Phoenix 52 and an utility tug Pegasus 51, two other Maju Maritime tugs that were delivered in early June 2003, at the Brunei Liquefied Natural Gas Terminal in Lumut, Brunei; these vessels were contracted to Keppel Singmarine in May 2002.

Circle 36 on Reader Service Card

Austal USA Delivers Zephyr



Austal USA delivered the 143-ft. (43.5-m) passenger catamaran Zephyr to Circle Line-Statue of Liberty Ferry, Inc. in New York City. Zephyr is Circle Line's first aluminum high speed vessel, and the second Austal USA has delivered to the New York area in the last three months. The new cat meets Circle Line's requirements for a vessel capable of fulfilling a variety of roles. With a service speed of 29 knots and COI for 600 passengers, the vessel has been developed through close co-operation between Austal USA and Circle Line and will expand the owner's harbor sightseeing cruises, and evening charter operations as well as providing speed and comfort on longer distance runs. The vessel will also be able to operate alongside Battery Park — the traditional home of Circle Line Statue of Liberty Ferry — where pilings and dock heights posed specific challenges. The vessel is powered by four Cummins KTA38M2 diesel engines, each coupled to a Hamilton 571 waterjet through a Reintjes WVS 440 reversing gearbox. This configuration allows the catamaran to be operated with either two or four engines, giving the vessel two distinct service speeds to match its varied operating profiles.

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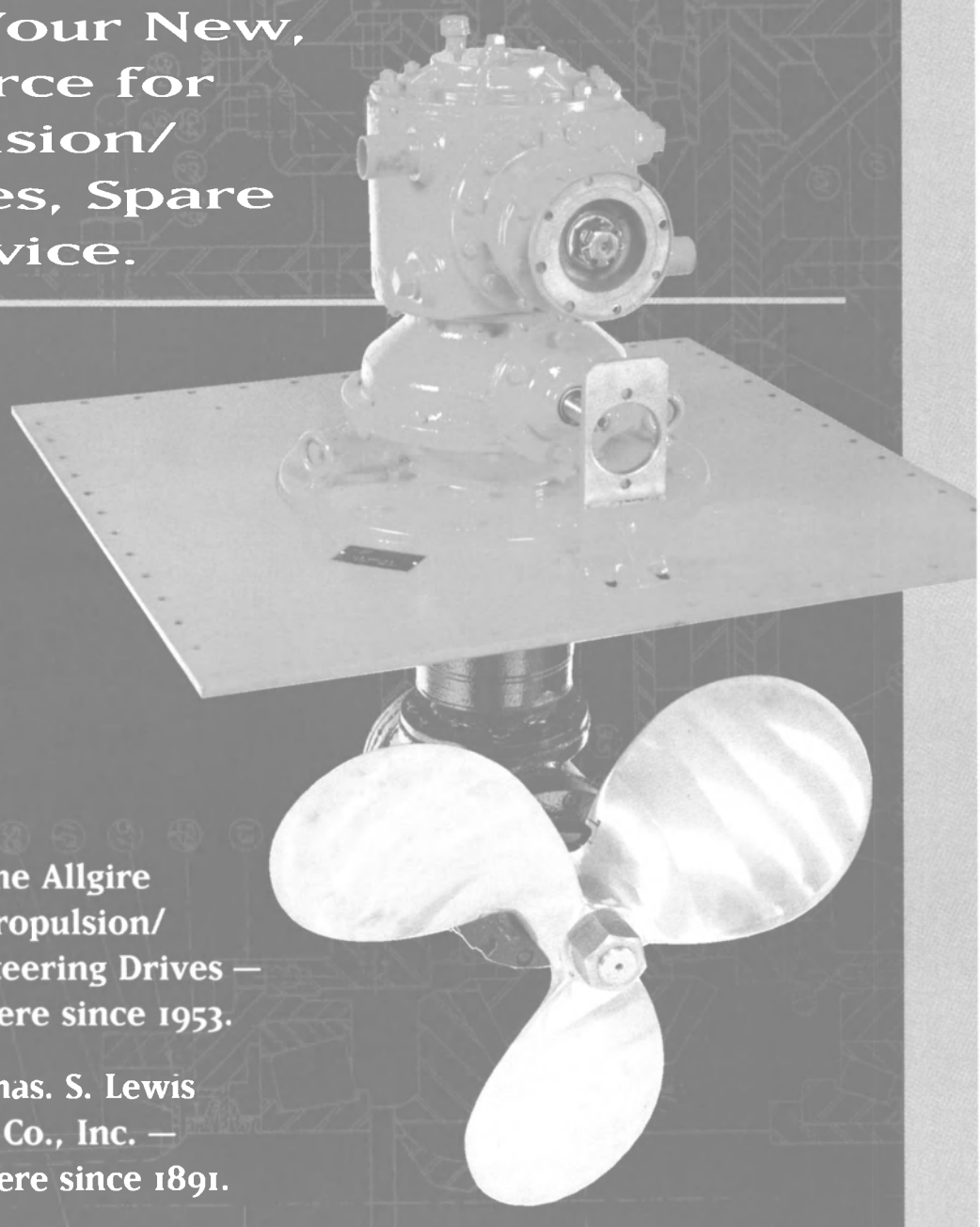

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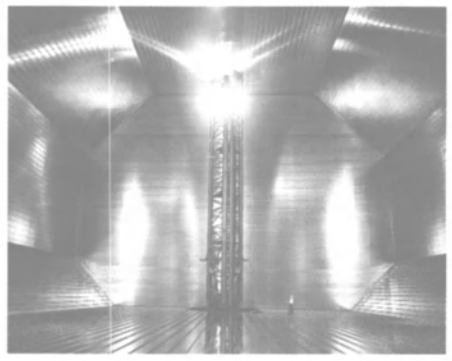
IZAR Delivers LNG Inigo Tapias

IZAR Sestao Shipyard has delivered the LNG, Inigo Tapias, which will be operated by the company F. Tapias for Repsol YPF-Gas Natural. After conclusion of tests, carried out by the shipyard in the Gas Natural facilities in Huelva and valued by the shipowner, the ship was delivered completely operative and was delivered a month ahead of schedule. During the tests, the cargo has reach quantity of 5,000 cu. m. of gas.

Main Particulars

Length	933 ft. (284.4 m)
Breadth	139 ft. (42.5 m)
Draft	37 ft. (11.3 m)
Depth	83 ft. (25.4 m)
Speed	19.5 knots
Crew	40 people

Propulsion: 28,000 kW at 83 rpm generated by one steam turbine type Kawasaki-IZAR, provided by the IZAR Factory of Turbines. This factory, located in Ferrol, has also provided the condensator of the propusion plant.



Above, Inigo Tapias after its delivery. Below, the inside of one of its massive tanks.

The Inigo Tapias has the capacity to transport 138,000 cu. m. of liquefied natural gas at 163 degrees C below 0, in four tanks with a double membrane type No96 as a system of isolation and contention of cargo. Inigo Tapias is the first LNG of this dimension built in Spain and the first of a series of five that IZAR has under construction for Repsol YPF, Gas Natural and Union Fenosa. IZAR is the only shipyard in Europe and among the few in the world, capable of the construction of this type of ship -high technology and added value- and has achieved a strong position in this sector.

Diesel Engines Factory in Manises provided five deck cranes, three hose handling cranes type GPH 500-1224 and two service cranes type GPS 320-1218.

Circle 178 on Reader Service Card

Seaspan Container Lines Orders Nine Ships

Seaspan Container Lines has placed an order for nine new 4,250 TEU container ships, which will be chartered to the Canadian shipping company, CP Ships. As the 36th large containership Seaspan has ordered from Samsung Heavy Industries over the past three years, the new ships will be built at Samsung Heavy Industries, in South Korea.

Wallace McGeorge Modified for Deep Dredging

Two Bollinger shipyards teamed to increase the dredging depth of the Pine Bluff Sand and Gravel Co. dustpan dredge, Wallace McGeorge, from 62- (18.8-) to 75 ft. (22.8 m), enabling it to dredge at higher river stages and dispatch sooner on a falling river.

In the process, Bollinger Quick Repair, Harvey, La., fabricated and installed 45-ton, 36 x 20-ft. (10.9 x 6 m), port and starboard sections to the horn of the dredge, increasing the vessel's overall length from 252.5 ft. (76.9 m) to 288.5 ft. (87.9 m). The shipyard then installed a new 46-ton, 40- x 15- x 30-ft. (12.1- x 4.5- 9.1-m), A-frame that it had pre-fabricated for the dredge. The A-frame, which more closely resembles an inverted "U", is used to accommodate a new "ladder" that was fabricated at Bollinger Gulf Repair, New Orleans and installed at Bollinger Quick Repair. An EMD 20-645-E4-diesel engine powers the pumping and suction systems and the boat's propulsion is supplied by two Caterpillar 3516 diesels driving through Ulstein Z-drive units. Ducote Engineering Associates, Inc. of Jefferson, La. provided design and engineering services for the project.

The Wallace McGeorge is under contract with the U. S. Army Corps of Engineers (USACE), Memphis District, to help maintain Mississippi River deep draft crossings between Baton Rouge and the Gulf of Mexico. According to **Mark Lemoine** of Pine Bluff's Alexandria, La. office, Brown and Root built the Wallace McGeorge, whose original name was Carl Burkhardt, in 1965 as a cutter-head dredge. Around 1980, it was converted to a dustpan dredge and renamed Lenel Bean by Bean Dredging, who had acquired the vessel. In 1991, Pine Bluff bought the vessel and later renamed it Wallace McGeorge.

The Wallace McGeorge departing Bollinger Quick Repair to assume its contract with the U.S. Army Corps of Engineers (USACE), Memphis District.

NASSCO Delivers M.V. North Star

National Steel and Shipbuilding Company (NASSCO), a wholly owned subsidiary of General Dynamics, has delivered the M. V. North Star to Totem Ocean Trailer Express, Inc. (TOTE). The North Star is the second of two new Orca-class trailerships built by NASSCO for TOTE's service from Tacoma, Wash., to Anchorage, Alaska. Her sister ship, the Midnight Sun, was delivered to TOTE in April. Both ships are 840 x 118-ft. (256 x 35.9-m) RoRo cargo ships capable of carrying highway trailers as large as 53 ft. in length. Cargo decks total 360,000 sq. ft. and are able to carry up to 600 cargo trailers and 220 autos as well as oversized freight. The ships employ the latest in marine and environmental protection technologies, including twin-screw, diesel-electric propulsion that can achieve a speed of more than 24 knots. The speed and efficiency of the onload/offload process is an important competitive advantage for TOTE and the ships' cargo can be loaded and discharged in nine hours.

Circle 182 on Reader Service Card

Careful, Your Species May Be Non-Indigenous

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

Dangers posed by movement of species from one part of the world to another where they are uncommon (non-indigenous) have been recognized since the black death (bubonic plague) arrived in western Europe from central Asia in the 1300's, killing up to one-third of Europe's population. Modern medicine has been able to address most disease outbreaks, as evidenced by our recent experience with SARS (severe acute respiratory syndrome). The environment has coped less successfully.

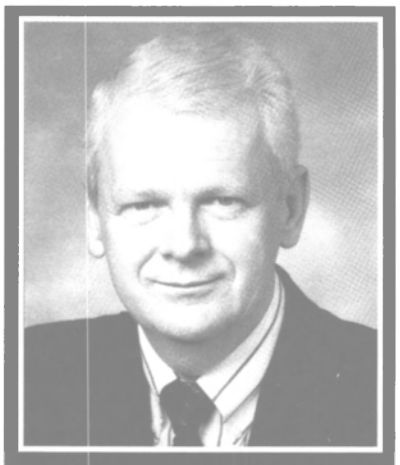
Since man began traveling long distances in relatively short time, plants and animals have also made the voyage. Some have been brought intentionally, as when European domestic animals and crops were transported to America and Australia for farming. Others, such as rats, were brought unintentionally. Regardless of why these non-indigenous species have reached a new environment, the result may be disastrous for the native species.

Modern large ships present a particular environmental problem in this regard, as they are both fast and carry large volumes of water when in ballast. This ballast water is commonly taken onboard when the vessel unloads its cargo in one port and discharged into local waters when the vessel is preparing to load a new cargo. As the distance between the two ports increases, the chances increase that plant and animal life in the ballast water will not be native to the waters where the ballast is discharged. Generally, the local waters where the ballast is discharged will be sufficiently different from the waters where the ballast was loaded that the plant and animals contained therein fail to survive. But, when those few non-indigenous species that do survive find a foothold, an ecological disaster is possible.

The Origin of the Species

It is believed that zebra mussels were transported in ballast water by ships sailing from ports in the Black Sea to the Great Lakes of North America in the early 1980s. Infestations of zebra mussels were not noticed until about 1988, when they started clogging water intake pipes. Zebra mussels are such successful breeders and prodigious eaters and have so few natural enemies in their new environment that they tend to crowd out native species. Damages resulting from the spread of zebra mussels in North American waters and resultant control expenses are estimated to cost $500 million annually.

While zebra mussels are the best known of the non-indigenous aquatic species, they are by no means alone. The European Green Crab, now found on both coasts of North America, is a voracious predator that feeds on bivalve mollusks and small crustaceans. The Chinese Mitten Crab (which may have been introduced illegally as a food source) has spread through the San Francisco Bay region, burrowing into and weakening dikes and levees, as well as competing with local species. A recent study indicates that between six and 25 percent of the different species of plants and animals found in coastal waters of California may be non-indigenous. For many of these, it is too early to determine whether they will have deleterious impacts on the local bios-



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

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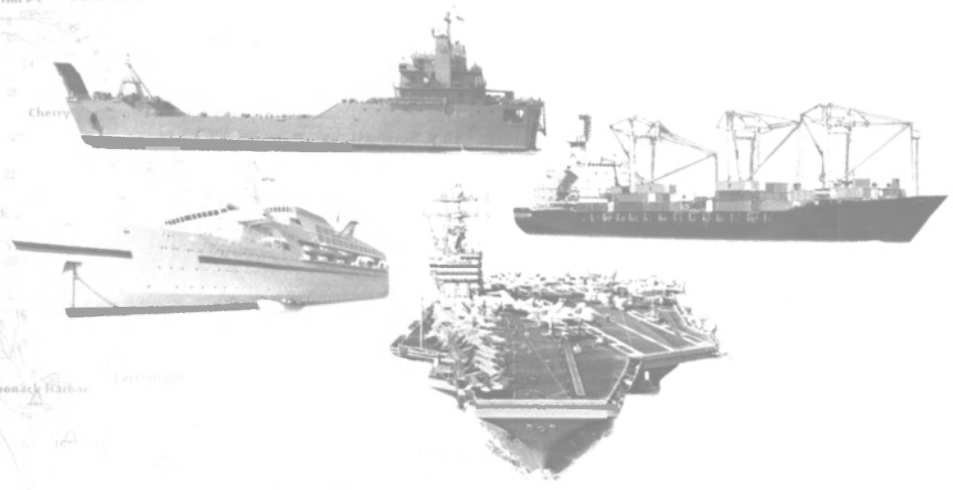

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phere. Other vectors for non-indigenous species to reach new environments range from intentional introduction (as when the Brown trout was brought to North America from Germany in the 1880's) to the unintentional (as when Caulerpa taxifolia, an exotic seaweed, was introduced into San Diego Bay by the emptying of aquariums). Recently, the state of Virginia proposed to import Asian oysters to plant in the Chesapeake Bay in an attempt to counteract the massive decline in domestic oysters.

In an effort to slow the spread of aquatic non-indigenous species, ballast water management programs have been introduced. One of the first was mandated for ships entering the Great Lakes from outside North America. These ships are required to demonstrate that they have exchanged their ballast water on the high seas while en route. High seas ballast water exchange remains the most widely accepted and widely utilized of the control techniques. This is true despite its downsides. Disposal of ballast water on the high seas may expose the ship to stability risks, particularly in heavy weather. Even the best current ballast water pumping systems do not fully empty the ballast tanks, leaving some water and sediment (along with the potential for non-indigenous critters) in the tanks when they are refilled. Some ships transit exclusively in coastal or shallow-water areas where ballast water exchange may provide minimal value. Australia has introduced a ballast water management program that includes a risk analysis to determine the likelihood that a ship's ballast water might contain harmful non-indigenous species.

Ballast Water and Other Guidelines

To reduce the probability that ballast water would contain significant numbers of non-indigenous species, the International Maritime Organization (IMO) established a set of voluntary guidelines. These include cautions against uptake of ballast water in very shallow water or in darkness when bottom-dwelling organisms may rise up the water column. These guidelines have been adopted by the U.S. Coast Guard (and have been made mandatory by the State of California).

The U.S. initially adopted a voluntary approach to ballast water management (except in Great Lakes and in the Hudson River north of the George Washington Bridge). The original program included a requirement that ships arriving from overseas report what ballast water management techniques were utilized on the voyage, but the techniques were only recommended and there was no penalty for not utilizing any and there was no penalty for failure to make the report. After three years, the results were not good. Only about 30 percent of arriving ships submitted the reports and only about 50 percent of the reporting ships stated that they had exchanged their ballast water or utilized other techniques. Based on these results, the U.S. Coast Guard is engaged in a rulemaking project that will establish civil penalties for failure to undertake ballast water management techniques and for failure to provide the required reports.

The IMO is engaged in a similar effort to improve ballast water management programs. A draft International Convention for the Control and Management of Ships' Ballast Water and Sediments has been prepared. An International Conference has been scheduled for February 2004 to consider and approve the Convention. Wide adoption of the Convention is expected to follow rapidly.

In the U.S., various state governments have taken their own approach. California made the complete U.S. Coast Guard voluntary program mandatory, including the guidelines, which no one knows how to enforce. Washington, Oregon, and Hawaii largely adopted the program that is in effect on the Great Lakes. Hawaii, though, also adopted a program intended to control non-indigenous species that might attach themselves to the hulls of ships. As with the California approach to guidelines, no one knows how to enforce this particular provision. The Port of Oakland, under prodding from the U.S. Environmental Protection Agency (EPA) adopted a ballast water program that is separate and distinct from the one adopted by the State of California. To many, this port-specific requirement is perceived as little more than duplicative reporting, with no measurable increase in environmental protection. It is clear that ballast water management has moved from a vague concept to specific guidelines and now to mandatory requirements in rapid succession. Unfortunately, the technology has not kept pace. Ships are still relying largely on the antiquated method of ballast water exchange, with all its shortcomings and hazards. A few ships have tried experimental techniques, but none have been approved by flag or port states. Thus, these vanguard ships run the risk of having to rip out expensive equipment if the various governments refuse to 'grandfather' them at some future date. It is hoped that effective innovative technology is developed and approved in the near future and that pioneering ships are granted appropriate relief for leading the way.

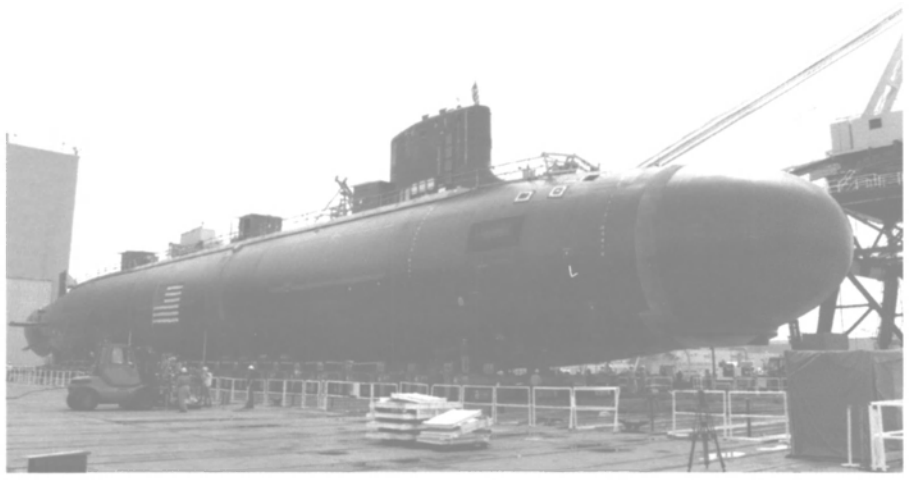
IBIA Warns on Tighter EU Sulfur Timetable

The International Bunker Industry Association (IBIA) says revisions to the proposed EU directive on sulfur content of marine fuels published on August 8, 2003 by the European Commission do not go far enough to introduce abatement and trading as means to reduce sulfur emissions. Also, IBIA warns that new provisions bringing entry into force of the directive only six months after the date of publication are likely to be unworkable. The proposed EU directive on sulfur content of marine fuels seeks to impose a limit of 1.5 percent sulfur on all marine fuels burned in the Baltic, North Sea and Channel, and also imposes a 0.2 percent sulfur limit on all fuels consumed in EU ports.

U.S. Sub Christened in "Home" Port

With a length of 377 ft. (114.9 m), a beam of 34 ft. (10.3 m) and a displacement of 7,800 tons, the Virginia, which is the first U.S. submarine designed to satisfy the requirements of regional and near-land missions in the post-Cold War era, was christened at Northrop Grumman Newport News on August 16, 2003. The ship is also designed with a reactor plant that will not require refueling during the planned life of the ship - reducing life-cycle costs while increasing underway time.

Unobtrusive, non-provocative and connected with land, air, sea and space-based assets, Virginia-class submarines will carry payloads that include special operations forces; unmanned undersea vehicles; mini-submarines to transport special operations personnel; and 38 weapons (torpedoes and Tomahawk cruise missiles). These capabilities will provide the U.S. Navy with continued dominance in coastal waters or the open ocean.



The Navy's newest and most advanced nuclear attack submarine, Virginia (SSN-774), moved outdoors for the first time on August 2, 2003 at General Dynamics Electric Boat shipyard.

The evolution of the new Virginia-Class began in 1998 when the U.S. Navy awarded a $4.2-billion contract for the construction of the first four ships in the class. With Virginia designated as the premiere ship, it was designed by Electric Boat, the Virginia class is being built jointly under a teaming arrangement between Electric Boat and Northrop Grumman Newport News.

Circle 16 on Reader Service Card

HSV 2 Swift Delivered to U.S. Navy

The new Catamaran HSV 2 Swift was delivered to the U.S. Navy on August 13, 2003, during a celebration in Hobart, Australia. High ranking U.S. Military officers joined with invited guests to witness the handover of the 321.5-ft. (98-m) Wave Piercing Catamaran HSV 2 Swift, Incat Hull 061.

Swift will serve operationally as an interim Mine Warfare Command and Support Ship (MCS), and support transformational mine warfare modular mission payload initiatives. In support of Navy experimentation, the HSV will be used to explore concepts, capabilities and military utility associated with the advanced hull and propulsion technology integrated with advanced communications in support of the Littoral Combat Ship (LCS) program.

