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AND
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GREAT SHIPS OF 1994



Gas Turbine Powered
Techno Superliner Prototype
Hits 54 Knots During Tests

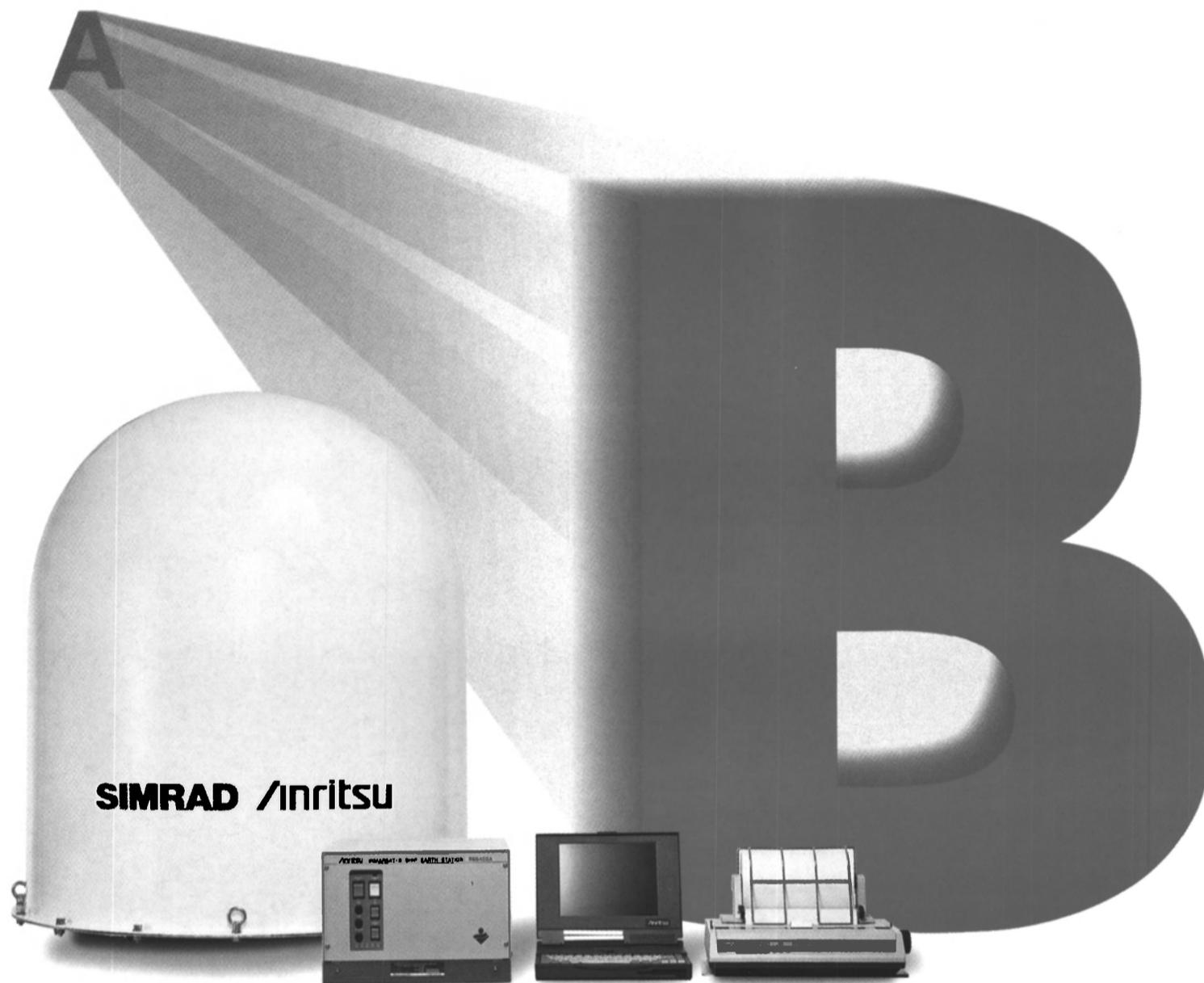
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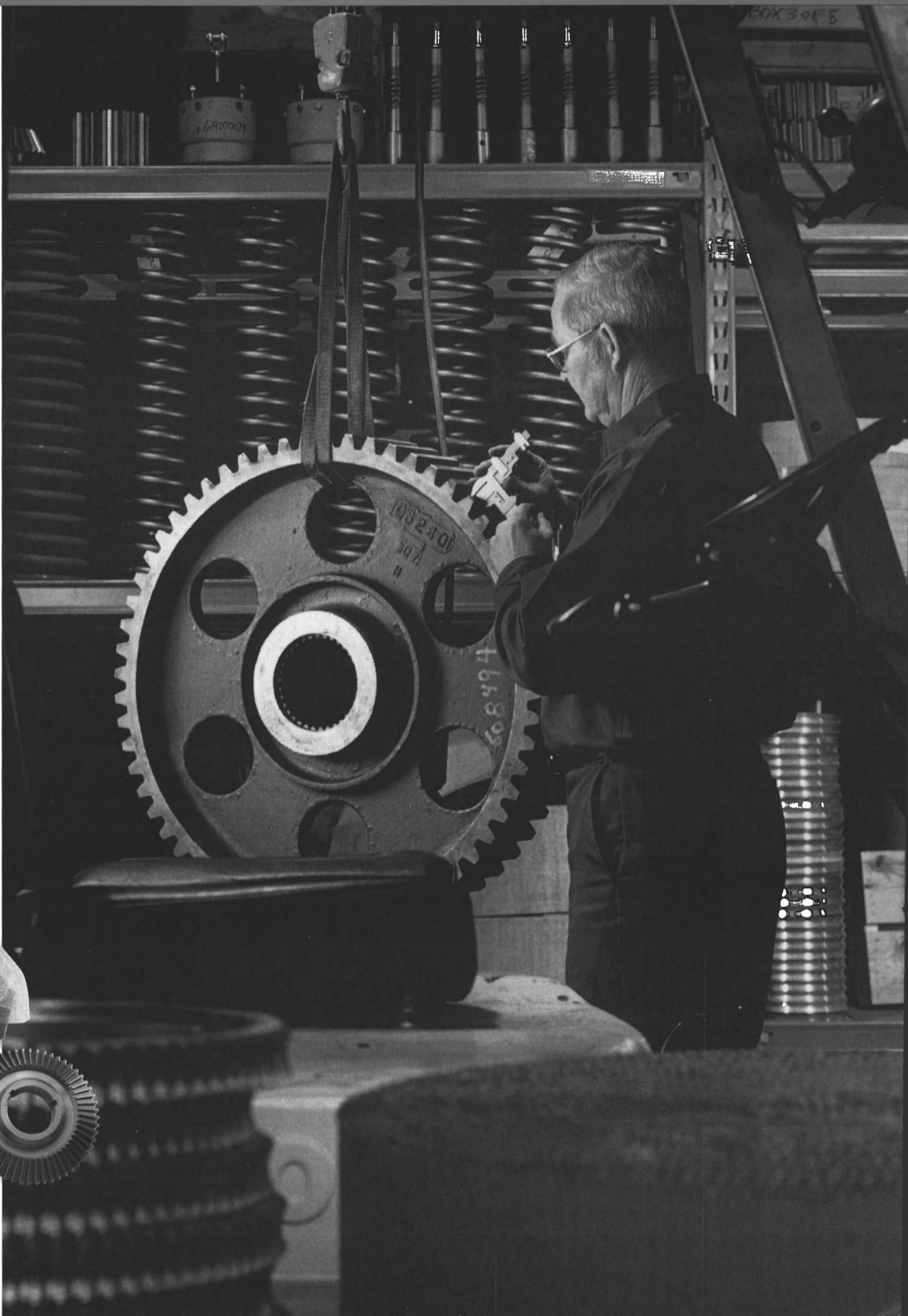
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ON THE COVER

ON THE COVER: The Hishoh is a large surface effect vessel prototype built as part of the Japanese government and private industry project dubbed Techno Superliner. A pair of MFT8 gas turbines drove the vessel to 54 knots during a recent trial. The gas turbines are a collaborative effort between Turbo Power & Marine Systems, a division of the United Technologies Corp., and the Takasago Machinery Works, a major manufacturing center within Mitsubishi Heavy Industries (MHI). See full story on page 22.

22 SHIP & BOATBUILDING TECHNOLOGY

Gas turbine-powered prototype Hishoh reaches 54 knots in recent trial.



29 GREAT SHIPS OF 1994

Nine vessels of various type are featured in this year's look at noteworthy builders, suppliers and owners.



44 THE DEADLINE IS NEAR...

The USCG's controversial COFR rule is about to take effect. Read up to discover 11th-hour options.



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NASSCO To Build Two More Sealift Ships For \$436 M

National Steel and Shipbuilding Company (NASSCO) of San Diego received \$436 million in contract awards from the U.S. Navy to build two additional Strategic Sealift Ships. A \$265 million contract to build the first large, medium-speed, RoRo ships for the Strategic Sealift Program was awarded to NASSCO in September 1993. The most recent contracts represent the exercise of options on the second and third ships in what could potentially become a six-ship program with a total value of \$1.3 billion.

The engineering and planning work required to build the ships has been underway for a year. Production of the lead ship will begin in third quarter 1995 with delivery scheduled in second quarter 1997. Production of the second ship will begin in the third quarter of 1996 with delivery in the second quarter of 1998. The third ship will begin production in the second quarter of 1997 with delivery set for the first quarter of 1999. The ships will be a NASSCO design.

For more information on NASSCO
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Coltec Wins \$40 M Contract

The Fairbanks Morse Engine Division of Coltec Industries received an order from Avondale Shipyards

Div. to produce engines valued at \$40 million for the next two ships Avondale is building for the Strategic Sealift Program.

The order includes eight 10-cylinder Colt-Pielstick PC4.2 engines, each rated at 16,290-hp, and related equipment for the propulsion of the 950-ft. (289.5-m) ships. Delivery of the first four engines is scheduled for late 1996, and delivery of the second four for early 1997.

Fairbanks Morse Engine, based in Beloit, Wis., produces large, heavy-duty diesel, gas and dual-fuel engines for marine propulsion and many other applications. Coltec Industries is based in New York.

For more information on
Fairbanks Morse
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Modular Tanker Consortium Reaches MARITECH Development Agreement

The Modular Tanker Consortium (MTC) signed one of the first cooperative agreements in the Advanced Research Projects agency's (ARPA) MARITECH program.

The MTC is a composed of nine U.S. companies and one foreign company: ABB Industrial Systems (Finland); BethShip Sparrow's Point Yard; Bird-Johnson Company; International Marine Software Associates; Kvaerner Masa Marine, Inc.; McDermott Inc.; Seaworthy Systems;

SPAR Associates; Wartsila Diesel; and Wilson, Gillette & Company. Together they will research the U.S. domestic and international markets for tank vessels which reportedly are environmentally friendly, safe and more economical to operate than traditional tanker designs.

The design and construction of the new tankers will be based on a modular concept, applied to entire sections of the ship: cargo midbody, bow and stern sections, deckhouses and machinery plants. The time and expense of constructing ships will be reduced as the engineering, design and manufacturing process is streamlined. Toward this end, MTC will develop software to feed engineering data to computer-aided design and manufacturing databases, then transfer the design data to production labor and material estimating, scheduling, budgeting and control systems.

Wartsila Diesel and Kvaerner Masa Marine will manage the 18-month project.

INTERTANKO: Zero Waste At Sea Is Possible

Waste disposal from ships at sea can be eliminated, **Philip Rankin** of INTERTANKO the international association of independent tanker owners, told a conference of more than 100 European environmentalists at the 1st Seas At Risk Conference in Copenhagen, Denmark.

INTERTANKO is the sole international shipping industry body at the "green" conference sponsored by the Danish government, and the association's participation builds on a record of recent exchanges of meetings with green groups in Europe and the U.S.

Addressing concerns over operational oily waste being dumped at sea and ending up on beaches, Mr. Rankin said operational dumping by ships can be stopped. However, "the establishment of adequate waste reception facilities in ports is an absolutely essential prerequisite for cutting waste disposal at sea," he said. Reception facilities in oil ports is a mandatory requirement under MARPOL, the Marine Oil Pollution Convention from the IMO. The Conference is expected to adopt a Declaration to present to the Ministerial North Sea Conference next year, which will discuss measures to cut North Sea pollution.

Greek Conference: Shore-Based Facilities Stressed

At an INTERTANKO Conference held in Greece, discussion focused on OPA 90 questions. Speakers stressed the need for the "Partnership for Prevention" INTERTANKO launched to improve shoreside systems and other factors which influence the safety of shipping: vessel traffic control, better charting, improved standards of pilotage and tugs. Also, responsible selection of ships by charterers was pinpointed as an important contribution to improving industry conditions.

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Building started on multi-role icebreaker

When Rieber Shipping A/S of Bergen, Norway announces that it is having a new ship built, the marine world tends to take notice. Its last newbuild, commissioned in 1990, was the M/V *Polar Circle*, an innovative combined Antarctic research and educational cruise vessel that generated great interest from the industry. Among many noteworthy features, it was fitted with reportedly the first commercial application of a full ECDIS system. Patently of immense versatility, *Polar Circle* was soon chartered and then purchased by the British Royal Navy and quickly renamed HMS *Endurance* as the long overdue replacement to a famous predecessor. The company's latest project, an 262.5-ft. (80-m) icebreaker currently under construction at Kvaerner Kleven Leirvik, also in Norway, is certain to be studied closely as the multi-role concept is advanced even further.

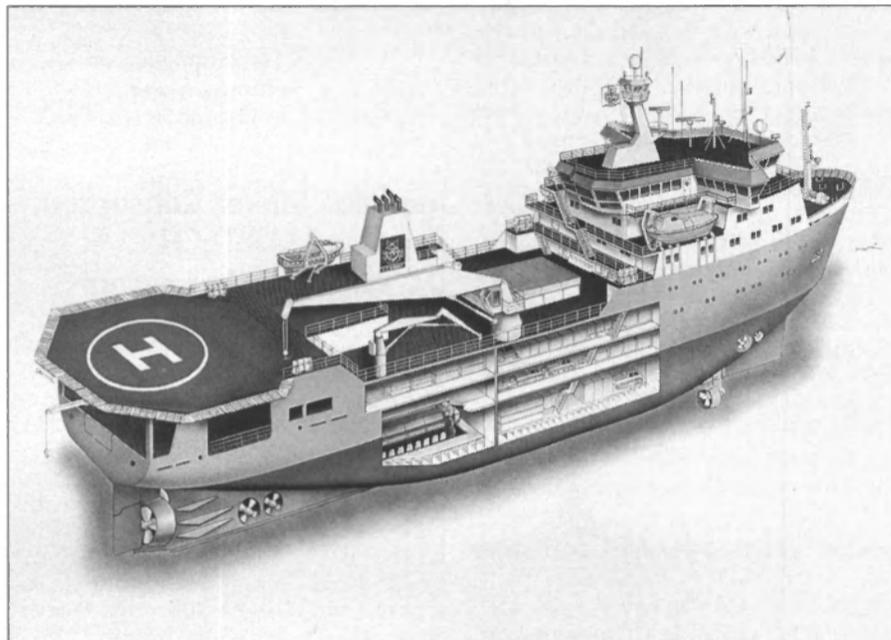
Rieber's existing fleet comprises a number of high ice class seismic exploration ships and four icebreaking research and expedi-

tion vessels which have extended experience in both the Arctic and Antarctic. Several of the company's vessels have been extensively involved in the Canadian High Arctic (Rieber has a branch office in Newfoundland) and M/V *Polar Duke* has been trading continuously, summer and winter since 1984, from Punta Arenas to the Antarctic Peninsula for the U.S. Scientific Mission. In order to utilize some of these vessels during the off-season they have also been equipped with maneuvering, navigation and handling equipment so that they are able to operate effectively as offshore survey and ROV support vessels. It is against this background that the Rieber in-house design team developed the new vessel.

Nevertheless, according to Managing Director **Sven Rong**, the decision to build a vessel capable of fulfilling a wide spectrum of roles was not just taken to attract a broader range of potential charter customers. Many leading research institutions, with which the company is closely associated, face ever more

restricted budgets and high vessel operating costs. This knowledge led to the conclusion that a significant under deck carrying capacity together with deck container fittings

on a vessel equipped with oceanographic, hydrographic and geophysical research facilities would provide them with a cost effective solution — the same vessel could keep the



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remote bases supplied with stores and equipment.

The ship will include provision for 3,000 cu. m. of under deck cargo, two separate stabilization tanks to extend the weather window when carrying out research work and facilities for ROV support, seabed mapping and pipeline route surveying. A fully redundant dynamic positioning system combined with sufficient deadweight will also enable the vessel to carry out cable laying duties. Mr. Rong considers that the ROV support capability is particularly significant. "This is the first vessel to be purpose built for ROV duties for a long time and I am certain that the market will welcome a vessel that meets all the latest safety and redundancy requirements," he told *MR/EN*.

An ice tank in Helsinki, Finland was used in the extensive model testing program which helped develop the final 262-ft. (80-m) x 56-ft. (17-m) x 20-ft. (6.15-m), 1,800-dwt double hull design. Power from two Ulstein Bergen BRM 6 diesels each developing 2,550 kW at 720 rpm will be transmitted through a Tacke "twin in/single out" gearbox to an Ulstein CP propeller inside a nozzle giving a maximum speed of 14 knots, a Brunvoll forward azimuthing thruster providing emergency "take you home" propulsion. A heat recovery system and an economic hull form will ensure maximum fuel

economy estimated at 9.5 tons/day at 12 knots with an endurance of around 40,000 nautical miles. Electrical power, a prime consideration on a scientific research ship where consumption is generally heavy, will be provided by two 2,200-kW shaft generators with two 600-kW auxiliary generators and a 150-kW emergency set giving 450 and 230V 60Hz plus 230/120V UPS 60/50 Hz for laboratory spaces.

The aft deck helicopter pad has been designed to accept a Super Puma and refueling arrangements, involving dedicated aviation fuel tanks, will be to the highest safety standards. The decks are engineered to be capable of taking heavy vehicles, and three cranes are included, although one would normally be restricted to ROV deployment.

Research facilities include both wet and dry laboratories, with direct access to the extensive research deck area, and a separate scientific store. Provision is made for the installation of two additional container laboratories, connection points to all necessary facilities including stabilized power being provided. Around 65 berths out of the total of 80 in 40 cabins would be available to the charterer and hospital, day room, dining room, gymnasium and sauna facilities are also provided.

Classified by Det Norske Veritas

(Continued on page 8)

New lease on life for ex-Gulf ships



The Veesea Tempest standing by in the North Sea.

The 187-ft. (57-m) Veesea Tornado is one of four virtually identical vessels — Veesea Tempest, Veesea Hurricane and Veesea Storm being the others — that form part of Vector Offshore's 11-vessel fleet. Interestingly, all four share a similar story, having been built by American Marine Corporation of New Orleans, La., in the early '70s

(See "VEESEA" on page 8)

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Fresh challenges face European standby operators

Offshore oil companies operating within the British sector of the North Sea are currently awaiting final approval for legislation submitted to the U.K. Health & Safety Commission in October which will award them greater individual responsibility for the provision of rescue facilities. In what some may see as a relaxation of the rules, the new style Offshore Installations (Prevention of Fire and Explosion and Emergency Response) Regulations will change current rules for "a standby ship to be stationed within five miles of all offshore installations" in favor of a general stipulation that oil companies provide "appropriate arrangements to ensure a good prospect of rescue." If it were not for the fact that the oil and gas bearing areas of the North West European Continental Shelf are serviced by 130

rescue vessels whose U.K. and Irish operators have invested heavily in upgrading and maintenance and pride themselves on the benchmark that a person should be recovered from the water within four minutes of an alarm sounding, it would be easy to see the new legislation as a retrograde step.

Recent investment will undoubtedly do much to allay fears as well over \$300 million has been spent in under five years upgrading all rescue vessels currently in operation and the very ethos of the SSOA — to foster the effective use of the vessels, gather information relevant to members' interests, conduct trials and tests on equipment — is further evidence of a perfectionist attitude.

Irrespective of oil company reaction to the new rules, purpose built vessels costing up to \$8.25 million each are being added to the fleet.

(Continued from page 7)

(DNV) to DNV W1, the exceptionally well equipped bridge will incorporate ECDIS, dynamic positioning with separate joystick and conventional back-up in wheelhouse and crew's nest, GPS, GMDSS, HPR tracking and taut wire, three radars, two gyros, and several echosounders. A TV monitoring

system involving 20 cameras will cover most areas of the vessel and the engine room computer monitored to ICS class. The vessel is being constructed to DNV classification as an icebreaker and to Norwegian Shipcontrol, SOLAS and IMO rules governing special purpose vessels.

New Database Of Sensors Offered

iData, a division of MCR Engineering, introduced SBase, an in-

formation database of thousands of sensors from manufacturers worldwide. The new database allows users to find and specify sensors in more than 30 different ways.

For more information on SBase Circle 19 on Reader Service Card

"VEESEA"

(Continued from page 7)

as anchor-handling tug supply vessels, and operated chiefly in the Gulf of Mexico under the names *Cayman Island*, *Conzumel Island*, *Canary Island* and *Aleutian Island*.

Today, as offshore standby vessels, they have benefited from various stages of refit, a process which started in 1991 when they were taken to Eastern Marine at Panama City, Fla., for work which included removal of the anchor handling winch to make space for a large survivor accommodation unit at the forward end of the aft deck. Each bridge was substantially upgraded with the provision of "Robstick" controls (every vessel in the Veesea fleet has identical controls to give manning flexibility).

Following the renaming, the vessels were sailed across the Atlantic to either the Wear Dockyard in northeast England or Forth Engineering in Leith, Scotland for the final fit-out as a fully fledged standby vessel to Draft 4 of the appropriate Code. Each vessel cost approximately \$1.6 million to convert and upgrade.

The vessels were then set to work in the North Sea, mainly with Conoco U.K. Ltd. Further upgrading took place in 1992 to implement relatively minor improvements thought necessary to fully meet the Cullen requirements — a drenching system was installed and the hospital/survivor reception areas enhanced. Although not built for standby purposes, these vessels are now considered to be perfect for the requirements and more than meet the most exacting of standards. Since starting work with Conoco, *Veesea Tornado*, for example, has been providing safety standby services non-stop to the Viking Bravo installation, a major platform in the Viking field in the Southern sector of the North Sea. Its sister vessels are similarly employed elsewhere in the area.



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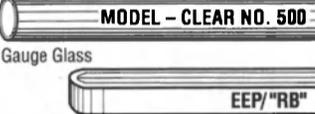
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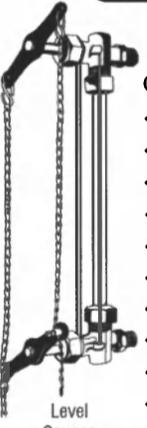
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First Spanish Shipyard Earns ISO 9002 Quality Certification

Astilleros Canarios, S.A. (Astican) has reportedly become the first Spanish shiprepair yard to have obtained the ISO 9002 Quality Assurance Certificate. The certificate was awarded by Lloyd's Register Quality Assurance. Astilleros Canarios specializes in shiprepair and conversion, and has one of the largest Syncrolift systems in the world. The Astican facilities are located on the Canary Islands.

Trinity's Halter Marine Wins \$47.2 M For Navy Oceanographic Ship



Halter Marine, Inc. of the Trinity Marine Group won a \$47.2 million contract from the U.S. Navy to build a T-AGS 60 class oceanographic research ship. The contract has options for two more ships which could bring the contract value to more than \$155 million. Halter is currently building three other T-AGS ships for the Navy.

The vessel will be built at Halter Marine, Moss Point, Miss., with construction support from its sister shipyards Trinity Marine - Gulfport and Equitable Shipyards, Inc., New Orleans.

The vessel is based on a sleek 329-ft. (100-m) design that exceeds Navy requirements. John Dane III, president of the Trinity Marine Group, said the ships had to be ultra-quiet and as vibration-free as possible due to the high-tech sensors and other equipment aboard.

The new T-AGS ship will be almost identical to those already under construction at Halter. It will have a 58-ft. (17.7-m) beam and a 19-ft. (5.8-m) draft at full load. The T-AGS 60 class ships are designed with a common bus diesel electric propulsion system, driving twin azimuthing propulsion systems (Z-drives). The Z-drives include gear reduction and 360-degree thrust direction control in a compact unit. Elimination of conventional reduction gears and long propeller shafts frees up space for other uses. Complete thrust control provides unparalleled ship control and maneuverability to permit line precise position keeping and track following. Continuous variable control of the ship's speed can be maintained up to maximum speed.

Two, 2,435-kW and two 1,825-kW diesel generators provide power to the propulsion system, ship service and laboratories through a power conditioner. Propulsion power is derived from two 4,000-hp DC motors.

The ship will carry the latest in over-the-side sensors and sampling equipment including corers and seismic equipment, and will be equipped with the most modern computing equipment linking sensors with processing and planning functions. A typical mission might include oceanographic sampling and data processing and analysis, and precise navigation and maneuvering. The civilian-crewed vessels will be operated for the Oceanographer of the Navy by the Military Sealift Command.

T-AGS 60, the first of the new Navy oceanographic ships building at Halter, will be delivered in the fall of 1994. The newest vessel is expected to be delivered 40 months after contract signing.

For more information on Trinity
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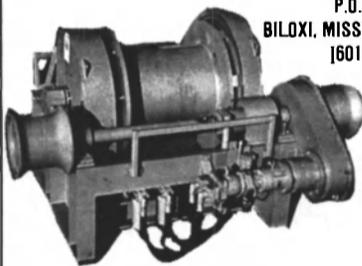
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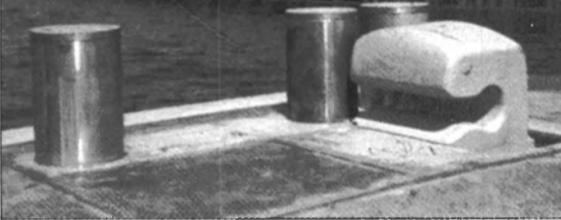
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PROPULSION UPDATE

Cummins Expands HP Range, Debuts New K38 Engine

In expanding its horsepower range and introducing the new K38 engine at the recent Workboat Show, Cummins showed how it has capitalized on a series of technical breakthroughs.

The K38 is now available at ratings of 1,320 bhp (985 kW) for medium continuous duty, and 1,200 bhp (895 kW) or 1,050 bhp (784 kW) for continuous duty applications. Typical duty for the engine is aboard fishing vessels, tugs and barges, crewboats, and ferries.

Previously, the 12-cylinder K38 had a top rating of 1,045 bhp.

"These new ratings, and the technology that's been applied to bring them to the market, represent much more than just an uprate," said Paul Rabe, vice president and general manager, Cummins Marine. "Because of its more efficient fuel consumption (.331 bsfc at rated speed for 1,200 bhp), the K38 offers a lower annual operating cost.

"Other customer benefits include improved durability, higher horsepower and better performance," he added.

The engine is expected to be available in early 1995, and the latest version of the K38 provides many end-user advantages. A new Holset turbocharger, low-temperature aftercooler and a new gallery-cooled piston are among the major improvements to the engine.

Other engine improvements include:

- a new high-lift "constant hertz stress" cam lobe design for improved

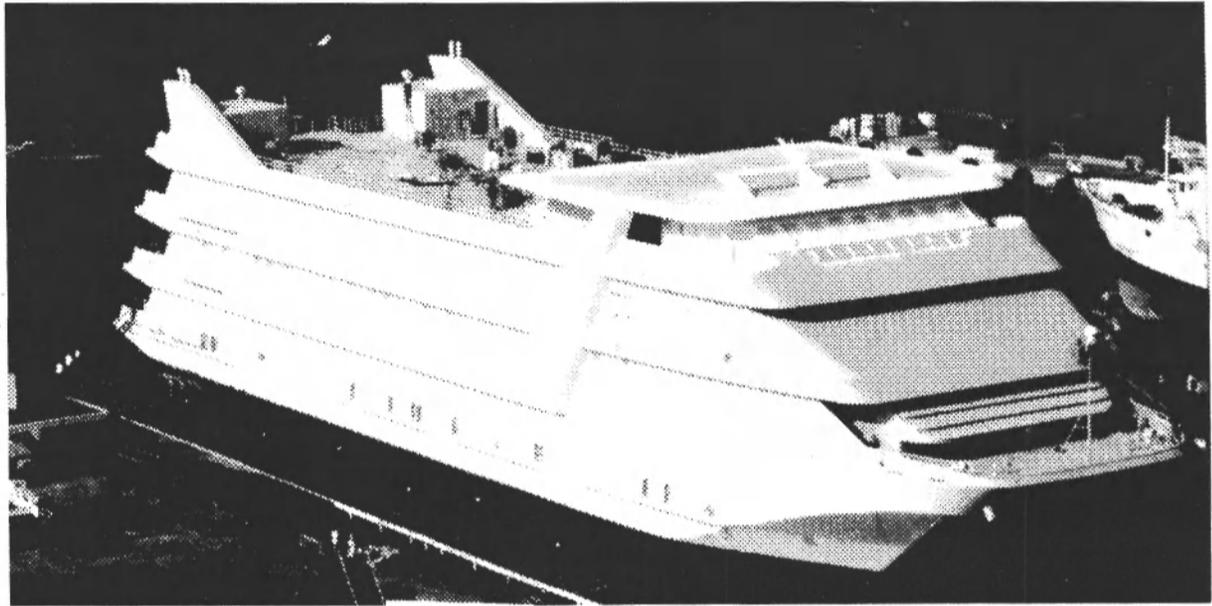
fuel injection and more efficient combustion;

- a new cylinder head design for improved engine performance across the operating range;
- water-cooled turbochargers;
- single point exhaust outlet;
- dry exhaust manifold with water-cooled shield;
- premium "K" injectors;

• ceramic injector link for longer life. Since the K engines debuted in 1974, the "V" engines have been regarded as reliable, durable and fuel-efficient, Mr. Rabe said. The KV series engines are built in Daventry, England, and more than 20,000 are in service worldwide.

For more information on Cummins
Circle 15 on Reader Service Card

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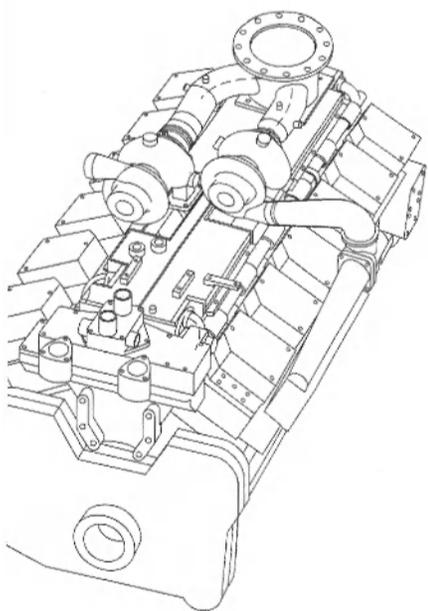


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A preliminary drawing of the Cummins Marine KTA38-M2.

Circle 275 on Reader Service Card

U.K.'s A&P Appledore, Japan's Mosh Int'l In Reciprocal Pact

The ship spares procurement service launched last year by U.K. ship repair and marine consultancy group A&P Appledore Ltd. is set to expand under a new marketing agreement with spares broker Mosh International of Kobe, Japan.

Each company will promote the other when spares are required from their respective markets.

A&P Appledore's Tyne-based team deals with more than 150 suppliers and supplies clients throughout the world. Mosh, a major force in Japanese ship spares procurement, specializes in locating obsolete spares.

For more information
Circle 14 on Reader Service Card

Oceaneering Affiliate Wins Part Of \$10 Million Platform Contract

Oceaneering International, Inc.'s Indonesian affiliate, PT Calmarine, in a joint agreement with PT Pelangi Niaga Mitra International, will perform the annual platform maintenance contract for Atlantic Richfield Indonesia, Inc. (ARII).

Over 200 platforms that ARII has offshore Northwest Java will be serviced. PT Calmarine will supply overall project management, maintenance equipment and crew, divers and diving equipment, and all third party services and equipment. PT Pelangi will supply its crane barge *CB 1*, an anchor handling tug *Escort*, a supply vessel, and a crew change vessel.

The value of the contract is approximately \$10 million with a duration of one year plus possible extension options.

At press time the barge was undergoing refit in Jakarta, and the maintenance equipment was being prepared for shipment from Singapore. Under the contract, diving and survey services will be required, and these will be supplied by PT Calmarine.

For more information on Oceaneering
Circle 25 on Reader Service Card

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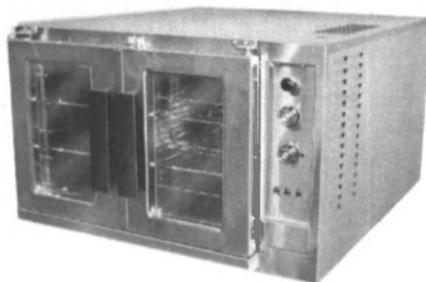
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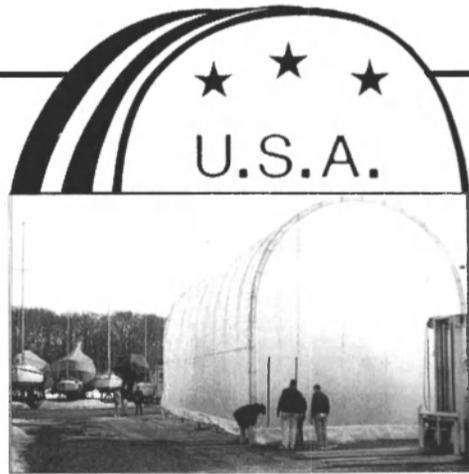
Austal Ships Wins Large Manufacturer Export Award

Western Australian shipbuilder Austal ships won the Large Manufacturers Export Award in the 1994 Western Australian Industry and Export Awards, just three years after the company won the award as the state's Best New Exporter.

The year has held numerous distinctions for Austal: breakthrough sales to new markets in Japan and the U.K., construction of the largest vehicle passenger ferry in Australia in progress, sale of its 23rd high speed passenger catamaran to China (including for gas turbine powered vessels), workforce doubling to almost 400 in a year, and an \$18 million yard expansion project.

Since the company's inception in 1988, more than 30 sales of high performance passenger vessels and cruise ships have been made to South East Asia region.

For more information on Austal Ships
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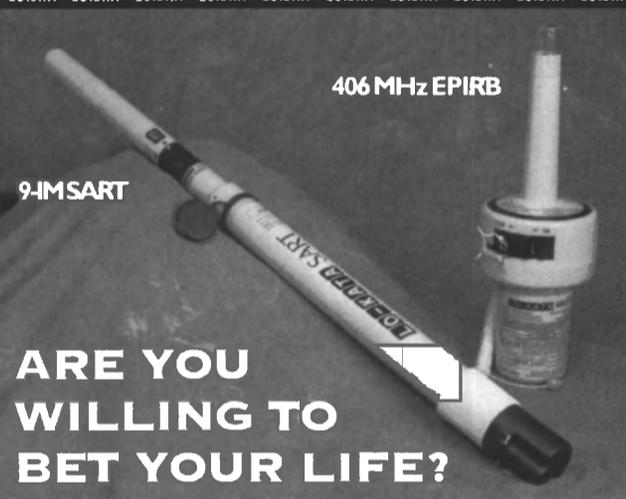
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RTZ Mining Purchases Pushboat *Joe/Nut*

RTZ Mining Company, Brazil, purchased the 5,600-bhp quadruple screw pushboat *Joe/Nut* from the American Boat Co. of Cahokia, Ill. The 162-ft.(49.4-m) shallow draft vessel was built by St. Louis Shipbuilding in 1956 as the *Missouri* and is powered by four EMD12-645E2 diesels. The vessel will be shipped from New Orleans to South America for service on the Parana and Plate Rivers, pushing iron ore barges.

Marcon International, Inc. of Coupeville, Wash. acted as broker in the sale of the pushboat.

RTZ also has on order directly from Jeffboat, Inc. of Jeffersonville, Ind. a total of 52 Mississippi River style 195 to 200-ft. (59.4 to 61-m) open jumbo hopper barges.

Maritime Reporter/Engineering News

THE CREWBOAT MARKET

Crewboat market continues steady comeback

While it would be foolhardy to declare the crewboat market as back in full swing, it is definitely a market segment to watch, as recent indicators show several orders of significance.

"The new construction market (for crewboats) looks like it is turning positive again," said Calvin Klotz, sales manager, marine division, Cummins Mid-South. And Mr. Klotz (Continued on page 14)

Cummins Helps Power Crewboat Market

Cummins engines — through its Gulf Coast distributor Cummins Mid-South — have enjoyed the recent resurgence in the crewboat market. Here's the latest on 1994 crewboat orders which have specified the Cummins KTA19M-700hp engine.

Owner	Yard	# Vessels	# Engines	Length	Del.
Galaxie Marine	Gulfcraft	1	5	145'	95
Galaxie Marine	Gulfcraft	1	4	135'	94
McCall Inc.	Gulfcraft	1	4	135'	94
McCall Inc.	Gulfcraft	1	5	145'	94
McCall Inc.	Gulfcraft	1	4	135'	95
Tidewater	Breaux Bros.	2	8	135'	95
Candy Fleet	Swiftships	2	8	141'	95
Candy Fleet	Swiftships	2	8	145'	95
Ashley Boynes (*Passenger Ferry)	Trinity	1	5	95'	95
TOTAL		12	51		



The crewboat *Maleo* (above) and its sistership *Pipit* were built by Trinity subsidiary Aluminum Boat Inc. and recently delivered to P.T. Baruna Raya Logistics, Jakarta, Indonesia.

Trinity's Aluminum Boats Delivers Two Crewboats To Indonesia

Trinity Industries, Inc. subsidiary Aluminum Boats Inc. has delivered two 85-ft. (25.9-m), all-aluminum crewboats, the *Maleo* and *Pipit*, to P.T. Baruna Raya Logistics, Jakarta, Indonesia.

Both vessels have a 20-ft. (6.1-m) beam and normal operating draft of 4.5 ft. (1.4 m). Each is powered by two Caterpillar 3412 DITA diesels

developing 764-hp, driving 36-in. by 31-in., five-blade manganese bronze propellers though Twin Disc MG518 reverse/reduction gears. Electrical power is provided by two Kato 40-kW generators driven by two Detroit Diesel 3-71 diesels.

The 21-knot boats can carry 45 passengers, six crew members and (Continued on page 14)

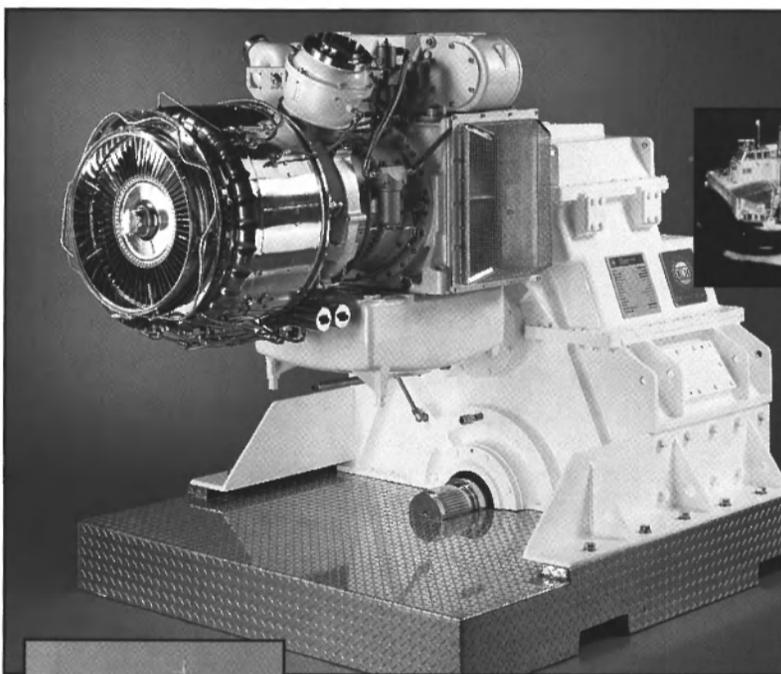
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Since the early 1980's, Cincinnati Gear has provided the propulsion system gearboxes for the Navy LCAC Hovercraft. To date,



CINTI has produced over 80 shipsets of gearboxes for this program.

In the 1990's the experience gained designing and producing these high performance marine gearboxes has been used to develop the MA 107, one of Cinti's MA Series of standard gas turbine powered marine reduction gears. The MA107 was designed for high reliability and long life, with the future in mind. Unlike the competition, the MA 107 was designed with higher power capability to accommodate anticipated increases in turbine power ratings in the years ahead. This makes the MA 107 slightly heavier, but capable of handling higher power in the future, without expensive gearbox replacements and ship modifications.

(Continued from page 13)

can be considered an informed source, considering the number of engine orders Cummins has received for crewboat newbuildings (please see chart, page 13). But optimism is coming from all sectors — owners, builders and suppliers — that the market will experience some growth.

According to Swiftships' Marketing Manager **A.J. Blanchard**, the yard continues to focus on the military market but is actively seeking commercial business to replace the decline in Navy building. He terms the crewboat market as "growing," and Swiftships currently has orders

to build four crewboats, including a 141-ft. (43-m) Hamilton Jet-powered vessel for Diamond Services, scheduled for delivery in January 1995.

Unique in that the vessel is waterjet powered, the Diamond Services boat is also an example of the trend towards ordering larger crewboats.

"We have seen an increase in the size of boats versus what was built 10 years ago," said Mr. **Blanchard**.

"A few years ago, boats 120-ft. (36.6 m) long were the biggest," said Mr. **Klotz**. "Today were seeing new boats 135 ft. (41 m)...the trend is going bigger."

Trinity Subsidiary Delivers Crewboats

(Continued from page 13)

15 long tons of cargo on their aft decks. *Maleo* can fight fires with its two fire monitors, which can pump 264 gallons of water and/or foam per minute from a 527-gallon foam tank. The vessel is also outfitted with a 20-ft. (6.1-m) oil dispersant spray arm and a 260-gallon dispersant tank.

Each vessel carries 4,200 gallons of fuel and 780 gallons of potable water.

Among her navigation and communications equipment are: two Furuno FR 1831 radars, one Sperry gyrocompass, one Icom SSB radio and two Raytheon VHF radios.

Maleo and *Pipit* are American Bureau of Shipping (ABS) classed A1, Maltese Cross.

Aluminum Boats, Inc. is one of 16 U.S. shipyards operated by the Trinity Marine Group, which is owned by Trinity Industries.

For more information on Trinity
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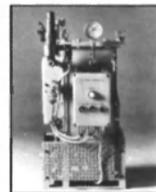
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MarAd News

• The Maritime Administration MarAd has given American President Lines, Ltd. (APL) permission to charter and operate a foreign-flag relief vessel for a single voyage of approximately 45 days commencing in late December.

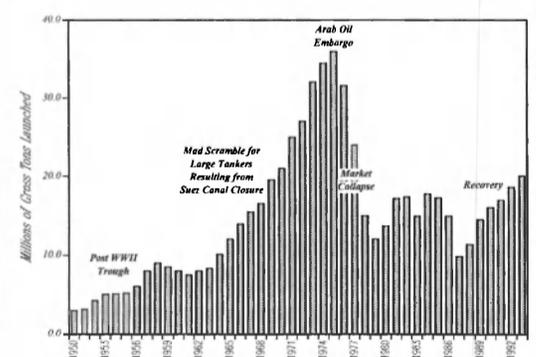
Section 804 of the Merchant Marine Act, 1936, as amended, precludes subsidized U.S.-flag operators or their affiliates from operating foreign-flag vessels which compete with essential U.S.-flag shipping services unless the Secretary of Transportation waives the provision of this section for a specific period of time. In its application, APL said it needs a vessel to maintain the operating schedule integrity in its services while the line haul vessels *President Grant* and *President Jefferson* undergo required drydocking, thereby continuing to meet the needs of APL's customers. MarAd found and determined that no suitable U.S.-flag vessels is available for the period coinciding with the required drydocking schedule of the *President Grant* and *Jefferson*. In addition, MarAd noted that no other U.S.-flag operator in the service objects to APL's proposal to utilize a foreign-flag vessel.

• Lykes Bros. Steamship Co., Inc. has requested Secretarial review of the Maritime Administration's approval of a section 804(a) waiver for Farrell Lines, Inc. The waiver would permit Farrell to ad hoc charter, operate, or act as agent/broker for any foreign-flag vessel between U.S. gulf and East coasts.

INDUSTRY TRENDS

by
James R. McCaul, President
IMA Associates, Inc.

The second half of the 1990's will see a partial repeat of the early 1970's — as the massive amount of tonnage built during that period reaches economic and physical obsolescence. This will provide many opportunities for shipbuilders and ship system suppliers.



Source: IMA Associates, Shipbuilding Industry Outlook, 1995 Edition

Maritime Reporter/Engineering News

Detroit Diesel Announces Two New Genset Engines

Detroit Diesel Corporation announced two new engines for powering generator sets up to 1,000 kWe and 2,000 kWe at 60 Hz standby rating.

The 24V-71TA, available immediately, is a mechanically-injected, modular unit utilizing Detroit Diesel Electronic Controls (DDEC) technology, which offers unaided starting at reduced temperatures; integral engine protection; simplified engine diagnostics; assistance in the combustion process; and reduced emissions. The engine is rated for standby power sets of 900 and 1,000 kWe at 60 Hz and for prime power sets of up to 1,000 JVA at 50 Hz.

Detroit Diesel also introduced an electronically-controlled 20V-149TIB engine, which incorporates the DDEC system as a standard feature, for genset applications. A 2,550-bhp version, suitable for 1,750 kWe standby use at 60 Hz, is available. A 2,925-bhp version, for 2,000-kWe standby application at 60 Hz, will be available in mid-1995.

Both engines utilize a modular assembly concept, which offers the benefits of proven components; interchangeable common parts with other engine configurations of the same series; the ability to use existing tools and expertise to maintain the engine; and lower rebuild costs at time of overhaul.

For more information on Detroit Diesel
Circle 27 on Reader Service Card

Keppel Units In Construction, Acquisition, Oil Deals

Singmarine Wins \$12 Million Tug Contract

Singmarine Industries Ltd. through subsidiary Singmarine Dockyard & Engineering, won a \$12 million contract for two harbor tugs from Keppel Smit Towage.

The new tugboats will be built to ABS class. Powered by two 1,500 bhp diesels and fitted with Z-peller propulsion, each will have a bollard pull of 45 tons. They are to be delivered by the last quarter of 1995.

Singmarine Wins \$16.9 M Ship Contract

Singmarine Industries Ltd. won a contract for approximately \$16.9 million from Steamers Container-ships Holdings, also of Singapore, to construct a container feeder ship. The 8,000-dwt vessel is to be built in Singmarine's subsidiary Singmarine Dockyard & Engineering, and is expected to be completed by the second quarter of 1996.

Singmarine Acquires Repair Yard In UAE

Singmarine Industries has acquired a ship repair company in the United Arab Emirates (UAE). Following the acquisition, Singmarine will spearhead and manage the

Keppel Group's shipyard operations in the Middle East, including Arab Heavy Industries PSJC (AHI).

Al-Majid Marine Engineering, which specializes in afloat ship repair, will be restructured. Al-Majid has been merged with an existing afloat repair division operated since August 1992 by Singmarine's subsidiary Western Eagle in the UAE.

Keppel Corp. In Offshore Australia Oil Venture

Keppel Corp. entered into an interim alliance with a consortium of companies to develop the Wandoo Oil field in the Carnarvon Basin, offshore Western Australia.

The alliance will be responsible for design, construction and installation of facilities for full field development. Apart from Keppel, mem-

ber companies in the alliance are Dawson/Brown & Root joint venture, Leighton Contractors, Ove Arup and Partners and Ampolex Ltd., which owns the Wandoo field. The field currently produces 12,000 barrels of oil a day, with estimated recoverable reserves of 75 million barrels.

For more information on Keppel
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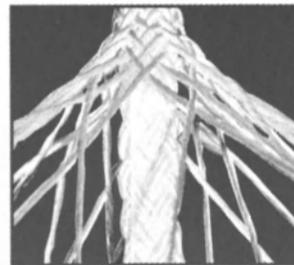
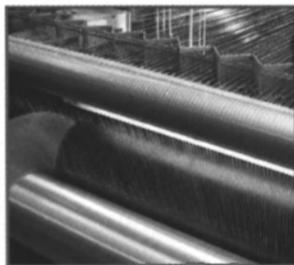
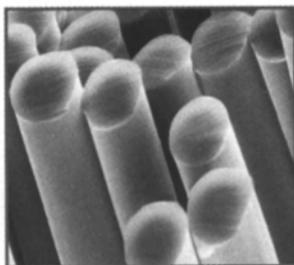


A. *Dacron is nothing more than a trademark indicating the source for that polyester material.*



Technically, all polyester (including Dacron polyester) is made from the polymerization of a dicarboxylic acid ester with ethylene glycol, a dihydroxy alcohol.

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application. All polyester offers great flexibility in manufacturing. This is exemplified by AlliedSignal Fibers application-oriented line of polyester products. Polyester can have ultra-low elongation (for heavy lifting applications), high modulus (for tires), or low shrinkage (for broad woven fabrics).

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optimal properties required for the wet environment. And, our revolutionary SeaGard[®] overfinish ensures the ultimate performance and protection against wet abrasion for polyester, as well as nylon.

When considering any type or brand of polyester, be aware of the engineered properties required for your application. The more important question is: which polyester is the best engineered product for the specific application?

For further information, contact AlliedSignal Fibers, 224 West 35th Street, Suite #1500, New York, NY 10001.

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F I B E R S

Circle 200 on Reader Service Card

PBI Wins \$6.4 M Corps Of Engineers Crane Deal

Peterson Builders Inc. (PBI), Sturgeon Bay, Wis., won a \$6.4 million contract from the U.S. Army Corps of Engineers to design, construct, test and deliver a floating crane.

The rotating crane is tub-mounted on a 150-ft. (45.7-m) steel ship-shaped hull barge with three spuds used for positioning and anchoring during crane operations. The barge arrangement includes a raised forecastle, machinery space, and a deck working area protected by timbers. Construction of the floating crane will begin in the summer of 1995 with delivery in 1996.

For more information on PBI
Circle 29 on Reader Service Card

Raytheon, Advanced Marine Technology In ECDIS Pact

Advanced Marine Technology, Seattle, a manufacturer of computer-based marine electronics, signed an agreement with Raytheon Marine Company for exclusive distribution rights to Advanced Marine Technology's Electronic Chart Display Information System (ECDIS) products. Raytheon will be responsible for worldwide marketing, sales and service associated with the ECDIS systems.

ECDIS summarizes real-time information from critical on-board sensors into graphical displays for easy interpretation. ECDIS systems are designed to improve safety and prevent disasters with anti-grounding and collision avoidance features.

For more information
Circle 30 on Reader Service Card

KCS Sells Tribon System To Various Yards

Kockums Computer Systems (KCS) AB of Malmo, Sweden, recently sold its Tribon shipbuilding system to Daedong Shipbuilding Co. of South Korea; Kawasaki Heavy Industries of Japan; and to Lindenau GmbH of Kiel, Germany.

Daedong purchased the Initial Design, Work Preparation, Hull and the complete outfitting applications of the system for its new yard in Jinhae, near Pusan, South Korea.

Kawasaki Heavy Industries purchased the complete hull and outfitting applications of the system for its Sakaide Works. Tribon was installed this summer and is now in use on an IBM hardware platform.

Lindenau, which has reportedly been successful recently in obtaining contracts for modern tanker newbuilds, also purchased the system to improve competitiveness and increase quality. The delivery of the system is connected with modernizing several plate cutting machines to achieve fully computer controlled operation. With these measures Lindenau Shipyard hopes to benefit in the areas of prefabrication and assembly.

For more information on KCS
Circle 31 on Reader Service Card

Corps Of Engineers Holds Dredging Workshops

The Portland district of the U.S. Army Corps of Engineers held two public workshops to explain the feasibility phase of the Columbia River Channel Deepening Study, the first in Portland, Ore., and the second in Longview, Wash. A

shared effort between the Corps and the Port of Portland staff, the workshops were designed to allow the public to learn about environmental issues surrounding the five-year study.

The study will evaluate the need for modifying the existing project authorization. Alternatives will include determining the viability of deepening the 40-ft. (12.2-m) Columbia River naviga-

tion channel up to three feet. Costs of the \$6.21 million study will be shared equally between the Corps and the Port of Portland. Between five and six million cubic yards (cy) of material are removed from the channel annually for maintenance. About 20 million cy more would need to be removed during a three-year period to reach the 43-ft. channel depth.

YARD PROFILE

NASSCO Invests In Technology To Capture Commercial Business

Ongoing reduction in new U.S. Navy ordering has affected National Steel & Shipbuilding (NASSCO) as much as any other company. However the largest shipbuilder on the U.S. west coast is making the necessary moves to ensure it remains a viable shipbuilder and repairer for the naval and commercial markets.

Employing 3,700 at its San Diego facility, NASSCO offers new construction, conversion, repairs and design capabilities. The yard has been involved primarily in U.S. Navy work most recently, but to become a bigger player on the international shipbuilding and repair market, it has refocused efforts geared to attract commercial ship owners and operators.

Government work, however, remains a staple, and the yard is now working on three firm orders (and looking to receive three options) for large sealift vessels. NASSCO is also converting three

container vessels to RoRos.

As a part of this effort, NASSCO received \$22.7 million in Title XI loan guarantees in the late summer, funds to be used for shipyard modernization. "This program marks the first major step in the overall modernization of the shipyard," said **Richard H. Vortmann**, NASSCO's president.

Facility upgrades, to be completed by the third quarter of 1996, will include a major new on-block outfitting shop, a large-capacity steel plate roll, a computer-controlled plasma steel plate burning machine, a 175-ton heavy lift gantry crane, and more. All projects are geared to adding new technology and increasing efficiency, enabling NASSCO to compete for commercial contracts.