Main Particulars - HSV 42

Designer/Builder	Incat, Hobart, Australia
Class	Det Norske Veritas
Length, (o.a.)	318 ft. (97.2 m)
Length, (w.l.)	302 ft. (92 m)
Beam, (o.a.)	87 ft. (26.6 m)
Beam of Hulls	15 ft. (4.5 m)
Draft	11 ft. (3.4 m), loaded
Speed	approx. 38 knots @ 700 tons dwt
	approx. 42 knots @ 350 tons dwt

For the Marine Corps, the HSV will conduct a series of limited-objective experiments, exercises, demonstrations and training events that develop interoperability potential of high-speed vessels with causeways, watercraft, amphibious ships and other shipping. Experimentation data will be used to access the military utility of HSVs and future joint and naval military operations or applications. The HSV is capable of maintaining an average speed of 35 knots or greater, loaded with 500 short tons, consisting of 350 personnel and military equipment. A minimum operating range of 1,100 nm at 35 knots is required by the contract, as is a minimum transit range of 4,000 n.m. at an average speed of 20 knots. Furthermore, she must be capable of 24-hour operations at slow speeds (3-10 knots) for experimentation with unmanned autonomous vehicles, and to support dedicated and emerging organic mine warfare missions.

The vessel, which is the fourth Incat Wave Piercing Catamaran to enter military service, will operate with crews stationed at Naval Station Ingleside, Texas, and Naval Amphibious Base Little Creek, Va.

Circle 43 on Reader Service Card

Historic USS Portland Out of Service

The amphibious dock landing ship USS Portland (LSD 37) was decommissioned during a ceremony on August 4, 2003, at Naval Amphibious Base, Little Creek, Va. In its last year of service, the 32-year-old ship was under the command of Cmdr. **Lawrence Creevy.**

LSD 37 was the second naval ship to bear the name Portland. The first USS Portland (CA 33), a heavy cruiser, was commissioned in 1933 and operated extensively in the Pacific Theater during WW II. After the attack on Pearl Harbor, Portland, with its nine, eight-in. guns, was the largest gunship in the region until late 1942. Although often outgunned by the Japanese fleet and severely damaged by a torpedo in the Battle of Guadalcanal, the vessel participated in almost every major naval engagement and survived the duration of the war. While operating in the Pacific Theater, Portland was credited with sinking two destroyers, shooting down more than a dozen airplanes and assisting in the sinking of three battleships. It was also responsible for the sinking of a Japanese submarine.

A Change in Course

News from BP, the world's largest oil company, that it plans to have "close control" over 50 percent of its tonnage by 2005 may bring a wry smile to more than a few old timers. It was not very long ago at all that oil majors were systematically divesting themselves of vessels that, they said, tied up capital unnecessarily and were not a part of their core business. At the time, they contended that they could rely on others to provide maritime transport more cheaply.

Has the wheel turned full circle? Last month BP's CFO **Byron Grote** revealed impressive results - BP's second quarter profit was $3.1million, up 42 percent year on year while its first half figures, at $6.8 billion, were up 81 percent. But he also affirmed that the company intends to control more of its own tonnage, either by owning or time-chartering it.

In his speech entitled "Prestige - A Charterer's Reaction" which Captain **Noel G. Hart**, Manager, BP Shipping (USA) presented at an INTERTANKO meeting in April and was published, in part, in the June 2003 edition of this publication, Hart said:

'Some of you would be aware BP is currently in the midst of expanding its fleet - we have nearly a dozen ships delivering this year alone. Have you asked yourselves why we are doing this?

I will save you the question — we are doing it to be less dependent on a spot market that continues to disappoint — remember the figure I quoted before — only half the ships we could use, we can use. And so our assurance strategy — which was embryonic at the time of the Erika incident, and which matured in the 12 months following, has determined a path for us across a broad range of our marine activities, but one more visible feature was to increase our capacity to move our own cargoes."

Hart pointed to some sobering statistics that were used, in part, to formulate the plan:

"BP inspects 2,200 tankers/year, utilizes about 1,000 SIRE reports, handles over 25,000 internal vetting enquiries/year and audits about 30 ship owners/year. There are over 12,000 tankers in our data base — we have a potential business interest to charter around 5,000 of those — the others are coasters, or committed into various closed trades not available for spot use and so on, yet we only approve of around 2,500 tankers. Half the fleet that we would want to charter is unacceptable to us. Even with the half that is acceptable, many will still fail an initial inspection."

A Look Back

Back in the 1960s and early 1970s, oil companies owned a greater proportion of tonnage themselves than at any time since. Then they had another chunk on long-term timecharter, other vessels on medium term deals, and relied on the spot market only for unforeseen requirements. Then came the age of the tanker independent and when the tanker market crashed, it was better for oil companies to charter in large volumes of third-party tonnage at loss-making rates than continue to run their own high-cost shipping operations along traditional lines.

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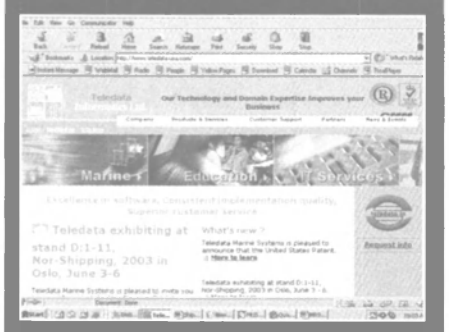
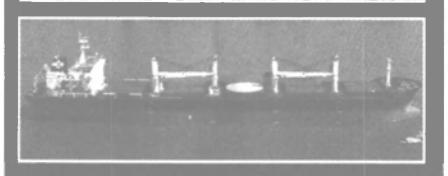
Now, in the wake of a number of high-profile tanker casualties but particularly the Prestige, the strategic risk associated with shipping activities, which are an essential part of any oil major's global logistics chain, is viewed completely different. Deep-pocketed oil companies simply cannot afford to risk over-reliance on independent tonnage, particularly in a tight market where good-quality ships are hard to find. Analysts believe that in certain sectors of the tanker market, such circumstances are now inevitable in the light of the faster phase-out of single hulled tonnage in the months ahead. Just look at the scale of the lawsuits bouncing backwards and forwards across the Atlantic between the Spanish Government and the American Bureau of Shipping. No major corporate, forced to take whatever tonnage it can get in a tight market, would want to find itself having to charter tonnage that it knew was marginal. In practice, no oil major probably would, but then that poses a risk to the company's other fields of operation.

TMS Software

Making Ship Management Simpler

Signs deal with Chartworld Shipping to help manage 30 ships





Teledata Marine Systems signed an agreement with Chartworld Shipping (Athens, Greece) to implement its ShipManager Inventory and Purchasing module in the office and across the fleet of 30 vessels. Chartworld already is an existing Teledata customer, having used the company's ShipManager Planned Maintenance System, onboard 17 vessels. With the new system, inventory and purchasing for the complete Chartworld fleet will be managed through ShipManager. All new vessels added to the fleet will receive an installation of both the ShipManager Planned Maintenance System and the Inventory - Purchasing modules.

Circle 185 on Reader Service Card

Univan Reports Steady Growth

The first half of 2003, under the watchful eye of Capt Vanderperre, Chairman of Univan has Univan Ship Management's fleet grow to in excess of 80 ships under full technical management. The growth has come from bulk carriers and two VLCCs (belonging to Fred Cheng/Shinyo International) and container ships, where Univan is well known for its unique expertise and dedicated technical and crewing pool.

As of June 30, Univan's fleet stood at 78 (up five from end 2002) and by end August an additional five ships will have been delivered to Univan, taking the fleet well into the 80s.

"Univan's dedication to technical expertise and its policy of having dedicated teams .. from management to crews .. for different class vessels .. is clearly the way to grow in the future,"

according to Capt. Vanderperre.

"It is especially pleasing to have added two more VLCCs to the fleet and the support of an experienced tanker operator such as Fred Cheng's Shinyo Group bodes well for the company's future," he said.

In the tanker sector, the company now has four VLCCs, two Aframax, six product and two chemical tankers under full technical management, 45 container vessels, four car and some 20 bulk carriers and multi-purpose cargo ships. On behalf of the Shinyo Group, Univan has also taken on the newbuilding supervision for three Panamax vessels at the Oshima Shipyard in Japan.

V. Ships Appoints New Marine Services CEO

V. Ships has appointed **Richard Hext** as CEO of the Group's Marine Services Division. The move follows a restructuring of the Group into two operating divisions — Ship Management and Marine Services. Based in London, the newly formed Marine Services Division will oversee all activities of the Group other than ship management, including commercial management, ship agency, consulting, travel, insurance, IT and various other support activities. **Roberto Giorgi** continues to head up the Ship Management Division, overseeing all cargo and leisure ship management activities within the group.

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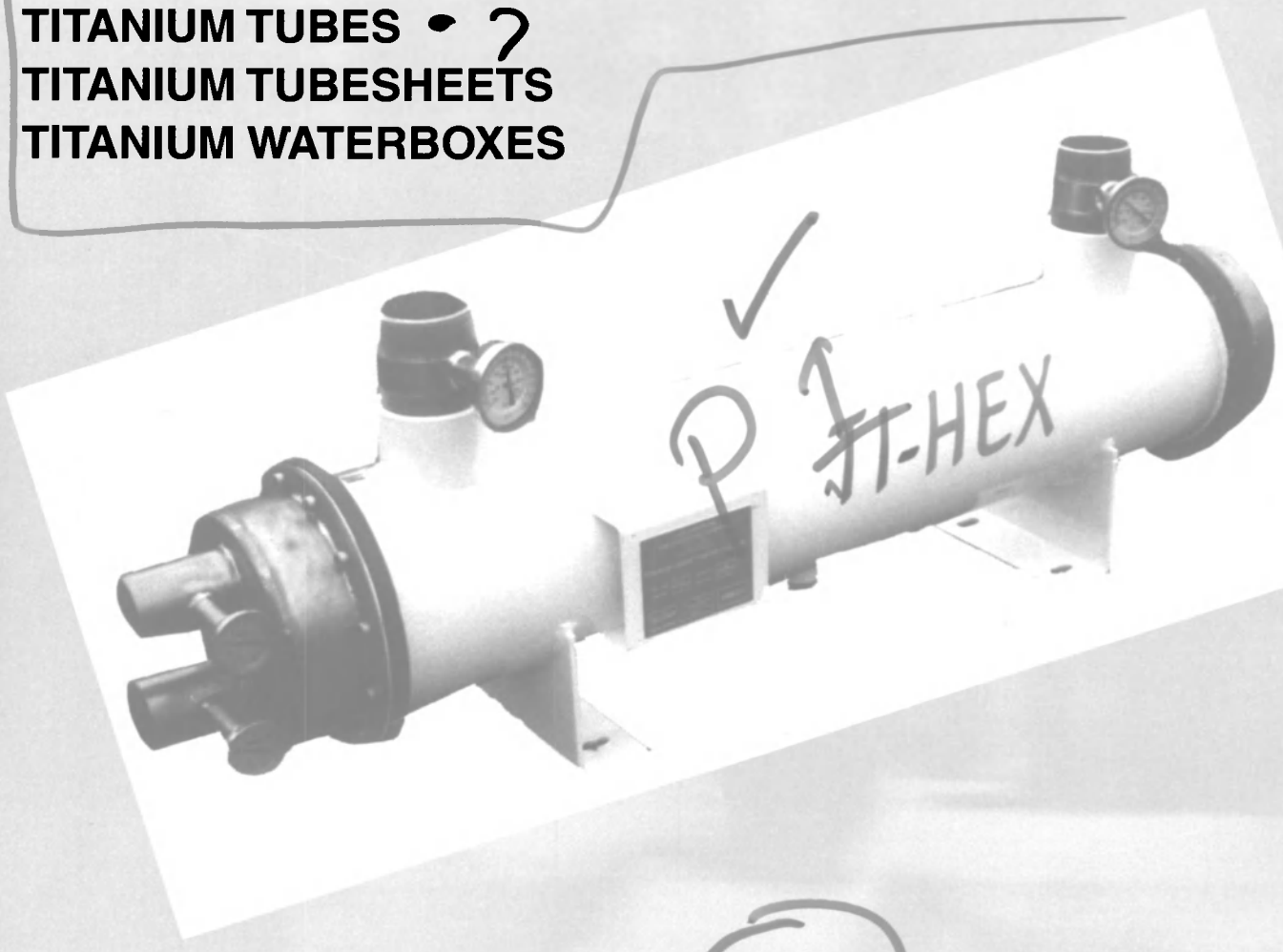

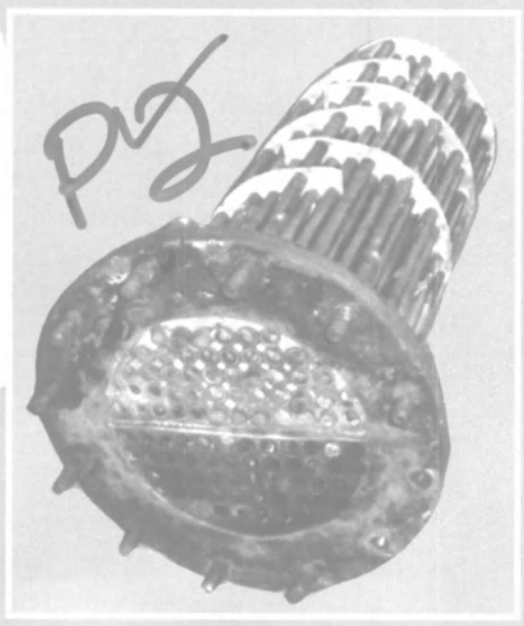

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Making Ship Management More Profitable

Xantic launched an upgrade of its AMOS Maintenance & Purchase enterprise solution and the shipboard application AMOS Express. The new V5.4 offers a range of benefits for users. AMOS M&P is a maintenance management system for the maritime industry, to meet the demands of fleet owners and managers aiming to improve performance and profitability. A range of enhanced functionalities have been designed to offer even greater support to core business processes. The demand for more detailed finance reporting has resulted in a new accounting module in AMOS M&P. This module is comprised of Account codes (registration of the types of expenditure and recording of used resources) and Cost Centers (separate financial areas where expenditure is registered against records of used resources).

Circle 184 on Reader Service Card

Stolt-Nielsen Appoints MD of Tanker Chartering

Stolt-Nielsen Transportation Group (SNTG) appointed **Hans Feringa** as Managing Director of Tanker Chartering, and **Tom Monssen** has been named Managing Director of Terminals. Feringa most recently served as Managing Director of Stolthaven Terminals since July of 2000. He joined the Stolt-Nielsen Transportation Group in 1996, as General Manager of Stolthaven Terminals Asia Pacific Business Development (Singapore), and was named Stolthaven Terminals Asia Pacific Director and Senior Vice President (Singapore) in 1999. Monssen was previously Managing Director SNTG South America (Brazil) from July 2000. He joined SNTG in 1984 as a Shipbroker, and was later promoted to Round Voyage Manager.

Trico Marine Hires New CFO

Trico Marine Services, Inc. has hired **Trevor Turbidy** as the company's new CFO. Before joining Trico, Turbidy was employed by Credit Suisse First Boston as a Director in their Investment Banking Division. In addition, Trico is continuing to make progress in executing on its liquidity enhancement plan. The company has entered into a definitive agreement to sell one of its North Sea vessels for $35.1 million — subject to customary closing conditions.

Isaacson Joins GE US Equipment Financing

GE U.S. Equipment Financing has appointed **Steve Isaacson** as National Sales Leader. Isaacson, who is a veteran of the commercial marine finance industry, joining GE in 2001 after a 15-year career managing SAFECO Credit's national marine group in Seattle. He had previously served the past two years as the northwest regional sales manager for GE USEF. He is a nationally recognized writer of marine finance topics, and has served as a member of the AWO.

Smith Appointed VP at Senesco Marine

On July 28, 2003, **John Smith** was hired as V.P. of Sales Engineering for Senesco Marine based out of the company's New Orleans office. Smith joins Senesco Marine with over 25 years experience in engineering, estimating, sales and construction of tank barges. Smith, who previously held the position of program manager and director of Barge Construction at Halter Marine, graduated from Delgado College in New Orleans with an AS in Engineering Technology.

Bodewig Awarded Crowley Trophy

Jose Roberto Bodewig, Crowley's general manager in El Salvador, was awarded the 2002 Thomas Crowley Trophy, Crowley Maritime Corporation's highest honor. Bodewig, who is based in San Salvador and works for the corporation's liner services business unit, is the second trophy recipient this year.

Bodewig & Crowley

Bodewig joined Crowley in 1988 as assistant general manager of El Salvador, and was promoted to general manager in 1991. He also served as acting general manager of Guatemala for almost a year between 1997 and 1998. In 2001, Bodewig assumed additional duties as Director, Crowley Logistics El Salvador, S. A. de C.V., which is now Crowley Transportes El Salvador, S. A. de C.V.d.

Payload Pivotal to Fast Sealift Ship

By David Tinsley, Technical Editor

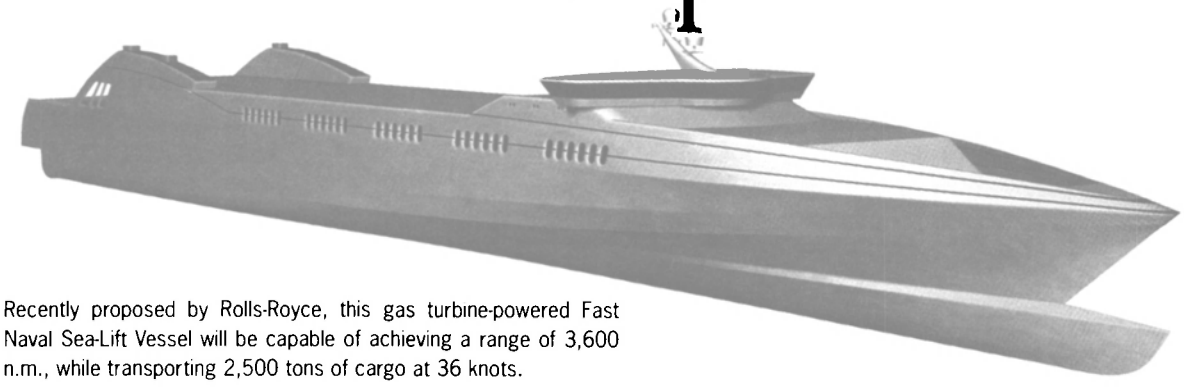
While catamaran and multi-hull vessel technology is increasingly being explored for its potential in high-speed military and logistical support applications, Rolls-Royce has unveiled a proposal for a fast naval sealift ship based on a monohull RoPax ferry design.

The impulse for developing a vessel type with that rare combination of exceptional speed and relatively high payload capacity originates from the changing emphasis in military support requirements, not least the deployment of rapid response forces to distant areas at short notice. The project has also been driven by a general trend towards faster combatants and the complementary need for a faster speed of back-up and replenishment.

The Rolls-Royce proposal entails a 4,000-dwt vessel of 581 ft. (177 m), capable of achieving a range of 3,600 n.m., transporting 2,500-tons of cargo at 36-knots. Short-haul operations, with a much decreased fuel volume, would allow shipment sizes up to 3,700-tons, in the case of sustaining a speed of 40 knots over 500 n.m. The comparatively high cargo capacity is not restricted by volumetric capacity, since the design encapsulates 1,800 lane-m for military vehicles and equipment.

The fast sealift vessel concept underscores Rolls-Royce's endeavors to transfer technology across its commercial and naval businesses. It offers a pragmatic solution to emerging military needs, with the cost and time benefits of using a commercial, off-the-shelf (COTS) design of fast ferry.

It is based on the P2500 RoPax series, formulated in the late 1990s by Nordvestconsult, one of two west Norwegian commercial ship design houses owned by the UK group. Although not built to date, the P2500 was originally developed in response to a Mediterranean ferry operator's project requirements, and the design was tank-tested and taken through the classification process. The parameters had included a speed of 42-knots, and dimensioning for 1,500-passengers plus 38 full-length trucks and 245 cars.



Recently proposed by Rolls-Royce, this gas turbine-powered Fast Naval Sea-Lift Vessel will be capable of achieving a range of 3,600 n.m., while transporting 2,500 tons of cargo at 36 knots.

As well as offering commercially acceptable operating costs at a service speed of 42-knots, the monohull form had been devised to produce favorable resistance characteristics at significantly higher speeds, to as much as 60-knots. The new, fast sealift ship design is also scaleable to meet individual customers' needs.

In the context of currently available, fast commercial designs, Rolls-Royce acknowledges that aluminum catamarans have already exhibited benefits with respect to the shortsea transportation of troops and equipment, and in littoral support. The capability to transport military personnel is a factor in their operational success. Such vessels are also inherently flexible and can even provide the opportunity to deploy forces directly on to a beachhead. "The catamaran vessels currently in naval use are, however, physically limited in size (around 120 m) and cargo capacity (just over 500 tons)," observes Rolls-Royce, adding that "Their size also limits achievable range and effective operation in high-sea conditions."

By contrast, the emphasis in the fast sealift proposal has been on maximizing deadweight at the requisite speed and endurance, while allowing navies to gain advantages in reduced production times, structural weight and build and operating costs by recourse to monohull technology bred in the commercial marine environment.

Through the Nordvestconsult P2500 project and also the group's joint work with Spanish shipyard and engineering organization IZAR on an innovative design of 37-knot shortsea freight carrier, Rolls-Royce has studied the relative merits of monohull, catamaran and surface effect ship (SES) forms for high-speed transport needs. Factors which were deemed advantageous in those projects, including deadweight to speed relationship, build techniques and cost, propulsive power requirements, cargo carrying layout, and seakeeping performance, held good in the selection of a monohull for the fast sealift concept.

The main structure would be in high tensile steel, with only the fourth and bridge decks to be fabricated from aluminum alloy. The monohull design is also considered to provide higher levels of damage stability, as flooding would occur symmetrically. By combining a wave-piercing bulbous bow with a monohull form, a longer waterline has been achieved with a very low angle of water entrance at the bow. This offers reduced resistance and minimized slamming, while producing better motions.

The nominated power plant comprises three of Rolls-Royce's newly-developed MT30 marine gas turbine, conferring a power concentration of 108-MW from less than 70 tons of installed prime movers. Propulsive effect would be delivered via Allen gearboxes through Kamewa waterjets. The MT30 is also central to the European High Speed Cargo Vessel(EHSCV) design developed by Rolls-Royce and IZAR.

The Chairman's Influence on Design

One of the most enduring business relationships has been reinforced by the Evergreen Group's decision to entrust construction of an extensive new series of post-Panamax containerships to Mitsubishi Heavy Industries. The project is distinguished not only by its scale, in calling for 10 S-class newbuilds of 6,724-TEU to be delivered between September 2005 and the end of 2007, but also by the adoption of the 'Greenship' design concept proposed by Evergreen chairman Dr. Chang Yung-Fa. Through its special attention to pollution prevention, the 'Greenship' approach calls for fuel oil storage to be protectively located within the athwartship bulkheads dividing the cargo holds. "We don't want fuel oil tanks to be located at the sides and at the bottom of the ships," commented Dr. Chang.

"If fuel oil tanks are located inside the hulls along the transverse bulkhead, damage to tanks and oil leakage incidents caused by grounding and collisions can be dramatically reduced," he added.

The new generation of 984-ft. (300-m) S-type vessels will become the largest ships in the Evergreen-owned fleet, stowing 15-wide rows of containers in the holds and carrying deck stacks in 17 rows. Promising a service speed of 25.3-knots from a 74,700-bhp Sulzer 10RTA96C engine to be produced by Mitsubishi under license, the series will be well-suited to the group's express liner operations between the Far East and Europe.