For more information on NASSCO
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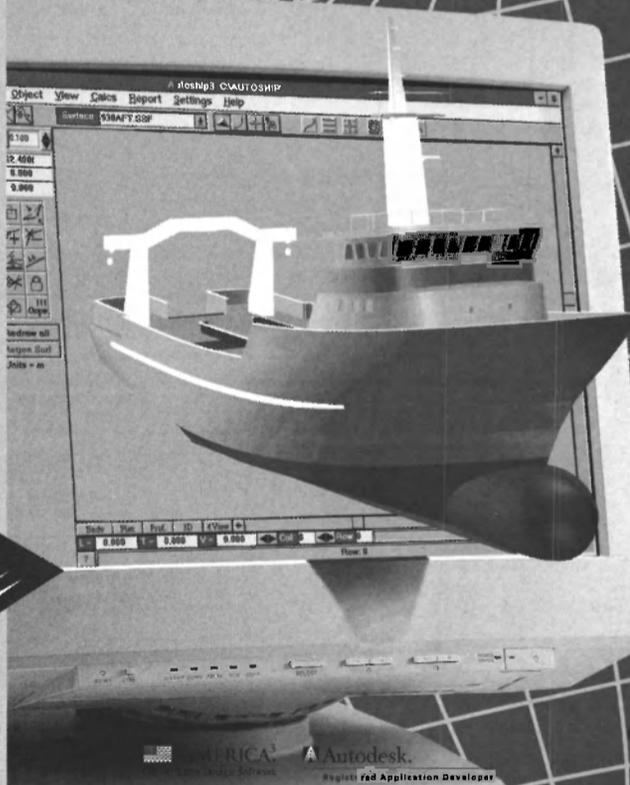
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DOT Awards \$17 Million In Ferry Boat Discretionary Funds

U.S. Secretary of Transportation **Federico Pena** announced that the Department of Transportation (DOT) has allocated more than \$17 million among 13 states for construction projects on ferry boats and ferry terminal facilities.

"Our nation's ferry system remains a key link in many regional transportation systems," Secretary **Pena** said. "These funds illustrate the continuing commitment of the Clinton Administration to help rebuild America by investing in our nation's infrastructure in order to create the seamless intermodal system this country needs." The funds were distributed as follows:

Alaska	\$1 million
Kentucky	\$90,000
Massachusetts	\$960,000
Michigan	\$2.4 million
Missouri	\$278,800
New Jersey	\$2 million
New York	\$1.5 million
North Carolina	\$2.8 million
Pennsylvania	\$1 million
Rhode Island	\$1.2 million
Utah	\$760,000
Virginia	\$520,000
Washington	\$2.8 million

Maritrans Pays Stockholder Dividend

Maritrans Inc. declared a dividend of \$.02 per share payable as of Dec. 12, 1994 to shareholders of record as of Nov. 28, 1994.

Stephen A. Van Dyck, chairman and CEO, commented, "We believe that the actions we have taken in recent years have strengthened our position ... We are confident that we can now commence a dividend, which we expect will continue quarterly and may grow with the passage of time and the implementation of our distribution strategy."

Campbell, D'Entremont, Reardon Join Marine Atlantic's Board

Canadian Transport Minister **Douglas Young** announced the appointment of **J. Richard Campbell** of Commercial Cross, P.E.I., **R. Irene D'Entremont** of Yarmouth, N.S., and **Gerald P. Reardon** of Sydney, N.S., to the board of directors of Marine Atlantic Inc. Marine Atlantic is a Crown Corporation with a mission to provide quality, safe and efficient marine transportation and hospitality services. Its principal activity is the operation of the major ferry services in the Atlantic provinces on behalf of the government of Canada.

Cheramy Founds Maritime Consultancy



David Cheramy

David Cheramy, former marketing manager for Portland Ship Yard (PSY) for ten years, has founded Maritime Consulting International (MCI), providing market development and project management services.

Current and recent MCI projects include a market

study on second-tier shipbuilding opportunities over the next five years; identifying specific opportunities in the maritime market; and safety management systems activities.

MCI offers clear, well-researched market and strategic plans; definition of a client's product, location of the market niche and timely design of a sales strategy; consultation in outsourcing and combining design, engineering and production specialists to lower costs and increase profits; preparation of creative proposals and closing important sales; and providing combinations of direct sales and support of sales staff. Clients include Mitsubishi Heavy Industries, PSY, West Coast Shipping, and Mar Com Inc.

For more information on MCI
Circle 90 on Reader Service Card

Falk Makes Additions To Sales Staff

Roy J. Durkee has been assigned to the Mid-Atlantic district office sales staff, and **W. Bryant Medders** to the Birmingham, Ala. district sales office staff of the Falk Corporation. Mr. **Durkee** will serve the company's customers in northern New Jersey, southeastern New York and Connecticut. Mr. **Medders** will serve customers in northern Mississippi, central Tennessee and Alabama.

Kop-Flex, Flender AG Reach Transmission Product Agreement

Kop-Flex, a Baltimore, Md.-based manufacturer of power transmission products, entered into a strategic alliance with A. Friedr. Flender AG, a manufacturer of power transmission products worldwide, to market a line of resilient couplings in North America. The resilient couplings will be supplied from its headquarters plant in Hanover, Md., and also from its Canadian facility near Toronto, Ontario.

Dunagin Named Boston Whaler's Marketing/PR Manager

Teresa Dunagin has been promoted to manager of marketing, communications and public relations for Boston Whaler. Ms. **Dunagin** joined the Edgewater, Fla.-based boat manufacturer in January as marketing coordinator.

Tidewater Names O'Malley Chairman, President & CEO

Tidewater Inc. elected **William C. O'Malley** chairman of the board, president and CEO, succeeding **John P. Laborde**, whose retirement became effective Oct. 20, 1994. Mr. **Laborde** will serve as a consultant to Tidewater under the terms of a three-year contract.

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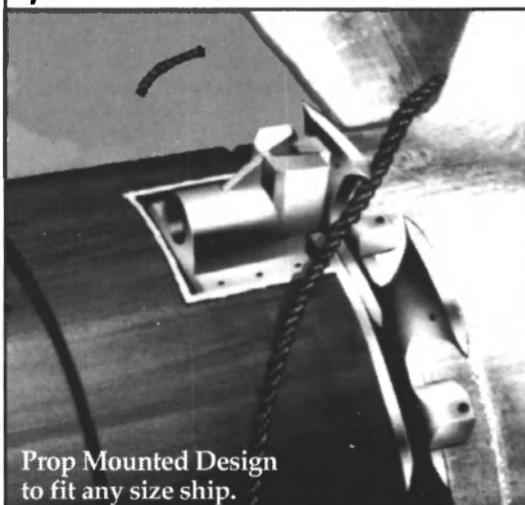
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Welding Technique Helps Navy Save Millions

When maintenance welding required cutting into the hull of a Navy submarine, **John Bartly** knew there had to be an easier way.

Mr. **Bartly** supervises 15 welding engineers as a U.S. Navy employee on Mare Island in San Francisco Bay. A former president of the American Welding Society, he has decades of experience.

He and his engineers approached Hobart Lasers & Advanced Systems in May 1990 (formerly Martek) to create a multi-faceted program which would meet several welding challenges he faced in his assignment to repair Navy submarines and other seagoing vessels.

To date, Hobart has evaluated equipment, developed accessories and conducted feasibility studies on a number of innovative processes for the Navy. Hobart's Application Development Centers provide an opportunity to test applications on state-of-the-art CW Nd:YAG lasers; Orbitig control systems; Viper tube-to-tube welding heads; HAWCS computer-controlled variable polarity plasma/gas tungsten arc systems; and other equipment.

A challenge Mr. **Bartly** faced was the repair of deteriorated valve seats on the steam chest, which contains control valves to throttle the submarine's steam flow. Conventional welding processes in these applications are low yield and must be repaired several times. The low power density process required Mr. **Bartly's** welders to cut through the pressure hull of the sub, remove the item to be repaired, take it to the shop, preheat it, manually repair the item, post-weld heat it, machine it, return it to its original position, and repair the opened pressure hull. To cut down on this process, saving time and money, Hobart's engineers found that by using laser technology they could perform the repairs without having to remove the component, as the preheat and post heat are not required. "Because it has a 150-ft. (45.7-m) fiber optic delivery system, our 2,400-watt CW Nd:YAG laser welding head can be brought internal to the vessel and locally tooled with accessories, potentially saving millions of taxpayer dollars," said **Tim Webber**, a Hobart Laser Applications manager.

In repairing the steam chests, old material must be machined off and replaced to a precise finish, size and polish. Currently, Hobart is developing a system with a small articulated gantry robot, small enough to get in the operator's lap. Using rotary motion, the robot welds a hardface alloy place from a small mechanical bridge. A pendant-like controller is used by the operator at the welding site to set up parameters as necessary. The laser generating equipment sits outside the vessel.

For more information on Hobart Lasers & Advanced Systems
Circle 103 on Reader Service Card

Avondale Awards Mapeco Contract For Keyless Hydraulic Shaft Couplings

Mapeco Products, a division of Walz & Krenzer, Inc., was awarded a contract from Avondale's shipyard Division for eight keyless hydraulic

shaft couplings for the first ship of its Sealift new construction program. They will reportedly be the largest keyless shaft couplings to be made in the U.S. to date.

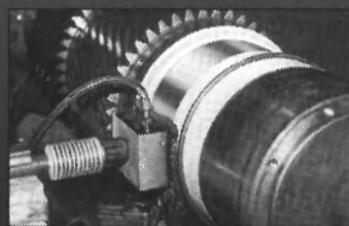
Mapeco has previously supplied couplings for the T-AGS 45 and LSV-21. In addition to the couplings, Mapeco is also supplying Pilgrim

Radial Fit Bolts to be used in conjunction with the flanged keyless couplings.

While popular in Europe, this is reportedly the first U.S. marine application for the Pilgrim Radial Fit Bolts.

For more information on Mapeco
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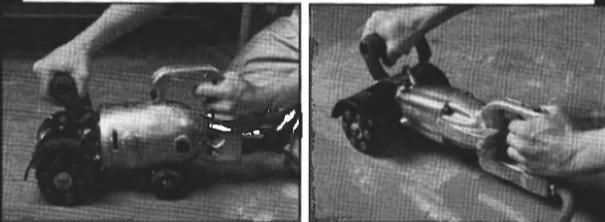
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DOD Unveils New Science & Technology Strategy

The Department of Defense (DOD) recently unveiled its *Defense Science & Technology Strategy*, a plan which charts post-Cold War defense product development, taking into consideration reduced military budgets and increasing com-

petition on the international level. The DOD plan discusses 19 specific technology areas in detail, providing specific objectives, funding and schedules. "The department is for the first time proactively developing technology that has the potential to

be the basis for both military and commercial products," said **Anita Jones**, director, defense research and engineering. "An integrated industrial base will serve defense needs better, as well as enhance U.S. economic competitiveness."

The Ships and Watercraft Technology Area provides the technology for improved combat efficiency, survivability, and stealth of surface ships, submarines and unmanned undersea vehicles. Funding for this area is \$108 million in FY '94.

The following are the funding plans for surface ships, submarines and unmanned undersea vehicles.

SHIPBUILDING INDUSTRY OUTLOOK

1995 EDITION

Report No. 7125 — \$875 per copy

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Forecast of shipbuilding demand through 1999

- o number of ships to be built
- o available market revenues

Anticipated technology developments

- o electric propulsion systems
- o shipboard automation
- o cargo handling advances

Competition for future orders

- o future role of major players
- o emerging competition from China
- o potential role of U.S. yards

Strategic positioning options for maximizing market penetration

- o niches with highest value added
- o where competition is vulnerable
- o financial engineering possibilities

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Surface Ships

Surface Ship science and technology (S&T) supports future joint warfare capabilities by developing hull, mechanical and electrical options which reduce the detectability of U.S. Navy ships; increase the ability to absorb both combat and peacetime damage; and increase operational efficiency.

The S&T plan for surface ships also calls for a Navy which can engage quickly, covertly and decisively. For example, by 1995 a goal is to include a closed loop degaussing system for mine countermeasure ships, and a low-cavitating propeller. For the year 2000, goals include an advanced enclosed mast/sensor system that will minimize topside signature and enhance sensor performance; a shipboard electromagnetic condition monitoring system that will enable a ship to manage electromagnetic transmissions to minimize interference and active electromagnetic signature; and an advanced combatant degaussing system that will minimize magnetic mine vulnerability. Goals for 2005 include 10-25 dB or similar reductions in radar cross section (RCS), infrared (IR), acoustic, magnetic and electric signatures.

To do more with less ships, the Navy plans to keep future fleets more ship shape with: advanced fiber optic temperature and smoke sensors; a design guideline for blast hardened bulkheads and hull girders; use of advanced composites to increase payload 50 percent; and a new integrated hull armor system which costs 50 percent less and is 20 percent lighter.

Finally, to boost operational efficiency, the Navy has set goals for 1995 as seeking more reliable, reduced emission (NO_x) and more efficient marine gas turbine engines; an advanced electrical distribution system; and machinery monitoring and control system architecture. Goals for 2000 are permanent magnet electric drive system and shipboard solid state power building blocks. Goals for 2005 include: shipboard mechanical and electrical systems that reduce weight by 30 to 60 percent, reduce manning up to 50 percent, reduce cost by 50 percent and reduce maintenance and logistical support 50 percent.

Submarines

In short, stealth enhancing technologies — with a particular focus on noise reduction — as well as hydrodynamic efficiencies are the

(Continued on page 24)

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OF COURSE.

Techno Superliner Prototype Hits 54 Knots During Tests

Fast ship powered by Turbo Power & Marine Systems gas turbines

The *Hishoh*, a large surface effect vessel prototype built as part of the Japanese government and industry co-sponsored Techno Superliner program, recently achieved at-sea speeds exceeding 54 knots. The vessel also reportedly demonstrated successful stability at four to five-meter wave heights.

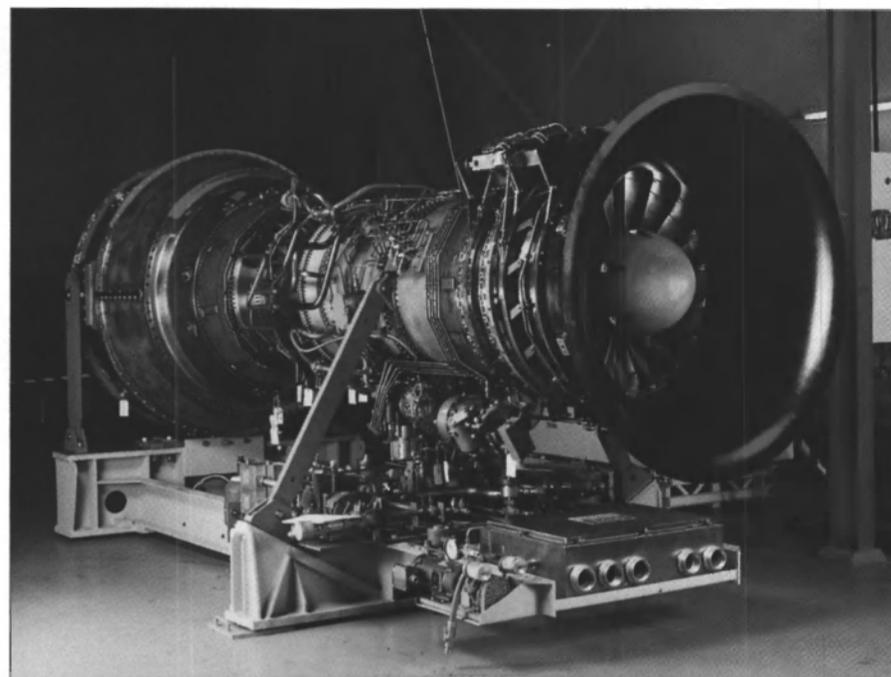
A pair of MFT8 gas turbines driving waterjets provide the propulsion power for the vessel. The MFT8 gas turbine is the result of a collaboration between Turbo Power & Marine Systems, a division of the United Technologies Corp. and the Takasago Machinery Works, a major manufacturing center within Mitsubishi Heavy Industries (MHI). In the collaboration, Turbo Power supplies the GG8 gas generator; MHI supplies its newly developed lightweight power turbine, as well as the MFT8 "package" including the gas turbine enclosure.

The MFT8 reportedly develops

33,000 shaft horsepower (shp) at ISO base load conditions, rotating at 5,000 rpm. The bare weight of the unit is 6.2 short tons (5.5 metric tons). With a specific fuel consumption at base load conditions of .388 pounds per shp hour (176 gr/shp-hr), the manufacturers claim the gas turbine is very efficient.

"I was fortunate enough to be aboard the *Hishoh* during sea trials," said Randy Hogan, vice president and general manager, Turbo Power and Marine Systems. "The voyage was impressive, very fast, yet stable and quiet. Ship operator executives, who each took a turn at the helm, were delighted."

The 230-ft. (70-m) *Hishoh* is a very large prototype ship, designed at nearly half size of the proposed commercial version. The commercial version is designed to be 417 ft. (127 m) long — with a cargo capacity of 1,000 tons — and powered by four MFT8s. The Techno Super-



liner program is, in part, the result of a need for improved commerce within and among the various islands of Japan and with other East Asian countries. Congestion on the Japanese roadways has increased due to improved economic conditions and JIT-LTI (Just-In-Time, Less-Than-Trailer-Load) commercial traffic. Therefore the Japanese government and private industry partners turned to the sea for solutions. The goal established in 1989 was to build and test two different types of high-speed prototype

"Techno Superliner" ships. The plan was then to determine the economic viability and potential ship owner market, followed by commercial adaptation of the ship pending the findings. The design of the *Hishoh* (TSL-A), an air cushion hybrid hull type, began in 1992 by MHI and Mitsui Shipbuilding. The forward half of the ship was built at Mitsui's Tamano Works, and the assembly was conveyed to MHI's Nagasaki Shipyard.

For more information on the MFT8
Circle 18 on Reader Service Card

PROPULSION UPDATE

Dual Fuel Technology

Test Aims To Combine Best Aspects Of Diesel And LNG

by Kathleen Gleaves, contributing editor

The *MV Olympic* project underway in Tacoma, Wash., will go into the record books as the "first" in many categories. Noteworthy among those is first marine mass transportation vessel fueled by both LNG and diesel utilizing the newest dual-fuel technology. Plus, first LNG training platform, first opportunity for U.S. Coast Guard (USCG) and ABS to set LNG standards, and first long-term economic and environmental impact study on LNG for the maritime industry.

The Clean Air Act Amendments of 1990 and the Energy Policy Act of 1992 both paved the way for the coming growth of natural gas technology. Specifically mentioned in the legislation as an alternative energy source, natural gas' clean emission profile and domestic abundance make it of major interest. Largely-overlooked bonuses are the good engine wear and maintenance characteristics achieved with natural gas fuel.

Compressed natural gas (CNG) has been a safe, reliable alternate fuel for transportation. Liquid natural gas (LNG) has seen some use in

buses and as "boil-off" fuel from LNG cargo tankers.

LNG has two primary advantages over CNG: the ability to carry more fuel in the same space, and no need for large volumes of high-pressure gas. However, LNG presents its own tactical problems, cryogenic liquefaction being the most obvious. Storage of the liquid in its - 260-degree "comfort zone" is another stumbling block.

For LNG to become universally available, liquefaction, or cryogenic, plants are needed relatively close to consumption sources. Specially-designed fittings and hoses used in the fueling process must be leakproof, and personnel must be trained in cryogenic handling techniques.

Early problems with carbon steel holding tanks which failed at cryogenic temperatures have been rectified. Today's tanks are constructed of eight percent nickel stainless steel, double-walled and vacuum-insulated.

High-horsepower commercial engines designed for use with LNG are nonexistent, but running a standard diesel engine on LNG reduces

its power output by 25 - 40 percent. Until now, converting to gas meant investing in more power or reducing power production, two no-win scenarios.

Energy Conversions Inc. (ECI) of Fife, Wash. offers an alternative. A dual-fuel conversion kit developed by ECI Engineers allows large-horsepower, medium-speed diesel engines to run on 92 percent LNG and eight percent diesel, reportedly achieving the economic and environmental benefits of LNG while maintaining full diesel-rated power.

The ECI conversion kit is de-

signed for use on General Motors EMD model 645 two-cycle diesel engines.

Paul Jensen of ECI believes his company has proven the viability of the system on two locomotive engines currently in use by Burlington Northern Railroad.

The maritime connection for the *MV Olympic* project will include Marine Design Associates, Inc. (MDA) of Victoria, B.C. MDA developed the first approved CNG marine passenger vessel conversion for the British Columbia Ferry System.

(Continued on page 25)



(Left to right): Scott Jensen of Energy Conversions Inc. (ECI); Wesley Moore of Systems Management Sciences (SMS); Paul Jensen of ECI; William Bass, a consultant; William Berlin, Marine Design Associates (MDA); and John Pounds of MDA (not pictured) are the primary forces behind the LNG test project.

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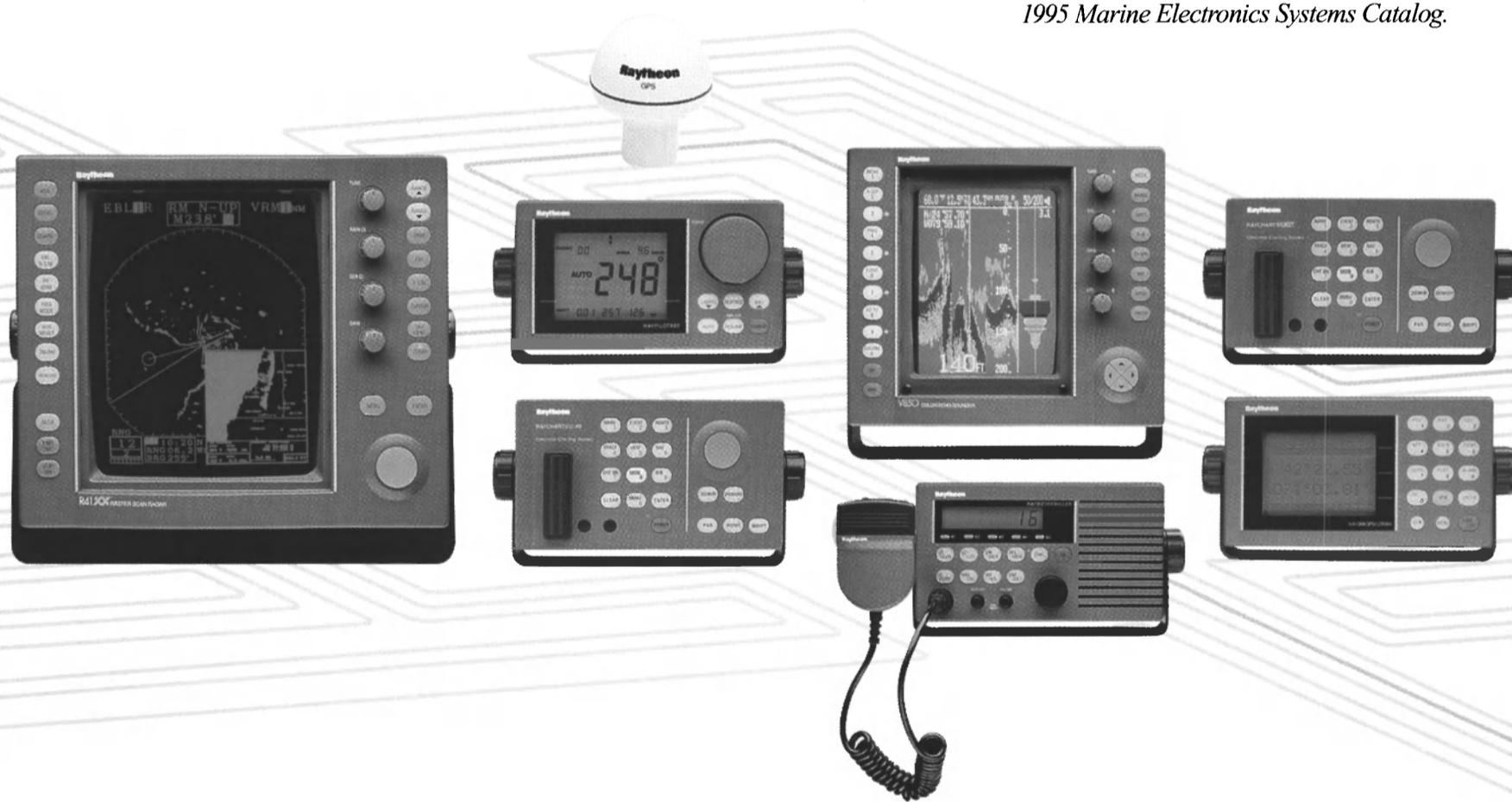
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main focuses of submarine technology development. Submarine S&T provides the attributes for a covert survivable platform having improved advanced joint war fighting capabilities to: maintain real-time knowledge of the enemy; engage regional forces promptly and on a global scale; employ capabilities suitable to actions at the lower end of the full range of military operations; and counter the threat of

weapons of mass destruction and ballistic and cruise missiles to continental U.S. and deployed forces. Technology will thus be focused on enhancing the stealth quality of submarines, and focus on maintenance of SSN21 acoustic signature goals at reduced cost, reduction of the signature of surfaced submarines, and reduction of electromagnetic signatures consistent with the threat. Specifically strategies to accomplish

goals are design methods, active mount and coating concepts, composite hull components and imaging and diagnostic technologies. Hydrodynamic studies will address propulsion technology for reduced cost and wake signature, and improved maneuverability and control. Specifically, the Navy is looking for a cost reduction of 30 to 50 percent and weight reductions of 20 percent over the SSN21 propulsion.

Unmanned Underwater Vehicles

S&T focus for UUVs will be to make the vehicles smaller and lighter, as well as more able to work in shallower waters.

To accomplish these goals S&T dollars will be given for lightweight, low signature composite hull technology and thrust vector pump jet technology (to provide optimum control at low speeds). To help improve UUV endurance, rechargeable lithium batteries are being developed, with expected availability in three years. Aluminum-Oxygen semi-fuel-cells, with four times energy density of silver zinc batteries, will be tested at sea in FY '95; and a Wick-Stirling thermal system program is proceeding toward demonstration in FY '97.

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Year(FY)	94	95	96	97	98	99
Funding (\$M)	40	37	42	44	27	28

Year(FY)	94	95	96	97	98	99
Funding (\$M)	42	52	55	48	30	35

Year (FY)	94	95	96	97	98	99
Funding (\$M)	26	36	36	31	27	26

Mediterranean Shipping To Add Four Ships: Two Existing, Two Newbuilds

With a decision that significantly increases its fleet, Mediterranean Shipping Company(MSC), Geneva, ordered the construction of two 3,300-TEU ships and purchased six 2,000-TEU ships.

According to **Nicole Arena**, president of MSC (USA), the general agent, the substantial investment was necessary to satisfy the demands of the trade. The two new vessels will be built by Italy's Fincantieri for delivery in early 1996. The ships will cost \$48 million each and will sail at 23 knots. Six other ships have been purchased from Oldendorf and Norasia. These ships are all of recent construction and will be deployed in the South Africa and Australia trade. MSC operates a fleet of 67 ships, 56 of which it owns.

SSPA Consultants Retained For FastShip™ Model Tests

SSPA Maritime Consulting AB has been commissioned to perform model tests for the FastShip™, the next generation of trans-oceanic freighters. Thornycroft, Giles & Co. Inc., Virginia, has spent the last 15 years developing the FastShip (See MR/EN August 1994 for full story). By using gas turbines and waterjet propulsors the ship will cross the north Atlantic in 3.5 days.

For more information on SSPA Maritime Consulting
Circle 3 on Reader Service Card

Circle 24C on Reader Service Card

Continued from page 22)

Dual Fuel Technology

MDA representative **Bill Berlin** states that natural gas vessels have shown "much less engine repair, multiple times over expected measures — the same for lubricating oil and filters."

Building on the experience gained on the two B.C. ferries, MDA will provide vessel engineering designs, as well as act as an interface between the consortium and the regulatory bodies.

Systems Management Sciences, Inc. (SMS) will provide contract and shipyard management services, and will work as primary interface between the project and the various governmental agencies. Prime operatives **John Pounds** and **Wesley Moore** will oversee both the conversion phase and the long-term testing procedures. ECI and SMS have been working for nearly a year on the acquisition of the surplus vessel, funding of the projected \$5-million project, and coordinating the input from sources as varied as Russian cryogenic specialists in Moscow, Russia to the staff of the National Center for Advanced Transportation Technology (NCATT) in Moscow, Idaho. Integrated parties from the College of Engineering at Washington State University have also been involved.