Evergreen's design move in eschewing the conventional practice of carrying heavy fuel oil for the main engine in the double bottom or hull sides gives added momentum to the industry's re-think of such arrangements in large containerships.

Recent months have seen the introduction into service of the first vessels in Mitsui OSK Lines program of Panamax containership newbuilds, in which the internal structure has similarly been used to provide bunker capacity.

The policy applied in eight vessels of around 4,600-TEU has meant that at least 50-percent of each vessel's total fuel capacity, sufficient for a 10,000-mile voyage, has been transferred from the double bottom to transverse bulkheads. Mitsubishi was assigned four of the new, 25-knot MOL class, while the other quartet was placed with IHI Marine United.

The Lure of the Electric Drive

By Stuart C. Karon and Dr. Swarn Kalsi, American Superconductor

In the September 2002 issue of Maritime Reporter and Engineering News, a detailed discussion was featured on the advantages of future High Temperature Superconductor (HTS) machinery for propulsion of electric drive ships. Since then, development of HTS ship propulsion motors has moved ahead — at a rapid pace — specifically in three areas:

- **Motors** A 5-MW 230-rpm machine for the U.S. Navy's Office of Naval Research (ONR) is undergoing factory tests. ONR is now funding the next step - design, fabrication and factory testing of a 36.5-MW 120-rpm machine to prove the technology at full-scale for warships.
- **Generators** Development of HTS generators has also leapt ahead with the initial production of 10-MVAR synchronous condensers for utility voltage adjusting service. These condensers are very similar in design and operation to 10-MW, 1,800-rpm generators.
- **Very large systems** HTS technology is particularly well-suited to high torque marine propulsion systems, and the small size, light weight, high efficiency and inherent quietness offer unique solutions to propulsion of very fast and very large ships.

While diagnostic devices using superconducting magnets are common in hospitals and some industrial applications, virtually all rely on low temperature superconductor wire that must be maintained within a few degrees of absolute zero to function. Commercially available high temperature superconducting wire, developed over the past decade at American Superconductor Corporation (AMSC), achieves superconductivity at temperatures up to 100 degrees above absolute zero, in the vicinity of the temperature of liquid nitrogen. While very cold by human standards, this temperature is easy and inexpensive to achieve and maintain. Commercially available refrigerator systems and straightforward insulation systems combine to make HTS superconducting machinery practical and affordable in any industrial setting, including ship propulsion.

Motors

AMSC and ALSTOM Power Conversion have teamed to design and build the Navy's 5-MW 230-rpm marine propulsion motor, now undergoing factory tests at ALSTOM's facility in Rugby, U.K. (see figure 1 below)

The HTS field coils on the rotor are cooled by a small quantity of helium gas, using commercial off-the-shelf Gifford-McMahon refrigerators, that is fed to the rotor through a rotating seal at the non-driven end on the far side of the motor shown in Figure 1. The refrigerator system used in this prototype motor has several times more capacity than is required for a 5-MW motor, and was purposely designed in this manner to demonstrate the refrigeration system required for a large marine propulsion motor. (see figure 2 below).

A brushless exciter power is used to energize the HTS coils in a manner analogous to conventional synchronous motors. This same circuit is also used to quickly de-energize the coils if needed in response to a system casualty or for machine performance monitoring. The stator is liquid-cooled for maximum power density. The motor is a six pole, 4.2kV machine, and has characteristics as outlined in Table 1 below.

Table 1

List of Parameters	Value
Geometric scaling from 25 MW	~0.7
Estimated weight	26 tons
Number of poles	6
Motor Outside Diameter	1.6 m
Motor length over end turns	1.6 m
Number of phases	3
Speed at full-load	230 rpm

Table 1: The US Navy's 5-MW HTS motor is approximately one-half the size and weight of a similar conventional synchronous motor.

Because of the very high magnetic flux densities provided by the HTS rotor coils, the stator requires no iron teeth to distribute the flux. A primary source of noise is thereby eliminated, and additional stator copper can be packed into the space formerly occupied by the stator iron teeth to further enhance the machine's power density. Other than their extraordinary advantages, AMSC's HTS motors are essentially common AC synchronous electric motors, and can therefore be driven by standard electronic motor drives. The AMSC 5-MW motor will be delivered to the Navy with an ALSTOM VDM 5000 commercial electronic drive system.

Preliminary 5-MW motor testing results confirm the motor's design basis. Efficiency is extremely high, as predicted. Other machine operating parameters are also as expected, including the performance of the HTS coils, the coil exciter, and the refrigeration system. Factory testing will be completed shortly, and HTS motors in the 5-MW size range will soon be available for commercial delivery.

Conventional motors of this size are already used in thousands of moderate-sized ships, of which more than 100 are powered by diesel electric propulsion systems. Among these ships in this size range are cruise ships, product and chemical tankers, RoRo passenger ships, cable layers and icebreakers. Each of these ship types, as well as many others, will benefit from the small size and weight of HTS motors, and any that spend a significant time operating at part load will also see a substantial gain in fuel efficiency.

The commercialization of HTS marine propulsion motors comes at a time when both naval and commercial ships are rapidly transitioning from mechanical to electric propulsion. The Navy recognizes the extraordinary capabilities of HTS technology to deliver (in small, light, quiet and affordable packages) the very large power warships require. It therefore recently conducted a competition for the design, fabrication and factory testing of a large HTS ship propulsion motor. This Navy solicitation set rigid requirements for a 36.5-MW motor's performance and physical characteristics, particularly weight.

An AMSC-led team won this competi-

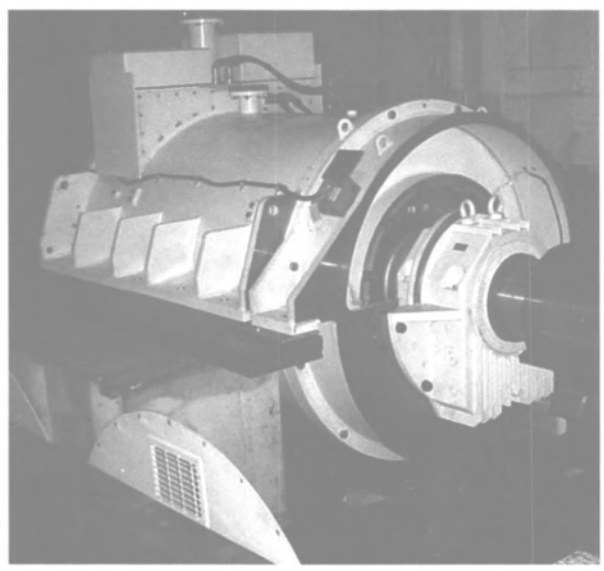


Figure 1 Variants of the HTS 5-MW marine propulsion motor will be available for insertion in new construction ships in 2005.

tion, has proven its HTS design algorithms and technology in the Navy's 5-MW program, and is now applying its HTS design algorithms and technology to the design and fabrication of a 36.5-MW (49,000-shp) 120-rpm motor. This motor is sized for the Navy's future DD(X) class ships, and its delivery is scheduled for spring 2006. The design effort is proceeding in accordance with the proposed schedule, and the program is on track to deliver the motor on time.

Generators And Synchronous Condensers

At the same time, AMSC has begun fabrication of a prototype for a 10-MVAR SuperVAR dynamic synchronous condenser (DSC) ordered by the Tennessee Valley Authority (TVA). DSC's ensure proper VAR levels are maintained in electric power transmission and distribution systems, thereby allowing the unimpeded flow of power through the lines and lowering costs. The SuperVAR machines are similar to 10-MW 1,800-rpm generators, and thus the production of these TVA machines is setting the stage for the future commercialization of HTS generators, both in marine and land-based applications. Like their motor cousins, HTS generators are smaller, lighter, and more efficient than conventional generators.

For example, a 36-MW marine generator and its support equipment will weigh about 40 tons and will measure less than 6.5 ft. (2 m) in diameter and less than 13 ft. (4 m) in length overall. Coupled with a GE LM 6000 or Rolls Royce MT-30 gas turbine (GT) at about 22 tons, a combined GT generator set will weigh only slightly more than 60 tons. These lighter and compact GT generator sets can now be located in a ship's superstructure, thereby minimizing the space requirements for the engine room and GT ducting.

Brian Ackerman, a marine propulsion consultant, recently evaluated this concept. He studied nine different diesel-direct drive container ships for the impact of a deckhouse GT generator set electric drive using conventional (and not HTS) generators. He estimated that the GT deckhouse system would make room for 4-16.4 percent more containers in the nearly vacant engine room, depending on the size of the ships. Ackerman further estimated that the added revenue from the container increase would pay back the greater first cost of the GT electric-drive and it's more expensive fuel in an average of 2.7 years, again depending on the specific ship. Ackerman noted that conventional generators control the weight of the GT generator sets and sometimes lead to arrangement problems at the higher ratings. With HTS generators, such difficulties will be ameliorated.

Very Large Systems

Ackerman's study also assumed electric pod drive in his analyses, which also maximized the revenue space made available in the former engine room. What he did not discuss was the difficulty that conventional electric drive or even direct diesel drive faces at very high power — the larger ships in his study need up to 77-MW of propulsion power, preferably in a single shaft for simplicity. This much power is not available with today's electric drive technology and is also problematic with direct drive diesels, currently the most common propulsion system in modern container ships. A recent issue of *Marine Engineers Review* suggests that direct-drive diesels may be reaching their practical size limit because of the vibration, heat stress and ship hogging they cause. Here again, HTS motors offer a solution. Because of the high

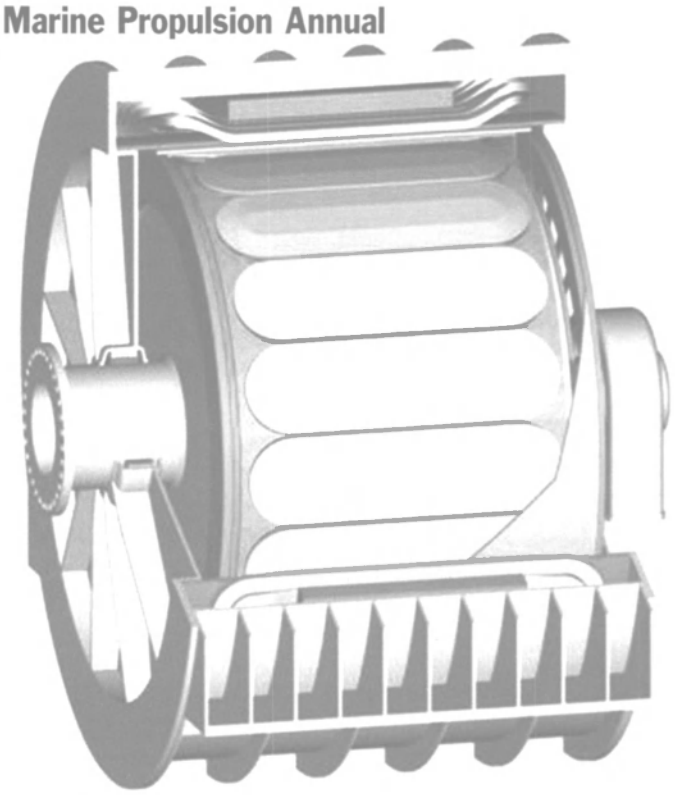


Figure 3 The 36.5 MW HTS marine propulsion motor uses technology validated in the U.S. Navy's 5-MW Motor and earlier developments.

flux densities and gap shear stresses generated by the superconducting field coils, HTS motors follow fundamentally different scaling laws than do conventional motors. HTS motors scale according to a 1/5 (0.2) power rule instead of the conventional 1/3 (0.3) power rule. This means that very high horsepower HTS motors are not much bigger than more moderate-sized HTS motors. For example, a 25-MW 120-rpm will be only 1.4 times dimensionally larger than AMSC's 5-MW HTS motor, despite having five times the power and ten times the torque of the smaller machine. Replacing the diesel with a gas turbine will remove the design limitations created by the diesel engine's great size and weight.

HTS technology also greatly improves today's electric ship propulsion systems. Consider the conversion to electric propulsion of the Queen Elizabeth 2 in 1987. The electric propulsion modification designers were constrained by the existing engine room layout and volume in which they could install, leading to the selection of two 44-MW 150-rpm synchronous pancake motors. Each weights about 400 cu. tons and measures about 29.5 ft. (9 m) in width and height and about 20 ft. (6 m) in length. Each motor is so large, and the ship's installation restrictions so severe, that each was built, delivered and installed in quarters — two half stators and two half rotors. The motors and the other ship's electricity needs are met by nine 10.5-MW medium speed conventional diesel generator sets with a total weight of more than 2,000 tons.

Conversion of the QE2 to electric drive was a remarkable achievement. The installation has worked well and the ship continues to operate today as the premier transoceanic cruise ship of our

time. But what would have been possible if HTS technology were available in 1987? An HTS 36.5-MW motor, developing the identical torque of the QE2 motors, 2.1 million ft.-lbs., would be very much smaller and lighter. Table 2 compares the pair.

Table 2

	QE2 Motor	HTS Motor
Torque	2.1 Mfp	2.1 Mfp
Weight	400 tons	<70 tons
Height	9 m	4 m
Width	9 m	4 m
Length	~6 m	4 m
Volume	486 cu. m.	60 cu. m.

Table 2: An HTS ship propulsion motor of equivalent torque rating to that installed in the QE2 will be less than 1/5 (0.2) the weight and approximately 1/8 (.125) the volume of the ship's currently installed propulsion motors.

The HTS motor would have been far easier to ship to the construction site and install. Further, because the HTS motor is an AC synchronous machine, it can be driven by any conventional synchronous drive, including the technology used on the QE2. Nothing new is needed here.

As to the nine diesel generators, three 36-MW GT HTS generator sets would provide more power, would weigh far less at about 210 tons, and could have been mounted in the superstructure to open up vast areas in the engine room for productive revenue-generating purposes.

Water jet drive motors for large, ultra-high speed ships are another attractive target for HTS technology. HTS GT generator sets located in the ship's superstructure and HTS electric water jet drive motors below may be an enabling combination for such ships.

HTS motor and generator commercialization is occurring at a rapid rate, prompted by the Navy's marine propulsion motor development contracts and TVA's order of five SuperVAR dynamic synchronous condensers, both involving AMSC. Earlier predictions of significant size and weight benefits, as well as greater efficiency, are being validated through these efforts. Further, no technology shortfalls have been revealed and none are foreseen.

The space, weight, efficiency and quietness advantages of HTS technology can translate directly into unique propulsion system arrangements and more revenue producing space in future passenger and cargo ships, as well as spawn the development of new ship designs of novel hull forms. The benefits to the maritime industry will be profound.

For more information
Circle 176 on Reader Service Card

About the Authors

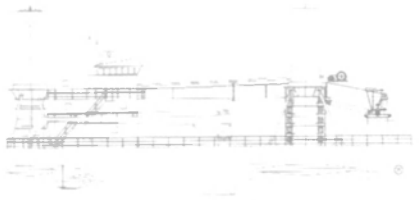
Stuart C. Karon *is Director, Government Programs and Director, Business Development for the SuperMachines Business Unit at American Superconductor. Formerly a U.S. Navy Officer and subsequently marketing & sales director in the commercial sector, Stuart is responsible for structuring effective government-funded R&D and system design/development programs, and for bringing about the business relationships necessary for the American Superconductor Corporation SuperMachines Business Unit to achieve its objectives. For more information, you can reach him at skaron@amsuper.com.*

Dr. Swarn Kalsi *is Director of Advanced Design for the SuperMachines Business Unit at American Superconductor. He has more than 35 years of directly related experience in all aspects of superconducting magnet technology and electrical engineering.*

Cat Power For Unique Boat

One of the most talked about crew/supply boats this year is a new 160 x 32-ft. (48.7 x 9.7-m) vessel designed by A. K. Suda, Inc. and built in Bayou La Batre, Ala. An innovative design, the vessel has no deep tonnage frames or tonnage openings and yet is certified by the Coast Guard as under 100 grt. Deep tonnage frames have long been used by boat designers as a way of excluding areas in the hull from inclusion in the 100 grt measurement — tonnage openings on the vessel's main deck are used in the same way.

The vessel has no watertight boundary between the engine room and the passenger seating forward and yet meets or exceeds USCG stability standards. There is no need for a watertight bulkhead on the main deck to get from one personnel area to another. A lower lightship with the same deadweight gives lower displacement and hence higher stability and speed for the same power - it is that simple. The 100 GRT volumetric measurement is critical because vessels that do not meet this standard cannot be classified as either Subchapter T or Subchapter K vessels. "Passenger vessels that are not Subchapter T or Subchapter K are more expensive to build and to operate because of increased manning requirements and other factors," said **Ajay Suda**, naval



Outboard profile of the new 130-ft. by 100-ft. lift boat, designed by A.K. Suda, which features Techcrane cranes.

architect. Suda is careful not to reveal exactly how he accomplished this design innovation, but he was very complimentary to the Coast Guard and to ABS. "Who gave this design a full review and in the end were satisfied that it met all of their criteria.

Most vessel designers know that tonnage frames have no structural value and simply get in the way," Suda added "To us they are an unacceptable compromise to good design."

"We simply used the rules that the Coast Guard and the classification societies developed and with a creative approach, we were able to save considerable amounts of aluminum," Suda added. "I may have pushed the envelope slightly on various applicable rules of the U.S. Coast Guard, but the design provided an equal or greater level of safety and strength than required by ABS and Coast Guard rules," Suda said.

The absence of tonnage frames in the hull means that tanks do not have the unnecessary obstruction caused by these frames making cleaning easier. No tonnage frames also means that crew accommodations can be larger. With a more spacious hull, passenger seating can now be on two levels.... in the hull and on the main deck. A total of 81 passengers can be accommodated as well as 10 crewpersons in larger, more comfortable quarters. Four Caterpillar 3512 DITA engines generating 1,575 hp each power the vessel; ZF gears transfer this power to propellers.

Lift Boat Tech

A.K. Suda also designed an innovative lift boat which is currently under construction, a 133 x 100-ft. (40.5 x 30.4m) lift boat with an 11-ft. (3.3-m) deep hull. The vessel is being built for C. S. Liftboats in Erath, La. Once again, Suda was able to bring the vessel in at less than 100 GRT without tonnage frames. The lift boat has 240-ft. (73.1-m) legs that can work in up to 180 ft. (54.8 m) of water. The deck area totals 8,300 sq. ft., about 50 percent of which can be used for variable loading. Loading for the cargo deck is 800 kips and the main deck loading is 400 psf. A pair of Caterpillar 3508B diesels, rated at 960 hp each, powers the vessel. Service power comes from three Caterpillar 3412 gensets, each rated at 175 kW. The vessel has accommodations for 42 persons in the hull of the vessel. Once again the absence of deep tonnage frames eliminates unnecessary weight. Classified by ABS, the vessel mounts two cranes — the main being a Techcrane Model F200-100 that can lift 100 tons at 30 ft. — the auxiliary an EBI Model C30-60 with a capacity of 17 tons at 10 ft.

Steyr Comes to U.S.

The 246 Steyr

Austria's Steyr Motors is aiming to make its mark in the U.S., as it has struck an agreement with Stewart & Stevenson to sell its modern, high-tech, lightweight marine diesel powerplant here. Steyr also forged a relationship with Mercruiser, with kits offered for Bravo I, II and III stern drives. The diesel line had its genesis with the Steyr-Daimler-Puch auto group and can now brag about an 80-year history of engine development for civil, military and marine uses. Steyr's monoblock high performance alloy material, and lightweight components are designed to provide a very favorable power to weight ratio. The 246 Steyr is a six-cylinder inline diesel, using an electronically controlled engine management system with two-stage direct injection.

Circle 56 on Reader Service Card

New BEB's Fitted With Ultra Dynamics Waterjets

The UltraJet 305

TACOM placed a recent order with the U.S. Coast Guard to renovate their fleet of Bridge Erection Boats (BEBs).

The renovation included new Cummins engines powering UltraJet 305 waterjet units via ZF gearboxes, and upgraded electronics package, hydraulically operated haul-in system to lock and secure bridge sections and additional amenities such as cab heaters and seating.

Circle 12 on Reader Service Card

NVA Orders MAN B&W Engines

German owner, NVA, has ordered 2 + 2 electronically controlled MAN B&W 12K98ME-C engines to power 8,400

TEU containerships. Each engine, which will be built by HSD in Korea, will be able to power an 8,400 teu containership, which measure 1,099 x 140 ft. (335 x 42.8 m). The ships are to be built at Daewoo in Korea with MAN B&W Holeby GenSets, type 7L32/40.

Circle 12 on Reader Service Card

MAN B&W Flexibility With Two Strokes

Long term service experience has confirmed the effectiveness of the inherent design measures embodied in MAN B&W Diesel MC/MC-C and ME/ME-C two-stroke engines for direct coupling to controllable pitch propellers (CPP) or de-clutchable propellers.

Ensuring operational flexibility and high safety margins, the CPP installations featuring MAN B&W two-stroke engines with bore sizes up to 70 cm, are customary for tankers deployed in offshore loading or where ice class is demanded. Such a propulsion plant often embraces a shaft generator, usually, a simple synchronous generator requiring a constant engine speed to deliver electrical power or a generator capable of delivering constant frequency power at varying engine speeds.

Crosshead bearings show a significantly different load pattern when operating in the full speed-idle load mode. At the full load condition (100 percent engine load and 100 percent engine speed) the bearing load mainly points downwards, thus creating high oil film pressures in the lower shell of the crosshead bearing.

All sizes of MAN B&W two-stroke engines may also be specified for plants in which the propeller is de-clutchable. In these installations, the engine can be operated for power generation at full speed with the propeller de-clutched at loads from 0 to 100% for prolonged periods. MC/MC-C and ME/ME-C engines applied in these plant configurations are designed for continuous operation in a flexible load range.

By far, the most complex assembly to analyze is the main bearing cap in the bedplate. An important step is evaluating the contact pressure between the bearing shell and the bearing saddle, this pressure distribution being calculated during assembly when the main bearing caps are tightened. Controlling the contact pressure distribution is crucial in avoiding fretting of the back of the bearing shell.

In other steps of the analysis, contact pressure distribution is superimposed with the variation in contact pressure distribution originating from the various running conditions. The full speed-idle load mode is naturally of special importance, as this running condition requires the most attention in avoiding bearing shell back fretting.

Crosshead bearings show a significantly different load pattern when operating in the full speed-idle load mode. At the full load condition (100 percent engine load and 100 percent engine speed) the bearing load mainly points downwards, thus creating high oil film pressures in the lower shell of the crosshead bearing.

Much effort is being directed towards achieving optimal conditions with respect to load-carrying capacity and oil film build-up in this highly loaded bearing.

In the full speed-idle load mode, however, the upper shell of the crosshead bearing participates in the load-carrying process.