Methane, the major component of natural gas, exhibits ideal knock characteristics for spark-ignited engines, but not for compression-ignited engines like standard high-horsepower diesels. ECI's system injects a small amount of diesel oil near the top of the piston stroke. The diesel fuel with its lower ignition temperature acts as a pilot charge, igniting the gas mixture.

This approach requires a lower compression ratio than normal. To alleviate the lower efficiency generally associated with lower compression ratios, ECI's patented piston crowns and cylinder heads are specially designed to minimize loss and allow for full diesel-rated horsepower. The Gas Inlet Valve, an electrically-activated pneumatic device, is also patented by ECI. In a standard natural gas power generating plant, monitoring equipment within the engine room constantly checks for gas leaks. Should one occur, the system automatically shuts down.

While an excellent safety feature in a stationary plant, such a shutdown on a moving vessel could prove disastrous. To assure uninterrupted power flow, ECI's patented Electronic Control Unit automatically switches the fuel mix to pure diesel the instant a shutdown occurs.

Another important aspect of the *Olympic* project is the opportunity for engineers, scientists and regulatory bodies to work together to set realistic standards for this blossoming new industry. According to SMS's **John Pounds**, his initial contacts with UCGG representatives have been positive and encouraging. Mr. **Pounds** said, "The Coast Guard has been given a number of studies over the years. This project will prove the concept and provide a foundation for setting the rules for (LNG) passenger vessels."

The year-long test period will include fuel efficiency tests under demanding conditions providing conservative baseline fuel consumption figures. Engine wear testing will include before-and-after micrometer measurements of all wear parts providing comparisons to manufacturer's expected wear data. Routine maintenance — repair parts, lubricating oil, filters, etc. — will be performed on an as-needed basis over the course of the test period and consumption levels will be compared to the manufacturer's expectations from a diesel fueled system. Once testing is complete, the vessel will continue to serve the industry as a training and research station in the areas of cryogenics, LNG technology, environmental enclosures, and synthetic lubricants, among several other possibilities. Government officials and industry insiders foresee a rebirth in the regional maritime trades if this project proves its worth.

For more information on the system
Circle 11 on Reader Service Card

Trinity Acquires Gulf Coast Fabrication As 16th Yard In Group

Trinity Industries, Inc. has acquired Gulf Coast Fabrication, a shipbuilder located in Pearlinton, Miss., offering new construction, modifications, conversions and repairs. The company will retain its name and will be the 16th shipyard in the Trinity Marine Group. Terms of the transaction were not disclosed. In making the announcement, **John Dane III**, president of Trinity Marine Group, said, "We are delighted with this acquisition because of the high quality of work produced at Gulf Coast for a long list of repeat customers, and for the addition of **Dan**

Mortimer and **Fred May**, former owners of Gulf Coast Fabrication, to our management team. Dan will remain as president of Gulf Coast Fabrication, Inc. and additionally will become a senior vice president of the Trinity Marine Group. **Dan Mortimer** and I both worked for Halter Marine, Inc., years ago. Later, we both founded our own companies and he was a tough, but honorable competitor. It's great to have him back on the same side again."

For more information on Trinity
Circle 8 on Reader Service Card

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Circle 207 on Reader Service Card

AMBAR Introduces Bollinger-Built RIB Line To U.S.



AMBAR Marine, Inc., a subsidiary of AMBAR Inc., introduced a new series of Rigid Inflatable Boats (RIBs) in the U.S. ALsafe Severe Service/Rescue Boats are built by Bollinger Machine Shop & Shipyard in Lockport, La.

Although new to the U.S., ALsafe RIBs are based on a design used for more than 12 years in the North Sea in military and commercial applications; over 200 are reportedly in service there.

The proprietary hull construction process for ALsafe RIBs uses marine grade aluminum extrusions for the entire outer hull structure, reportedly providing a light but extremely rugged and durable hull with improved longitudinal rigidity. Continuous deadrise construction of up to 26 degrees provides seakeeping capabilities and for sustained high speed operations in high sea states. Low-density polyurethane foam is incorporated into compartments under the deck to provide positive floatation in all conditions.

ALsafe RIBs are available in standard lengths between 18 ft. (5.5 m) and 29.5 ft. (9 m). Custom construction is available in lengths up to 49.2 ft. (15 m). Standard propulsion is provided by waterjets coupled to marine diesel engines with hydraulic maneuvering controls and steering. A coaxial reversing hydraulic gearbox is available, and allows the flow of water through the waterjet to be reversed to clear the system of any debris, if necessary. The engine is designed and equipped to run dry prior to deployment. Outboard propulsion is also available on some models.

The boats are designed with a carrying capacity that can exceed six tons and are intended to accommodate up to 10 personnel plus crew. The electrical system and the engine compartment are waterproof and the craft are totally self-bailing and self-righting.

For more information on AMBAR Marine
Circle 53 on Reader Service Card

Saab's Third-Generation TankRadar



Saab has introduced a third generation of its TankRadar level gauging system, which uses a light pen to activate the system's various functions.

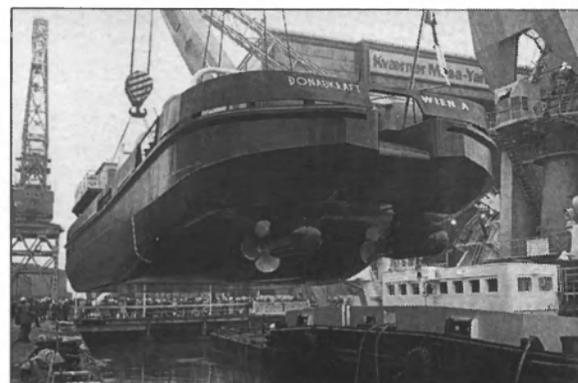
The Saab TankRadar is a carrier wave, frequency-modulated radar. The signal is aimed at the surface of the tank contents and reflected back. When the signal is delayed, the difference frequency is proportional to the distance between the level gauge and the surface of the tank contents. That frequency is used to determine the tank level to millimeter accuracy.

The signal can be guided to the tank contents in various ways: for the highest sensitivity, a parabolic antenna is used. This antenna produces a very narrow radar beam, allowing the user to measure cargoes under demanding circumstances — in deep tanks, tanks with waves, and tanks with restricted space — regardless of the contents. A cone antenna is for simpler applications. It is small, practical and easy to install for less demanding applications and shallow tanks. A third alternative is a still pipe, which functions as a circular wave guide that directs the radar signal down into the tank.

The light pen interface is a recent addition intended to make system use simpler. By minimizing the risk of overspill, the new system protects the environment. It is intrinsically safe, so the equipment will not cause sparks on deck; and the system can be serviced while in operation — without the need to open the tank.

For more information on Saab Marine Electronics
Circle 1 on Reader Service Card

Diesel-Electric Icebreaker, *Röthelstein*, Launched At Kvaerner's Helsinki Yard



The river icebreaker *Röthelstein*, for the Österreichische Donaukraftwerke AG, Austria, has been launched at Kvaerner Masa-Yards' Helsinki New Shipyard. The vessel, to be delivered in spring 1995, will operate in assisting river traffic and break ice formations at the power stations in the river Danube.

The new icebreaker has an extremely shallow draft, only 7.2 ft. (2 m). In spite of this, the vessel can break more than 2.3 ft. (.7-m) thick level ice in continuous mode of operation. This is the result of extensive development work at Kvaerner Masa-Yards' Arctic Research Center. The vessel will be equipped with two azimuthing electric propulsion drives. The new azipod propulsion system has been jointly developed by Kvaerner Masa-Yards and ABB Industry of Finland. The ice trials of the vessel will be conducted in the Baltic in winter 1995.

For more information on Kvaerner Masa-Yards
Circle 12 on Reader Service Card

Röthelstein Particulars

Length (max)	138.8 ft. (42.3 m)
Breadth	32.8 ft. (10 m)
Draft	6.6 ft. (2.0 m)
Max. height	19.7 ft. (6.0 m)
Displacement	400 t
Shaft power	1,100 kW

New Twin Disc Transmission For High-Speed, High-Output Use

Twin Disc introduced the MG-5202DC (Deep Case) transmission for use with high-speed/high output diesel engines in heavy duty and intermediate applications including commercial workboats, fishing boats and military vessels.

The MG-5202DC is a vertical offset (400 mm/15.74-in. drop), single-reduction marine transmission covering a range of 368 to 731 kW (493 to 980 hp), available in ratios of 4.03:1, 4.59:1, 5.04:1, 6.10:1, 6.55:1 and 6.96:1. It can be operated at full rated capacity in either forward or reverse for ahead propulsion when installed on standard right hand rotation engines. It is equipped as standard with 14- or 18-in. torsional couplings and reportedly offers solid, predictable response through oil-controlled, oil-cooled clutches. Other standard features include precision single helical gearing for smooth, quiet operation and oil filter/strainer. Accessibility for maintenance was stressed in the design: it is not necessary to remove the transmission or disturb alignment for most service functions.

Twin Disc's popular trolling valve option offers the ability to obtain propeller speeds lower than possible at engine idle with the clutch fully engaged. A live PTO option rated 112 kW (150 hp) at 1,800 rpm is also available.

For more information on Twin Disc
Circle 50 on Reader Service Card

Kawasaki Jet Piercer *Hayabusa* Launched



Kawasaki Heavy Industries Inc. launched a wave-piercing catamaran aluminum high speed car ferry, type Kawasaki Jet Piercer AMD 1500 Mark II for joint owners Maritime Credit Corporation of Japan, Tokyo and Kyushi Ferry Boat Co., Ltd., Yawatahama, Ehime Prefecture. The vessel is based on a design from Advanced

Multi-Hull Designs (AMD) of Australia, and was christened *Hayabusa*, which means "falcon." *Hayabusa* is the first Kawasaki jet piercer.

Hayabusa reportedly achieves excellent seakeeping with spear-like twin bows that pierce the waves rather than ride over them. Its propulsion system consists of four marine diesels driving a KPJ-169A waterjet propulsion system, developed and designed by Kawasaki. Two engines are fitted on each twin hull.

The vessel features automated control for safe navigation by a reduced number of crew; a remote control and monitoring system for the main engines; and waterjets and main auxiliaries. The vessel will be outfitted after launching and is expected to be delivered this month.

Hayabusa Particulars

Length (o.a.)	328 ft. (100 m)
Breadth molded	65.6 ft. (19.98 m)
Depth molded	23.9 ft. (7.3 m)
Gross tonnage	2,200 (Japanese system)
Capacity	460 passengers
Engine output	2 x 5,420 kW at 1,000 rpm
	2 x 4,060 kW at 1,000 rpm
Speed (max.)	35 knots

RECENT SHIP SALES

This report, compiled by Shipping Intelligence, Inc. — a New York maritime consulting firm — tracks the prices of secondhand bulk carriers and tankers.

Date	Vessel Name	Type	DWT	Year Built	Sale \$ (millions)
11/14	Bowen King	Bulker	16,631	76	\$3
11/7	Araucaria	Bulker	19,426	73	\$2.175
11/7	Mercury	Bulker	22,225	80	\$6.5
11/14	Ken Sun	Bulker	22,245	80	\$6.49
11/14	Forkham	Bulker	23,260	80	\$6.75
10/31	Global Access	Bulker	22,294	81	\$7.35
10/24	Aynur Urkmez	Bulker	23,978	82	\$8.5
10/24	Drava	Bulker	25,243	74	\$2.4
10/18	Aishima	Bulker	25,388	84	\$10.3
11/7	Handy Accord	Bulker	25,410	83	\$10.35
11/11	Danish K	Bulker	26,272	78	\$5.85
11/7	Stellar Sophy	Bulker	26,965	86	\$13.2
10/24	Bergen Splendour	Bulker	27,470	77	\$5.9
10/31	Spar Seven	Bulker	27,470	77	\$5.75
10/31	Sarla	Bulker	27,704	77	\$5.8
10/24	Tusa	Bulker	28,317	77	\$5.2
11/14	Pionero	Bulker	33,264	84	\$12.5
10/31	Bergen Queen	Bulker	34,687	83	\$11
10/24	Seaqueen	Bulker	34,698	83	\$11
11/14	Jin Li	Bulker	37,636	84	\$12
11/11	New Amethyst	Bulker	38,410	85	\$14.8
11/11	Junri	Bulker	38,594	85	\$13.75
10/24	Shinya Maru	Bulker	41,200	82	\$9
11/11	Trinity Beach	Bulker	42,055	86	\$16.4
10/24	Kelvin Resource	Bulker	42,244	85	\$16.7
10/24	Joann M	Bulker	50,202	76	\$7
10/17	Fortuna	Bulker	64,168	83	\$16.8
11/7	Sally Stove	Bulker	64,353	81	\$14
11/7	Valaivia	Bulker	64,746	81	\$12.3
11/7	Astor	Bulker	64,835	78	\$9
10/25	Aiyassas	Bulker	65,159	82	\$15
10/31	Aiyassas	Bulker	65,159	82	\$14.9
11/7	Delphic Flame	Bulker	65,163	82	\$13.95
10/24	Evangelia T	Bulker	66,289	74	\$6.5
10/24	Santa Margarita	Bulker	68,676	89	\$21
11/7	White	Bulker	79,491	75	\$3
10/31	Polycrusader	Bulker	116,630	77	\$9
10/24	Shoho Maru	Bulker	145,299	82	\$17.34
11/7	Nord Boy	Bulker	149,212	89	\$34
11/14	Sea Braves	Tanker	22,755	82	\$8.4
11/7	Astralabe	Tanker	40,509	88	\$20
10/24	Chizukawa	Tanker	59,996	81	\$10.25
10/24	Liberty Bell Venture	Tanker	61,375	81	\$11.1
10/17	Bregen	Tanker	68,159	89	\$27
11/14	Gateway North	Tanker	82,169	80	\$12.25
11/7	Ocean Victor	Tanker	82,283	81	\$14.5
10/24	Jahre Prospect	Tanker	85,922	81	\$14
10/31	Albe	Tanker	88,272	81	\$13
10/24	Ursa Major	Tanker	96,550	76	\$5.75
10/17	Star Louisiana	Tanker	115,829	75	\$5.05
11/14	Aretusa	Tanker	197,245	76	\$10
11/11	Pacific Memory	Tanker	228,857	75	\$6
10/31	New Resource	Tanker	262,166	76	\$5

For further information, contact: Shipping Intelligence, Inc., 25 West 43rd St., New York, N.Y. 10036, tel: (212) 997-0966.

REQUEST FOR EXPRESSIONS OF INTEREST:

The City of Vallejo California intends to issue a Request for Proposals for two 300 passenger high speed catamarans of proven hull design to operate between Vallejo and San Francisco. The RFP will contain a performance specification.

Shipyards interested in receiving information on this solicitation and copies of the RFP, when issued, should contact:

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Principal, Water Transportation
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65 Marion Street, Suite 306
Seattle, Washington 98104

Telephone: (206) 622-6221
Fax: (206) 622-1429

Circle 283 on Reader Service Card

Atlantic Marine Completes Empress III.

Atlantic Marine completed construction of its latest casino boat for Empress River Casino Corp.

The *Empress III* differs from the previous two vessels built for Empress in that it is an oceangoing vessel, measuring 288 ft. (87 m) x 76 ft. (23 m).

The Rodney E. Lay & Assoc.-designed vessel is scheduled to operate on Lake Michigan out of Hammond, Ind., and is certified with a Great Lakes Load Line and partially protected certificate up to 20 miles offshore.

Additional design work was performed by Flume Systems of Or-

ange, N.J. for the incorporation of a roll stabilization system. Outfitting of the vessel includes: main propulsion from twin Caterpillar 3512TA marine engines producing 1,210 hp at 1,300 rpm; ship-board electrical service via a pair of Caterpillar 3512TA 845kW @ 1,200 rpm gensets; and interior design by Interior Design International, Inc. of Seattle. The vessel is also outfitted with bow and stern thrusters, each 600 hp, and an Anschutz One Man Bridge System.

For more information on
Atlantic Marine
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Russian Registry Transfer Approved

MarAd has given approval to Mark F. Maring Enterprises II, Inc., Seattle, Wash., to transfer to Russian registry the 452-gt fishing vessel *Arctic Discovery*. The vessel was built in 1976 in Moss Point, Miss.

MarAd approval is required under section 9 of the Shipping Act, 1916, as amended.

Gilman Corporation Selected In USCG Buoy Project

The National Data Buoy Center has announced its intention to negotiate exclusively with the Gilman Corporation of Gilman, Conn., for the next generation of very large lighted U.S. Coast Guard (USCG) buoys. The buoys are made of Gilman Corp.'s trademarked Softlite® Ionomer Foam, sized to

replace the old style steel 8x26LR. The Gilman buoys were chosen after a survey covering nearly 400 types of buoys and 22 manufacturers worldwide and a yearlong series of tests performed jointly by the National Data Buoy Center and the USCG.

Secretary of Transportation **Federico Peña** personally congratulated Gilman Corporation President **Richard L. Gilman** on the results of the 8 x 26 evaluation.

Trimble ProBeacon MSK DGPS Receiver For Pinpoint Accuracy

Trimble Navigation debuted the ProBeacon, an MSK (Minimum Shift Keying) receiver for Differential GPS data transmissions from marine radiobeacons. The ProBeacon's all-digital design provides faster acquisition and better tracking of signals from radiobeacons for surveyors, dredge operators, resource management agencies, crop dusters and others who need to know their precise position.

Better than one meter accuracy is reportedly practical using a Trimble 4000 Maxwell as a reference station, a GPS mobile receiver of similar capability, and the ProBeacon to receive reliable and accurate data. The ProBeacon's signal processing is based on the proprietary noise cancellation technique, utilizing multiple channels to reject "impulsive" noise. It uses advanced computer logic, constantly monitoring Message Error Ratio. Should the signal degrade for any reason, ProBeacon will switch automatically to a different beacon.

For more information on Trimble
Circle 5 on Reader Service Card

Sifco's New Power Pack Leads Easier To Handle

Sifco Selective Plating, Cleveland, Ohio, offers new electroplating power pack leads that are reportedly easier to handle and designed to prevent accidental disconnection.

The leads' rubber insulation has been replaced with a more flexible neoprene cover, making the leads easier to handle and store. On the power pack end of the leads, new universal twistlock connectors allow leads to be connected to any of the five types of Sifco power packs. On the leads' tool end, a locking post and receptacle configuration prevents accidental disconnections, eliminating the possibility of arc damage to the component.

For more information
Circle 4 on Reader Service Card

Penska Joins National Marine

J.R. Penska joined National Marine, Inc., a New Orleans-headquartered marine transportation company operating both dry and liquid barges and towboats, as compliance manager. His primary responsibility will be for quality and audit functions, both internal and external, for National Marine and its vendors. Mr. Penska was recently retired from the U.S. Coast Guard where his last assignment was chief of the Merchant Vessel Safety Branch at the Eighth Coast Guard District headquarters with program responsibility for the Coast Guard's marine inspection, marine investigation and licensing throughout the Gulf Coast.

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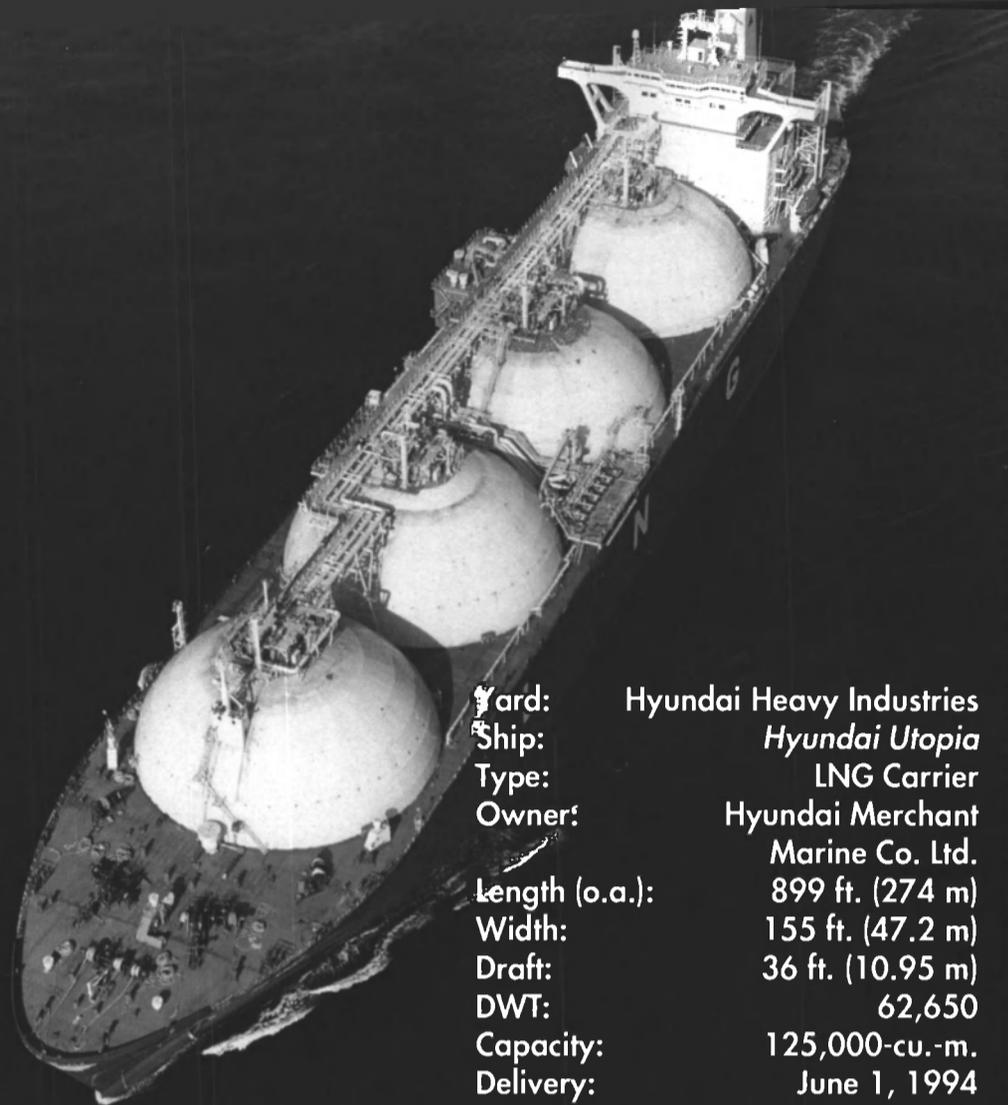
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GREAT SHIPS OF 1994



**MARITIME
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Yard: Hyundai Heavy Industries
Ship: Hyundai Utopia
Type: LNG Carrier
Owner: Hyundai Merchant Marine Co. Ltd.
Length (o.a.): 899 ft. (274 m)
Width: 155 ft. (47.2 m)
Draft: 36 ft. (10.95 m)
DWT: 62,650
Capacity: 125,000-cu.-m.
Delivery: June 1, 1994

For more information on Hyundai Heavy Industries
 Circle 42 on Reader Service Card

Korea's first-ever liquefied natural gas (LNG) ship was delivered in June from Hyundai Heavy Industries' (HHI) Ulsan yard. The 125,000-cu.-m., 900-ft. (274-m) Moss-type ship, named *Hyundai Utopia*, was put into service by its domestic owner, Hyundai Merchant Marine Co., Ltd. (HMMC) to transport one million tons of Indonesian LNG per year.

The *Hyundai Utopia*, 155 ft. (47.2 m) wide, 87 ft. (26.5 m) deep with a design draft of 36 ft. (10.95 m), is the first of three identical ships built by Hyundai for Korea GAS Corporation's (KGC) long-term LNG import plan. The second ship (*Y.K. Sovereign*) is due for delivery in March 1995 to Yukong Line Ltd., another domestic owner. Construction of the cargo tanks for the third ship, scheduled for delivery to HMMC in December 1996, commenced in June.

Construction of spherical cargo tanks for *Hyundai Utopia* started in September 1991 and keel-laying took place in July 1992. She was launched in February 1993 with sea trials completed in November of the same year. *Hyundai Utopia* successfully carried out gas trials at Pyong Taek LNG Terminal between April 16 and May 5.

Hyundai Utopia has a flying passage on the tank covers, which reportedly gives easy access to the compressor room and to the upper deck for easy survey, inspection and maintenance of the cargo piping and the electric cable.

The cargo containment system is of the Moss Rosenberg concept, which consists basically of a single wall and an insulated spherical tank supported by a vertical skirt. Cargo loading is performed by shore pump facilities after the cargo tank is cooled down. Generated vapor during loading is returned to shore by using high-duty, on-board compressors. During a loaded voyage, generated boil-off gas is heated up and delivered to the main boilers as fuel gas by low-duty compressors and a boil off gas heater.

The cargo is discharged by two electric motor-driven submerged pumps with a capacity of 1,400-cu.-m. per hour on the bottom of each cargo tank, and supplement gas is received from shore during discharging operation to maintain cargo tank pressure. The ship's pressure discharge system pressurizes one cargo tank and shifts cargo to the other tank, in case both pumps in a single tank fail at once. During ballasted voyages,

(Continued on page 42)

Yard: Daewoo Heavy Industries Ltd.
Designer: Daewoo
Ship: Titus
Owner: Walleniusrederierna
Type: 6,000-unit Pure Car/Truck Carrier
Length (o.a.) 652 ft. (199 m)
Breadth: 106 ft. (32.26 m)
Draft: 31 ft. (9.5 m)
DWT: 16,600
Delivered: Nov. 1, 1994

For more information on Daewoo
 Circle 46 on Reader Service Card

batteries connected.

The 652 ft. (199 m) long vessel has 13 car decks, including three steel pontoon type liftable decks operated by a mobile deck lifter and one stern ramp/one side ramp with total design load of 105 tons and 30 tons respectively. In holds, six movable ramps, including a ramp cover and seven fixed ramps, are provided for loading/discharging cars to each deck they serve.

The vessel is designed with good stability performance characteristics to meet the U.S. weather criteria and Subdivision/Damage Stability requirements regulated in SOLAS chapter II-1, part B-1. Automatic heel control

system by means of transferring the ballast water between the two wing ballast tanks, is provided. The control devices and indicators are mounted on the heel control panel in the wheelhouse.

The layout of the wheelhouse is designed and built to the guidelines of IMO MSC/Ciro, 566, extending the wheelhouse to bridge wings with front projection and providing big windows on all of the walls. A centralized wheelhouse console for one-man operation is installed in the front center, providing the ship control console and surveillance control

Daewoo contracted to build three of the 6,000-unit pure car/truck carriers (PCTCs) for Wallenius Lines. The *Titus* is the first in the series, and was put into service on a main trade route of Japan-Europe after the vessel's delivery at the beginning of November.

The design was developed in close cooperation with the owner to ensure that the Wallenius' goal of improving service — as compared to existing vessels — was met.

The vessel was designed and built as a multi-purpose single screw RoRo PCTC to carry cars, trucks and other vehicles with fuel in their tanks and



sole, etc. A bridge wing console permitting control of M/E rpm and bowthruuster is installed on each enclosed wing bridge. Additionally, an integrated Selesmar navigation system interfaced with all navigation equipment is provided in the wheelhouse.

The vessel is powered by one B&W 8S60MC rated at 20,000 bhp, a power plant which helps drive the ship to 20.5 knots at design draft at MCR. Two diesel generators (1,400 kW each), one 950-kW shaft generator and one 150-kW emergency generator are also installed.