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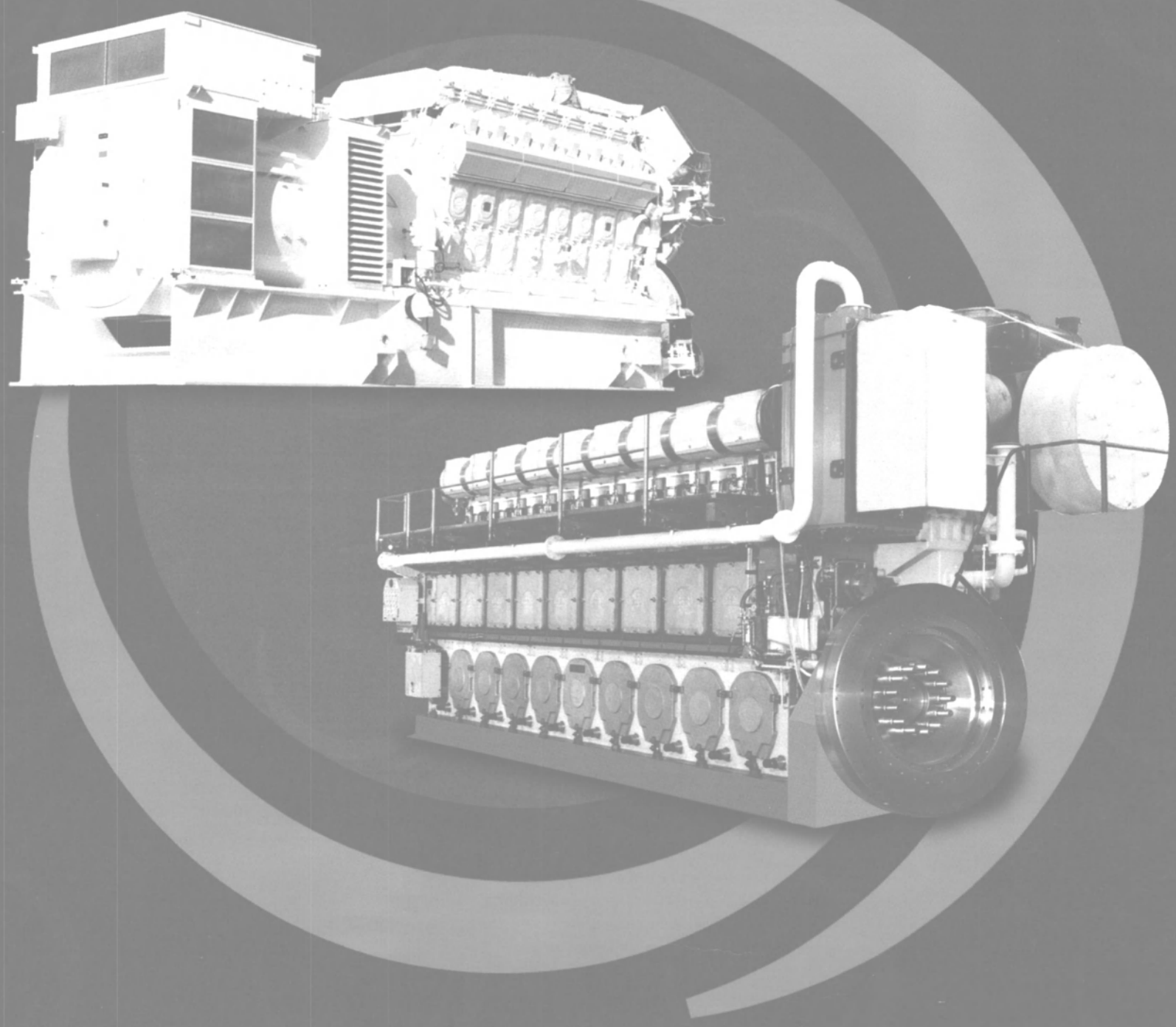

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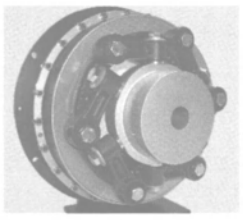
Circle 288 on Reader Service Card

Centa Leads the Way with Centax CX-L

Centa Corp., Westmont, Ill. has seen considerable growth in the use of its CENTAX CX-L series torsional couplings for marine propulsion drivelines. The company's CX-L coupling uses a set of specially designed link arms between the rubber torsional element(s) and the output hub that allows for large axial and angular misalignments, thus making it a unique solution for applications where the engines and/or transmissions are on soft mounts or for applications where significant hull flex is present.



Circle 183 on Reader Service Card

Siemens Promotes Fuel Cell Power

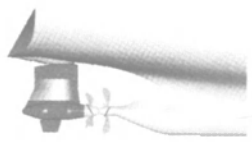
Siemens Industrial Solutions and Services Group (I&S) received an order from HDW Fuel Cell Systems GmbH (HFCS) to supply a transportable 160 kW fuel cell system for emission-free power generation on ships. The system is housed in a container, which allows it to be brought onboard for demonstrations and tests, and to be seamlessly connected to the ship's power supply. It is scheduled for delivery in spring 2005. Siemens will install the complete system in a 20-ft. transport container so that it can be made available for potential users for testing. In addition to four fuel cell modules manufactured by Siemens with a gross output of 40 kW each, the container accommodates all the process engineering and electrical engineering systems needed for operation, control and monitoring, as well as a converter, which adapts the electrical energy generated so that it can be fed into the ship's power system.

Circle 191 on Reader Service Card

Unique RoPax Ferries

Mitsubishi Heavy Industries was tapped by Shin Nihonkai Ferry Co. to build a pair of large, high-speed RoPax ferries, innovative concept vessels with a single-shaft system that is the combination of contra rotating propellers (CRPs) and a pod drive unit. The 17,000-gtships are due for delivery next June.

They will measure 736.5 x 85 ft. (224.5 x 26 m) and will have a maximum speed of 31.5 knots. They will be outfitted with a steerable Azipod unit from ABB Azipod, installed in a contra-rotating mode aft of the mechanically driven main propeller. The intent: the power of a twin screw installation with far higher efficiency.



Circle 190 on Reader Service Card

Trials Begin on Unique Maneuvering Aid

The SEA-AHED — the merciful acronym for Simulation Environment and Advisory System for On-board Help, and Estimation of Maneuvering Performance During Design — was scheduled to be installed onboard P&O Princess Cruises' Golden Princess for trial this summer. The trial is a three year project funded by the European Commission Competitive and Sustainable Growth Program, which unfortunately does not have a snappy acronym. The purpose of SEA-AHED is:to allow a ship's maneuvering characteristics to be determined very early in the design process; to develop a nav aid displaying, in real time, a vessel's current position together with a future position, predicted or simulated., and to develop a maneuvering training aid which allows crews to replay previous maneuvers.
For additional information, contact Rory Doyle at BMT, roryd@bmtech.co.uk

"Ink" It In: WMTC a Must for Maritime Professionals

"BLINSKEY, HERE, WILL NOW READ HIS PAPER ON SHIP VIBRATION CONTROL."

Co-chairmen of the WMTC technical committee, Admiral **Robert E. Kramek**, (left) (USCG retired), President and COO, ABS Americas, and Dr. **Henry S. Marcus**, Professor of Marine Systems in the Ocean Engineering Department at the MIT, guarantee that the WMTC in San Francisco will be an international and worthy event.

By Greg Trauthwein

Mirroring the metamorphosis of the globalization of the marine industry and seeking to stake a leadership claim atop the marine technology information heap, the World Maritime Technology Conference & Exposition will bring together the world, both literally and figuratively, in San Francisco in late October. Set in historic San Francisco and scheduled for October 17-20, this meeting is being hosted by the Society of Naval Architects and Marine Engineers (SNAME) but as the "World" in its title belies, includes participation from around the globe, tapping the expertise of professional marine technical organizations from 11 countries.

"This is the largest assembly of 'who's who' in naval architecture, marine engineering and ship production that we have ever had," said Admiral **Robert E. Kramek**, (USCG retired), President and COO, ABS Americas, and co-chairman of the conference's technical committee, with Dr. **Henry S. Marcus**, Professor of Marine Systems in the Ocean Engineering Department at the Massachusetts Institute of Technology.

The conference is designed to make itself relevant to a broad spectrum of the modern maritime industry, as hundreds of papers on nearly every topic are set for discussion in San Francisco. "From the perspective in someone interested in design, construction and operation, there is nothing like this in the U.S.," said Dr. Marcus. "There has been nothing like this."

The conference papers are divided into four major categories:

- Ship Operations (major security, safety, quality);
- Design & Technology (major emphasis on innovative naval design and commercial projects);
- Ship Production (there will be 29 papers with views on Ship Production from U.S. and International Yards); and
- The role of Marine Technical Societies in Meeting Industry Challenges in the New Global Economy (categorical papers on risk assessment and a very healthy Offshore Design sector).

(A full, updated listing of the conference schedule will be available on www.worldmaritimetechnology.org).

A Meeting of Minds

The World Maritime Technology Conference is planned to be a regular event, held every other or every third year

Get More Information

For additional details on attending this year's World Maritime Technology Conference & Exposition, October 17-20 in San Francisco, visit **www.worldmaritimetechnology.org** or contact SNAME HQ: Eileen Romanelli, tel: (201) 798-4800; fax: (201) 798-4975; or e-mail: eromanelli@sname.org

(SNAME, it should be noted, will continue to hold its Annual Meeting and Exposition). Admiral Kramek explained:

"There isn't a major ship built in the world today that does not include the U.S., Europe and Asia. We find ourselves cooperating globally like never before, but we've never gotten together like this before. There is a cry (from the major maritime organizations and flag states) for more standardized cooperation and rules, and this conference is a big step in that direction."

He described the U.S. as "host" of the inaugural event, and envisions a traveling conference hosted by fellow naval architecture and marine engineering technical societies in subsequent years around the world. Supporting its international feel is not only a roster of technical presentations from around the globe, but two noted maritime leaders fulfilling highly visible speaking roles: **William O'Neil**, Secretary General of the International Maritime Organization will serve as the keynote speaker, while **Choo Chiau Beng**, Chairman and CEO of Keppel FELS, is the (invited) featured banquet speaker.

The process of building ships today, particularly large offshore structures is indeed an international venture, with a vessel designed in the U.S. built in Korea and outfitted in Europe, for example. "Look at the last 20 years," said Dr. Marcus. We have evolved from an environment where class societies, shipyards and countries must compete tooth and nail, to one with a changed attitude, where cooperation and information sharing is more common.

Admiral Kramek concurred, noting for example that Keppel FELS is "like the United Nations of shipyards," with 18 facilities around the world, including AmFels in Brownsville. "We're starting to see something new; shipyards in one country are cooperating with shipyards in another to improve quality." He singled out Kvaerner Philadelphia as a shining example, as it evolved from a shuttered naval facility to one of the most modern shipyards in the country.

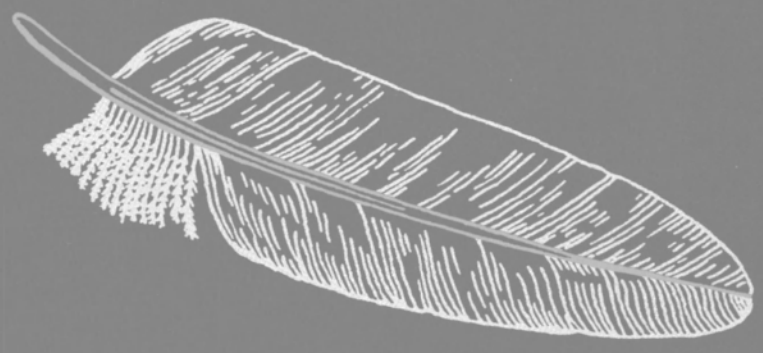
Technology Leads the Way

The marine industry is often saddled with the stigma that it is behind the curve technologically, which could be a factor, albeit very small, in the attrition of young engineering minds and bodies to other industries. Dr. Marcus reasons that when companies build assets that cost tens of millions of dollars and are designed for a 25+ year lifecycle, it is prudent to not always be the trying ground for new technologies. Admiral Kramek, however, dispels the notion, citing several examples in the process.

"I don't agree with that premise," he said. "Today we are designing and building LNG and CNG carriers with the highest quality stainless steel production technology, ship designed to carry LNG at temperatures -140 degree C. Just think, also, of the tremendous advances in containerization. Just 50 years ago, we were just starting to think about containers; today we are building and operating 8,000 TEU ships, and at the conference, we will be talking about 12,000 and 14,000 TEU ships.

I had a professor years ago at Michigan, and every day he would remind us about risks in the maritime area. There are great risks in making quantum leaps in technology in (this) environment. I do not think that we are risk averse, I think we are careful because failure (in our business) is so significant.

It's not hard to explain why it's so easy to opt for Geislinger:



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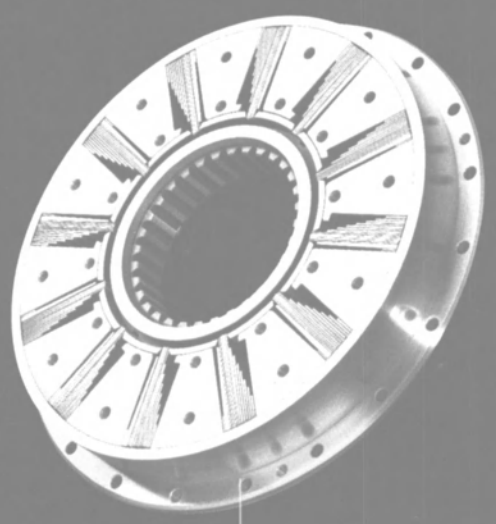

COUPLINGS AND DAMPERS. BUILT TO LAST.

GEISLINGER

Guido Perla: Colombian Born, American Made

***Guido Perla** has always had a love of the sea. Perla, who was born and raised in Barranquilla, Colombia, came to the U.S. in 1971 to pursue his dream of using the "tools" he was given to become a naval architect. His story is one that is marked by innovation, relationships and hard work. — By **Regina P. Ciardiello**, managing editor*

Guido Perla's philosophy on naval architecture and marine engineering — on life — is easily summed up: "I always follow what my father used to say," Perla said. "It is better to be wrong than to be average." Perla is not shy to admit that he's not always perfect, but that does not mean that he will not try and try again until he achieves perfection. "You don't learn anything from sitting around and doing nothing," Perla quips. "You learn from making a move and taking risks. When we came into this world, we were given a brain, hands, eyes and a body - they are tools," he continues. "You can do anything you want with these tools - you can put them on a shelf and leave them there, or you can grab your 'tools' and try."

While Perla admits that he strays from traditional, stock designs, there are some in the industry that are afraid to take these risks, or are maybe just content with traditional, conventional designs. While he's not advising that owners and operators should abandon tradition for experimentation, he's simply suggesting that some may benefit from as he puts it: "just wanting to stay on the continent rather than going across the ocean," or some may not. But, according to Perla, "if you don't try you'll never learn how to make it (the vessel design) better." Not that Perla is trying to play the role of the preacher of technology to the marine industry; he's simply advising that you have to at least make an attempt. "I'm not trying to insult anybody," Perla says. "But there are shipyards that have fully embraced technology and are doing great, some have even improved a lot in the last 10 years. Then there are others who have just not done anything."

"I owe the credit to the beginning of GPA to Peter Schmidt, the owner of MARCO who gave me my first job. The day we signed the contract is the day that I consider the start of GPA."
• Guido Perla •

Perla does however acknowledge that technology as a whole is becoming more widely accepted in the marine industry in the last 10 years - even among those groups who were unofficially labeled as "traditional" and/or "cautious" companies. He does warn, however, "I have also seen companies spend millions of dollars on technology and go bankrupt."

"It's (technology) a tool, and if you don't utilize it the right way, it doesn't matter how much money you invest or how much you believe in the project - you need to make it work for you," he says.

Go West Young Man

Born and raised in Baranquilla, Colombia to Italian parents, Guido Perla had an interest in anything that had to do with boats and ships. On the water, at any free moment, Perla formed his love for two modes of transportation — ships and planes — an early age. Perla, who often went sailing near his home on the Caribbean Sea, often dreamt of taking his love of vessels into a profession where he could create and design them. Unfortunately though, Perla's dreams were at first squelched when he realized that no institutions of higher learning in his native country offered courses of study in naval architecture or marine engineering — unless he joined the Colombian Navy. Rather than give up his civilian life, Perla decided to divert his interest towards mechanical engineering instead. During his course of study, Perla landed a job at a local Colombian shipyard, UNIAL S.A., and while there he found his niche — and luckily so did his boss at the shipyard. According to Perla, the owner of the yard cut him a deal that would allow him to travel to the U.S. to live out his dream. But his were plans put on hold when the shipyard workers decided to strike. Luckily a rival area shipyard, Astilleros Magdalena, S.A., which was in need of a naval architect, knew of Perla's familiarity of the marine industry and made him a similar offer. At the urging of his boss, Perla left his native country bound for the U.S., to pursue a degree in naval architecture and marine engineering at the University of Michigan.

It was not smooth sailing for Perla however. At the end of his first term at Michigan, the shipyard that had backed him went broke — leaving him with no tuition money. Undaunted, he found that he was eligible for a scholarship that would cover his next term's tuition. But not before, as Perla says, "immigration got in the way." Since he was not an American citizen, the University deemed he was not eligible for the scholarship unless he had a sponsor. Therefore, it came down to finding a sponsor or leaving the U.S. Ironically, he contacted the original shipyard, which by now had resolved its labor issues. His former boss offered Perla the same deal they had shaken on the year before on the condition that he would pay the yard back after he graduated.

It was also during his time at the University of Michigan that Perla not only found his niche in naval architecture, but found love as well with another student, **Karen Olsen**, who became his wife in 1973, after graduation.

Since Perla had fallen in love with both the U.S. and his wife, he had no intentions of returning to his homeland, so he began interviewing at various shipyards for positions as a marine engineer. He landed his first job at the now-defunct Jacksonville Shipyard. And in 1975, Perla headed west to a small town just north of Corpus Christi, Texas where he took a job designing OSVs and shrimp boats. While he was happy that he was doing what he had set out to do, Perla wanted more, so he and his wife traveled with their two small children, **Bianca** and **Guido, Jr.**, in 1977 to

GPA has provided Rigdon Marine LLC with the design for ten state-of-the-art GPA 640 platform support vessels (PSVs) to serve the Gulf of Mexico shelf and deepwater production markets. The 210-ft. (64-m) vessels, currently under construction at Bender Shipbuilding and Repair.

All-American - GPA recently (in partnership with Lockheed Martin), provided detailed design and engineering support for R/V Kilo Moana, a 185-ft. SWATH (small waterplane area, twin hull) oceanographic ship, which is owned by the Naval Sea Systems Command and operated by the University of Hawaii. Built by Atlantic Marine.

For Crowley Maritime's subsidiary, VMS, GPA provided preliminary, contract and detail design of the Alert, Attentive and Aware, all ABS classed and USCG inspected, for service in Alaska. Propulsion is provided by two Caterpillar 3612B diesel engines driving two Kamewa Aquamaster US 5001 Azimuth Z-drives.

the Pacific Northwest to take advantage of what at that time the booming fishing industry. After several rounds of interviews, Perla received offers from most, but there were two that had the most impact. One was the position offered by **Joseph Martinac, Sr.**, owner of JM Martinac Shipbuilding in Tacoma, Wash. — a yard that specialized in Tuna Seiners; the other from **Peter Schmidt**, the owner of MARCO Shipbuilding in Seattle, Wash. Perla chose to work for Martinac, as they were known for their innovative designs of Tuna Seiners. "They (the Tuna Seiners) were sleek, good looking boats and I wanted to design them," Perla says. "So I went to work for Joe (Martinac)."

After etching a name for himself at Martinac, Perla was tapped again by Schmidt of MARCO, who had just purchased Campbell Shipyard in San Diego, Calif. He wanted Perla to design a Tuna Seiner, but there was one catch, there was no tele-commuting involved, which meant Perla would once again have to pack up and move his family down the Pacific coast. Not wanting to forego a valuable opportunity, he proposed to work for Schmidt on a consulting basis. Schmidt however was not interested. "We don't hire consultants, Schmidt had told Perla. "We do everything in-house." Two weeks later, though, on December 28, 1979 to be exact (the day is also Perla's wedding anniversary), Schmidt called Perla with an offer that he couldn't refuse. "He (Schmidt) called me and said, 'Do you want to be in business?' Perla said. "And I said yes I would." Schmidt then told Perla to "name his price," which he did, thus beginning the evolution of Guido Perla & Associates, Inc. (GPA), with the agreement that Perla would design a 300 LT vessel simply named what its function was: "Tuna Seiner," for Schmidt for construction at Campbell Shipyard. "I owe the credit to the beginning of GPA to Peter Schmidt, the owner of MARCO who gave me my first job," Perla said. "The day we signed the contract is the day that I consider the start of GPA."

A Hand Shake

That is how, Perla admits, most of his deals have been sealed since establishing his company in 1979. While GPA has weathered the ups and downs of the marine industry and has still always managed to come out on top.

There is not one specific project that Perla could say he gained the most satisfaction from, rather he has taken each project and treated it as an individual accomplishment, each with a different meaning for different reasons, most of which are the valuable relationships that he has established with clients. "I approach jobs not because of business, but through relationships," Perla says. "Every project that we take at GPA I go for because I like the person, I like their philosophy and I like their approach and ideas.

I don't ever take a job because of the

amount of money I'll make, or because it's a large high-profile project," Perla says. "I take jobs because the only thing you have left after every project is the relationship you have with your client — money comes in and out and is forgotten quickly."

Perla shapes each project as a reflection of the person of whom he is working with, rather than just formulating a design on paper. Therefore, he tries to tailor each design based upon the specific person he's dealing with. The word "stock design" will more than likely never be uttered through the offices of GPA. "When I design a boat, it is like fitting a suit for this person," Perla says. "I will do a certain boat a certain way because the look of the boat and the operation of the boat fits that person.

It's for the satisfaction of giving to that person that boat, just to know that you have put your feelings into it. That is the only thing I will take when I die," he continues. "I could talk for hours about every project that I have worked on, and each would have a different story."

Perla admits though that the industry has changed over the years in terms of negotiating the deal. It used to be where he could have a conversation with his client about an idea for a project that would include just a handshake and parting words of confidence — specifics would be discussed later. But, Perla says that this practice is becoming more difficult to do with shorter schedules and rising taxes and insurance costs, which have given way to thick contracts. With operating costs already on the rise, Perla is finding that more of his dollars are being spent on legal fees. Aside from the financial burden, Perla finds it frustrating that this type of business is replacing the heart and soul of the deal. "Sometimes I feel that this industry is being drowned by lawyers, that there is no dialogue anymore," he says "It's just two businessmen sitting together and working something out - two lawyers trying to stretch their paychecks as long as they can. That's the part I don't like, that we are being dominated by the legal business."

But not all of his clients are being forced to turn this way - and still there are a few that have managed to leave the attorneys behind. "Fortunately, I have clients where we can still sit down at a table and work things out without the lawyers," Perla says.

Technology on the Rise

Perla finds technology has simplified much of his work as a marine engineer and naval architect. The biggest change has been the use of computers," Perla says. "They have simplified quite a bit of work in the calculations of things such as stability and propulsion, which were customarily a very tedious process.

Before the advent of CAD/CAM technology most drawings were presented through 2-D images, which according to Perla was sometimes difficult to conceptualize on a 3-D object. "We used to use 2-D, but this was difficult, especially for someone like me who likes things to look in proportion and pleasing to the eye," he says. Just a year after the start of GPA, he was instrumental in introducing CAD/CAM to small shipyards. He went on to develop NC (Numerical Control) tapes that would enable small- and medium-sized yards with the ability to burn steel. Customarily a practice that had been available exclusively to larger shipyards, Perla created a program that would produce NC tape via Auto CAD that was available to the smaller shipyards. "In my opinion, the core to shipbuilding in America are small- and medium-sized yards," he says. "They keep the biggest amount of movement and production in the U.S."

However, even with this new technology available, the yards did not have the expensive machines that were used to cut the steel. This didn't last however, as a deal was made with the steel manufacturers who would, using Perla's program, cut half the steel for the shipyards. "The breakthrough was being able to go to the steel company and say, 'Can you cut this part and deliver it to the shipyard,' that was when things started," Perla says. "For me that was a big achievement - that I was able to contribute to this technology for the small shipyards."

The first GPA-designed vessel created with this new computer lofting was F/V Starbound, a 240-ft. (73.1-m) Factory Trawler built for Aleutian Spray Fisheries by Dakota Creek Industries. With many of these yards, such as Bender Shipbuilding & Repair, Nichols Bros., MARCO and Dakota Creek using Perla's technology, he has found that he has become a victim of his own success. "Bender is one of my original clients," Perla says. "I must have done too good of a job, because now they do all of the steel cutting themselves. For many years I did the development of all the construction and engineering for them, even NC tapes, but now they have their own engineering staff."

This was not always the case however. When Perla started GPA in 1979 the marine industry was down, not an ideal year to start a business. The fishing industry was drying out and with the exception of defense work, most other areas of the marine industry were headed toward a downward spiral. Perla stepped in. "One of the reasons I started my company in 1979 was with the idea to provide design and detailed construction engineering to the shipyards," Perla says. "Now we are spending a lot more on the engineering than we used to say, 10 to 15 years ago. What I have found is that for every hour of engineering you spend you are saving a minimum of five times that on the production process; the engineering is the thinking."

But with skilled engineers also comes the craftsmanship of the shipyard workers to ensure vessels are produced cheaper, faster and better - a team effort, which Perla notes can be broken down in one simple function - weeding out and laying down new roots. "Imagine you are going through a jungle, the engineers cut the trail, while the production people follow behind planting," he says. "Neither one can do the job without the other."

On the operations side, Perla has observed that many innovations that many companies were afraid to employ on their vessels are now becoming the norm, such as diesel electric and Z-drive propulsion, which are exemplified through two ground-breaking design attributed to GPA; the series of three PRT Class (Prevention and Response) 140-ft. (42.6-m) Z-drive, tugs, which were constructed by Dakota Creek for Crowley's Vessel Management Services - and Kilo Moana, a 185-ft. (56.3-m) SWATH oceanographic ship - owned by the Naval Sea Systems Command and operated by the University of Hawaii. This vessel was designed by GPA in partnership with Lockheed Martin and built by Atlantic Marine with a fully integrated electric drive system.

Regardless of how you route your voice communications, SeaWave helps manage your costs more easily than ever before. SeaWave's Least Cost Routing automatically finds the best available rate for all calls placed on board your vessel. Furthermore, SeaWave virtually eliminates administration associated with your communications investment by preparing a comprehensive and understandable billing statement that may be viewed on board the vessel, sent to payroll or invoiced directly to each user – SeaWave saves you time and money.

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Thrane & Thrane Offers the Capsat Fleet33

Thrane & Thrane now offers the TT-3088A Capsat Fleet33, a product which the company dubs the smallest, lightest maritime Fleet terminal ever. The new terminal completes Thrane & Thrane's previous introductions of maritime high-speed terminals, the Capsat Fleet77 and the Capsat Fleet55.

The Capsat Fleet33 comes with a very small and compact antenna, measuring just 35 cm in diameter, and a weight of only four kg. With the new terminal, packet data services and worldwide telephony becomes available for vessels, who otherwise never considered an Inmarsat terminal due to the terminal's size, weight, and cost. The new terminal provides users with an integrated 9.6 kbps fax and data service within the

Inmarsat spot beam area. Also, it is prepared for the Mobile Packet Data Service (MPDS) planned for introduction in the beginning of 2004. MPDS allows users to remain always connected since charges are made only for the amount of data sent and received rather than the time spent online. MPDS is therefore an ideal solution for e-mail, web and intranet access. Thrane & Thrane's Marine Sales Manager, **Kim Bille Gram** said. "Imagine being a long way from your port of call, perhaps several days outside of cellular phone or VHF coverage, and still be able to go on the Internet to get up-to-date precise weather information, send and receive e-mails or simply make quality phone or fax calls. Capsat Fleet33 does all that and more in an unprecedented compact form."

Circle 181 on Reader Service Card

SeaWave Family Designed

for Ease of Use

SeaWave LLC's family of products include voice and data marine communications, weather, tracking and billing. SeaWave Integrator 3.0 and SeaWave Navigator 2.0, the core of the marine communications suite, include both hardware and Microsoft Windows-based software. Both products use Throughput Technology Software (TTS), which combines a light application interface with superior data compression, state-of-the-art signal processing, auto connect and Automatic Link Establishment (ALE).

SeaWave Navigator 2.0 is an HF/SSB-only product able to obtain transfer rates similar to some satellite systems for a fraction of the cost. The software continuously scans available HF frequencies during periods of inactivity. When a communication task is initiated, the sys-

tem automatically tunes the radio to the optimal frequency to route e-mail and download forecast information so it is waiting on a PC, much like a land-based system. Available in any combination of Satellite, Cellular GSM and HF, externally, SeaWave Integrator 3.0 can support Inmarsat B, Fleet 77 & 55, with others slated to be supported shortly. SeaWave Integrator also employs Least Cost Routing (LCR) technology to automatically find the least expensive means to send and receive data. Ship location, signal quality, available mediums, message size and other factors all play a role in LCR. SeaWave makes it easy to bill for usage, since traffic is measured for each user as it passes through the Integrator. The end result is a consolidated and easy-to-read hotel-style invoice. SeaWave can also reconcile the charges from different satellite carriers into an advanced billing system. Subscribers can either have a direct billing relationship with SeaWave, or the vessel can cover the cost of the account. Users can sign up for SeaWave service while onboard and underway with little involvement from the ship's key operator. SeaWave is also a launching pad for value added applications such as STAR (Ship Tracking and Reporting). Using STAR software, users may track their vessel or fleet at predetermined time intervals, read reports filed from the ships along with their GPS coordinates and even overlay weather information to impart conditions the captain encountered while at sea. Time slice animations show a ships course and can be compared to an intended course.

STAR is currently available at no charge to all SeaWave customers in mySeaWave, a land based portal providing worldwide access to e-mail, tracking, weather, news and billing information. mySeaWave also provides users a means to check usage, past invoices, change payment method, passwords, vessel call sign and more. A desktop version of STAR, which includes weather overlay, will be available in the Q4 2003.

Circle 188 on Reader Service Card

PGS Geophysical Renews With Telenor

Norway's PGS Geophysical renewed its global satellite communications agreement with Telenor through June 2005. The current agreement calls for Telenor to continue to provide its fully managed Sealink service to a PGS Geophysical fleet of 14 high-tech 3-D seismic vessels operating around the world. PGS Geophysical acquires, processes, markets, and sells high quality seismic data worldwide. Oil and gas companies use this data to explore for and develop new hydrocarbon fields, and to manage fields in production.

The Sealink system provides corporate voice and high-speed data communications, at speeds up to two Megabits per second, essentially extending PGS's corporate network to all of its vessels. All vessels are connected to a PBX network providing on-board offices with immediate direct dial access. The Sealink solution is an essential business tool enabling PGS Geophysical to rapidly and efficiently gather, process, and disseminate research information to its customers. Sealink recently inaugurated the Sealink Prepaid Calling Program. Prepaid scratch cards are available to companies for resale to crewmembers, clients, and passengers. The prepaid cards can also be easily recharged through the Internet.

Telenor Upgrades Global C Network

Telenor Satellite Services upgraded its

Inmarsat C ground network and has begun transitioning all of its Inmarsat C services to the company's earth station at Eik in Norway. As a result of re-engineering its network, Telenor has standardized the capabilities of its system, making Inmarsat C a seamless, state-of-the-art suite of services, designed for ease-of-use. In addition to basic messaging, Telenor's Inmarsat C is a primary communications tool for fleet management, Homeland Security and maritime safety, and Supervisory Control and Data Acquisition (SCADA). The service provides reliable data satellite communications for users on land, at sea, and in flight.

Circle 187 on Reader Service Card

Nera F55 Terminal Gets Inmarsat Type Approval

Inmarsat granted full type approval to the new Nera F55 maritime communication terminal. Tailored for small to medium-sized vessels, the product completes Nera's family of Inmarsat Fleet communication solutions.

"The terminal is authorized for use and is available in all markets where Inmarsat operates," said **Terje Ask Henriksen**, president of Nera SatCom. "The F55 completes Nera's family of Inmarsat Fleet solutions, which makes "always on" connectivity available to vessels of all sizes, anywhere."

The Nera F55 is designed to be a flexible maritime communication solution targeted at the wide range of small and medium-sized vessels, from the coastal fleet and supply ships to coastguard vessels and larger yachts. The F55 joins F77, intended for large ships, and F33, for yachts, fishing boats and other smaller vessels, to complete Nera's full range of Inmarsat Fleet communication solutions.

The Nera F55 features voice communication and high quality ISDN connections through a compact unit with low power consumption. It is designed as a plug-and-play solution, tailored to the communication needs of medium-sized vessels. Nera F55 employs the latest Inmarsat Fleet satellite platform with its unique Mobile Packet Data Service (MPDS) capabilities. With MPDS, the communication system is permanently online, allowing quick and easy downloads, while users pay only for data transmitted and received.

Circle 189 on Reader Service Card

The services available with Nera F55 include:

Global service

Voice	4.8 speech (Mini-M voice)

Spot Beam service

Voice	4.8 speech/64 kbps high quality
Data	64 kbps data/56 kbps data
Telefax	64 kbps fax G4/9.6 kbps fax G3
MPDS	64 kbps

More SatCom Products on page 60

Monitoring Technology...Advanced

As the information age firmly roots onboard vessels of all shapes and sizes — from tugboats to tankers — there is a glaring need for enhanced information processing and handling to ensure that crews maintain their focus on the safe and efficient operation of the vessel. Today's modern wheelhouse increasingly comes with the "cockpit" feel, as designers strive to standardize the form and function as another step towards safety and efficiency. Paramount to this task is the identification and integration of products designed and manufactured with the unique rigors of the marine industry in mind. Monitors onboard vessels are one product category particularly critical to modern ship operations, as they are the hub whereby collected information is relayed and acted upon.

Leading the Way

For more than 20 years, Conrac GmbH has been manufacturing approved CRT displays for high performance professional application in the medical, military and maritime industries. During this time, a great number of monitors have been manufactured which meet the requirements of MIL Spec, radar, IEC 60936, IEC 60945-3, IEC 61172 ECDIS, and GL approval, and are still in operation today. The same is currently happening with Conrac's approved range of TFT LCD monitors.

Developed specifically for maritime applications, a range of TFT monitors has been developed and several more models are in the pipeline. Conrac, a Data Modul company, is unique in that all controller electronics for its monitors are developed and manufactured in-house, which translates to single-source accountability. Another key point: all of the company's units also have a modular based platform, meaning that the interface boards, LVDS adapters, dimmable backlight inverters, and software in each of its TFT product line (15-in., 17-in., 18-in., 19-in., 23-in.) are used across the board, a trend that will continue with the company's newly developed 30-in. and 40-in. TFT display. While all of this means a strong degree of reliability and compatibility for the end customer, it also give the manufacturer a strong advantage with OEM customers, as it is able to easily implement special requirements and changes from customers, giving it a high degree of flexibility. Data Modul, located in Islandia, NY, is the sales agent for Conrac GmbH. Conrac GmbH is located in Weikersheim, Germany, where it operates a 180,000-sq. ft. modern production facility which can produce 4,000 TFT and 8,000 plasma displays per month.

Circle 174 on Reader Service Card

The SD Series

Available in 17, 18, 19 and 23-in. sizes, the SD - Ship Display - Series of TFT displays from Conrac, a Data Modul company, is designed to be reliable, flexible and efficient. Below are some technical specifications on the company's 23-in. unit, the 6023 SD.

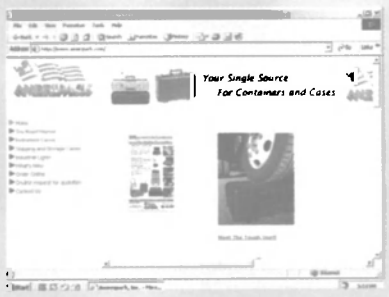
6023 SD

Data Modul's 6023 SD high resolution multi-frequency TFT-display for shipborne applications is supplied in rack/console mount versions. Built in a robust seawater resistant aluminum housing treated to protect from corrosion, it provides a high contrast, flicker-free image for reduced eye strain.

Panel type	Full color active matrix TFT (Super Fine)
Size	23.1 in. (58 cm)
HxWxD	550 x 610 x 111.58 mm
Weight	16kg
Resolution	Multiscan up to 1,600 x 1,200 (UXGA)
Horizontal Freq.	30-85 kHz
Vertical Freq.	50-85 Hz
Dimming range	100:1
Contrast ratio	500:1 typical
# of colors	16.7 mio colors
Viewing angle	+ 85 degrees horiz/vert
Lamp life time	50,000 hours @ 25 degrees C ambient temp., continuous operate

Marine Security Systems

Ameripack Inc.



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Don't continue to feel frustrated with cases that do not protect contents, have short telescopic handles, and wheels that fall off. Road Warriors from Ameripack Inc. help to alleviate these problems that sometimes cause glitches during transportation. With custom foam inserts in various gauges to properly protect test equipment, leak detectors and other sensitive contents, the Road Warriors are molded in rugged ABS material, and are also equipped with Military specified recessed stainless steel latches and three spring loaded padded handles. In addition, a silicon O-ring design seals out water, salt air, dust and can be locked for security purposes. With 12 sizes to select from, divider systems and lid organizers are customized to customer specifications. The case also boasts a long and locking telescopic handle and is equipped with three-in. wheels with a wide wheel base to avoid tipping.

Circle 83 on Reader Service Card

C-Tech Ltd.

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P.O. Box 1960, Cornwall, Ontario K6H6N7
Tel: (613) 933-7970; Fax: (613) 933-7977

The CSAS-80 Omni Surveillance Sonar is a third-generation high performance sonar designed for the detection of underwater intruders such as divers with open and closed breathing apparatus, diver delivery vehicles, mini submarines, and submarines. The sonar is a seabed, dockside or ship deployed Omni-directional sonar that comes as a stand-alone system, specifically designed for harbor surveillance or, alternatively, the system can be configured for monitoring the perimeter of a variety of vulnerable shore, surface or deep water sites. The Sonar can also be deployed from a ship to provide security in high risk locations, such as foreign ports. It also provides facility for manual or unattended operation and can be integrated to operate in conjunction with a series of sonar systems to maximize area coverage. In addition, the sonar can be integrated with other sensors, including passive sonars, surface sensors and cameras to give an overall tactical picture of a designated area. **Circle 84 on Reader Service Card**

Honda

Power for USCG Boats

The USCG's new Defender Class craft from Safe Boats will be powered exclusively by twin Honda BF225 4-stroke outboards. The Hondas can propel the new 25-ft. (7.6-m) Response Boat - Small, or RB-S as the Coast Guard refers to it through 30-mph winds and 6-ft. seas. The BF225s will provide a top speed of over 45 knots allowing the Safe Boat reaches plane in less than four seconds. Its marine-grade 5086 aluminum hull with integral, sealed air chamber and polyethylene, non-deflatable foam collar make the craft one of the safest boats on the water. The RB-S features an all-welded, self-bailing deck; insulated and heated full cabin; upper spotter windows; port and starboard sliding doors; marine electrical cable; stepped transom; and locking long gun storage. The boat's fuel tanks are .25 5086 rolled bottom, fabricated aluminum.

Circle 194 on Reader Service Card

AS&E

X-Ray Inspection Systems

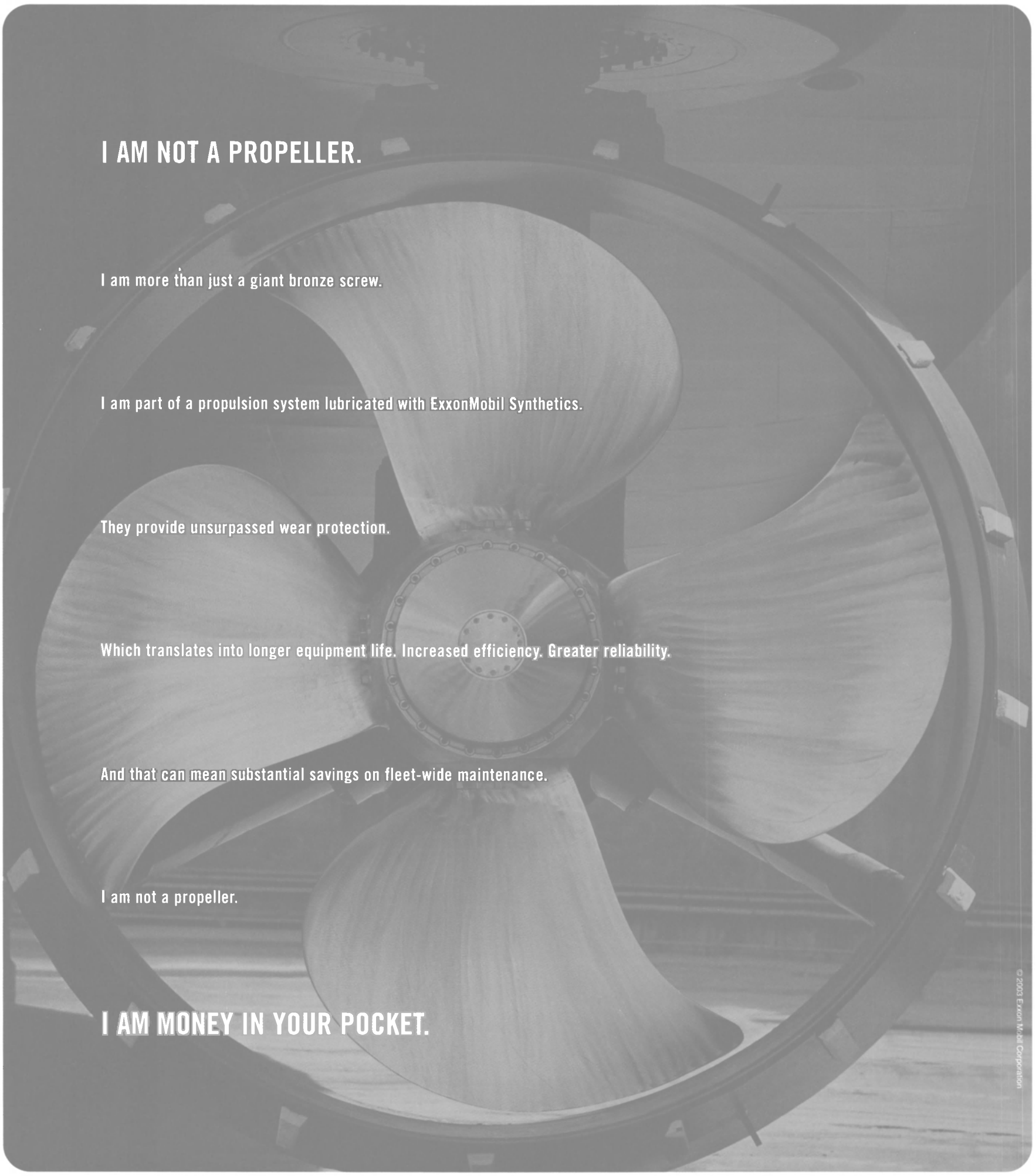
The Shaped Energy inspection system combines cabinet-safe, high-energy transmissions with Z backscatter X-ray imaging to provide penetration, excellent spatial resolution and contrast sensitivity with minimum radiation to cargo and the environment. The system is ideally suited to inspect densely loaded cargo containers, as it can penetrate up to 12 inches of steel or eight feet of water with easy cargo interpretation and identification.

Circle 87 on Reader Service Card

Brooks

Locks and Seals

Specialists in providing solutions to accommodate new Customs-Trade Partnership Against Terrorism (C-TPAT) rules, Brooks offers a host of sealing systems designed to keep cargo compliant, including Multi-Lok, Poly-Check, Poly-Lok II, Secure



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Marine Security Systems

Grip Seal and Secur-Pull Seals. For Containers or trailers, the company offers Intermodal II Seals and e-Seal, a disposable, electronic container seal with three omni-directional frequencies. It incorporates interactive electronic data storage with a rugged anti-theft barrier.

Circle 88 on Reader Service Card

Columbia Research Corp

Diver Mobility Platform

Columbia Research Corporation has designed a manned wet submersible for use in port security applications involving inspections of ship hulls and harbor facilities. This craft uses the latest sonar technology to scan hulls, structures and the seafloor for the presence of mines and contraband. It's electric propulsion system drives it to a max. speed of six knots.

The 3,600 pound unit features GPS/Doppler nav, a low light/infrared video and two sonars.

Circle 89 on Reader Service Card

Azonix Dynalco

ProPanel Navigator

Azonix Dynalco's new ProPanel Navigator marine application computer is completely watertight, designed and manufactured to work for long durations in harsh and hazardous environments.

Circle 70 on Reader Service Card

DataCard

Identification Systems

Datacard Identification boasts one of the industry's most extensive product lines, which feature seamless compatibility between components.

Circle 90 on Reader Service Card

EMX Inc.

Pearl Harbor Gets Visible

Harbor Security in and around Pearl Harbor, Hawaii is becoming more visible with installation of Day/Night Surveillance Cameras. EMX Inc. has a contract to supply surveillance systems in and around the famous harbor area.

Circle 173 on Reader Service Card

Gyrocam Systems

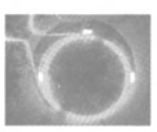
Patrol Surveillance

The same gyrostabilized technology used on aircraft is available to marine patrol units from GyroCam Systems. The Marine Patrol Surveillance System provides steady images even in the roughest seas.

Circle 92 on Reader Service Card

Intenslite

Helps Light the Way Out



Intenslite International has developed an Emergency Escape Path lighting system dubbed Transit, which is visible even in the densest of smoke. This product is a side emitting fiber optic rope lit by a compact green laser.

Circle 71 on Reader Service Card

L-3

Cargo Inspection Systems

L-3 Cargo inspection products use proprietary technology that is specifically designed for the examination of cargo. Security and Detection Systems offers three types of cargo inspection systems: Pallet X-ray Systems; Freight X-ray Systems; and Container and Vehicle X-ray Systems.

Circle 95 on Reader Service Card

Rapidscan Security Products

X-Ray Security Inspection

The Rapidscan Model 532H is an x-ray security inspection system designed for customers requiring secure inspections of large palletized cargo weighing up to 6,600 pounds. With a large tunnel opening of 59 in. x 65 in., large cargo containers can be quickly and easily scanned.