Titus Equipment List

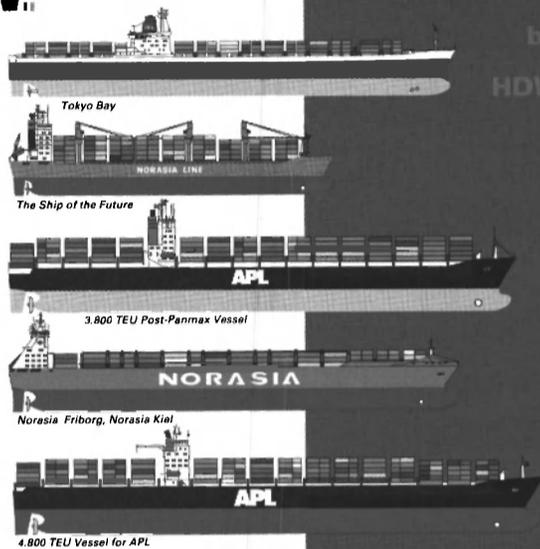
Main engine	Hanjung B&W	VHF	Standard
Auxiliary engine	Ssangyong-Wartsila	Radar	Sielsmar Intl. Selescan
Propeller	Lips B.V.	Compass	Tokimec, John Lilley & Gillie
Thrusters	Techno Nakasmima Co.	GPS	Shipmate
Generators	Hyundai	Autopilot	Kockum Sonics AB
Emergency generator	Ssaangyong	SATNAV	Selesmar Intl.
Anti-Heeling system	Norcontrol	Air conditioning	Flakt
Coupling	Daewoo	Lifeboats	Hyundai Precision
Engine control	K.T. Electric	Liferafts	Viking-AS
Steering controls	K.T. Electric	Davits	DongWoo
Deck machinery	Aquamaster Rauma	Fire fighting system	Nam Yang
Shafting	Daewoo	Desalination equipment	Alfa Laval
Bearing	Japan Marine Tech.	Waste management	Electrolux
Coatings	Dong-Ju Hempel, I.P.K.		

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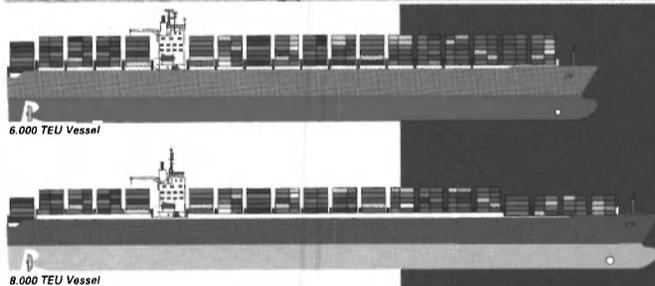


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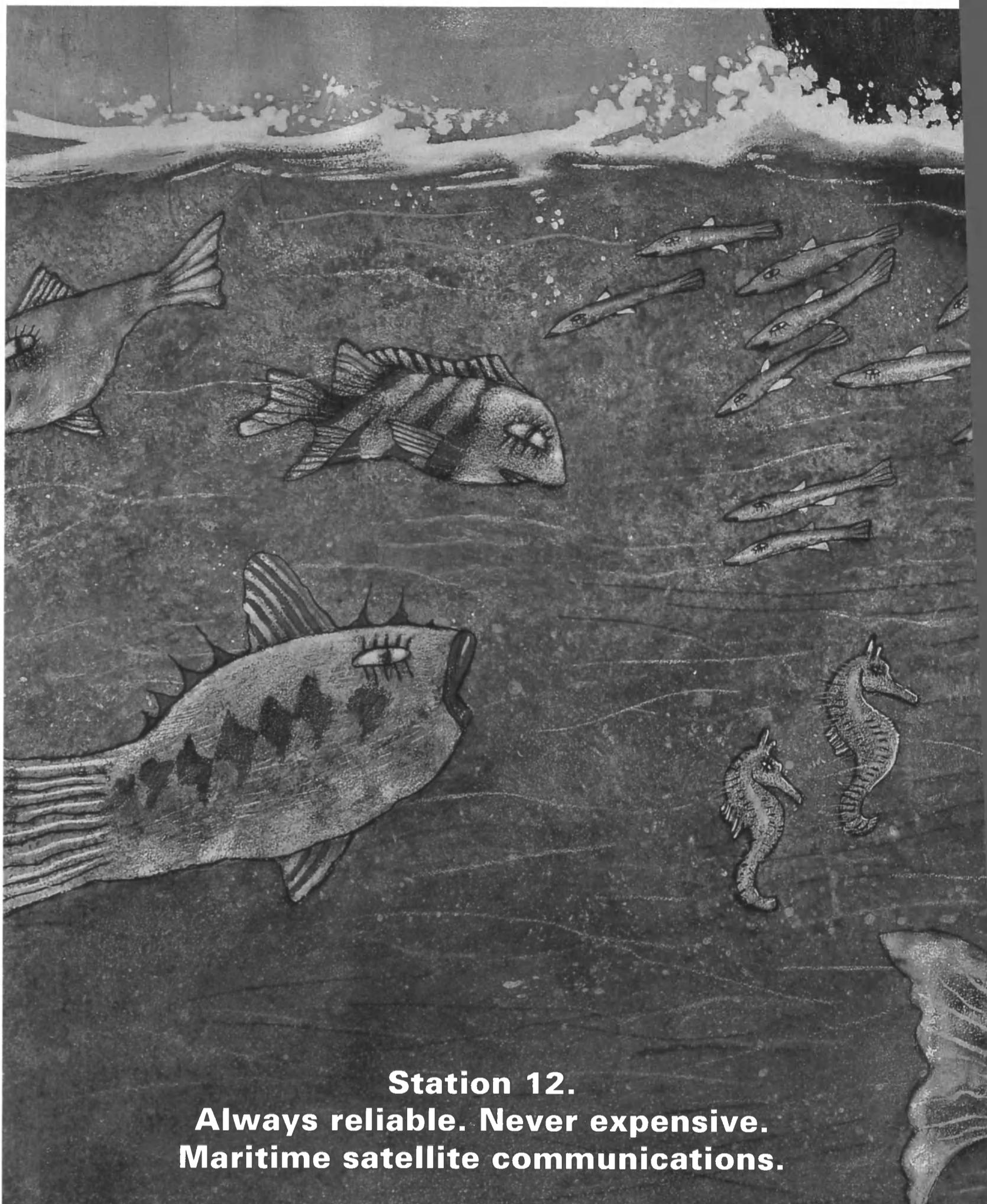


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I think
they're on 12

I think
they're cute

Yard: MTW Schiffswerft GmbH
Ship: Westerdeich
Type: Containership
Owner: Reederei Gebr. Peterson GmbH

Length (o.a.): 551.2 ft. (168 m)
Breadth, molded: 87.6 ft. (26.7 m)
Depth: 47.2 ft. (14.4 m)
Design Draft: 31.8 ft. (9.7 m)
Container capacity: 1,572 TEUs

For more information on MTW Schiffswerft
 Circle 44 on Reader Service Card



Westerdeich, a 551.2-ft. (168-m) containership of type CC 1600, was recently delivered by MTW Schiffswerft GmbH, Wismar to owner Reederei Gebr. Peterson GmbH, Rendsburg, Germany.

Built in accordance with the rules of Germanischer Lloyd (GL), the new ship reflects special attention to the issues of time-saving in loading containers, efficient arrangement and selection of container-handling gear, and optimizing space utilization inside cargo holds and the engine room.

The cargo loading area is subdivided by waterproof transverse bulkheads into four areas where containers may be stowed in 40-ft. bays that can hold two 20-ft. containers. The division of the bays helps ensure favorable installation by three electro-hydraulic, 40-ton capacity cranes with 92-ft. (28-m) outreach. Generally, the vessel is built to carry 1,572 TEUs, of which 576 can be carried in the cargo holds and 986 on deck.

The vessel's shape has been designed to meet the task requirements for a high-draft vessel — that is, its freeboard draft will create no significant drop in speed as compared to a high-draft vessel. The design of the bulbous bow fits into this concept. The aft ship design including the stern bulb and the arrangement of a big propeller aperture as well as the wide deck beams in the fore and aft ship meet current requirements for high-speed and advanced containerships.

Main propulsion is by one two-stroke diesel engine directly clutched to a low-speed diesel engine of type 6RTA62 by Dieselmotorenwerke Rostock, with an output of 13,000 kW. At 90 percent engine output, the vessel achieves 20 knots. The engine is of reversible type, has two single-stage charge air coolers and two BBC exhaust-gas turbochargers of type VPR 454. The vessel is designed for operation on heavy fuel oil with a viscosity of 600 cSt/50 degrees C. The vessel's equipment also includes an STN shaft-generator in the wave train, semi-balanced rudder and a Schottel bowthruster.

The main dimensions specified in connection with a low block coefficient CB at design draft follow the current trend toward higher-speed containerships, with moderate power increase. The vessel is classed by GL.



Yard: Hanjin Heavy Industries
Ship: Nedlloyd River Plate
Type: Container Carrier
Owner: Leonhardt & Brumberg
Designer: HHIC
Length (o.a.): 551 ft. (168 m)
Length (b.p.): 518 ft. (158 m)
Breadth, molded: 89 ft. (27.2 m)

Draft (design): 28 ft. (8.75 m)
DWT (design): 19,762
DWT (scantling): 21,473
Service speed: 19.36 knots
Delivery: May 16, 1994

For more information on
 Hanjin Heavy Industries Co. Ltd.
 Circle 48 on Reader Service Card

The M.V. *Nedlloyd River Plate*, built for Leonhardt & Brumberg by Hanjin Heavy Industries Inc., is a 1,400-TEU container carrier constructed under the special supervision of and according to the full requirements and recommendation of Germanischer Lloyd.

The containership, powered by a MAN B&W 6S60MC two-stroke, single acting airless injection, crosshead, direct reversible, turbocharged diesel, develops 16,680 ps at 105 rpm, has a maximum speed at ballast condition of 20.4 knots, and a maximum range of 15,000 nautical miles. Operation of the main propulsion is carried out according to the pre-set program, by operation of main telegraph transmitter at the wheelhouse control console.

Cell guides have been provided for 40 ft. containers in container holds and 20 ft. containers have been stored inside of 40 ft. container cell guides.

Its maximum carrying capability is 1,444 TEU, including reefer containers (100 TEU).

The ship is designed as raked stem with bulbous bow, transom stern without curvature and flush deck with forecastle.

The main hull structure consists of the deck, side shell, longitudinal bulkheads and double bottom in cargo tank space has been built as a longitudinal framing system.

All accommodation space, including navigation bridge and propulsion machinery space, have been located aft. For the comfort of the crew and

(Continued on page 42)



Westerdeich Equipment

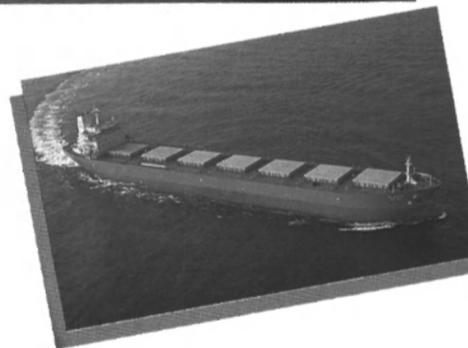
Main engine	Dieselmotorenwerke Rostock
Auxiliary engines	MaK Kiel
Shaft generator	STN/Lloyd Dynamowerke Bremen
Emergency generator	MAN
Rudder	KGW
Bowthruster	Schottel
Stern tube seals	Blohm + Voss
Container securing	CONVER
Aux. exhaust-gas boiler	HTI
Watercooling system	APV
Fuel treatment, Watermaker	Alfa Laval
Sewage treatment	Hammworthy
Engine controls, Intercom	STN
Cathodic protection	Jotun
Air-conditioning	Noske-Kaesser
Satellite communications	Magnavox, Sailor
VHF	Sailor/IMC Japan
SART	SERPE
Gyrocompass, Autopilot	Anschutz
Compass	Cassens & Plath
Radar	Racal-Decca
Satellite navigation, Speed log	Trimble
Radio direction finder	Plath
Loran C	MLR Electronic
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Navtex receiver	JMC/Japan
Navigation lamps, signaling lights and searchlights	Aqua Signal

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Circle 214 on Reader Service Card



Yard: Harland & Wolff (H&W)
Ship: *Erradale*
Owner: China Navigation Co.
Type: Capesize bulk carrier
Length (o.a.): 930 ft. (283.6 m)
Breadth: 145.6 ft. (44.4 m)
Depth: 79 ft. (24.1 m)
Design draft: 54.8 ft. (16.7 m)
Scantling draft: 58 ft. (17.75 m)
DWT: 162,000
Capacity: 181,000-sq.-m.

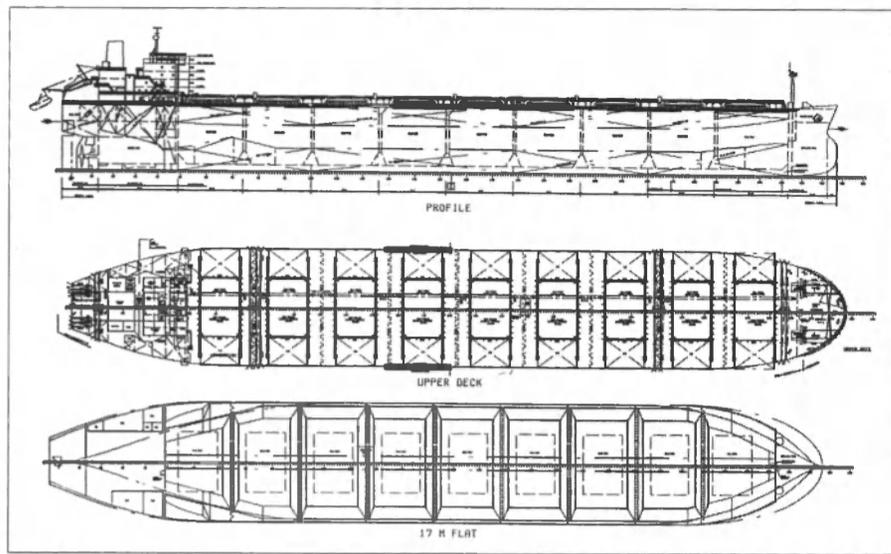
For more information on Harland & Wolff
Circle 47 on Reader Service Card

In mid-January, the 162,000-dwt capesize bulk carrier *Erradale* was named at Belfast's Harland & Wolff (H&W). This is the first time in many years that shipowner China Navigation Co. (CNC), part of Hong Kong's John Swire Group, has built in the U.K., the original order being part of an expected series of six such vessels to be delivered to CNC and U.K.-based shipowner Cenargo, each company taking three ships. However, the Cenargo three and two of the CNC ships were eventually canceled due to the lowering of freight rates in the bulk trade, leaving just the one ship on order.

H&W's shipowning arm, Trassey Shipping, was to take delivery of a

second vessel. Both this ship and the CNC vessel were chartered to Belgium operator CODAM, the CNC ship for one year with various options, and the Trassey ship for seven years. The *Erradale* is the prototype of H&W's new S162 series of capesize bulk carriers. The ship is of high standard; the quality, safety and potential second-hand price of the vessel attracted CNC to the design.

The main features of the vessel are the 65 percent mild steel content for additional hull strengthening, increased scantlings in tanktop, hopper sides and transverse bulkheads, strain gauges, computerized maintenance management and the advanced International Paint epoxy



Technical drawings of the bulk carrier built for China Navigation Co. by Harland & Wolff.

coating system throughout the vessel. Specifically, in an attempt to resist mechanical damage and avoid fatigue, the *Erradale* was designed with: tank top and hopper sides in all holds increased to 25.5mm thick mild steel to cater for heavy grabs; side shell thickness 24mm mild steel in way of mid-body main hold framing; and special attention to the design of cargo hold framing and the connection to hopper and topside structure. Paying special attention to corrosion control, all ballast tanks are coated with 300 microns solvent free epoxy; all cargo holds (except tank top and lower strake of hoppers) are coated with 250 microns tar epoxy; and all coatings were applied in a controlled environment at H&W. The cargo system comprises nine cargo holds, each fitted with a sophisticated fixed cargo washing unit and a programmable deck washing system, additional electric generation capacity, and a one-man bridge operation, specially designed by the owner and containing an integrated navigation system. The main propulsion system consists of a Hyundai-built MAN B&W low speed diesel, designed to burn low grade bunker fuel up to 700 Cst at a fuel consumption rate of 125g PS/h.

Erradale Equipment List

Main engine	Hyundai MAN B&W
Generator engine	MAN Holeby
Emergency diesel	Beta Marine
Propeller, intermediate shafts	Hyundai Heavy Indus.
Shaft bearings	Vickers
Stern tube seal	Kobe Steel
Pumps	Hamworthy Engineering
Coolers, purifiers, filters	Alfa Laval
Electrochlorinator	Cathelco
Separator bilge	Parmatic Esplen
Boilers	Aalborg Ciserv
Hold cleaning guns	Consilium Marine
Engine room valves	Young & Cunningham
Paint	International
Cathodic protection	M.G. Duff
Light fittings	Kockum Sonics
Monitoring & control	Norcontrol
Radio comm. equipment incl. integrated bridge system	Raytheon
Rudder castings	Weardale Steel
Rudder pintle	Centromor
Funnel	Marine Skills
Plate, mild steel	British Steel
Gantry crane	Maskinfabrik ACTA
Sundry davits	Crown Overseas
Air conditioning	ABB Flakt
Lifeboat, lifeboat davit	Vickma
Liferafts	Vickma
Firefighting equipment	Unitor Ships Service
Anchor & cables	Vicinay Cadenas SA
Deck machinery	Pusnes
Steering gear	Porsgrunn
Lift	MacGregor Navire
Ladders, accommodations	Welin
Accommodation outfit	H&W
Fireproof doors	IMAC
Hull stress monitor	BMT Cortec

Yard: Howaldtswerke-Deutsche Werft (HDW)
Ship: *Norasia Kiel*
Type: "Open Top" Containership
Owner: Norasia Schiffahrts
Length (o.a.): 794 ft. (242 m)
Breadth: 105.8 ft. (32.24 m)
Draft (max.): 39.4 ft. (12 m)
Draft (design): 36.1 ft. (11 m)
Container capacity: 2,789 TEU
DWT (At max. draft): 41,470
DWT (At design draft): 35,380
Service speed: 22 knots
Crew: 16

For more information on HDW
Circle 41 on Reader Service Card

The *Norasia Kiel* is the second "open top" containership from HDW of Kiel, Germany — reportedly the second in all of Germany, and one of the first in the world — and it is also what HDW deems a successful beginning for a new generation of ships.

According to the company, the ship is based on ideas it developed in the seventies, but the difference between HDW's open top ship and the few comparable ships built so far, says the company, lies in the various material novelties:

- The free deck concept, with the deckhouse placed aft: allows container gantry easy access to all holds, and free-fall lifeboats are directly accessible. The yard also managed to keep deckhouse vibrations far below permitted values in spite of its extreme placement.
- The HDW lightweight shelter: offers protection from tropical rainstorms and — combined with the deckhouse tower's small area of wind pressure and the windbreaking front hood — reduces wind drag, resulting in four percent less

(Continued on page 41)



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Circle 263 on Reader Service Card

Hanne Knutsen

(Continued from page 32)

as well as for the main alternators, auxiliary systems and electric motors of the thrusters. Sea water cooling circuit pipes are made of copper-nickel.

The Loading System

In addition to the conventional loading systems, the vessel is equipped with two "offshore" loading systems: one for articulated loading turrets (APC) and buoys (OLS); and a submerged turret loading system (STL). The *Hanne Knutsen* is reportedly the first newbuilding incorporating both systems.

The loading systems and tank arrangements are designed to

handle crude oils with low vapor tensions in two segregations.

Four transversal collectors have been installed in the cargo manifold for crude oil and two others to send the cargo vapors to shore. Inert gas is generated and purified in a Flexinert plant with the vapors coming from the main diesel generators.

The ship features a sophisticated integrated control system redundantly computerized with process stations and a local area network (LAN) with control stations in the engine room, cargo control and wheelhouse.

The automation system in the engine room is designed to be operated without personnel, and the automation in the wheelhouse is designed to be operated by one person.

Hanne Knutsen Equipment List

Main generators driving engines	Sulzer	Radio communications	S.R.M.
Auxiliary generator engine	Bergen	Radars	Atlas-Krupp
Main propulsion electric motor	ABB	Gyropilots	Anschutz
Electric generators	ABB	Doppler log	Atlas-Krupp
Sternube bearing	Rolla	Echosounding	Simrad
Propeller	NavaLips	Satellite navigator	Saturn-ABB
Emergency generating set	Caterpillar	Bridge integration	Kvaerner Eureka
F.W. generating plant	Alfa Laval	Integrated control system	Simrad
Coolers	Alfa Laval	Deck machinery	Ulstein
Centrifugal pumps	Kvaerner Eureka	Service crane	Navacel
Screw pumps	Kvaerner Eureka	Access hatches	Faro
F.O. & L.O. Purifiers	Alfa Laval	Doors & Windows	Aux. Naval
Foam F.F. system	Unitor	Coatings	Sigma
Air compressors	Roweco	Lifeboats & Davits	Harding
Sewage treatment plant	Aries	Modular cabins	A.E.S.A.
Steering gear	Porsgrunn	Air conditioning	Novenco
Transverse bow & stern thrusters	Ulstein	Pumps	Kvaerner Eureka
Active rudder	Willi Becker	Oil monitoring system	Seres
Steel pipes	Almesa/Cunado	Tank cleaning equipment	Consilium
GRP pipes	Sarplast	Inert gas generating plant	Maritime Protection
Main switchboard & Cycloconverters	ABB	Pressure & Vacuum valves	Pres-Vac
Electric cables (automation)	Ericsson	Cargo valves & Control system	Kvaerner Eureka
Fire detection	Salwico	Cargo tanks level indicators	Saab
DPS	Simrad	Gas detection equipment	Omicron

Yard:	Chantiers de l'Atlantique
Ship:	Petronas Tanker
Type:	LNG Tanker
Owner:	Petronas Marine
Length:	889 ft. (271.1 m)
Breadth:	142 ft. (43.3 m)
Depth (to upper deck):	103 ft. (31.4 m)
Draft:	36 ft. (11 m)
Total cargo volume:	130,300-cu.-m.
Speed:	21 knots

For more information on Chantiers de l'Atlantique
Circle 49 on Reader Service Card

Chantiers de l'Atlantique, a subsidiary of GEC Alstom, delivered in July the first of five methane carriers for Petronas Marine of Malaysia. The keel for the first vessel was laid in September 1992, and the production schedule for the series of five will run through July of 1997. The 130,000-cu.-m. liquefied natural gas (LNG) carriers have been constructed using automated manufacturing and assembly processes. Each ship has four tanks which are incorporated in the ship's metal structure.

Liquefied natural gas is stored in four tanks, and the Petronas vessel is the first which combines the Gaz Transport Membrane system with a reduction in the number of tanks: four-cargo-tank design, as opposed to a design incorporating five or six cargo tanks, which was previously associated with the system.

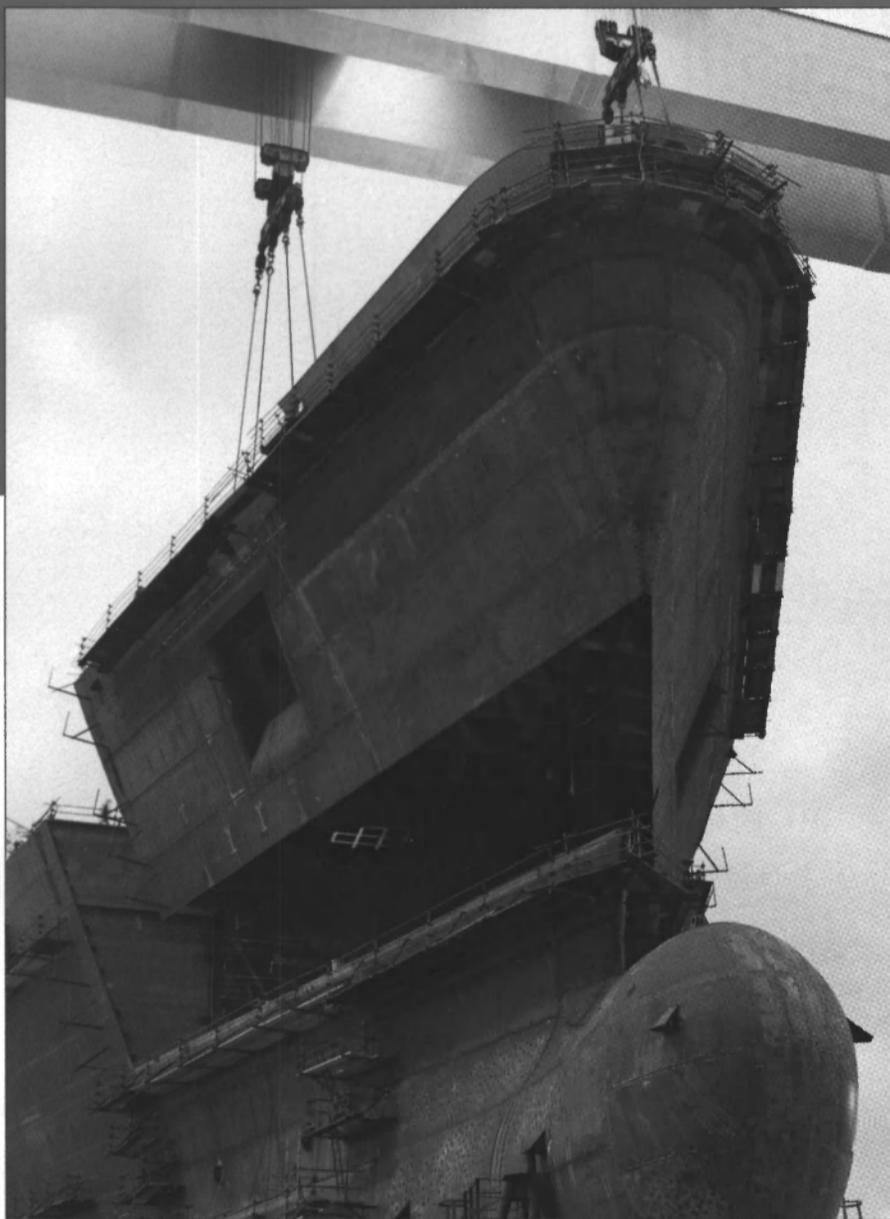
Thermal insulation for the liquid methane cargo is provided by a double layer of plywood boxes filled with perlite, an insulating powder made of volcanic materials. Gastightness is ensured by a .7-mm thick membrane made of Invar, a steel and nickel alloy which has an extremely low coefficient of thermal expansion. For safety reasons, a second, identical membrane is placed between the two layers of boxes to ensure tightness in the event of a leak in the first membrane. To minimize the cost of as-

sembly operation aboard the ships, components have been extensively standardized and widespread use has been made of prefabrication techniques. The construction of a carrier requires 50,000 plywood boxes, each measuring 3.3 ft. (1 m) by 3.9 ft. (1.2 m), which are produced in a fully automated, purpose-built workshop on site. In addition, the special Invar parts forming the tank corner structures are made in completely pre-fabricated 10-ft. (3-m) long elements.

Special attention has been given to optimizing the supply of the many components installed aboard the ship. Materials are delivered by the erectors themselves using the just-in-time method with the aid of a computer system.