Circle 97 on Reader Service Card

SAIC

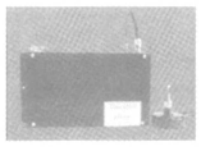
Cargo Inspection System

SAIC's award-winning Vehicle and Cargo Inspection System (VACIS) helps respond to the security challenges of he day. The VACIS family of products is designed to provide fast, reliable and cost-effective solutions for inspecting everything from intermodal containers to passenger vehicles. In addition, VACIS offers a variety of configurations for virtually any inspection environment.

Circle 99 on Reader Service Card

SecureFleet

Fleet Management



The SMT-100 Real Time Tracker is a unique Internet-based open architecture mobile communications platform designed to transmit and receive data via a wireless network.

Circle 199 on Reader Service Card

SISCO

A-Pass Marine

A-Pass Marine is a rapid passenger check-in and boarding accountability and vessel access control system incorporating authentication and validation of passenger, crew and visitor identification and travel documents.

Circle 198 on Reader Service Card

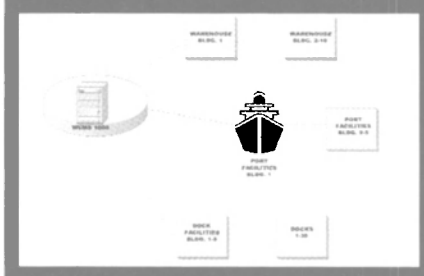
Varian Medical Systems

Field Radiography

Varian's Linatron-MP is a portable field radiography system, compact to inspect everything from fracture-critical components in bridges and buildings to nuclear reactor vessels and aircraft.

Circle 196 on Reader Service Card

Avert Catastrophe with Rapid Warning



In today's uncertain world, the safety and security of employees, customers and facilities is a major concern daily. Quick reaction to a potential tragedy - from fires to terrorist strikes - is critical. Now, with the Wide Area Emergency Messaging System (WEMS-1000) from ATS-Plus, Inc. makes the difference between a disaster and the saving of lives and property. The WEMS-1000 technology lets industry, government, universities or any other large entity simultaneously: warn of impending danger and direct the appropriate emergency response and action. Whether or not your facility has a computer network infrastructure, ATS-Plus can both design and implement an emergency messaging system to bring safety and security closer than ever, sending live or recorded messages to many people in many locations instantaneously, simultaneously and easily. ATS-Plus's technology is not a communications system. It is designed to quickly send live or pre-recorded voice messages to many people in many locations simultaneously and effortlessly, and can exist within an entity's current communication infrastructure or it can be a separate system altogether. It can use fiber optic, landlines or wireless communications media

Circle 82 on Reader Service Card

Taylor Chairman of Tidewater

Dean E. Taylor has been elected as Chairman of Tidewater Inc.'s Board of Directors. Taylor, who has served as president and CEO of the company since October 2001 and March 2002, respectively, will continue to retain those positions in addition to his new post.

VT Halter Marine CEO to Speak in New Orleans

Ret. Gen. **Boyd "Butch" E. King**, CEO, VT Halter Marine will deliver a keynote address at the International WorkBoat Show. King will speak at the Ernest N. Morial Convention Center on December 3, 2003 at 12:30 p.m.

Pascoe Appointed Chief at LISCR

The Liberian Registry has appointed Captain **David Pascoe** as Chief, Maritime Operations & Standards. Pascoe will have overall responsibility for Maritime Safety, Security, Investigations and Marine Technical and Communications.

Griffin Marine, Instone Intl. form Griffin Americas

The U.S. operations of Griffin Marine Travel and Instone International Americas will merge, creating one of the of the largest competitive provider of crew travel management services in North America. The chief officers of Griffin Americas will be **Robert B. Westendarp**, CEO and **Rod Vamosi**, COO.

Northrop Grumman VP joins HSLA Board

The Homeland Security Leadership Alliance has appointed **Gene Kakalec**, who currently serves as V.P Business Development, Northrop Grumman. Kakalec will become HSLA's 12th board member.

Port Of Canaveral Adds New Directors

Continued growth and organizational restructuring has prompted the Canaveral Port Authority to add three new staff directors, including two newly created positions. **Margi Starkey**, the former assistant director of Finance, has been promoted to the new position of Director of Accounting; **Jerry Simon**, the former Chief of Security, has been promoted to the new position of Director of Security in a reorganization of the Operations Department; and **Mark Blake**, a former construction engineer with the North Carolina State Port Authority, joins the staff as the new Director of Construction. He replaces **Richard Lombroia**.

Senesco Wins NY Ferry Terminal Contract

Senesco Marine is also working on a piece of a major construction project in New York City — the building of the Pier 79 Ferry Terminal. Senesco Marine has been contracted to build three of the main passenger floats for the Pier 79 Terminal. When complete, the passenger floats will be 104 x 35 ft. (31.6 x 10.6 m).

Sonsub and Torch Offshore Sign Frame Agreement

Sonsub has signed a one year Frame Agreement with Torch Offshore, L.L.C to provide ROV support onboard the Midnight Wrangler. The agreement calls for Sonsub to supply its 200 hp, in-house designed and built Innovator work class ROV with a depth rating of 3,000 m.

Laurin Maritime to Utilize Bass' SAFIR

BASS reported that Laurin Maritime has signed an agreement for delivery of SAFIR for optimizing the administration of reporting according to the chapter nine of the ISM code. Laurin Maritime will also utilize the system further by including internal audits, inspections and other company specific procedures.

SUNY Maritime Goes International

In its efforts to make quality education more convenient and cost effective, the SUNY Maritime College will begin offering its Masters Degree in International Transportation Management on-line beginning with the spring 2004 semester. For Course descriptions and more information about these classes can be found on-line at www.sln.suny.edu.

PMI to Train AMHS Personnel

Pacific Maritime Institute (PMI), the West Coast affiliate of the Maritime Institute of Technology and Graduate Studies (MITAGS) will be providing Fast Rescue Boat training for marine personnel of the Alaska Marine Highway System (AMHS).

CP Ships Commits to Newbuild Charters

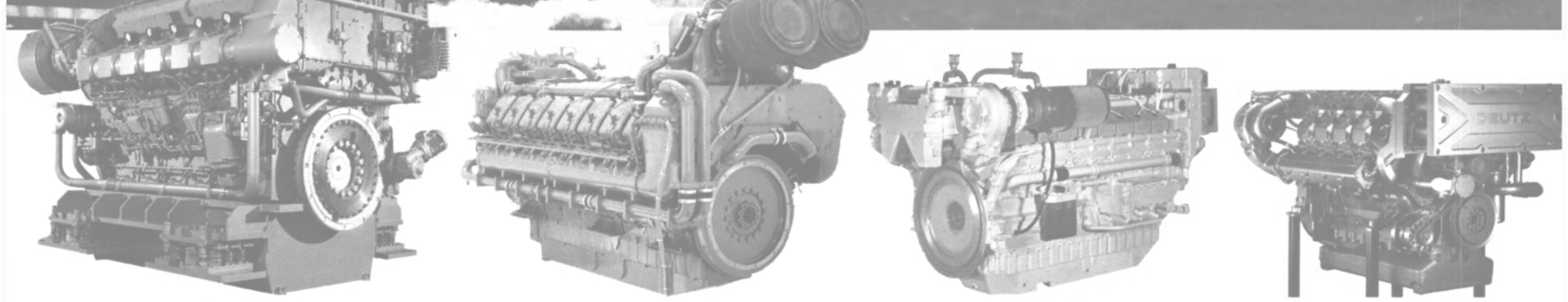
CP Ships Ltd. has signed an agreement to the long-term charter of nine 4,250 teu newly built containerships from Seaspan Container Lines for a term of up to ten years. Scheduled for delivery between late 2005 and early 2007, the ships will be built by Samsung Heavy Industries of Korea.

Conrad Reports 2Q Results

Conrad Industries reported a net loss of $726,000 for the three months ended June 30, 2003 compared to net income of $300,000 for the second quarter of 2002. The loss for the six months ended June 30, 2003 was $1.05 million compared to net income before a cumulative effect of a change in accounting principle of $758,000 and earnings before a cumulative effect of a change in accounting principle per diluted share of $0.10 for the first six months of 2002.

OSG Reports Record First Half Results

Overseas Shipholding Group, Inc. reported $86 million of net income for the first six months of 2003, the highest earnings during the first six months of any year in the company's history.



628

1333 - 4825 BHP
Speed 750 - 1000 min^{-1}
Water-cooled L6, L8, L9, V12 and V16

620

1197 - 3046 BHP
Speed 1500 - 1860 min^{-1}
Water-cooled V8, 12 and V16

616

418 - 1776 BHP
Speed 1500 - 2300 min^{-1}
Water-cooled V8, V12 and V16

1015

272 - 590 BHP
Speed 1500 - 2100 min^{-1}
Water-cooled V6 and V8

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Outlook for Floating Production Systems

By James R. McCaul, President, International Maritime Associates, Inc.

Floating production has evolved to a mature technology that opens for development oil and gas reservoirs that would be otherwise impossible or uneconomic to tap. The technology enables production far beyond the depth constraints of fixed platforms, generally considered to be 1,400 ft. (426.7 m), and provides a flexible solution for developing short-lived fields with marginal reserves and fields in remote locations where installation of a fixed facility would be difficult.

Types of Floaters

Floating production systems vary greatly in appearance - from ship-shape FPSO vessels to multi hull production semis to cylindrical shaped production spars. But common to all is machinery and equipment to lift oil and gas from seabed wells and perform initial processing of the raw production. Here's a rundown of the systems in operation.

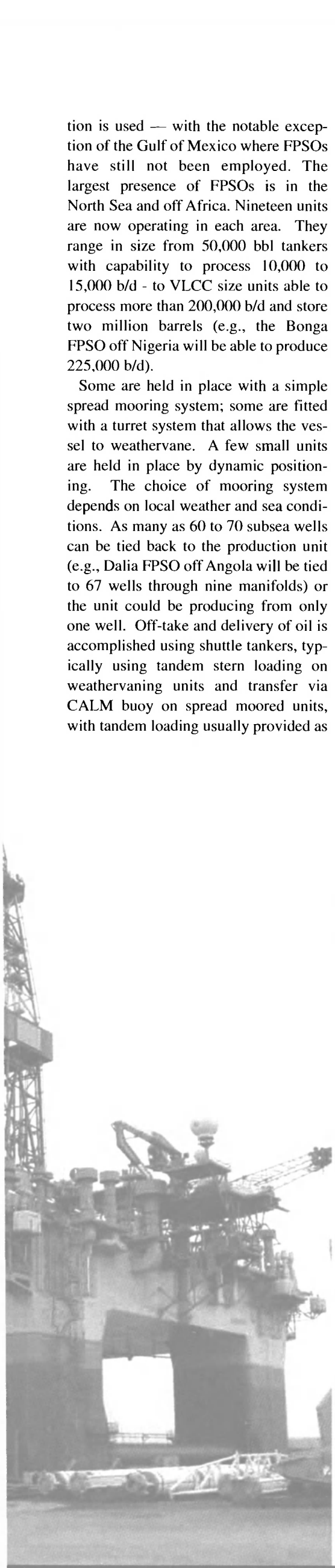
FPSO Vessels 89 FPSOs are in service, another 24 on order. Fourteen of the units on order are purpose built hulls, 10 are conversions of vintage tankers, mostly VLCCs. FPSOs are found in all offshore areas where floating produc-

Built by Keppel Offshore & Marine Limited (Keppel O&M) and due for delivery to Maersk Contractors two weeks ahead of schedule in mid August 2003, this new generation semi-submersible rig was named LIDER at Caspian Shipyard Company (CSC) in Baku, Azerbaijan. Capable of operating in water depths of up to 1,000 m and drill depths of up to 9,140 m, LIDER has a variable deck load of 4,000 tons and is able to accommodate 130 people. It is specifically designed to handle large water depths and high formation pressures, which are anticipated at the first well in the Zafar Mashal structure.

tion is used — with the notable exception of the Gulf of Mexico where FPSOs have still not been employed. The largest presence of FPSOs is in the North Sea and off Africa. Nineteen units are now operating in each area. They range in size from 50,000 bbl tankers with capability to process 10,000 to 15,000 b/d - to VLCC size units able to process more than 200,000 b/d and store two million barrels (e.g., the Bonga FPSO off Nigeria will be able to produce 225,000 b/d).

Some are held in place with a simple spread mooring system; some are fitted with a turret system that allows the vessel to weathervane. A few small units are held in place by dynamic positioning. The choice of mooring system depends on local weather and sea conditions. As many as 60 to 70 subsea wells can be tied back to the production unit (e.g., Dalia FPSO off Angola will be tied to 67 wells through nine manifolds) or the unit could be producing from only one well. Off-take and delivery of oil is accomplished using shuttle tankers, typically using tandem stern loading on weathervaning units and transfer via CALM buoy on spread moored units, with tandem loading usually provided as backup.

Cost of FPSOs varies greatly. Capital expenditure for a high production purpose built FPSO for a large field offshore Africa can exceed $700 million, with the hull costing $100 to 120 million, the topsides $500 to 600 million. The Girassol FPSO, now operating off Angola, cost $756 million. The hull cost $150 million, topsides $520 million and project management and delivery comprised the balance. A more recent project, the Erha FPSO being built for offshore Nigeria, carries a total contract price of $700 million, with the hull costing $110 million, topsides and delivery the balance. At the other extreme, an FPSO for a marginal field utilizing a second hand tanker and fitted with a 50,000 b/d plant could entail a capex of one-tenth this amount. The operator of the Okwori field off Nigeria is planning to use an FPSO for production, but only if total capex for development is within $120 million. An FPSO operating offshore Libya since 2001 began producing on the field for a capital expenditure of



$55 million, with conversion and topsides plant installation done at Malta Drydocks. Hull and topsides contracts are sometimes awarded separately, sometimes awarded as a single contract. Sometimes the bidders are given the choice of taking the whole thing or just a portion. The upcoming competition for the Akpo FPSO contract will divide work into three packages — hull, topsides and project management — and bidders will have the choice of bidding one, two or three work packages.

FPSO fabrication and conversion contracts have become the province of Asian yards. Samsung and Hyundai are the big players in high end FPSO fabrication (e.g., units for Kizomba, Dalia, White Rose, etc). Dalian and Shanghai Waigaoqiao have been making inroads on low-end projects (e.g., Belanak, Caofeidian, Panyu FPSOs). Almost all recent FPSO conversion work has been captured by Keppel, Jurong, Dubai Drydocks and MSE.

Production Semis 38 production semis are in service, with three more on order. Brazil, where the concept of using converted drill semis for production originated, accounts for 19 of the units now in service. The North Sea is the other area where a large number of production semis are in service, with 12 units now operating. Until now there has been little use of production semis in the Gulf of Mexico. An early version, Garden Banks, was removed from operation several years ago. But this production concept has again found appeal among Gulf field operators. A production semi (Nakika) is now being installed in the Gulf and two more (Atlantis and Thunder Horse) will begin operating in the Gulf within the next two years.

Production semis vary greatly in size and complexity. Some older units offshore Brazil, Africa and Southeast Asia have capability to produce only 10,000 to 25,000 b/d of oil. At the other extreme, the Thunder Horse production semi will have processing capacity for 250,000 b/d and an existing unit in the North Sea, the Asgard B, can produce 130,000 b/d condensate and 1,300 MMcf/d gas.

Some of the larger systems have tie backs from more than 20 wells. Thunder Horse will be tied, initially, to 25 wells. As there is no storage on the production unit, either a separate floating storage unit is employed on the field for storage and offloading or pipeline off-take direct to shore is utilized. Most production semis utilize the latter. Because of motion at the surface, well control devices are fitted at the ocean floor and fluids are brought to the surface via flexible or steel risers. However, Shell's new Nakika production semi in the Gulf of Mexico will utilize dry trees for some wells - i.e., well control devices will be on the topsides for easy maintenance. The days of taking a surplus drill rig and converting it at minimal cost to a production semi are gone. Now that candidate surplus hulls are no longer available, the units now being built are rather costly. A purpose built production semi intended for use on a complex field will cost $500 to 900 million, depending on the plant capacity and gas producing capability. The Kristin production semi, now being built for use off Norway, entails capital expenditure of $860 million for hull and topsides. The Thunder Horse semi hull is a $300 million fabrication job, while the hull and topsides for Nakika cost $600 to 650 million. Three major Korean yards are the big players in this sector. Hyundai had entire contacting responsibility on the Nakika production semi. Daewoo is building the hulls for the Thunder Horse and Atlantis semis, with McDermott supplying the topsides. Samsung is fabricating the Kristin production semi hull, and Aker Stord is supplying the topsides.

Production Spars Seven production spars are in service, six on order - all in the Gulf of Mexico. This type of production system has not found favor else-

where, at least to date. These are purpose built cylindrical shape units supporting a topside deck fitted with capability to process 25,000 to 100,000 b/d. The largest unit is ExxonMobil's Hoover/Diana spar, which has ability to produce 100,000 b/d oil and 325 MMcf/d gas. The smallest unit is Neptune, the original spar deployed in the Gulf of Mexico in 1997, which can process 25,000 b/d. A new unit under construction, Red Hawk, is a small spar designed for gas production.

Weight bearing capability is less than the previous two production systems and spars would generally be used on mid-size fields. Storage could be provided in the hull - but spars built to date have no storage. Spars are widely used in the Gulf of Mexico, as pipeline infrastructure in the Gulf to date has eliminated the need for storage on the field. Also, spars are stable platforms that allow well control devices to be placed on the topsides. Operators in the Gulf find this to be of importance as it reduces maintenance costs associated with high paraffin oil.

A heavy deckload spar such as Hoover/Diana will entail a capital expenditure of $300 to 500 million. Smaller spars such as Devils Tower will have a capex in the $200 million area. Light deckload spars such as Red Hawk will cost in the $100 million area.

Hull cylinder fabrication has been largely the province of Technip, using its facility in Finland. Hulls for six of the seven spars in service have been fabricated in Finland and three more are on order there. But McDermott has taken three spar hull contracts using the company's fabrication facilities in the UAE and Indonesia, a venture that has not worked out too well, and a recent order for a small spar hull went to Gulf Marine in Texas. Spar topsides fabrication has been almost totally the province of McDermott.

Tension Leg Platforms TLPs come in three variations — large deckload, mini and wellhead. Altogether, there are 15 TLPs in service (nine full size, five minis, one wellhead) and four on order (two minis, two wellhead). The original full size version is a large expensive unit capable of supporting a high throughput processing plant. The Snorre TLP, operating in the North Sea, holds the current TLP plant capacity record, with capability to process 190,000 b/d oil and 113 MMcf/d gas). Two full size TLPs are operating in the North Sea, seven in the Gulf of Mexico. Because heave motion of the floater is restrained by tendon tension, well control devices can be installed on the topsides, making maintenance easier. The ability to use dry trees has historically been a major reason for choosing this type production system. But full size TLPs have fallen out of favor due to their high cost and inability to be used in very deep water. Tendon weight becomes a major issue as the water depth increases beyond 1,200 m.

Now interest has shifted to mini-TLPs designed for mid-size deepwater fields. They are smaller, lighter and able to support a processing plant up to 50,000 to 60,000 b/d. But unlike their big brothers, they are able to be used in very deep water. The Magnolia mini-TLP, now on order, will be placed in 4,691 ft. (1,430 m) water depth. Modec and IHC Caland are marketing mini-TLP designs, five of which have been installed and two more are on order.

Using TLPs as wellhead platforms has also recently gained favor. The TLP is fitted with machinery to control well production and the oil processing plant is placed on an accompanying production unit. ExxonMobil is utilizing a combination wellhead/FPSO production system on its massive Kizomba A and B developments offshore Angola. A smaller wellhead TLP/production barge combination is now being installed on the West Seno field off Indonesia.

Capex for a large wellhead TLP will likely be in the range of $500 to 600 million. The Kizomba A wellhead TLP cost $650 million, but this is an exceptionally large and complex field and the cost will probably come down as additional units are built. Capex for a small wellhead TLP will likely be in the range of $80 to 100 million. The West Seno wellhead TLP/production barge combination cost $265 million, of which the TLP probably accounted for two-thirds. Mini-TLPs cost about $150 to 250 million, depending on the capacity of the production facility placed on deck.

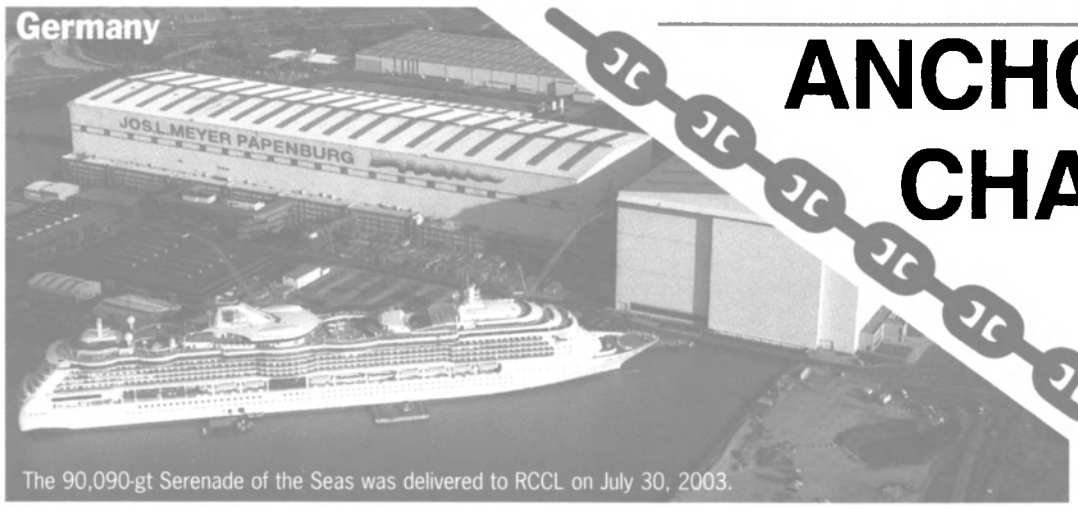
Samsung and Daewoo are the big players in TLP hull fabrication. Samsung is fabricating the Marco Polo and Magnolia hulls, Daewoo has the contract to supply the wellhead TLPs for Kizomba A and B. Hyundai is also in this market, having fabricated the small wellhead TLP for West Seno and is in line for the second unit on this field. This is a lot different than the old days, when Belleli basically controlled TLP hull fabrication. Topsides fabrication for Gulf of Mexico units has been going to McDermott, Gulf Marine or Kiewit Offshore. ABB/Heerema has a role in topsides engineering and fabrication for the wellhead TLPs off Africa.

Future Floater Orders In a recent study, we identified 94 offshore projects that have strong likelihood to utilize a floating production system should they move to the production stage. West Africa is the clear leader in terms of potential projects, with 12 projects in the bidding or final design stage and another 14 in the planning phase. The Gulf of Mexico is second, with 17 projects planned or under study. In third place is Brazil with 15 projects, followed by Southeast Asia with 12, Australia with eight and Northern Europe with six projects. Based on our analysis of projects being planned, we see a requirement for 245 to 270 floating production systems by the end of the decade. Taking into account: the number of units currently in operation, the number of units now on order, and the likely scrapping and loss rate, we see a need to order 62 to 89 additional floaters over the next five years to meet this requirement.

Of this total, we expect 60 percent will be FPSO vessels, 30 percent spars or TLPs and 10 percent production semis. We also project that the mixture of floater orders will produce a capex value of $22 to 31 billion over the five year forecast period.

About International Maritime Associates

International Maritime Associates (IMA) was formed in 1973 to provide strategic planning support to clients in the offshore oil and gas, maritime and technology sectors. IMA performs the research needed to size the available market, analyze customer requirements, assess competitor strengths/vulnerabilities and evaluate options for optimizing market position. This article is taken from a new in-depth assessment by IMA of the outlook for FPSO vessels, production semis, TLPs and spars. The 80 page report is the 19th in a series of in-depth analyses by IMA of this market sector that began in 1996. Contact ***Jim McCaul****, Tel: 202-333-8501, email: imaassoc@msn.com, website: www.imastudies.com.*



The 90,090-gt Serenade of the Seas was delivered to RCCL on July 30, 2003.

Meyer Werft Delivers to RCCL

Main Particulars - Serenade of the Seas

Class	DNV
Flag	Bahamas
Length, (o.a.)	962 ft. (293.2 m)
Length, (b.p.)	873 ft. (266.2 m)
Breadth, (molded)	106 ft. (32.2 m)
Draft	26 ft. (8.1 m)
Number of decks	15
Tonnage	90,090 gt
Total engine power	59,000 kW = 80,240 hp
	via two GE gas turbines
Propulsion power	40,000 kW = 54,400 hp
	via ABB propulsion
Dynamic positioning	Kongsberg Simrad
Integrated Bridge System	Litton Marine
Gas turbines	GE Marine
Thrusters	Rolls-Royce
Propulsion	ABB
Bridge alarm	CAE
Ship automation	Valmarine
Speed, (max.)	25 knots
Passenger capacity	2,490
Officers and crew	858

The most recent addition to Royal Caribbean's (RCCL) fleet of vessels is the 90,090-gt Serenade of the Seas, which was delivered to the cruise line by Meyer Werft Shipyard in Papenburg, Germany on July 30, 2003. The third member of the Radiance-class fleet, Serenade, along with its sistership, is a luxury cruise vessel boasting a very slim, yachtlike design with extensive use of glass on the outside, as more than 80 percent of the vessel's cabins are designated as outside cabins. Serenade features advanced technology designed to make the ship efficient, and to ensure it is as quiet and vibration free as possible. To this end, it features an advanced gas turbine propulsion plant, and its 15 decks employ the latest in sound dampening technology.

Following Serenade's delivery, the vessel sailed from Amsterdam to Boston, Mass. on August 4, 2003 continuing on to New York City where it was christened there by actress **Whoopi Goldberg**, who was

LEFT: Aboard RCCL's Serenade of the Seas with actress **Whoopi Goldberg,** (center), flanked by RCCL chairman and CEO, **Richard Fain** (left), and Capt. **Nikolaos ("Nick") Antalis**. Goldberg served as Serenade's godmother.

RIGHT: Serenade is the third in a series of Radiance-class vessels for RCCL.

Serenade's godmother on the evening of August 22, 2003.

The vessel was scheduled to commence its fall itinerary with destinations of Canada/New England before repositioning to San Juan for its winter schedule in November 2003.

The ship, which had made its way down the East Coast from Boston, was on display in the port prior to its christening. With Capt. **Nikolaos ("Nick") Antalis** as Serenade's master, the vessel will be in good hands due to Antalis' breadth of experience and strong following among RCCL passengers. Since joining RCCL more than eight years ago, Capt. Antalis had spent the last four years as master of Vision of the Seas, and had previously served as master aboard various ships on Royal Cruise Line and Regency Cruise Line. But what prepared him for his current positions, Antalis says, is the 10 years he spent aboard cargo ships. "You build seamanship on cargo ships," he said.

Capt. Antalis moved cargo for a variety of companies during those years, mostly on the NY to Japan and NY to Europe routes.

Serenade of the Seas features an 11-story glass Centrum with six glass elevators facing out to the sea.

New Equipment

The ship features a total of 1,055 passenger cabins divided into 238 inside cabins and 818 outside cabins including one Royal Suite, six Owner's Suites and 17 Balcony Suites. In addition, Serenade also has 14 cabins for passengers with disabilities.

Generous on space, the cabins are equipped to meet the requirements of handicapped persons.

Divided into seven fire zones, the ship complies with the rules for a two compartment vessel and is designed as per the latest IMO regulations. The vessel holds four tenders, 14 lifeboats and two fast rescue boats. In addition, it is also equipped with two "Marine Evacuation Systems," which enable a fast evacuation via chutes onto the liferafts.

The ship is fitted with an Integrated Bridge System (IBS) by Litton Marine that includes all components required to ensure safe navigation. The main feature of the Bridge is the Voyage Management System, which allows radar display and the electronic sea chart to be laid one above the other.

Serenade's optimum maneuverability is provided by two azipods (with an output of 20,000 kW each) and three bow thrusters, all operated by joystick control.

Regarding power, the vessel's combined gas/steam turbine system (COGES) by General Electric is installed for electric power generation. As an environmentally friendly plant, this system is comprised of two gas turbines with an output of 25 MW each and one steam turbine made by Fincantieri with an output of 7.8 MW.

Circle 47 on Reader Service Card

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- Schiffbautechnische Gesellschaft e.V.
- The Society of Naval Architects and Marine Engineers (Singapore)

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REGISTER FOR THE WMTC&E online by visiting

www.worldmaritimetechnology.org

SatCom Products

EMS
EMS SatCom, a division of EMS Technologies, entered the maritime market with its pedigree of land-based communication solution expertise. At NorShipping in Oslo earlier this year, the company announced that it has received full Inmarsat type-approval for its new Fleet 55 Maritime satellite terminal.
Circle 101

Globalstar
Globalstar USA provides sales and tentals of Globalstar voice and data satellite phone equipment and services to customers throught the United States and the Caribbean. Globalstar USA was one of the first providers to offer Globalstar satellite phone service, launching commercial service February 2000.
Circle 102

LandSea Systems
LandSea Systems has introduced the Capsat Fleet55. The high-speed terminal provides cost effective voice and data communications based on either MPDS or a 64K ISDN connection. The smaller dimensions of the random antenna makes the Fleet55 suited for yachts, patrol boats and fishing vessels.
Circle 103

Nera F55
Inmarsat has granted full type approval to the new Nera F55 maritime communication terminal. It is intended for small to medium-sized, vessels completing Nera's family of Inmarsat Fleet communication solutions. It is designed to be a flexible communication solution targeted at the wide range of small and medium-sized vessels from the coastal fleet and supply ships to coastguard vessels and larger yachts.
Circle 104

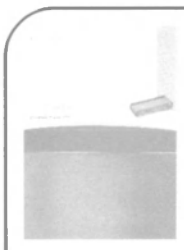
Sea Tel
The Sea Tel 4003 Broadband Maritime Communications System (BMCS) provides business-class connectivity for your at-sea communications requirements. Always-on Internet connectivity at high inbound and outbound speeds.
Circle No. 105

Telesea
TeleSea has debuted its line of high-speed offerings from Wheat Wireless Services, Inc. Their communication network provides broadband service for mariners traveling within 30 miles of the coast. TeleSea's technology can provide the maritime community with internet capabilities at sea with greater speeds and a higher overall performance.
Circle 106

Xantic
The Xantic Chatcard delivers numerous advantages for comapnies and users alike. It can be used for Inmarsat-A, -B, -M, mini-M and GAN MultiMedia, making it a cost-efficient solution. Accounting is simpler because users pay in advance. Chatcard can be used without staff and crew needing to interfere with valuable equipment.
Circle 107

Thrane & Thrane
Thrane & Thrane now offers the TT-3088A Capsat Fleet33, a product, which the company dubs the smallest, lightest maritime Fleet terminal ever. The new terminal completes Thrane & Thrane's previous introductions of maritime high-speed terminals, the Capsat Fleet77 and the Capsat Fleet55.
Circle 108

Eurocom
ECI is a supplier of maritime communication equipment. ECI develops, produces and markets maritime communication equipment for both radio and satellite communication and for all types of vessels. Products of the well-known ECI-brands: SAILOR and SKANTI are sold world-wide through distributors and partners.
Circle No. 109



Stratos
Stratos Fleet 77 is the first in a family of new high bandwidth, IP enabled Inmarsat satellite systems. Stratos Fleet F77 is an integrated service providing a choice of a Mobile Packet Data, ISDN, PSTN and low cost voice telephony.
Circle 110

SeaWave
SeaWave offers two-way Internet e-mail, full-color and text weather forecasts, vessel tracking and other information services to private, government, and commercial vessels. They offer professional worldwide marine communication services at a low cost with proprietary technology and state-of-the-art hardware and software.
Circle 111

Marlink
Telenor Satellite Services provides mobile data, high-speed data, Internet access, e-mail, fax and voice communications services to the maritime industry. Using the worldwide network of Inmarsat satellites and its own network of land earth stations, Telenor Satellite Services provides services to ships at sea.
Circle 112

iDirect
iDirect Technologies develops broadband IP VSAT solutions. iDirect's remote terminal includes a modem, IP router, TCP accelerator, GPS interface and QoS for voice and data. www.idirect-tech.com.
Circle 113

Poseidon
Poseidon is a vendor of maritime training systems located in the Lofoten Islands, in the Arctic regions of northern Norway. The company has developed over the past 10 years into the world's leading supplier of PC-based GMDSS networked simulators and educational materials.
Circle 114

JetDock
Jet Dock Watercraft Management Systems, are patented, modular, drive-on dry docking systems designed for fast docking, launching, repairing, and maintenance of all types of vessels. The drive-on docking systems and platform systems are used for private, corporate, and military purposes. They can be expanded for changing needs and are easy to disassemble and reassemble
Circle 115

Marine Guard
Today's vessels can encounter numerous challenging docking situations in our global marine environments. UPC's Marine Guard Floating Monopile Donut Fenders provide an inventive fendering system to meet these challenges.
Circle 116

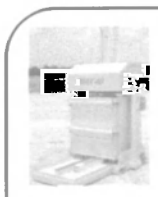
Samson
A jacketed Dyneema 12-strand braided core offering the highest resistance to abrasion, cutting and wear. The fuzzy DPX jacket is a proprietary blend of Dyneema SK-75 and polyester fiber. This combination offers the superior cut resistance and durability inherent to HMPE fiber coupled with excellent grip on winch drums and the higher resistance to frictional heat inherent to polyester fiber.
Circle 117

NautiCast
NautiCast AG is an AIS-Systems specialist, catering for the maritime and inland waterway industries. NautiCast offers the AIS-Transponder, the X-Pack DS. NautiCast production is ISO 9001 certified and outsourced to Siemens AG Austria. The X-Pack DS fully complies with all IMO and SOLAS regulations.
Circle 118

Dubai Drydock
Dubai Drydocks is dedicated to providing a ship repair service in compliance with the highest standards of quality and reliability, at internationally competitive prices. To this end, Dubai Drydocks has achieved ISO 9001-2000 Quality Management certification for its entire operations.
Circle 119

Ameripack
The Road Warriors from Ameripack are air and water tight transit cases designed and manufactured to provide the most protection in any environment. Ameripack provides custom foam inserts in various gauges to properly protect your test equipment, leak detectors and other sensitive contents; lid organizers among other features.
Circle 120

Lloyd's Register
Lloyd's Register's series of worldwide training courses for company security officers (CSOs) and ship security officers (SSOs) has received approval from the U.K. Maritime and Coastguard Agency (MCA) and the Isle of Man Marine Administration (IMMA).
Circle 121



GB International
GB International engineered the MAX 40 Compactor to provide affordable, rugged, reliable and versatile operation with a simple push-button pneumatic control for the operator. Aesthetic in appearance, it can be customized to your specifications, and is available for purchase or lease.
Circle 122

Sailor
Sailor UAIS1900 is an integrated system with a 12-channel GPS and built-in VHF. To format the system so that it is operational, only a display system, such as the new KDU1905, a VHF antenna, a GPS antenna and power needed. The new keyboard display unit has a graphical display. It is easy to use with large buttons and a backlit display. It fulfills IMO requirements of a mandatory control and display unit.
Circle 123

Techcrane
Techcrane Global Corporation provides worldwide sales and service for marine cranes. Techcrane.net proudly offers a full arsenal of marine crane CAD drawings and technical data specifications for all visitors
Circle 124

Frank Mohn
Frank Mohn AS supplies submerged cargo pumps to the world tanker market. The company was founded in 1938 and is located outside Bergen in Western Norway. They offer FRAMO Cargo offloading pumps for FPSO applications. A FRAMO cargo pumping system includes profesional assistance during project evaluation, technical support during engineering.
Circle 125

BUYER'S DIRECTORY

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

Flagship Marine, Inc, 2427 SE Dixie Hwy , Stuart, FL 34996, 800-316-6426, 772-283-4611, sales@flagshipmarine.com, Contact: Tom Martland, www.flagshipmarine.com

Port-A-Cool, PO Box 2108, Center , TX 75935

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

Taylor Made Environmental, P.O. Box 15299, Richmond, VA 23227

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

Edgewater Machine & Fabricators, 400 Megan Z Ave., EDGEWATER, FL 32132

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

Washington Chain & Supply, P.O. Box 3645, Seattle, WA 98124

ANTIFOULING

Flexdel Corp. /Aquagard, 1969 Rutgers University Blvd., Lakewood, NJ 08701, 888-353-9335, 732-901-6504, flexabar@sprintmail.com, Contact: Joe, Andy, or Rick, www.aquagard-boatpaint.com

Jotun Paints USA, 9203 Highway 23, Belle Chasse, LA 70037

AUTOPILOT SYSTEMS

Beier Radio, 1990 Industrial Ave, Harvey, LA 70058

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

Orkot Composites, 2535 Prairie Rd, Unit D., Eugene, OR 97402, 541-688-5529, 541-688-2079, mscott@polymersealing.com, Contact: Mike Scott, www.orkotmarine.us

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

BILGE SYSTEMS

Fast Systems, 14040 Santa Fe Drive, Lenexa, KS 66215-1284

Westfalia Separator, Inc., 100 Fairway Court, Northvale, NJ 07647, (201) 767-3900, (201) 784-4399, brown.courtney@wsus.com, Contact: Courtney Brown

BLOCKS & RIGGING

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

BOATBUILDER

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

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

BOLLARDS

Maritime International, 100 E. Vermilion St. #212, Lafayette, LA 70501

BRIDGE SUNSCREENS

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

BROKERS

Marcon International, P.O. Box 1170, Coupeville, WA 98239

BULKHEAD SEALS/PANELS

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

Thermax, 3115 Range Rd, Temple, TX 76501

BUOYS

Datrex, P.O. Box 1150, Kinder, LA 70648

CAD/CAM SYSTEMS

Albacore Research, 4196 Kashtan Place, Victoria, BC V8X 4L7, Canada

Autoship Systems Corp., Suite 312-611 Alexander Street, Vancouver, BC V6A 1E1, Canada

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

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

CAPSTANS

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

CARGO MONITORING & CONTROL SYSTEM

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

CAST IRON REPAIR

In-Place Machining, 1929 N . Buffum St, Milwaukee, WI 53212

CHAINS

Crandall Drydock Engineers, PO Box 505804, Chelsea, MA 02150

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

Washington Chain & Supply, P.O. Box 3645, Seattle, WA 98124

CHEMICALS/ CHEMICAL CLEANERS

Uniservice Americas, 57174 Hardin Rd., Slidell, LA 70461

CLASSIFICATION SOCIETY

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

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

DeFelsko Corp, 802 Proctor Ave.. P.O. Box 676, Ogdensburg, NY 13669

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

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

Hempel Coatings , 10-3511Viking Way, Richmond. BC V6V 1W1, Canada

Jotun Paints USA, 9203 Highway 23, Belle Chasse, LA 70037

Nace International, 140 South Creek Dr., Houston, TX 77084

Resto Motive Laboratories, P.O. Box 1335, Morristown, NJ 07962-1235

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

Seawave, 76 Hammarlund Way, Middletown, RI 02842

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

COMMUNICATIONS SERVICE

Maritel Marine Communications, 16 E. 41st Street, NY, NY 10017

COMPOSITE SHAFTS

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

COMPOUNDS

Philadelphia Resins, P.O. Box 309 , Montgomeryville, PA 18936

COMPUTER SOFTWARE MONITORING SYSTEMS

Azonix Corp., 900 Middlesex Turnpike, Bldg 6, Billerica, MA 01821, (978) 670-670-6300, (978) 670-8855, ProPanel-Mariner@azonix.com

COMPUTER/ COMPUTER SOFTWARE

Autoship Systems Corp., Suite 312-611 Alexander Street, Vancouver, BC V6A 1E1, Canada

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

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

Beier Radio, 1990 Industrial Ave, Harvey, LA 70058

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

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

L-3 Communications Westwood Corp;Tano Div., 5700 Citrus Blvd, Ste E, New Orleans, LA 70123, 504-733-4777/ 1-800-229-TANO, 504-734-2127, guy.hardwick@l-3com.com

MMC International, 60 Inip Dr, Inwood, NY 11096

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

Tano Corp., 57017 Citrus Blvd., Ste. E, New Orleans, LA 70123

CORROSION CONTROL

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

Gardner Denver Water Jetting Systems, 8807 Emmett Rd., Ste 100, Houston, TX 77040

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

Geislinger Corporation, 200 Geislinger Drive, Battle Creek, MI 49015

Interexpo Ltd Couplings In Stock, Plateia Theatrou 4, Athens 105 52, Greece, +30 210 3245666, +30 210 3248666, +30 210 3249666, interexpo@interexpo-ltd.gr, Contact: Marie Helene Charon, www.coupling.gr

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

MMC International, 60 Inip Dr, Inwood, NY 11096

CRANE - HOIST - DERRICK - WHIRLEYS

Bisso Marine Co., P.O. Box 4113, New Orleans, LA 70178

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

Edgewater Machine & Fabricators, 400 Megan Z Ave., EDGEWATER, FL 32132

Holly Hoist Corp, P.O. Box 86, St. Clair Shores, MI 48080

Liebherr Werk Nenzing GMBH, P.O. Box 10, A-6710, Nenzing, Austria

CRANKSHAFT GRINDING

Goltens Marine, 160 Van Brunt St., Brooklyn, NY 11231

CRANKSHAFT REPAIR

Goltens Marine, 160 Van Brunt St , Brooklyn, NY 11231

In-Place Machining, 1929 N . Buffum 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

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

Edgewater Machine & Fabricators, 400 Megan Z Ave., EDGEWATER, FL 32132

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

Rapp Hydema, 4433 27th Ave. West, Seattle, WA 98199

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

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

W.W. Patterson . 3 Riversea Road, Pittsburgh. PA 15223

DESALINATION - REVERSE OSMOSIS

G.E.T. Inc., 3135 Golden Ave , Long Beach, CA 90806

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

DIESEL CYLINDER INDICATORS

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

DIESEL ENGINE OVERHAUL

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

Goltens Marine, 160 Van Brunt St., Brooklyn, NY 11231

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

DIESEL ENGINE- SPARE PARTS & REPAIR

Aquamarine Engineering, P.O. BOX 83495, San Diego, CA 92138

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

GE Marine Engines, 1 Neuman Way, Cincinatti, OH 45215

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

Goltens Marine, 160 Van Brunt St., Brooklyn, NY 11231

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

Man B&W Diesel A/S, Telgtholmsgade 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

NREC Power Systems, 5222 Hwy 311, Houma, LA 70360, 985-872-5480, 985-872-0611

Reagan Equipment, 2550 BelleChase Hwy, Gretna, LA 70054

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

Wartsila Diesel, 201 Defense Hwy, Annapolis , MD 21401

DIESEL FUEL DECONTAMINATION

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

DIGITAL TORQUE METER SYSTEMS

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

DISPLAY TECHNOLOGY

Kent Modular Electronics Ltd., 611 Maidstone Road, Rochester, Kent, UK

DIVING & SALVAGE

Bisso Marine Co., P.O. Box 4113, New Orleans, LA 70178

DOCK FENDERING SYSTEMS

Plastic Pilings Inc., 1485 South Willow Ave , Rialto, CA 92376

DOCUMENTATION/DATABASES

Zaetric Business Solutions, LLC, 24800 I-45 North, Suite 324, Houston, TX 77386, 713-824-1654, 713-621-4885, inquiries@zaetric.com, Contact: David Woody, www.zaetric.com

DOOR LOCKS

The Brass Works Inc., P.O. BOX 566, DeLand, FL 32721, 386-943-8857, 386-943-8810, info@marinedoorandcabinethardware.com

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

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

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

Crandall Drydock Engineers, PO Box 505804, Chelsea, MA 02150

ELECTRICAL EQUIPMENT

MMC International, 60 Inip Dr, Inwood, NY 11096

ELECTRONIC CHARTS

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

Navionics, 6 Thatcher Lane, Wareham, MA 02571, 800-848-5896/508-291-6000, 508-291-6006, sales@navionics.com

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

ENGINE ROOM LIGHTING/ MONITORING & CONTROL

GMT Electronics. 171 Main St.. South River, NJ 08882

ENGINES

BTMC, 5810 Columbus Pike. Lewis Center, OH 43035, 740-548-4282, 740-548-5756, davemiller@btmccorp.com, Contact: Dave Miller. www.btmccorp.com

Fairbanks Morse, 701 White Avenue, Beloit, WI 53111

GE Marine Engines, 1 Neuman Way, Cincinatti, OH 45215

Power Research Inc., 6970 Portwest Drive, #180, Houston, TX 77063

EVAPORATORS

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

Beaird Industries, 601 Benton Kelly St. , Shreveport, LA 71106

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

EXHAUST

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

EXPANSION JOINTS

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

Maritime International, 100 E. Vermilion St. #212, Lafayette, LA 70501

Plastic Pilings Inc., 1485 South Willow Ave., Rialto, CA 92376

Poly-Hi-Solidur, 2710 American Way, Ft. Wayne, IN 46899

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

Seaward International, 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

AAF International, 10300 Ormsby Park Pl. STE 600, Louisville, KY 40223, 888-388-0529, 888-398-0529, mbragg@aafintl.com, Contact: Myles Bragg. www.aafintl.com

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

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

G.E.T. Inc., 3135 Golden Ave , Long Beach, CA 90806

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

Pt. Canaveral Marine Fire Fighter Academy. P.O. Box 267, Cape Canaveral, FL 32920

FLANGES

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

FLOW CONTROLS

Hoffer Flow Controls, 107 Kitty Hawk Lane, Elizabeth City, NJ 27906

FLUID SEALING & PACKING

The Delmar Company, Highway 60 Rte 4, Dillwyn, VA 23426

FUEL ADDITIVES

Power Research Inc., 6970 Portwest Drive, #180, Houston, TX 77063

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

GAS TURBINES

GE Marine Engines, 1 Neuman Way, Cincinatti, OH 45215

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

GMDSS- GEAR BOXES & BEARINGS

Beier Radio, 1990 Industrial Ave, Harvey, LA 70058

GOVERNORS

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

GPS

Leica Navigation, 23868 Hawthorne Blvd, Torrance, CA 90505-5908

Standard Horizon, 10900 Walker St , Cypress, CA 90630

GROUNDINGS

Sohre Turbomachinery, 132 Gilbertville Rd., 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