One of the first operations carried out inside the tanks is to weld metal elements called coupler studs to the ship's double hull, working from data provided by a precision topographical survey. The studs anchor the first layer of boxes. Chantiers de l'Atlantique has developed a special device for this purpose.

The Dromadec system comprises a viewing unit, an on-board computer, a stud positioning arm and a welding torch. Using the topographical data provided by a laser and a distance measuring device, the computer places each coupler at the desired position before welding it



automatically to the double hull. Dromadec reportedly makes it possible to achieve the precision specifications set for assembling the tank's insulation elements, namely a +/- .9-mm positioning accuracy for the studs relative to the topographical data. Chantiers de l'Atlantique and a number of specialist firms worked to develop machines to au-

tomate the welding of the membranes and achieve maximum quality. A single ship requires 90,000 m of resistance seam welding and 21,000 m of TIG welding. The ship is powered to a speed of 21 knots at 100 percent MCR (26,720 kW) at 93 rpm. The ship is designed to be operated with the LR mark Unattended Machinery Space (UMS).

Norasia Kiel

(Continued from page 38)

power consumption.

- The engine plant: fitted compactly as far aft as possible.
- The one-man bridge: fitted out as a ship's operation center.
- Reduced loading and discharge costs, optimum ratio of the number of containers to the propulsive power, optimized arrangement of the main engine with its low fuel requirements, and the ship's very good lines reportedly make the vessel one of the most economical of its size in the world.

Usually container ships have four to five layers of containers on the hatch covers. On an open top ship, hatch covers no longer need to be stored on land during loading and discharging and the containers no longer need to be lashed to the deck. The molded depth was increased and the cell guide frames for the containers were raised to the uppermost layer. Of the 11 container layers, eight are in the hold and three jut out topside.

HDW conducted extensive seakeeping tests with a model in order to counter possible dangers caused by breaking seas in heavy weather. In order to prevent water collecting in the holds during monsoons and to protect the containers from water, the ship was fitted with lightweight rain shelters, each covering one container bay, laid on the drainpipes on the upper edge of the cell guide frames' bulkheads, which lead the water off to the side of the ship.

Norasia Kiel Equipment List

Main engine	Mitsubishi
Auxiliary engine	Yanmar
Emergency engine	Caterpillar
Propeller	Lips
Exhaust gas boiler, Switchboard	HDW
Steering gear	Porsgrunn
Bowthruster	KaMeWa
Winch arrangement, Compressors	Hatlapa
Centrifugal pumps, Screw pumps	Allweiler
Lifts	Schmersal
Separators	Westfalia
Plate cooler	GEA
Fire fighting equipment	Norske
Sewage treatment plant	Hamworthy
Evaporating plant	Serck Como
Incinerator	Vesta (Atlas Danemark)
Shaft generator	AEG
Transformer	Siemens
Gyrocompass, Steering control and Autopilot	Plath, Atlas Elektronik
Batteries	Hoppecke
Anemometer	Thies
Speed log	Atlas Elektronik
Satnav/GPS	JRC
Loran-C	Furuno
Radar plant, Echosounder	Atlas Elektronik
Direction finder	Plath
Fire detection	Servoteknik
Automation systems	STN
Remote level indicator	Hoppe
Anchor, Anchor chains	Mester
Cargo hold hatches	Kvaerner
Windows	Bruno Peter
Freefall boat/rescue boat	E. Hatecke
Davits	Davit-International
Life rafts	Deutsche Schlauchbootfabrik
Accommodation ladders	Fassmer
Ventilators	Witt & Sohn
Air conditioning plant	Noske-Kaesser
Refrigerated provision rooms (prefab)	Foster
Iron oxide epoxy shop primer	Bufa-Bauerle
Paint for outside & inside hull	Hempel's
Paint for ballast tanks and empty cells	Hempel's
Paint for freshwater tanks	Sigma Coatings
Sacrificial anodes	Cetema BV

In spite of the shelters, HDW did not reduce the lavish pumping plant prescribed for the ship. The first three holds are fitted with hatch covers. They will be used to carry dangerous cargoes. Two layers of containers can be carried lashed onto these hatch covers. The Panamax breadth allows 11 containers in the hold and 13 over deck in the athwartships lattice. The gaps between the 13 containers stowed next to each other topside amount to only

45mm. Consequently there are T-shaped cell guides and, for easier container handling, insertion guides placed alternately high and low.

The longitudinal subdivision of the open top holds were determined in agreement with the owners so that they offer a suitable ratio of 40-ft. to 20-ft. holds. An important consideration in the ship's design was the total height of the container stacks. With no hatch covers, the bottom-most containers bear the

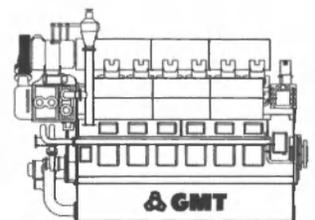
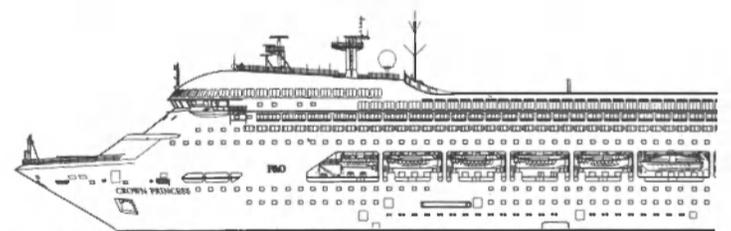
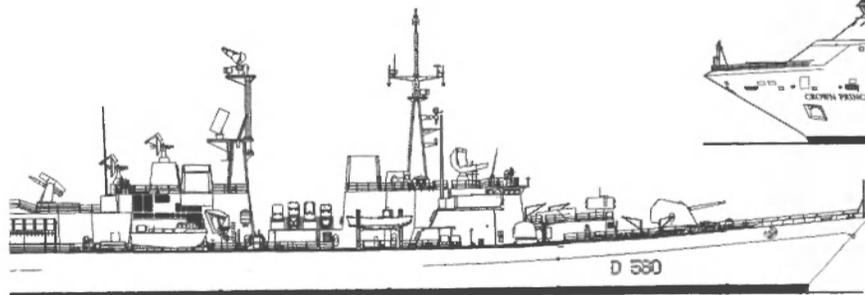
entire weight of the stack. Between 260 and 270 tons can be placed in the midships area. This means with 11 layers of containers, a weight of up to 24.5 tons per container is acceptable. The ship is powered by a slow-speed, two-stroke diesel, Mitsubishi 7UEC 85 LSC engine plant driving a fixed-pitch propeller. The engine has a nominal output of 27,290 kW (37,100 hp) and a low specific fuel consumption of 165 g/kWh (121 h/hp).

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Circle 218 on Reader Service Card

Hyundai Utopia

(Continued from page 30)

small amounts of cargo will be left in the cargo tank for maintaining a cold condition and positive pressure.

Vessel Control

The *Hyundai Utopia's* Centralized Administration and Control Center (CACC), situated just below the wheelhouse, is arranged on the accommodation deck and allows for centralized control of loading, discharging, ballasting, deballasting and continuous monitoring and control of the cargo handling system. It features an integrated automation system; a shipboard man-

agement system; a CACC console, or person-machine interface style operation panel, communication system, operating lever of the main engine, etc.; and a custody transfer system.

Propulsion

Main propulsion machinery consists of a marine steam turbine driving a single propeller through double reduction gears and two sets of main boilers of the gas/oil dual burning type. The machinery is remotely controlled from the wheelhouse and CACC. Unattended operation of the main engine is possible.

Equipped with four independent spherical tanks 131.2 ft. (40 m) in diameter, the ship has a lowered mooring deck, transom stern and single screw propeller driven directly by a steam turbine. In the forward part, a fore peak water

ballast tank, a bowthruster room and a void are arranged.

The boiler can be operated exclusively with gas in the normal going mode as well as operated by conventional gas/oil burning. The Automation Combustion Control (ACC) contains the total BOG system, which keeps the pressure in the tanks constant via computer control.

Hyundai Shipyard has prepared for building LNG ships since the 1970s, and now has devoted its No. 1 dock exclusively to the construction of this ship type. Hyundai has developed designs for both the membrane and Moss types of LNG carrier.

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Hyundai Utopia Equipment List

Main engine	Mitsubishi
Generator engine	Hyundai-Daihatsu
Propellers	Hyundai
Main boiler	Mitsubishi
Thrusters	Kawasaki
Emergency generator	MAN-Damp
Model starters	Hyundai
Boiler feed p/p turbine	Conffin
Deck machinery	Fukushima
Shafting	Hyunda
Bearing & Seal	Japan Marine
Coatings	Korea Chemical
VHF	Anritsu
SSB	Anritsu
Radar	Krupp Atlas
Collision Avoidance	Krupp Atlas
Compass, GPS & Autopilot	Tokimec
Satnav	JRC
Pump	Ebara Japan
Heat exchangers	Mitsui
Air conditioning	Hipress
Life boat	Hyundai
Life raft	Viking
Davit	Wool
Oily bilge separator	Blohm+Voss
Distilling plant	Sasakura

Nedlloyd River Plato

(Continued from page 38)

long life of the vessel's equipment, vibration and noise is designed to avoid resonance.

Nedlloyd River Plato Equipment List

Main engine	MAN B&W
Propeller	Lips
Auxiliary diesel-alternator	Hyundai Heavy Inc.
Boilers	Konus
Cargo cranes/gear	Hagglunds
Winches, Windlasses	Aquamaster Rauma
Hatch covers	MacGregor Navire
Ballast control syst.	Samgong Co.
Bow thruster	Brunvoll
Bridge control syst.	Norcontrol
Fire detection	Thorn EMI Tech. Co.
Fire extinguishing syst.	Nam Yang
Radars	Atlas
Satnav	Racal Decca
Echo sounder	JRC
Radios	Sailor
Incinerator	Kangrim Inc.
Oily water separator	Hanyoung Engineering
Sewage treatment	Coma

WORLD ORDERBOOK

The following is a compilation of all ships in the world orderbook at the end of the third quarter 1994. Publisher is not responsible for errors or omissions. (Source: Lloyd's Register)

Where Building	UNDER CONSTRUCTION		NOT COMMENCED		TOTAL		% of World Tonnage	DWT
	No.	GT	No.	GT	No.	GT		
Argentina	13	44,804	2	230	15	45,034	0.11	58,558
Australia	24	25,693	1	150	25	25,843	0.06	5,636
Belgium	11	86,340	4	56,880	15	143,220	0.34	238,240
Brazil	26	482,598	14	386,740	40	869,338	2.07	1,242,997
Bulgaria	12	112,870	1	4,407	13	117,277	0.28	171,957
Canada	2	610	3	6,660	5	7,270	0.02	2,849
Chile	6	3,263	5	2,700	11	5,963	0.01	5,274
China, People's Republic of	40	602,355	66	1,363,841	106	1,966,196	4.67	3,342,332
China, Republic of (Taiwan)	9	485,091	19	635,000	28	1,120,091	2.66	1,890,461
Croatia	15	428,845	9	230,000	24	658,845	1.57	922,095
Denmark	14	328,966	30	953,200	44	1,282,166	3.05	2,251,520
Egypt	14	27,710	4	1,610	18	29,320	0.07	37,040
Fiji	1	3,125	--	--	1	3,125	0.01	450
Finland	10	494,474	9	449,000	19	943,474	2.24	361,440
France	8	348,245	6	255,790	14	604,035	1.44	270,355
Georgia	--	--	--	344	1	344	0.00	35
Germany	63	838,595	50	1,091,125	113	1,929,720	4.59	1,994,606
Greece	7	16,770	1	5,000	8	21,770	0.05	15,150
Hong Kong	1	202	--	--	1	202	0.00	100
India	52	98,089	6	32,891	58	130,980	0.31	151,075
Indonesia	8	17,750	4	34,340	12	52,090	0.12	67,600
Iran	10	8,579	4	3,867	14	12,446	0.03	11,437
Italy	40	785,221	18	445,250	58	1,230,471	2.92	1,130,247
Japan	190	4,594,276	188	8,016,909	378	12,611,185	29.97	18,984,860
Korea (North)	--	--	1	9,626	1	9,626	0.02	8,000
Korea (South)	63	3,151,324	158	8,195,141	221	11,346,465	26.97	18,274,523
Malaysia	7	22,427	--	--	7	22,427	0.05	37,860
Malta	6	14,995	--	--	6	14,995	0.04	18,140
Mexico	3	5,364	--	--	3	5,364	0.01	5,430
Netherlands	65	129,609	35	123,769	100	253,378	0.60	217,081
New Zealand	--	--	1	400	1	400	0.00	1,000
Norway	22	140,317	20	166,419	42	306,736	0.73	349,048
Pakistan	1	8,200	3	9,900	4	18,100	0.04	21,100
Peru	19	7,636	2	560	21	8,196	0.02	3,960
Philippines	1	546	2	6,000	3	6,546	0.02	10,720
Poland	37	429,888	51	861,830	88	1,291,718	3.07	1,696,496
Portugal	23	15,920	7	9,520	30	25,440	0.06	35,456
Romania	71	960,741	18	424,654	89	1,385,395	3.29	2,287,677
Russia	20	117,993	109	673,342	129	791,335	1.88	1,098,676
Singapore	27	87,759	14	75,635	41	163,394	0.39	242,398
Slovakia	5	10,206	5	10,288	10	20,494	0.05	31,815
Spain	41	408,998	29	260,631	70	669,629	1.59	950,985
Sweden	2	16,528	1	31,000	3	47,528	0.11	30,650
Thailand	2	3,920	--	--	2	3,920	0.01	5,160
Turkey	23	164,729	13	191,812	36	356,541	0.85	626,050
Ukraine	5	100,871	32	702,551	37	803,422	1.91	1,131,805
U.K.	21	308,312	10	245,260	31	553,572	1.32	1,015,023
U.S.	36	22,193	43	50,182	79	72,375	0.17	84,681
Vietnam	1	1,038	--	--	1	1,038	0.00	1,364
Yugoslavia	9	38,000	13	48,600	22	86,600	0.21	117,450
World Total	1,086	16,001,985	1,012	26,073,054	2,098	42,075,039	100.00	61,458,862

Orderbook By Type

Where Building	Type					Total	Where Building	Type					Total
	Tankers	Ore/Bulk Carriers	General Cargo	Specialized Carriers	Fishing			Tankers	Ore/Bulk Carriers	General Cargo	Specialized Carriers	Fishing	
Japan	3,822	5,114	1,802	1,545	4	12,611							
Korea (South)	4,987	3,770	1,840	307	--	11,346	Brazil	243	488	137	--	1	869
China (Peop. Rep.)	369	1,367	216	2	5	1,966	Ukraine	617	63	105	--	4	803
China (Taiwan)	151	694	271	--	2	1,120	Russia	201	168	356	34	7	791
Germany	82	40	1,342	--	19	1,930	Spain	435	--	152	--	14	670
Romania	416	684	240	24	2	1,385	Croatia	481	102	38	23	--	659
Poland	60	402	756	--	19	1,292	France	--	--	--	420	3	604
Denmark	640	376	98	164	--	1,282	U.K.	240	251	--	46	1	554
Italy	275	175	50	173	3	1,230							
Finland	--	10	--	461	--	943	World Total	13,531	14,015	7,946	3,410	132	42,075

MarAd Sets Strict Conditions For APL Foreign-Flag Activities

The Maritime Administration (MarAd) announced conditions under which American President Lines, Ltd. (APL), a subsidized U.S.-flag ship operator, would be permitted to operate six new foreign-built ships under a foreign registry. Subsidized shipping companies are not permitted to operate foreign ships that compete with U.S.-flag vessels without a section 804(a) waiver.

MarAd said the new ships must be registered in one of five nations which permit U.S.-owned ships to be under the effective control of the U.S. They also must be enrolled in MarAd's Voluntary Sealift Agreement that will ensure their availability to the U.S. military if needed.

APL also must agree not to scrap or re-flag any U.S.-flag ship covered by its operating subsidy contract prior to Oct. 1, 1995. In addition, APL must agree to transfer the new ships to U.S. registry should a program like that proposed in the Administration's Maritime Security and Trade Act be enacted into law. Congress did not complete action on the bill this year, but President Clinton has said he would work with the new Congress next year to pass a maritime reform program.

"If the administration's maritime reform efforts are successful, these new ships some day will operate under the American flag," Maritime Administrator **Albert J. Herberger**

said. "In the meantime, we have ensured that they will remain under American control.

"In addition, our action preserves American seafaring jobs on existing U.S.-flag ships until the outcome of our efforts is known."

APL has said it expects to operate the six new vessels in service under foreign registry in its Pacific South Express loop. The Pacific South Express loop itinerary deployment is San Pedro-Long Beach-Oakland-Dutch Harbor-Yokohama-Kobe-Pusan-Kaohsiung-Hong Kong-San Pedro. APL will re-deploy other ships to its Seattle-Japan service. Three of the ships are being built in Germany and three in Korea. They are expected to be delivered between May and November 1995. MarAd's action came in the form of a conditional waiver of section 804(a) of the Merchant Marine Act of 1936, as amended. Section 804 prohibits a subsidized operator from operating a foreign-flag vessel which competes with any essential American-flag service unless a waiver is granted under special circumstances and for good cause.

Other MarAd News

Scrapping Sale OK'd
The Maritime Subsidy Board has

authorized the termination of the Liberty Belle Limited Partnership's (LBLEP) Title V contracts relating to the *Liberty Belle*.

The vessel, built in 1976 for Yeon Shipping Corp., with the aid of construction-differential subsidy (CDS), has inefficient steam turbine engines that render the vessel uncompetitive in international markets. It is being sold solely for the purpose of scrapping and may not be

used in any other capacity. LBLEP is required to comply with all applicable provisions of the CDS contracts and the Merchant Marine Act, 1936, as amended.

MarAd Receives Section 9 Applications

• Sea-Land Service, Inc. & Affiliates, Elizabeth, N.J., have asked permission to transfer to Marshall

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Portland's Ship Repair Business Strengthened With Cascade General Sale

Cascade General, Inc., the only marine repair contractor at the Port of Portland's international shipyard, has been bought and recapitalized by **Tore Steen**, majority owner of Ponderosa Acquisition Corporation of Portland.

Mr. Steen said the acquisition is designed to improve Cascade General's competitiveness with other West Coast ports for marine repair work for cruise lines, petroleum transporters and operators of other large vessels.

The Port of Portland, which operates the only public shipyard in the U.S., provides a 982-ft. (299 m) long drydock, the largest floating drydock in the Pacific Rim, for ships up to 1,200 ft. (366 m) long.

The transaction was financed by Capital Consultants, Inc. of Portland. Terms were not disclosed.

Cascade general was acquired from its four shareholders, **Steven H. Anderson, Ernest Brawley, Loy Kahler** and **Surenda Menon**, all of whom will remain with the company in management positions.

The purchase of Cascade General follows the recent closure of the shipyard's other marine contractors, West State, Inc. in October of 1994 and Northwest Ma-

rine 1992.

Mr. Steen said that the volume of available marine repair business made it very difficult for multiple companies to compete profitably and survive. The company recently renewed its use agreement with the Port of Portland, and will formally request the Port to grant it a single-operator agreement, allowing it to exclusively provide ship repair services at the Portland ship yard through a long-term lease on the facilities at Swan Island.

Founded in 1904 as Albina Engine and Machine Works, the company operated as Dillingham Ship Repair from 1969 to 1987, when a group of managers and associates bought the company assets and renamed it Cascade General Inc.

Today, Cascade General specializes in all phases of ship repair services for oil tankers, general cargo carriers, cruise ships, luxury liners and military vessels. Cascade General has recently completed work on two Holland American Line cruise ships, the *Rotterdam* and the *Westerdam*, and is performing work on the *ARCO Sag River*, an oil tanker.

For more information on
Cascade General
Circle 106 on Reader Service Card

Islands registry the containerships *Sea-Land Pride* (ex-Galveston Bay), *Sea-Land Value*, *Sea-Land Motivator* (ex-Raleigh Bay), *Sea-Land Freedom* and *Sea-Land Mariner*. The 47,667-gt *Pride*, *Value* and *Motivator* were built in Korea in 1985 and 1984, respectively; the 32,629-gt *Freedom* and *Mariner* were built in 1980 in Japan.

• The Western Co., of North America, Houston, has requested

permission to sell the 6,344-gt drilling rig *Alaskan Star* to Star International Drilling Ltd., Grand Cayman, Cayman Islands. The rig was built in 1976 in Hiroshima, Japan. If approved, the rig would be transferred to Panamanian registry.

.....

Falcon Rig Sale Approved

Falcon Rig (Liberia), Ltd., has been given approval to sell the drill-

ing unit *Loosbrock Star* (ex-Marlin No. 14) to Falcon Offshore, Inc., Broussard, La., without change in Liberian registry.

.....

SeaRiver Applies For Operation & ODS Of Ex-Equity Tanker

SeaRiver Maritime, Inc., has asked MarAd to approve the transfer to it of an operating-differential

subsidy (ODS) agreement from the bankruptcy estate of Equity Carriers, Inc., along with approval to operate the 211,000-dwt tanker S/R *Mediterranean* under that contract. SeaRiver said its purchase agreement with response to Contract MA/MSB-439 from the bankruptcy estate is subject to:

- MarAd approval of the transfer of Contract MA/MSB-439,
- MarAd's obtaining approval of funding for at least one of the three operating subsidies comprising Contract MA/MSB-439 for the balance of the period of Contract MA/MSB-439, which expires on May 23, 2001, and
- MarAd and SeaRiver's agreement to necessary amendments to Contract MA/MSB-439.

SeaRiver states that it is a wholly owned affiliate of Exxon Corporation (Exxon) and has operated the S/R *Mediterranean* in the foreign trade since September 1990.

SeaRiver also said it also operates vessels in the domestic trade and foreign-flag tankers in worldwide trading.

In addition to the other approvals requested, written permission under section 805(a) and waiver of the provisions of section 804(a) of the Merchant Marine Act, 1936, as amended, would be required.

.....

Sea Trader Applies To MarAd For Barge Sale

Sea Trader Tank Barges Inc., Hoboken, N.J., has requested permission to sell the 1,282-gt *Seatrader Bay Breeze* and the 1,312-gt *Seatrader Islander*. The proposed purchaser is Barge Management, Inc., Baldwin, NY. If approved, the barges would operate in the local bunkering trade. MarAd permission is required under section 9 of the Shipping Act, 1916, as amended.

.....

MarAd Clarifies Port Controller Standby Service Pacts

MarAd published a proposed rule in the *Federal Register* clarifying events that allow the activation of the Federal Port Controller (FPC) Service Agreements. The FPC's regulations (46 CFR Part 346) would be amended to state that standby service agreements between the U.S., acting through MarAd, and port authorities or private corporations may, at the direction of MarAd, become operational upon deployment of the Armed Forces of the U.S., or other requirements of the nation's defense. They would make the timing of the FPC activation consistent with that in MarAd's regulations governing priority use and allocation of shipping services, containers and chassis and port facilities. A notice of proposed rulemaking has been assigned Docket R-155. Comments on the proposed rule must be received in writing by the 5:00 pm January 17, 1995, by the Secretary, MarAd, Room 7210, 400 7th St. SW, Washington, DC 20590. For additional information, contact **John Pisani**, Office of Ports and Domestic Shipping, tel.: (202) 366-4357



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SHIP REPAIR & CONVERSION: Review of 1994

Blohm + Voss performed one of the more innovative jobs of the year, winning an order to convert three Sea-Land ships.

The contract entailed shortening each containership by three midship sections — from 950 ft. (289.5 m) to 856 ft. (261 m) — and giving each a new bow structure to improve streamlining. The **Hamburg Shipbuilding Research Institute (HSVA)** was involved in the hydrodynamic calculations and in the planning of the experimental work.



The two and a half year old *Stena Concertina* was in **Norfolk Shipbuilding and Drydock Corp.'s (Norshipco) Titan** drydock for blasting and coating; tailshaft and rudder clearance inspections; valve, pump and generator repairs; and other planned maintenance and inspections. The vessel is a technologically advanced double-hull oil tanker from Mitsui O.S.K. Lines.



Before & After: The transport vessel *Super Servant 1* (pictured above) underwent a conversion at Rotterdam's **YVC Bolnes Dockyard**, becoming the D.P. Fall Pipe stonedumping vessel *Tidewind* Rollingstone.

The *Overseas Ohio* had a head-on collision with an iceberg off of Alaska. The ship was carrying salt water as ballast at the time of the accident. Part of the \$1 million repair work included replacement of the rudder bearings, for which **Orkot** was chosen.



FINANCIAL UPDATE

Operating Leasing: Source For "Off Balance Sheet" Financing For Ships

Much of what is written about marine finance markets concentrates on newbuild financing, which in some cases obscures the important second-hand market and alternative financing options. San Francisco-based PLM International, a transportation equipment leasing company, offers ship owners a financing alternative — second-hand vessel operating leases.

During the first nine months of 1994, 169 new tanker and bulk carriers were delivered to shipyards, representing 15.2 million dwt of new capacity. During the same period, 110 tankers and bulkers — totaling 24.1 million dwt — traded hands within the second-hand market.

Second-hand transactions play an important role to nearly everyone in the industry: owners, charterers, brokers, bankers, and shipyards. For example, ship owners will always need to dispose of their older tonnage to meet clients' service demands and to raise capital for newbuildings. With more than 60 percent of combos, VLCCs, Suezmax, and handysize bulker tonnage more than 15 years old, and approximately 50 percent of handysize tanker and LPG tonnage in the same situation, it is assumed that the continued operation and finance of older tonnage has and will continue to represent a major part of ship owners' financial requirements.

Traditional bank finance and mezzanine debt structures provide the bulk of second-hand ship finance. But, these lenders have become more targeted toward specific markets and the nature of the vessels for which they will provide funding. Therefore, public and private placements of equity and debt also play an important role. While leasing is usually regarded as a secondary-but-important source of financing, the popular concept of leasing is invariably medium- or long-term finance leasing, in which the lessor takes little or no technical risk. Operating lessors, limited in number in the industry, provide an alternative.

Unlike other transportation equipment sectors, the marine industry has few financial sources willing to undertake the risks of vessel ownership and accept short-term lease or chartering commitments in return. Consequently, the owner is left to fill shorter-term requirements from the marketplace, often facing the option of chartering tonnage from another ship owner.

PLM has formulated a potential solution to this dilemma. PLM International is a financial organization whose main business is raising syndicated equity from limited partner investors and employing the capital raised through these investments in transportation equipment. Of PLM's \$1.3 billion equipment portfolio, \$550 million is invested in ships, mobile offshore jackup drill-

ing rigs, and marine cargo containers. The marine fleet consists of 27 vessels, five drilling rigs, and more than 30,000 containers.

Vessel operating leases are offered to clients through short- to medium-term full-service time charters. The company is interested in taking some commercial and operating risk to improve the yield to its limited partnership investors. It manages these risks through a staff of marine professionals, typically with 20 to 25 years of marine technical and chartering experience.

In an average transaction, an operating lessor may purchase a 10-year-old vessel and time charter it back to the seller or a related party for two to three years. PLM seeks to own the vessel at the end of the term and will renew the charter or remarket the asset to others at that time. The vessel remains in the owner's control but not on his balance sheet. Unlike finance leases, operating leases are typically off balance sheet transactions. An operating lessor's typical clients are large, financially sophisticated owners who have diversified financing sources available to them. They may have a large fleet replacement program planned or in progress for which its borrowing capacity is designated. While their financing is slightly more expensive, selling a vessel and leasing it back allows the owner to continue to control that asset during the period when replacement tonnage is built.

For more information on PLM
Circle 104 on Reader Service Card

Luce Named President Of Canarctic

Martin P. Luce was named president and CEO of Canarctic Shipping Co. Ltd. of Canada. He began his career in marine service in 1955 as a navigating officer. In 1979 he was appointed as general manager of Canarctic, and most recently was the company's executive vice president. Canarctic has 16 years of shipping experience trading in the North Atlantic, Canadian Arctic, Gulf of St. Lawrence, Baltic Sea and European coastal waters. It is an established tanker operator specializing in moving crude oil and oil products through ice-covered waters.

Sonsub Takes ROV, Template Deliveries; Installs Heidrun Field Riser

Perry Trittech Delivers Two Voyager™ ROVs To Sonsub

Perry Trittech Inc. delivered the *Voyager No. 2* and *Voyager No. 3* Remotely Operated Vehicle systems (ROVs) to Sonsub International, Inc. of Houston. Both systems have already been deployed in the North Sea and Africa.

The *Voyager*, developed in cooperation with Sonsub, is Perry Trittech's new standard inspection ROV, featuring magnetically coupled brushless DC thrusters, three channels of fiber optic video, and an advanced control system based on Perry Trittech's TRITON™ ROV control system.

McDermott Delivers Drilling Templates To Sonsub

Sonsub has taken delivery of two

three-slot and two four-slot subsea drilling templates, designed by Sonsub and manufactured by McDermott Inc. The templates were ordered by Sonsub to meet anticipated future demand particularly in the Gulf of Mexico.

Sonsub North Sea Uses ROVs For Riser Installation

Following its successful completion of all infield subsea trenching activities in the Heidrun field earlier this year, Sonsub North Sea had been awarded a contract by Coflexip Norge AS to perform ROV work for the installation of two 16-in. export risers in the Heidrun Field. The risers are being set in 350m of water, and will be installed entirely by remotely operated intervention, including DGPS and acoustics for positioning.

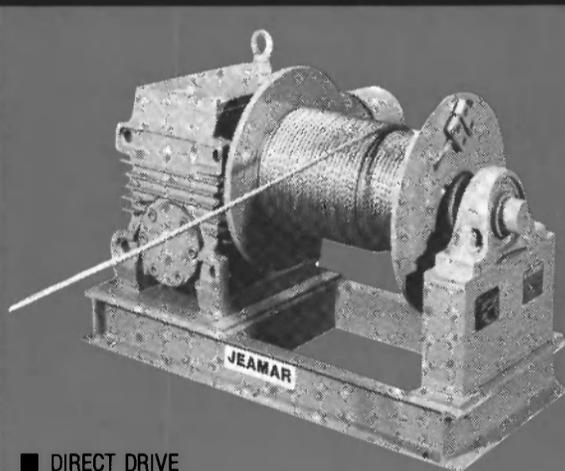
For more information on Sonsub
Circle 34 on Reader Service Card

Tenmat Ferroform Used On Dredgers

Ferroform T12 was introduced to United Marine Dredging, which owns and operates eight suction dredgers used for dredging aggregate. Each vessel is equipped with an automatic aggregate unloading system consisting of two buckets with 10-30 ton capacities. Trials were conducted using Ferroform. According to Tenmat, the results showed a significant increase in life and with no added problems of having to maintain and lubricate the bushes. United Marine is embarking on a replacement program to use Ferroform on its older vessels.

For more information on Tenmat
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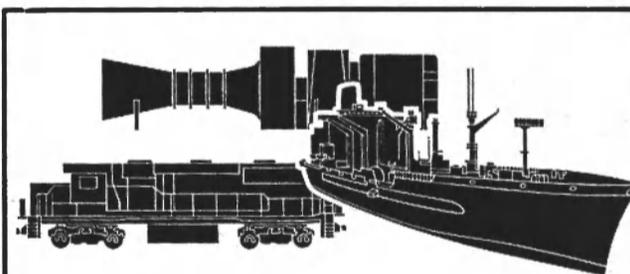


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OPA 90 UPDATE: COFRs — Tanker Industry Deadline Is Near

by Michael Minogue, Director, Environmental Crisis Management

On July 1, 1994 the U.S. Coast Guard (USCG) issued its interim final rule (IFR) pertaining to Certificates of Financial Responsibility (COFRs) under OPA 90. Unfortunately for vessel owners and their insurers, the International Group of P&I Clubs, the IFR more or less mirrored the USCG's proposed COFR rule of September 1991. In short, it requires that the vessel's oil pollution liability insurer act as a

guarantor under the certificate. The International Group of P&I Clubs, maintaining their original position, have refused to act as such guarantors. Accordingly, the certificates cannot be obtained by evincing the P&I Clubs as the insurer. However, the P&I Clubs have indicated that they would continue to provide their Members with such coverage, albeit without the required certification.

OPA 90 COFRs have raised the minimum limits of financial responsibility a vessel owner is required to evidence. A tank vessel (regardless of whether it is carrying an oil cargo or not) must have certification (at least \$1,200 per grt or \$10 million, whichever is greater, for pollution plus \$300/grt or \$5 million, whichever is greater, for CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act). Non-tank vessels must be certified for \$600/grt or \$500,000 whichever is greater for oil pollution plus for CERCLA, \$300/grt or \$5 million whichever is greater when carrying hazardous substances as cargo or \$300/grt or \$500,000, whichever is greater when not carrying such hazardous cargoes.

In essence then, any tanker in excess of 6,500 grt must have financial responsibility equal to \$1,500/grt. Any non-tank vessel over 5,500 grt engaged in carrying hazardous cargoes would have to evidence financial responsibility for \$900/grt.

The amount of such certification need only be equal to the maximum OPA 90 limit for the largest vessel in a fleet or group of vessels. For instance, if a vessel owner has six tankers and three non-tankers in his fleet with the largest tanker being 10,000 grt and the largest non-tanker being 100,000 grt, then the amount of the certificate that would cover all nine vessels would have to be \$90 million (100,000 grt x

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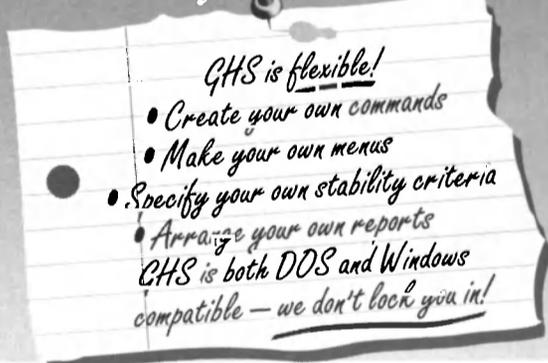
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Aside from oil spill response equipment staged at seven sites in Louisiana alone — OMI offers response teams to combat spills, computerized tracking/modeling that predicts and tracks travel times for the leading edge, peak concentration, and trailing edge of a contaminant plume; NRDA background research, including preassessment planning and resource database access, identification of economic and natural resource impacts; regulatory documentation/reporting to provide technical documentation of spill event response activities, environmental impacts and mitigation efforts.

For more information on Oil Mop
Circle 54 on Reader Service Card

Maritime Reporter/Engineering News

900/grt). In that same fleet, if the largest non-tanker were only 15,000 grt, then the amount of the certificate would be \$15 million (10,000 grt x \$1,500/grt).

As most everyone expected, the FR of July 1 did provide for an implementation period. Tankers are required to obtain the new certificates by December 28, 1994, tank barges by July 1, 1995 and non-tank vessels/barges on expiry of their existing COFR — but no later than December 28, 1997.

The IFR does allow for alternatives to the P&I Clubs or insurance per se. The vessel owner could provide evidence of financial responsibility by self-insurance, financial guarantees (letters of credit) or surety bonds.

In order to qualify for self-insurance, the vessel owner must demonstrate that its net assets in the U.S. are greater than its worldwide liabilities. A financial guarantee such as a letter of credit drawn on an approved U.S. bank is another possibility. Again, in order to do so, one must have sufficient capital deposited in the bank to cover that letter of credit. For foreign operators, the letter of credit must be drawn on a U.S. bank.

The final alternative is the surety bond route. One bond for an amount equal to the largest OPA 90 limit in a vessel owner's fleet would cover all the vessels in that fleet. The bond would have to be written by an approved U.S. Treasury surety(s). However, most bonding companies require sufficient collateral in the form of a letter of credit or the like making their cost prohibitive, especially for vessel owners with smaller fleets.

Recognizing the limitations of these alternatives and the opportunities available as a result, a number of firms have entered the picture proposing a myriad of solutions. These are Shoreline, OPAClub and First Line.

Shoreline is a mutual insurer similar to a P&I Club. It is registered in Bermuda and unlike OPAClub and First Line, is offering primary cover with limits of \$300 million. That would have included certification as well. However, with most tanker owners having already paid their U.S. surcharge to their P&I Club for the 1994-5 policy year, the cost of Shoreline's primary cover was seen as a duplication of what had already been in place and had been incurred/paid.

Shoreline has since amended their proposal to offer their \$300 million coverage in excess of what the P&I Clubs have in place. With Shoreline as excess insurer, providing certification from the ground up and the P&I Club cover remaining as primary, Shoreline has been able to reduce its rates from \$0.87/dwt/voy to \$.46/dwt/voy for a 20-year-old dirty oil tanker. However, as mutual insurer, Shoreline can charge supplementary calls in case of catastrophic losses similar to a P&I Club.

Shoreline's reinsurance details had been brought into question but the USCG has reviewed that

reinsurance program and offered its conditional approval of it. Shoreline has only to provide the USCG with its financial guaranty bond before being formally authorized as acceptable. OPAClub will issue a single master surety bond for approximately \$300 million to cover all the vessels entered in the Club. OPAClub offers certification only and therefore only members in good standing with their P&I Clubs will be allowed to participate in this pro-

gram. As a rate, OPAClub will charge \$1/grt for a tanker and \$.60/grt for a non-tanker. There are certain minimum rates on a per vessel and a per fleet basis but these are subject to change as OPAClub's negotiations continue. In addition, OPAClub requires that each vessel owner execute a letter of credit equal to ten times the amount of the premium. OPAClub intends to use those Letters of Credit to provide the USCG with enough bonding

capability to be deemed an acceptable insurer. OPAClub has been conditionally approved by the USCG. OPAClub believes they will need a subscription of 30 million tons to be viable. This subscription is required to provide the letter of credit capacity required to support the master bond.

As with Shoreline, OPAClub is a mutual insurer with the prospect of supplementary calls in the case of a catastrophic loss. OPAClub is pres-



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ently working on reinsurance to alleviate this problem.

First Line is offering certification plus breach of warranty cover. In other words, they will cover when the P&I Club does not — i.e., non-payment of calls, vessel out of class, unseaworthiness within the knowledge and privity of the vessel owner. Unlike Shoreline and OPAClub, First Line is not mutual insurance. Therefore, the premium is fixed with no risk of supplementary calls. The

rate is \$.50/grt per year for tankers carrying persistent oil, plus a per-voyage charge of between \$.25/grt and \$.40/grt, dependent on age.

As of this writing, Shoreline, OPAClub and First Line have not been formally and unconditionally approved by the USCG, although approval for all of these is expected. None have written an OPA 90 COFR. Yet, negotiations with the USCG, P&I Clubs, vessel owners and reinsurers continue. Reports range

from optimism to pessimism and back again on a daily basis.

Some OPA 90 COFRs have been issued to date, but the great majority have gone to U.S.-flag vessels. All have used either self-insurance or financial guarantees. Much pressure has been brought upon the USCG to postpone the Dec. 28 deadline. Lacking Congressional or presidential intervention, the next few weeks will determine which vessels obtain certification and from whom.

USCG Orders Unitor Oil Bag

The U.S. Coast Guard (USCG) is to use the Unitor Oil Bag (UOB) as part of its anti-pollution measures. The USCG approved a \$170,000 order by Marinette Marine Corp (MMC) for two 150-sq.-m. (40,000 gallon capacity) Unitor Oil Bag (UOBs) for deployment aboard a 225 ft. (68.6-m) buoy tender under construction at its Wisconsin shipyard. It is the first time the USCG will use UOBs and the first time they have been ordered for shipboard use. They are scheduled for delivery this month. The UOB is a compact collapsible, towable, temporary storage container available in standard sizes ranging from 10 to 1,000 sq. m and manufactured from a durable coated fabric.

For more information on Unitor
Circle 59 on Reader Service Card

Unsinkable, Reusable Sorbent From Polmariner

Recently developed in Poland and soon to be marketed in the U.K. as "Oil-Sorbing Polypropylene Wool PF," Polmariner (U.K.) Ltd. offers a material that has the ability to both contain and absorb oil spills on land and water. With reportedly excellent oil absorption properties unaffected by water, it is unsinkable and reusable.

For more information from Polmariner
Circle 101 on Reader Service Card

BilgeMaster Offers Oil Separation With No Filters

National Fluid Separators' BilgeMaster coalescer separator is reportedly capable of ingesting 100 percent water or 100 percent oil or anything in between, and therefore deals with free-floating oil as a matter of design. No filters or filter media are used. The permanent coalescing elements effect separation to a quality where the water being discharged reportedly has an oil content of less than 15 ppm. The BilgeMaster operates unattended in any location.

For more information
Circle 102 on Reader Service Card

Gallagher Offers Complete Anti-Pollution Services

Gallagher Marine Systems, Inc. provides a full line of regulatory compliance assistance including OPA 90 required response and contingency plans, Qualified Individual and spill management team support, training courses, drill/exercise planning, U.S. state required contingency spill prevention plans, MARPOL-required Shipboard Oil Pollution Emergency Plans (SOPEP), software products to aid in pollution response, and consultation.

For more information
Circle 56 on Reader Service Card

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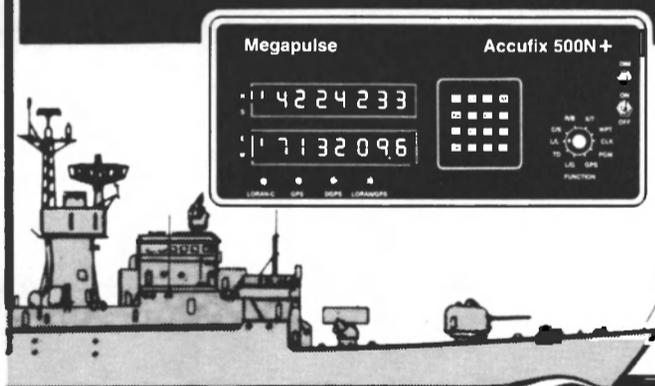
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MS Integrates Shipborne ADS Unit With Shore-Based VTS System

Electronic Marine Systems Inc. (EMS) completed the integration of a shipborne ADS unit with the shore-based VTS system supplied by Raytheon. The ADS unit was developed as an option to the basic DGPS/Chart Viewer, which is now used by 1 of the U.S. Coast Guard black boats in the 17th District.

For more information on EMS
Circle 21 on Reader Service Card

Headhunter Debuts New Fluid Control Monitors

Headhunter expanded its line of sanitation equipment to include programmable fluid level monitors for waste water, fresh water and diesel fuel tanks. A model for fresh water tanks includes terminals to provide a dry tank shutdown for the fresh water pump or a remote indication of a low tank level anywhere on the vessel.

For more information from Headhunter
Circle 16 on Reader Service Card

Midland Alarm Systems Certified Intrinsically Safe

Midland Manufacturing Corp., a maker of vapor recovery and alarm

systems for the marine industry, announced that its full line of alarm systems was certified as intrinsically safe both in the U.S. and Canada by Factory Mutual (FM) and Canadian Standards Association (CSA). The company also announced that it opened a 3,000-sq.-ft. Engineering and Conference Center in Skokie, Ill., a center which includes permanent working displays of its family of liquid cargo handling systems.

For more information on Midland
Circle 17 on Reader Service Card

Company Introduces New Low Smoke Coaxial Cable

Times Microwave Systems introduced its new LSRG Low Smoke/Non Halogenated Coaxial Cable series in response to the immediate military need for MIL-C-17 low smoke cables. These cables are designed to use standard connectors used on RG cables and are subjected to a swept return loss (VSWR) and RF transmission loss (attenuation) test that assures cable performance over the entire frequency band.

For more information
Circle 88 on Reader Service Card

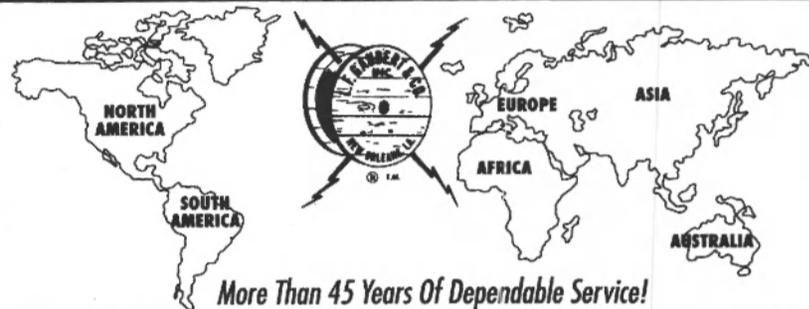
TQ Enviro Specializes In Gas & Vapor Detection

TQ Environmental Ltd. are specialists in marine gas and vapor

detection. In VLCC pump rooms the company provides intrinsically safe leak detection utilizing its GD100MkII infra-red sensors, installed directly through the bulkhead. Interfacing with the

company's RPB4000/RPB800 controllers, the complete system reportedly provides early gas leak indication. Sensor and mountings carry Lloyds, DNV and ABS (full system) approvals.

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canflex "SEA SLUG"



CANFLEX (USA), Inc.'s new 12,500-gallon Sea Slug under tow at approximately 5 knots during recent sea trials in Anacortes, Washington. Insert shows the unit moored alongside the dock, ready to be offloaded. The Sea Slug is an ideal unit for emergency lightering.

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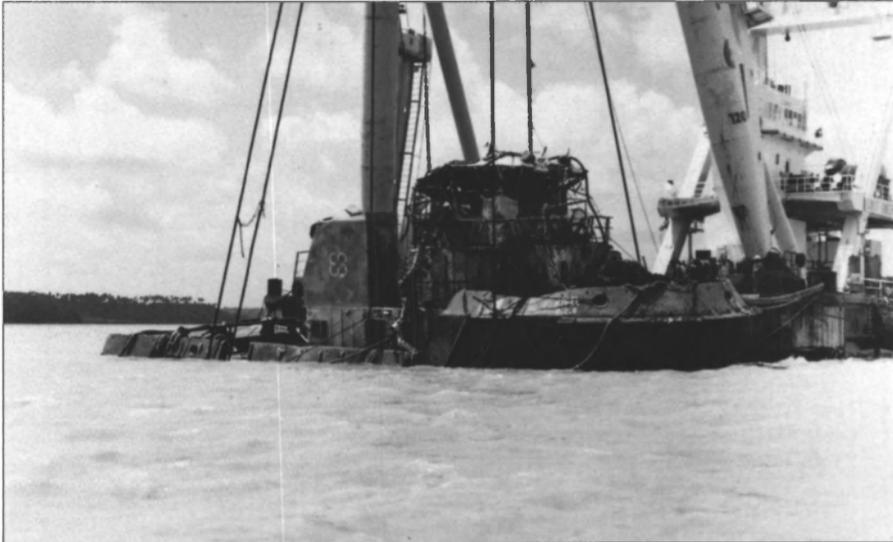
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Foss Environmental also provides industrial and environmental services, training, project management, and emergency response to spills.

Smit Tak Removes Casualties In Brazil, India



The removal of the *Rigel's* wreck had been unsuccessfully attempted before, but Smit Tak completed the difficult removal before the wreck could prove an obstacle to the bulk carrier *Berge Stahl*, which calls the port where the *Rigel* went down.

Smit Tak salvage experts have successfully completed a difficult wreck removal operation in the vicinity of the important iron ore export terminal at Sao Luis, northern Brazil.

A harbor tug, the *Rigel*, sank in the Fairway. The tug had been assisting a Polish bulk carrier on November 6, 1994 when the incident occurred. The tug — just 18 months old — went down in an area noted for its fierce current and constant bottom movement.

There was concern that the wreck of the *Rigel* could eventually block the approach to the iron ore terminal. This facility is used by the 365,000 dwt *Berge Stahl* — reportedly the world's largest bulk carrier — which calls at Sao Luis to load iron ore for Europe.

The 1,200-ton capacity sheerlegs Taklift 6, mobilized from the Gulf of Mexico, performed the wreck removal on behalf of the tug owners Sobrare Servemar and the Brazilian Salvage Association. The wreck was lifted bodily from a 131-ft. (40-m) water depth on September 21, following diving work and preparations assisted by local company O'Marinheiro.

Smit Tak Manager **Geert Koffeman** said: "This was a challenging wreck removal due to the adverse conditions on the site ... The current runs at up to six knots. The best you can hope for is three knots on a dead tide. There are just two diving hours a day — one hour at each slack water."

(Continued on page 49)

Miller Named President Of Sperry Marine

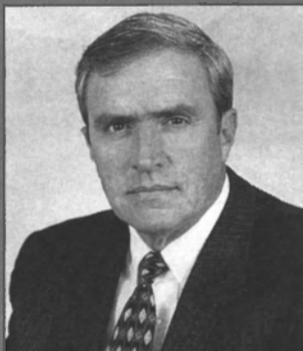
Admiral **Paul David Miller**, commander-in-chief of the U.S. Atlantic Command, became president of Sperry Marine Inc. of Charlottesville, Va. upon his retirement from the U.S. Navy on Oct. 31, 1994. **George A. Sawyer**, formerly Sperry Marine president and CEO, remains at Sperry as CEO and vice chairman of the board.

Completing a 30-year Navy career, Adm. **Miller** has served since July 1992 as commander-in-chief of the U.S. Atlantic Command and as supreme allied commander, Atlantic.

Recently, Adm. **Miller** was commended by President **Clinton** and congressional leaders for his innovative employment of joint military forces, including Army troops and Navy aircraft carriers, now deployed in Haiti.

"We are extremely pleased to be gaining an executive of the stature and experience of Admiral **Miller**," said Mr. **Sawyer**, a former assistant secretary of the Navy and executive vice president of General Dynamics Corporation.

Headquartered in Charlottesville, privately owned Sperry Marine is a world leader in the development and manufacture of marine navigation and control systems. The company maintains sales and service locations throughout the U.S., Europe and Asia.



Adm. Paul David Miller

ILU Reports On 1994 Ship Casualties To Third Quarter

Fewer ships lost but a significant increase in the total tonnage they represent sums up merchant ship casualty experience during the first nine months of 1994.

Statistics compiled by the Institute of London Underwriters (ILU), applying to ships of 500 gt and over, show that the nine-month period — and taking into account major casualties confirmed as total losses or constructive total losses (CTLs) to end-September — the number of ships lost was 75. But the total tonnage involved — 863,025 gt — continues to show a sharp deterioration, confirming the trend seen earlier this year.

Some major casualties, or partial losses, could possibly become total losses or CTLs, thereby increasing the total loss figures for the nine months.

Releasing the statistics, the ILU commented: "Based on updated figures, 139 ships totaling 889,499 gt became total losses in 1993, a year that brought a distinct improvement in loss ratios. It now seems more than probable that total tonnage lost this year may rise to over 1 million gt, which would equate with 1992 experience and, indeed, could be worse.

"However, underwriters will be encouraged by the lower number of ships actually lost. Also, as tonnage lost this year to date mostly consists of older ship types, in value terms 1994 could turn out no worse than 1993 unless there is a major reversal in the final quarter."

The *Estonia* Disaster

In the third quarter of this year, the *Estonia* tragedy overshadowed all else. The passenger/RoRo/cargo ferry (21,794 gt, built 1980) capsized with the loss of more than 900 lives, although 139 people were rescued. The vessel had an insured value of \$48 million, with an additional Increased Value policy of \$12

million.

The largest ship lost was the Turkish-flag tanker *Burak M.* (67,521 gt, built 1976) which sank while in ballast off the West African coast in September after engine room flooding. The vessel's insured value was \$15 million. Another high-value loss, in July, was the Cypriot-flag bulk carrier *Forum Chemist* (22,912 gt, built 1981), insured for \$10 million, which had an engine room fire while it was in the Mississippi River and was later declared a CTL.

A bigger but older Cypriot-flag bulker, the *Iron Antonis* (48,756 gt, built 1968) was a victim of heavy weather on September on a voyage from Tubarao, Brazil to China with a cargo of iron ore. The vessel sank midway between the islands of Tristan da Cunha and St. Helena; the crew of 24 apparently abandoned ship but no survivors were found.

Loss of Life

In a year when loss of life at sea was already increasing, the *Estonia* worsened the figures to a huge and tragic extent.

The ILU stated: "Our casualty reports show that 1,240 people were either killed or reported missing as a result of total and partial losses in the January - September period. This includes an estimate of 910 applying to the *Estonia*. The nine-month total compares with 613 for the whole of 1993 and 386 for 1992."

The ILU noted that it is extremely difficult to collate loss of life figures accurately; also, that its statistics apply only to ships of 500 gt and over, thus excluding many small fishing vessels and other craft (such as small ferries).

The ILU, which represents the company marine and aviation insurance market, compiles and publishes marine casualty data on monthly and annual bases.

For more information on the report
Circle 10 on Reader Service Card

Ships Lost By Type

General cargo	30
Oil/chemical tankers	8
Liquid gas carrier	1
Bulk carriers	10
Ore/bulk/oil carrier	1
Fishing/trawling	9
Cement carrier	1
Refrigerated cargo	4
RoRo cargo	2
Passenger/RoRo cargo	5
Livestock carrier	1
Tug/salvage	1
Dredgers, pontoons, etc.	2
Total	75

Ships Lost By Flag of Registry

Panama	14
Cyprus	9
Malta	5
St. Vincent & The Grenadines	5
Honduras	4
Indonesia	4
China	2
Egypt	2
Turkey	2

South Korea	2
Russian Federation	2
Italy	1
Ukraine	1
Philippines	1
India	1
Nigeria	1
Belize	1
Denmark	1
Chile	1
Pakistan	1
Danish Intl. Register	1
Norway	1
Liberia	1
France	1
Bahamas	1
Romania	1
Mexico	1
Singapore	1
Saudi Arabia	1
Venezuela	1
Ecuador	1
USA	1
Estonia	1
Taiwan	1
Vietnam	1
Total	75

Unitor Introduces Multipurpose Shipboard Electric Welder



Unitor introduced a compact, lightweight, multipurpose electric welding unit for shipboard use. Developed with Lincoln Electric, the UWI-350MP is designed to cover all shipboard arc welding and cutting requirements — but for operators who only require conventional coated electrode welding, comes in a basic form with a comprehensive list of “add-on” features.

The unit can handle all coated electrodes up to 3.3 mm diameter with sufficient output to supply welding current through 400mm, to 70mm² cable when using 4mm electrodes at 200A current.

The unit can be equipped for Tungsten Inert Gas (TIG) welding, but does not utilize high frequency current which can cause potentially dangerous radio interference. The UWF-MP wire feeder enables the UWF-350MP to undertake MIG welding of aluminum and MIG/MAG welding of stainless steels, brasses, bronzes, etc.

The unit can also be used for cutting — conventionally and underwater. An oxy-arc torch is used for cutting in the underwater mode, or an air carbon arc torch for normal cutting.

For more information on Unitor
Circle 51 on Reader Service Card



The Sea Transporter aground off Goa, India.

(Continued from page 48)

Smit Tak To Remove Bulk Carrier Wreck

Smit Tak has been awarded a major contract to remove the wreck of the bulk carrier *Sea Transporter*, which ran aground in heavy weather earlier this year, at a sensitive location on the Indian coast.