Aquamarine Engineering, P.O. BOX 83495, San Diego, CA 92138

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

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

HEAVY FUEL TREATMENT
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, 33131 Schoolcraft Rd, Livonia, MI 48150

INCINERATORS
Therm-Tec Inc., P.O. Box 1105, Tualatin, OR 97062

INFRARED IMAGING EQUIPMENT
Flir Systems, 16505 SW 72ND AVE, Portland, OR 97224

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

INSTRUMENTATION
Hoffer Flow Controls, 107 Kitty Hawk Lane, Elizabeth City, NJ 27906
Thermo Electron, 6801 Cochran Rd., Solon, OH 44139

INSULATION
M & A Supply LLC, 150 North Plains Industrial Rd., Wallingford, CT 06492, 203-294-9431, 203-294-1697, sales@ma-supply.com, Contact: Jeff Blake, www.ma-supply.com
Mascoat Products, 10890 Alcott, Unit 12, Houston, TX 77043
Pacor, Inc., P.O. Box 107, Westville, NJ 08093
Superior Energies Inc., 3115 Main Ave., Groves, TX 77619

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

INTERIOR DESIGN
Global Interior Group , 2426 Dennis Street, Jacksonville, FL 32204

INTERIORS
Custom Ship Interiors, Inc., P.O. Box 882, Solomons, MD 20688
Directions In Design, Inc., 1849 Craig Road, St. Louis, MO 63146, 314 205-2010, 314 205-0889, May-Zinsers@didinc.com, Contact: Sharon May-Zinser, www.didinc.com
Global Interior Group , 2426 Dennis Street, Jacksonville, FL 32204
Hopeman Brothers, P.O. Box 820, 435 Essex Ave., Waynesboro, VA 22980
Jamestown Metal Marine Sales, Inc., 4710 Northwest 2nd Ave. , Boca Raton, FL 33431
Lit Industries, 516 Costner School Rd., Bessemer City, NC 28016-9801
Panel Specialists Inc./Thermax N.A., 3115 Range Road, Temple, TX 76504-1240, 254-774-9800, 254-774-7222, thermax@erols.com, Contact: John Hutchison, www.panelspec.com

JOINER- WATERTIGHT DOOR-PANELING-CEILING SYSTEM
Custom Ship Interiors, Inc., P.O. Box 882, Solomons, MD 20688
Hopeman Brothers, P.O. Box 820, 435 Essex Ave., Waynesboro, VA 22980
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

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

LAUNDRY EQUIPMENT
Richard Galley Supply, PO Box 4035, Houma, LA 70361

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/RAFTS
DBC Marine Safety Systems, 101-3760 Jacombs Rd., Richmond, BC V6V 6T3, Canada
Edgewater Machine & Fabricators, 400 Megan Z Ave, EDGEWATER, FL 32132
Survival Systems International, P.O. Box 1567, 931 Industry Rd., Kenner, LA 70062, 504-469-4545, 504-466-1884, service@ssinola.com
Viking Life Saving Equipment, 1625 N. Miami Ave., Miami, FL 33136
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
Viking Life Saving Equipment, 1625 N. Miami Ave., Miami, FL 33136

LIFT EQUIPMENT
Mi-Jack Products, 3111 West 167th St., Hazel Crest , IL 60429

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

LIGHTING SYSTEMS/ EQUIPMENT
ACR Electronics Inc., 5757 Ravenswood Rd., Ft. Lauderdale , FL 33310-5247
Archway Marine Lighting, 4501 Swan Ave., St. Louis , MO 63110
Goltens Marine, 160 Van Brunt St., Brooklyn, NY 11231
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
Exxon Mobil Marine Lubricants, 3225 Gallows Road, Fairfax, VA 22037, 1+609-409-2741, 1+609-409-5699, unknown, Contact: unknown, www.exxonmobil.com
Power Research Inc., 6970 Portwest Drive, #180, Houston, TX 77063

LUBRICANTS/LUBRICATION SYSTEMS
Benjamin R. Vickers & Sons Ltd., Airedale Mills, 6 Clarence Road, Leeds, W. Yorkshire L510 IND, UK
Companion Products, Inc., 2040 Johnson Ct., Unit A, Kingston, IL 60145-0009

MACHINERY MAINTENANCE, REPAIR & TESTING
Goltens Manne, 160 Van Brunt St., Brooklyn, NY 11231
Mackay Communications, 2721 Discovery Dr., Raleigh, NC 27616-1851

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

MARINE CONSULTANTS
Hall Associates of Washington , P.O. Box 1554 , Mukiteo, WA 98275

MARINE DECKING & FLOORING
Hopeman Brothers, P.O. Box 820, 435 Essex Ave., Waynesboro, VA 22980
SlipNOT Metal Safety Floonngs (Div. of W.S. Molnar Company), 2545 Beaufait St., Detroit, MI 48207

MARINE DIESEL ENGINES
MAN Engines & Componets Inc., 591 SW 13th Terrace, Pompano Beach, FL 33069, 800-MAN-2842, 954-946-9098, www.man-mec.com

MARINE ELECTRONICS
ACR Electronics Inc., 5757 Ravenswood Rd , Ft. Lauderdale , FL 33310-5247
Beier Radio, 1990 Industnal Ave, Harvey, LA 70058
Comark Marine, 93 West Street, Medfield, MA 02052
GMT Electronics, 171 Main St., South River, NJ 08882
Hatteland Display, Bogstadveien, 19. , N-0355 Oslo Norway
Jotron Electronics, Box 85 , NO-328OT Jodalyng Norge, Norway
Leica Navigation, 23868 Hawthorne Blvd, Torrance, CA 90505-5908
Marine Electronic Solutions, 1522 Crabapple Cove, Jacksonville, FL 32225
Saab Marine Electronics, Box 13045, 402 5Goteborg, Sweden
Standard Horizon, 10900 Walker St., Cypress, CA 90630

MARINE ENGINEERING
Plastic Pilings Inc., 1485 South Willow Ave., Rialto, CA 92376
Scardana Amencas Bkg., 502 Empire St. , Greenfield Park J4V 1V7, Canada
Waterman Supply, P.O. Box 596, Wilmington, CA 90748

MARINE GLASS
Bent Glass Design Inc., 3535 Davisville Rd., Hatboro, PA 19040

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

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

MARINE POWER PLANT SYSTEMS
Auramarine Ltd , Box 849 , FI-20101 Turku, Finland

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

MARINE SENSORS
Airmar Technology Corp., 35 Meadowbrook Drive, Milford, NH 03055, 603-673-9570, 603-673-4624, sales@airmar.com, Contact: Peter Braffitt, www.airmar.com

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

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

MARITIME TRAINING & SCHOOLS
Manne Safety International, Marine Terminal , Laguardia Airport, NY 11371

METERS
Selco USA, Inc. , 2508 Lakebrook Court, Atlanta, GA 30360-1715, 1-877 selcous (1-877-735-2687) 770-455-9110, 770-455-3754, info@selcousa.com

MONITORING ALARM/CONTROL
Marine Electric Systems, Inc., 33 Route 17 South, East Rutherford, NJ 07073, 201 531-8600 Ext 231, 201 531-8606, info@marineelectricsystems.com, Contact: Gary Mandell, www.Marineelectricsystems.com

MONITORING SYSTEMS
G.R. Bowler, Inc. Marine Controls, 2261 Lake Rd , Ontario, NY 14519, 800-524-9570, 315-524-8753, gary@grbowler.com, Contact: Gary R Bowler, www.grbowler.com
Mackay Communications, 2721 Discovery Dr., Raleigh, NC 27616-1851
Prime Mover Controls, 3600 Gilmore Way, Burnaby, BC V5G 4R8, Canada

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

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

NAV/COMM EQUIPMENT
Beier Radio, 1990 Industrial Ave, Harvey, LA 70058
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
Transas Manne USA, 19105 36th Ave. W., Ste. 101, Lynwood, WA 98036-5760

NAVAL ARCHITECTS, MARINE ENGINEERS
A.K. Suda, Inc., 3004 19th St., Metaine, LA 70002-4989
Alan C. McClure Associates, Inc., 2600 South Gessner, Houston, TX 77063
Band, Lavis, & Associates, Inc., 900 Ritchie Hwy, Suite 203, Severna park, MD 21146
Bay Engineering, 253 N. First Ave., Sturgeon Bay, WI 54235
C. Baxter & Associates, P.O. Box 9006, Mobile, AL 36609
CDI Manne Co., 9550 Regency Square Blvd, Ste 400, Jacksonville , FL 32222
Computer Sciences Corporation-Advance Manne Center, 1201 M St. SE., Washington , DC 20003
CT Manne, 56 Crooked Trail, Rowayton, CT 06853
Cunningham & Walker, 1762 Providence Hollow Lane, Jacksonville, FL 32223
Dejong & Lebet, Inc., 1734 Emerson St., Jacksonville, FL 32207
Elliot Bay Design Group, 5301 Shishole Ave. NW, Ste. 200, Seattle, WA 98107
George G. Sharp, 100 Church St., New York, NY 10007
Guido Perla & Associates, 4300 King St., Ste 1200, Seattle, WA 98104
Jamestown Marine Service, 1084 Shennecossett Rd., Groton, CT 06340
John J. McMullen Associates, 4300 King St., Suite 400, Alexander, VA 22302
John W. Gilbert & Assoc., 199 State St., Boston, MA 02109
Kvaerner Masa Marine Inc., 201 Defense Highway, Ste 202, Annapolis, MD 21401
M. Rosenblatt & Son, Inc., 2341 Jefferson Davis Hwy, Arlington, VA 22202
Maritech, Seacliff, Bay Road, Newmarket, NH 03857
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 Mornson Drive, Ottawa, Ontano K2H 8S9, Canada
Nautical Designs, Inc., 2101 S. Andrews Ave., Ste 202, Fort Lauderdale, FL 33316
R.J. Mellusi & Co., 71 Hudson St., New York, NY 10013
Sargent & Herkes, 225 Baronne St., STe 1405, New Orleans, LA 70112
Scientific Manne Services, Inc., 101 State Pl., Ste F., Escondido, CA 92029
Sea School, 10812 Gandy Blvd, St. Petersburg, FL 33702
Seaworthy Systems Inc , PO Box 965, Essex, CT 06426
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 Manne 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
Klein Navigation, 11 Klein Drive, Salem, NH 03079, 603 890-1304, 603 890-9796, mail@kleinnavigation.com, Contact: Deborah Durgin, www.kleinnavigation.com
Nauticast AG, Manahilfer Strasse 50/211, A-1070 Vienna, Austria
Transas Manne USA, 19105 36th Ave. W., Ste. 101, Lynwood, WA 98036-5760

NOZZLES/ NOZZLE SYSTEMS
Harnngton Marine , 6720 124th Ave., Fennville, MI 49408
Nautican, 115 Kelvin Grove Way P.O. Box 428, Lions Bay, BC VON 2E0, Canada, 604-921-1920, 604-921-1925, josip@nautican.com, Contact: Josip Gruzling, www.nautican.com

OIL/WATER SEPARATORS
Alfa -Laval Separation, Inc., 955 Mearns Rd., Warminster, PA 18974
MMC International, 60 Inip Dr, Inwood, NY 11096
Westfalia Separator, Inc., 100 Fairway Court, Northvale, NJ 07647, (201) 767-3900, (201) 784-4399, brown.courtney@wsus.com, Contact: Courtney Brown

PAINTS AND ANTI FOULANTS
E Paint Company, 25 Research Road, E. Falmouth, MA 02536, 800-258-5998, 508-495-3210, epaint@epaint.net, Contact: Kimberly Fontaine, www.epaint.net
New Coat Technology, LLC, P.O. Box 130 228, Houston, TX 77219, 713-223-4370, 713-523-4606, sales@newcoattech.com

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

PIPE FITTINGS/CUTTINGS/CONNECTING/ SYSTEMS
GS-Hydro U.S., 1395 Bluehills Ave., Bloomfield, CT 06002
Jesse Engineering, 5225 7th St., E. Tacoma, WA 98424, 253-922-7433, 253-922-2536, tmorgan@jesse-wallace.com
Neptune Research, 1685 Latham Rd., West Palm Beach, FL 33409
RAMCO Manufacturing Co., 365 Carnegie Ave., Kenilworth, NJ 07033

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

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

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

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

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

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

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

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

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
Goltens Marine, 160 Van Brunt St., Brooklyn, NY 11231
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, Telgiholmsgade 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
Napier Turbochargers, P.O. Box 1, Waterside , South Lincoln LN5 7FD, UK
Nya Berg Propulsion AB, Box 1005, 430 90 Ockero, Sweden
Omnithruster Inc., 30555 Solon Ind. Pkwy, Cleveland, OH 44139
Propulsion Systems Inc, 601 NE 26th Court, Pompano Beach, FL 33064
Rolls-Royce Commercial Marine, 10255 Richmond Ave., Ste 101, Houston, TX 77042
Schottel Gmbh & Co., KG-Mainzer Strasse , 99-D-56322-Spay, Germany
Schottel Inc., 675 Industrial Blvd., Sugar Land, TX 77478
Voith Schiffstechnik GMBH & Co., P.O. Box 2011, 89510 Heidenheim, Germany
Voith Schneider America Inc., 121 Susquehanna Avenue, Great Neck, NY 11021
Wartsila Corporation, Box 244, FI-65101 Vasa, Finland
Wartsila Lips, 3617 Koppens Way, Chesapeake, VA 23323
ZF Marine, 3131 S.W. 42nd St., Ft. Lauderdale, FL 33312, 954-581-4040, 954-581-4078, www.zf.com, Contact: A.J. Halavacs, www.zf-marine.com
ZF Marine Group , Ehlerst 50, 88046 Friedrichshafen, Germany

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

PUBLICATIONS
Maritime Reporter, 118 East 25th street, New York, NY 10010, 212 477 6700, 212 254 6271, jomalley@marinelink.com, Contact: John O'Malley, www.marinelink.com

PUMP-REPAIR-DRIVES
Fybroc-Div.of Met-Pro, P.O. Box 144, Harleysville, PA 19438
Reagan Equipment, 2550 BelleChase Hwy, Gretna, LA 70054
Scardana Americas Bkg., 502 Empire St. , Greenfield Park J4V 1V7, Canada

RADARS-ARPAS
Ampco Pumps Co , 4424 West Mitchell St, Milwaukee, WI 53214
Beier Radio, 1990 Industrial Ave, Harvey, LA 70058
Furuno USA Inc., 4400 NW Pacific Rim Blvd, Camas, WA 98607

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

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

REVERSE OSMOSIS
G.E.T. Inc., 3135 Golden Ave., Long Beach, CA 90806

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

RIGID INFLATABLE BOATS
Willard Marine Inc., 1250 N. Grove St., Anaheim, CA 92806
Wing Inflatables, P.O. Box 279, 1132 Samoa Blvd., Arcata, CA 99521

ROPE-MANILA-NYLON-HAWSERS-FIBERS
Marlow Ropes, South Road, Halisham, East Sussex BN27335, UK
Puget Sound Rope, 1012 Second Ave., Anacortes, WA 98221

ROTATING EQUIPMENT
FCS, Inc., 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 MANAGMENT CONSULTANTS
Modern Maritime, 67 Bow St., Ste. 3, Portsmouth, NH 03801

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
FabEn Co., Inc., 2012 Karbach, Houston, TX 77092

Lalizas SA, 21 Haidariou St., 545 Piraeus, Greece
SlipNOT Metal Safety Floorings (Div. of W.S. Molnar Company), 2545 Beaufait St., Detroit, MI 48207
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, 1625 N. Miami Ave., Miami, FL 33136
Walport USA , 39-5A Dover Rd South, Toms River, NJ 08757

SALVAGE
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
Research Products-INCINOLET, 2639 Andjon Drive, Dallas, TX 75220, 800-527-5551, 214-350-7919, sales@incinolet.com
Sanitary For All, Inc., 3909 Witmer Rd., PMB 472, Niagra Falls, NY 14305

SATELLITE COMMUNICATIONS
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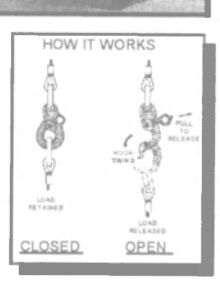

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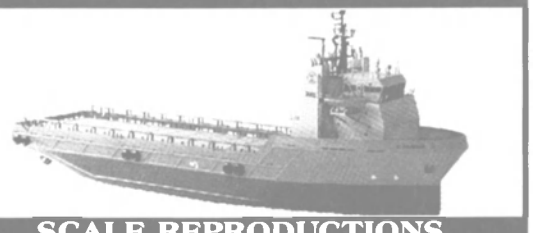

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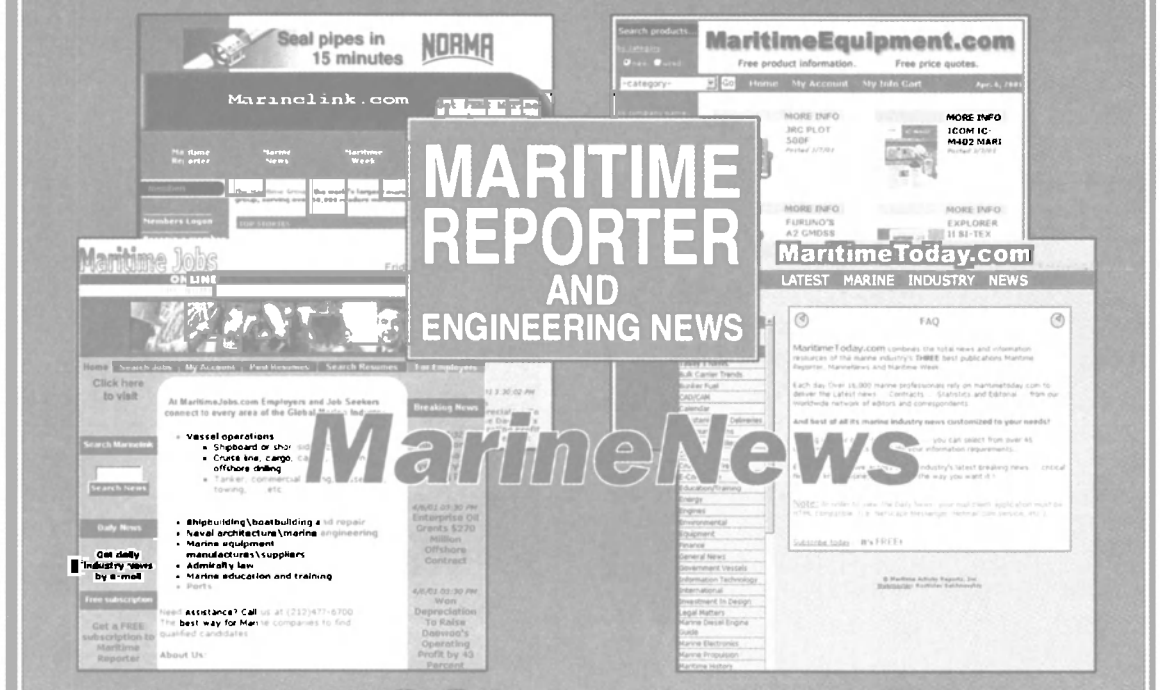

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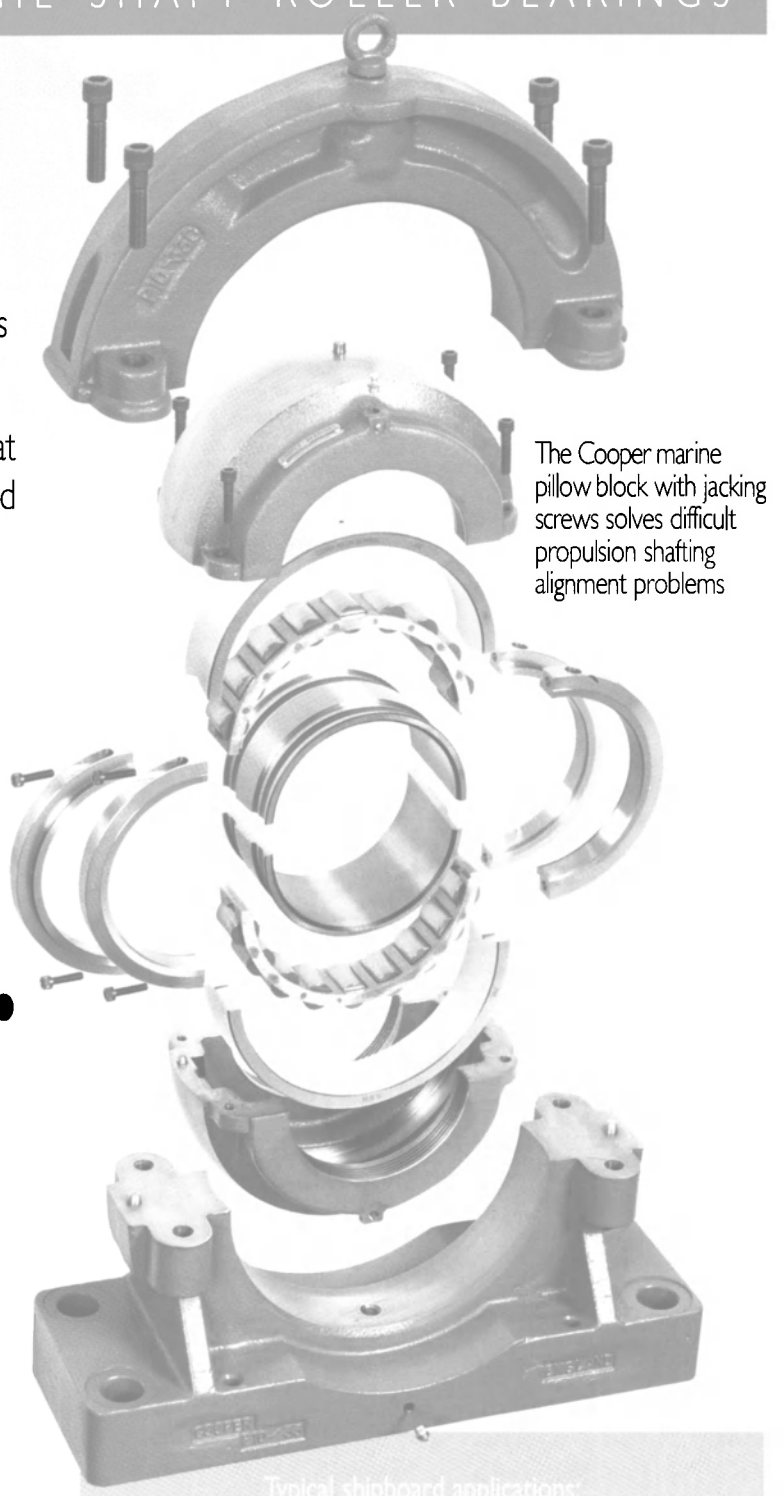

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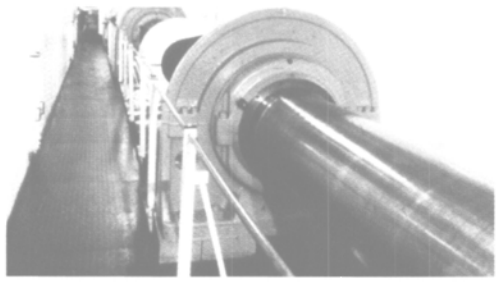

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