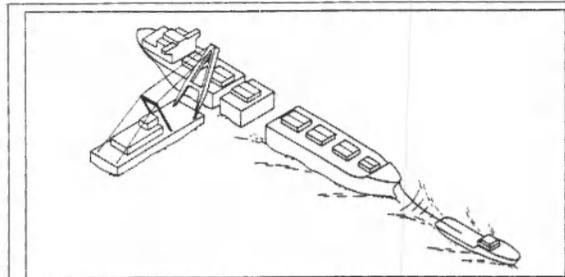
The 64,000-dwt Panamax vessel was on a ballast voyage in June when Force 11 monsoon winds pushed her ashore at Fort Aguada, Goa. The ship broke its back on a rocky shore, adjacent to an important amenity area and close to a major tourist development.

The *Sea Transporter* was built in 1972. Following the grounding, immediate action was taken to remove the environmental threat posed by the ship's bunkers. However, the condition of the vessel now rules out any refloating attempt. The ship has suffered very severe bottom damage; all holds in the engine room are flooded.

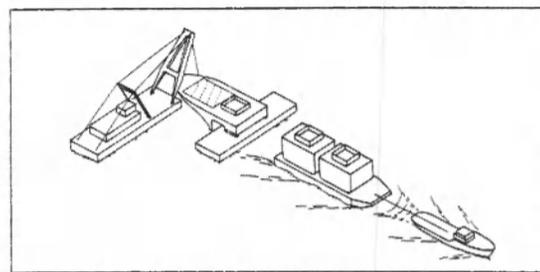
Smit Tak's contract is with the owner's P & I Club. **Bert Kleywegt**, an experienced senior salvage master, heads a 36-man salvage team preparing for the wreck removal. The team includes 12 personnel from a local company, Samson of Goa. Work is expected to be done by mid-January.

The plan calls for the removal of the casualty's mid-section and the refloating of the forepart and stern sections. A substantial salvage fleet

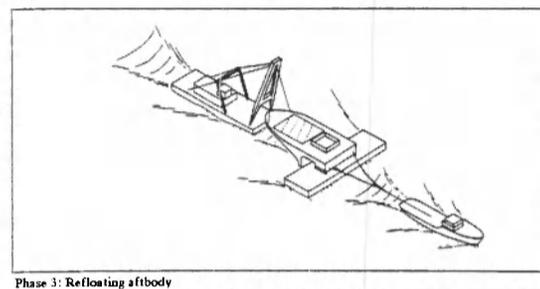
Wreck Removal Of Sea Transporter



Phase 1: Refloating forebody & Cutting midship sections



Phase 2: Removal of midship sections & Preparing aftbody for refloating



Phase 3: Refloating aftbody

was mobilized from Singapore, including the sheerlegs crane Smit Cyclone, an anchor-handling salvage vessel and other units, including two barges. Resources at the scene include diving, cutting and welding equipment, generators, submersible pumps, compressors and patching materials.

The Smit Cyclone will be used to remove the midsection, which will be loaded onto one of the barges. During the next stage, the accommodation block will be severed from the main body of the stern section and cut in two. Smit Cyclone will lift both onto the barge for the voyage to a scrap yard.

At this stage, final preparations will be made for raising the stern section. A lifting barge will be positioned at the severed end of Hold No. 7. The sheerlegs will be connected to the stern. Smit Tak's plan calls for the stern section of *Sea Transporter* to be lifted approximately three ft. (one meter) clear of the bottom. When refloated, it will also be towed away for scrap.

Elsewhere in the world, Smit Tak salvage teams successfully refloated two casualties on the same day — the 38,000-dwt Turkish vessel *Mustafa Sofuoglu*, carrying 3,612 tons of steel coils, and the 38,406-dwt geared bulk carrier *Constantinople*, Greek-owned and flying the Maltese flag.

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The MR/EN Jan. 1995
Casino Riverboat
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Rust Converters For Heavy Marine Use

As environmental laws escalate and maintenance costs climb, many marine operating companies are incorporating rust converters. Rust converters reportedly offer several advantages: reduction of metal preparation costs, easy application, environmental improvements, improved OSHA and EPA compliance — while still giving satisfactorily adhering to marine performance standards.

But there are also some disadvantages: performance is only as good as the top coats used to cover the converter/primer; durability is somewhat less than a zinc primer's (but cheaper); and they are not foolproof. There are more than 80 brands of coating products that make some claim to deal with rust removal or rust conversion. Some are better than others.

There are two types of basic rust converters available in the marine market today: phosphoric acid converters or tannic acid converters.

Phosphoric acid converters convert rust to an inert substance thought to be iron phosphate. Tannic acid based products convert rust to a different substance which research has shown to be magnetite or other inert forms of iron. There are, within each type, brand differences in performance claims and cost per gallon. Most are cost effective compared to sand blasting but the results vary by brand for heavy marine work.

Tannic acid converters mimic the natural chemical path of corrosion of steel. As steel comes into contact with moisture, a source of oxygen, it starts an electron/chemical reaction whose main product is rust. However, over time, generally 10 years or more, the rust continues to change to its original ore form. Research has shown that mild steel will naturally weather to produce either Goethite $FeO(OH)$; Lepidocrocite $y. FeOOH$; Hematite, Fe_2O_3 ; or Magnetite, Fe_3O_4 . Of these, the hematite and magnetite layers appeared

to play a key role in the mechanism of corrosion resistance for weathering steels in marine, industrial and rural environments.

The biggest fans of the tannic acid converters are vessel crews and drydock personnel who must remove the rust or apply the rust converter. The products are non-flammable and reportedly require less surface prep time. Most brands work over a wide range of temperatures and surface conditions. At drydock, welders can continue to work near areas being converter primed.

Nearly all the tannic based converters offer little or no release of Volatile Organic Substances (VOCs) into the atmosphere. Therefore, used in combination with normal coatings, they offer a reduction in VOCs.

Tannic based converters can offer the vessel owner the chance for reduced maintenance costs if directions are followed. The savings can be very dramatic, as much as \$1.00 to \$1.50 per square foot over conventional white metal sandblasting costs. Metal prep still remains the king-sized portion of the coatings

bill, not the paint costs.

The most common use of tannic converters is to ship maintenance. Common applications are deck houses, bilges, ballast tanks, holding tanks, double bottom voids, steering compartments, shaft tunnel chain lockers and engine rooms. It is especially popular with crews on smaller vessels such as tugs and fishing vessels. The lack of flammable vapors make these products especially useful for safe below-deck painting. The ease of application helps avoid application and mixing problems reportedly experienced with two part products. Barge owners use tannic converters for barge rakes, void areas and ballast tanks, decks, container racks and cranes. However, for successful coating life ballast tanks must be top coated. Working dredges, cranes and trawlers have commented on added economies after using converters.

Cost savings occur when equipment bearings do not require replacement after using converters as is reportedly the case with sandblasting.

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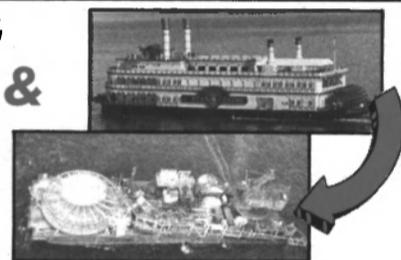
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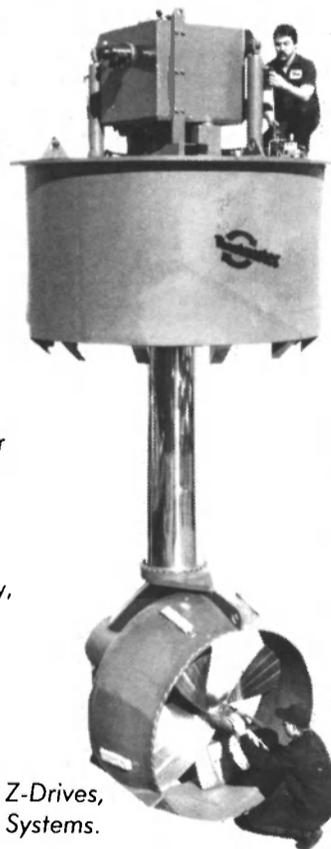
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publican Reorganization: What's In It For Maritime

At press time details were sketchy, but it appears that the publican party's election victory November 8 — and subsequent gaining of majority status in the House of Representatives and the Senate — could mean major changes in the maritime industry. The new

House Republican leadership has made its intentions — to make major changes in the structure and working of the legislative body — clear, and all indications point to the elimination of the House Merchant Marine and Fisheries committee. Preliminary plans call for a division of maritime jurisdictions among other committees. Look in the January 1995 edition of *Maritime Reporter & Engineering News* for full details.

Armawa Orders Container Feeders From Conoship

Armawa Shipping & Trading of Groningen, The Netherlands, ordered two 295-ft. (90-m), 200-TEU container feeder vessels from one of the associated yards of Conoship International, Tille Shipyards at Kootstertille. The Cono Feeder 200 has been specially developed by

Conoship's design department to meet the demand for smaller container feeder vessels. The vessels have a capacity of 207-TEU and a service speed of 13.5 knots. The box-shaped hold is covered by hydraulic folding hatch covers. Conoship International is currently negotiating further contracts for this vessel type.

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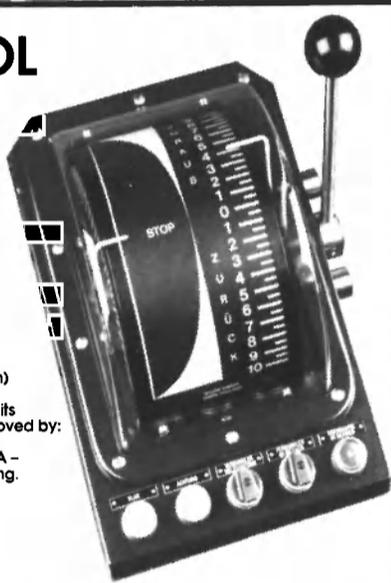
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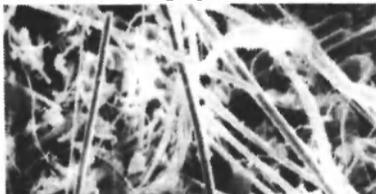
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A Scanning Electron Microscope looks at

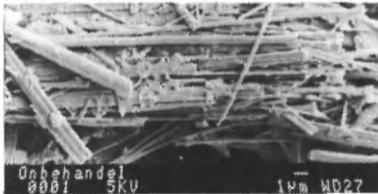
RAW UNTREATED ASBESTOS

EUROPE



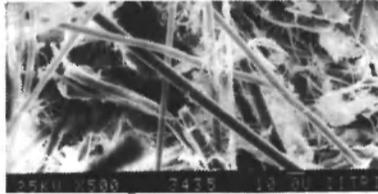
Swedish Naval Warship "Vastervik"

AFRICA



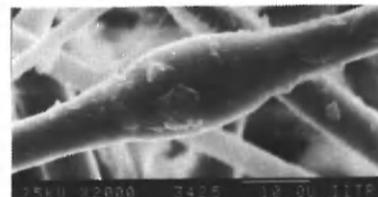
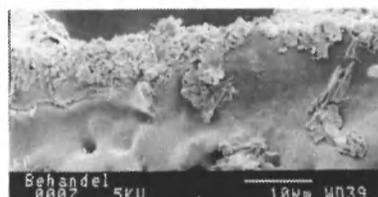
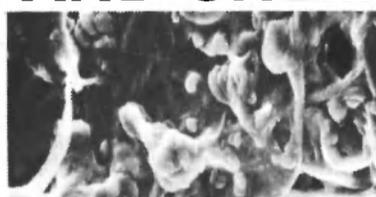
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NORTH AMERICA



Mobil Oil Refinery in Joliet, Illinois

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Inland Waterway Conference Slated For Corpus Christi

The "Inland Waterways Business Development Conference" will be held in Corpus Christi, Texas, on April 23-24 at the Marriott Bayfront. The conference, known for its business networking format, is in its fifth year. The day-and-a-half conference will include a reception, panel discussions and exhibitions. For more information, contact: Brohl & Co., tel: (201) 345-7813; fax: (201) 345-5207.

Elliott Bay Completes Design For New Hvide Tug

Elliott Bay Design Group of Seattle completed its contract to design a new Aquamaster-powered tug for Hvide Marine Inc. of Ft. Lauderdale, Fla. The new tug, due to start construction by the end of 1994, will be stationed in Port Everglades as a ship escort and assist vessel.

The vessel design measures 100 ft. (30.5 m) long with a 40-ft. (12.2-m) beam and a 14.5-ft. (4.4-m) depth. The all-steel vessel will have 6,000-gpm firefighting capabilities, compliments of a GM fire pump engine, two Skum monitors and a Skum pump proportioner, a Nijhuis pump, and a Viking foam pump.

For more information on Elliott Bay Design Group
Circle 109 on Reader Service Card

Hvide Tractor Tug Details

Owner	Hvide
Designer	Elliott Bay Design Group
Main engines	EMD
Propulsion units	Aquamaster Rauma
Ship service generators	GM
Fire pump engine	GM
Hawser winch hydraulic pump engine ..	GM
Lube oil pumps	Viking
Engine coolers	Fernstrum
Exhaust silencers	Maxim
Air compressors	Ingersoll-Rand
Oily water separator	Microphor
Air conditioning	Carrier
Alarm	Radio Holland
Hawser winch	Markey
Air horns	Kahlenberg
Nav. and deck flood lights	Aqua Signal
Monitors	Skum
Pump	Nijhuis
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Circle 262 on Reader Service Card

WORLD SHIPBUILDING ORDERBOOK

The following is limited survey of new construction in shipyards around the world, compiled by the editors of *Maritime Reporter & Engineering News*. The publisher is not responsible for errors or omissions. ("Size" is given in GT units otherwise noted; all dimension measurements are in meters). Source: *Maritime Reporter & Engineering News*, December 1994

SHIPYARD Vessel Name/Type	Size	Dimensions (m)	Engines	Owner	Delivery
Aarhus Flydedok — Arhus, Denmark					
Container/Arktis Faith	4,600	94 x 19 x 9	Krupp MaK	Elite Shipping	6/94
Container/Arktis Fantasy	4,600	94 x 19 x 9	Krupp MaK	Elite Shipping	9/94
NB No. 211/Container	4,600	94 x 19 x 9	Krupp MaK	Elite Shipping	12/94
NB No. 212/Container	4,600	94 x 19 x 9	Krupp MaK	Elite Shipping	3/95
NB No. 214/Cargo	6,200	101 x 20 x 11	Krupp MaK	Elite Shipping	6/95
NB No. 215/Cargo	6,200	101 x 20 x 11	Krupp MaK	Elite Shipping	10/95
NB No. 216/Cargo	6,200	101 x 20 x 11	Krupp MaK	Elite Shipping	1/96
NB No. 217/Cargo	6,200	101 x 20 x 11	Krupp MaK	Elite Shipping	4/96
NB No. 218/Cargo	6,200	101 x 20 x 11	Krupp MaK	Elite Shipping	8/95

Aukra Industrier A/S — Aukra, Norway

Petur Jonsson/Shrimp Trawler	n/a	59 x 13 x 8.5	Wartsila Vasa	Petur Stefanson	7/94
No. 95/Seismic vessel	n/a	82 x 40	Bergen Diesel	PGS Explorer	1/95
No. 96/Chemical Tanker	n/a	124 x 19 x 10	Stork-Wartsila	Anders Utikilens Rederi	2/96

Belgian Shipbuilders Corporation N/V — Antwerp, Belgium

No. 2188/Mooring Tug	370	33 x 11 x 4	n/a	n/a	94
No. 2189/Mooring Tug	370	33 x 11 x 4	n/a	n/a	94
No. 2190/Docking Tug	735	41 x 13 x 7	n/a	n/a	94
No. 2191/Docking Tug	735	41 x 13 x 7	n/a	n/a	95
No. 2192/Docking Tug	735	41 x 13 x 7	n/a	n/a	95
No. 2193/Docking Tug	735	41 x 13 x 7	n/a	n/a	95
No. 474/Hopper Barge	3,300	88 x 18 x 6	n/a	Jan de Nul	94
No. 475/Hopper Barge	3,300	88 x 18 x 6	n/a	Jan de Nul	95
No. 1196/Self Elevating & Propelled Platform	n/a	n/a	n/a	De Brandt	95

Blohm + Voss AG — Hamburg, Germany

M/V Elisabeth/Container	n/a	182.2 x 28.4	MAN	H.W. Janssen	11/94
-------------------------	-----	--------------	-----	--------------	-------

* in cooperation with Thyssen Nordseewerke of Emden, Germany

Boelwerf Vlaanderen, Temse, Belgium

LPG/Ammonia/VCM Tanker/ Kemira Gas	9,900	142 x 21 x 14	MAN B&W	Hol-Chem VI	4th 94
Cable Laying-Repair/ DSV/Navigator	9,250	138 x 20 x 11	Wartsila	Friary Subsea Surveyor N.V.	1st 95
Shuttle Tanker	55,783	240 x 41 x 21	Wartsila	N.V. Shuttle I	1st 96
Shuttle Tanker	55,783	240 x 41 x 21	Wartsila	N.V. Shuttle II	3rd 96

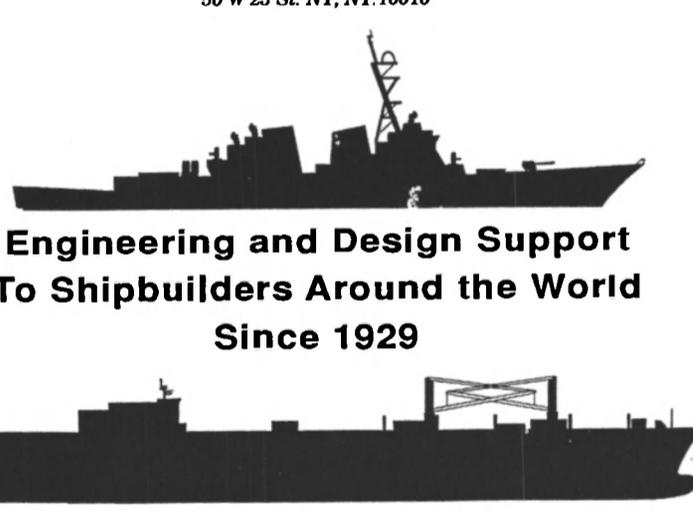
For Your Information...

For additional information on the shipyards listed in this review, please circle the corresponding number on the Reader Service Card bound in this issue.

Aarhus Flydedok	61	Meyer Werft	75
Aukra Industries	62	Newport News Shipbuilding	76
Belgian Shipbuilders Corp.	63	NKK	77
Blohm + Voss	64	MTW Schiffswerft	78
Boelwerf Vlaanderen	65	Odense Steel	79
Chantiers de l'Atlantique	66	Royal Schelde	80
Finnyards	67	Samsung Heavy Industries	81
Flender Werft	68	Sanoyas Hishino Meisho Corp.	82
Gdynia Shipyard	69	Sasebo Heavy Industries	83
Hanjin Heavy Industries	70	Schichau Seebeckwerft	84
Harland & Wolff	71	Simek A/S	85
Hitachi Zosen	72	Stocznia Gdanska	86
Langsten Slip & Batbyggeri	73	Transfield Shipbuilding	87
Lindenau	74		

SHIPYARD						SHIPYARD					
Vessel Name/Type	Size	Dimensions (m)	Engines	Owner	Delivery	Vessel Name/Type	Size	Dimensions (m)	Engines	Owner	Delivery
S-143/Bulk	77,200	260 x 43 x 24	N/A	Showa Line	11/94	Hull 1143	73,000dwt	225 x 32 x 19	B&W	Gestion Maritime	3/
S-144/Bulk	77,200	260 x 43 x 24	N/A	Mainbrace Nav.	1/95	Hull 1144	148,500dwt	274 x 48 x 23	B&W	E. Med. Maritime	7/
S-145/Oil	80,000	264 x 45 x 24	N/A	Global Transport	8/95	Hull 1145	46,000dwt	190 x 31 x 17	B&W	Pan Ocean Shipping	8/
S-147/Bulk	77,200	260 x 43 x 24	N/A	Frontier Maritime	3/95	Hull 1146	46,000dwt	190 x 31 x 17	B&W	"	10/
S-148/Bulk	77,200	260 x 43 x 24	N/A	Triumph Sea Ltd.	5/95	Hull 1147	46,000dwt	190 x 31 x 17	B&W	"	12/
S-149/Bulk	88,500	279 x 45 x 24	N/A	Panamanian	5/96	Hull 1121	73,000dwt	225 x 32 x 19	B&W	Alassia Steamship	1/
S-160/Bulk	77,200	260 x 43 x 24	N/A	Golden Island	1/96	Hull 1152	100,000dwt	253 x 44 x 19	N/A	Neptune Orient	6/
S-161/Bulk	77,200	260 x 43 x 24	N/A	Golden Compass	2/96	Hull 1152	100,000dwt	253 x 44 x 19	N/A	Neptune Orient	8/
S-163/Bulk	77,200	260 x 43 x 24	N/A	Assetta Co.	9/96	Hull 1152	100,000dwt	253 x 44 x 19	N/A	Neptune Orient	12/
Tsurumi Works						Sanoyas Hishino Meisho Corp. — Tokyo, Japan					
S-1060/Cement	4,990	108 x 17 x 9	N/A	Kitakyushu Unyu	9/94	Full Comfort	N/A	225 x 32 x 18	DU-Sulzer	Yick Fung	6/
MTW Schiffswerft — Wismar, Germany						Full Beauty	N/A	225 x 32 x 18	DU-Sulzer	Yick Fung	8/
Westerhever/CC1600	N/A	166 x 27 x 14	DMR-Sulzer	Westerhever	9/94	Maja Vestida	N/A	225 x 32 x 18	DU-Sulzer	Yick Fung	9/
Alsterstern/COT 20	N/A	161 x 23 x 12	MAN B&W	Rigel Schiffahrts	10/94	Sasebo Heavy Industries — Tokyo, Japan					
Elbe Trader/OC 1600	N/A	166 x 27 x 14	DMR-Sulzer	Herman Buss KG	11/94	Energy Phoenix	N/A	215 x 32 x 18	B&W	Triumph Sea Ltd.	8/
Treue Trader/OC 1600	N/A	166 x 27 x 14	DMR-Sulzer	Herman Buss KG	1/95	Energy Prosperity	N/A	215 x 32 x 18	B&W	Triumph Sea Ltd.	8/
PT 14	N/A	143 x 20 x 11	MaK	Guengzhou	3/95	Schichau Seebeckwerft AG — Bremerhaven, Germany					
PT 14	N/A	143 x 20 x 11	MaK	Guengzhou	8/95	No. 1089/Containership	1,684teu	163 x 28 x 11	BV-MAN B&W	Contship	12/9
PCV 400	N/A	150 x 24 x 11	MaK	Shanghai Maritime	8/95	Simek A/S — Flekkefjord, Norway					
PCV 400	N/A	150 x 24 x 11	MaK	Shanghai Maritime	2/96	Silex/tug	N/A	35 x 11 x 6	Wartsila	Torksey Ltd.	7/9.
Marlene S/BV 1700	N/A	164 x 28 x 11	MAN B&W	Henrich Schepers	3/95	Thrax/tug	N/A	35 x 11 x 6	Wartsila	Torksey Ltd.	7/9.
BV 1700	N/A	164 x 28 x 11	MAN B&W	Rudolph Schepers	1/96	Stocznia Gdanska — Gdansk, Poland					
Donaustern/COT 20	N/A	161 x 23 x 12	MAN B&W	Rigel Schiffahrts	5/95	B191/1/Containership	N/A	175 x 27 x 14	MAN B&W	Scholler Holding	6/9
Isarstern/COT 20	N/A	161 x 23 x 12	MAN B&W	Rigel Schiffahrts	12/95	B191/2/Containership	N/A	175 x 27 x 14	MAN B&W	Scholler Holding	9/9
Hong Kong Senator/	N/A	216 x 32 x 19	DMR-Sulzer	Conti-Reederei	9/95	B684/1/Bulk Carrier	N/A	190 x 31 x 19	MAN B&W	Gearbulk	11/9
Odense Steel Shipyard, Ltd. — Odense, Denmark						B369/1/3/Reefer	N/A	150 x 23 x 13	MAN B&W	Dole Fresh Fruit	9/94
L-149/Suhail Star/VLCC	300,000	N/A	N/A	Vela	9/94	B369/1/4/Reefer	N/A	150 x 23 x 13	MAN B&W	Dole Fresh Fruit	12/94
L-149/VLCC	300,000dwt	N/A	N/A	Vela	94	B684/2/Bulk Carrier	N/A	190 x 31 x 17	N/A	East Asiatic Co.	9/95
L-150/VLCC	300,000dwt	N/A	N/A	Vela	95	B683/1/Bulk Carrier	N/A	200 x 31 x 17	N/A	East Asiatic Co.	12/95
L-145/VLCC	299,700dwt	N/A	N/A	A.P. Moller	95	B683/2/Bulk Carrier	N/A	200 x 31 x 17	N/A	Wavelength Shpg.	5/96
L-146/VLCC	299,700dwt	N/A	N/A	A.P. Moller	95	B683/4/Bulk Carrier	N/A	200 x 31 x 17	N/A	Wavelength Shpg.	9/96
L-154/Container	4,800teu	N/A	N/A	A.P. Moller	95	Finnhansa/RoRo	N/A	183 x 29 x 15	NSD	Finnlines Ship Oy	8/94
L-155/Container	4,800teu	N/A	N/A	A.P. Moller	96	Finnpartner/RoRo	N/A	183 x 29 x 15	NSD	Finnlines Group Oy	12/94
L-156/Container	4,800teu	N/A	N/A	A.P. Moller	96	Transeuropa/RoRo	N/A	183 x 29 x 15	NSD	Poseidon	3/95
L-157/Container	4,800teu	N/A	N/A	A.P. Moller	96	B501/1/4/RoRo	N/A	183 x 29 x 15	NSD	Finnlines Group Oy	12/95
L-158/Container	4,800teu	N/A	N/A	A.P. Moller	96	B195/1/Passenger Cruiser	N/A	185 x 27 x 10	NSD	Falcon Inc.	97
L-159/Container	4,800teu	N/A	N/A	A.P. Moller	97	B195/2/Passenger Cruiser	N/A	185 x 27 x 10	NSD	Falcon Inc.	98
Royal Schelde — Vlissingen, The Netherlands						B508/31/Reefer	N/A	138 x 22 x 13	MAN B&W	Lorient Maritime	2/96
RoRo	N/A	126 x 21 x 6	MaK	Commodore	5/95	B508/32/Reefer	N/A	138 x 22 x 13	MAN B&W	Lorient Maritime	5/96
Samsung Heavy Industries — Seoul, Korea						Transfield Shipbuilding — Freemantle, Western Australia					
Ankleshwar/Hull 1110	140,000dwt	274 x 46 x 23	B&W	Shipping Corp. of India	8/94	HMTSS Te Mataili/Patrol	N/A	32	Caterpillar	Govt. of Tuvalu	10/94
Irene/Hull 1111	95,000dwt	243 x 42 x 20	B&W	Avra Ship Mgmt.	8/94						
Thalassini Tyhi/Hull 1112	73,000dwt	225 x 32 x 19	B&W	Avra Ship Mgmt.	9/94						
Hull 1142	308,500dwt	331 x 58 x 31	B&W	Yukong Line	12/96						

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NNS Signs Contract For First Foreign Commercial Order To U.S. Shipbuilder Since 1957

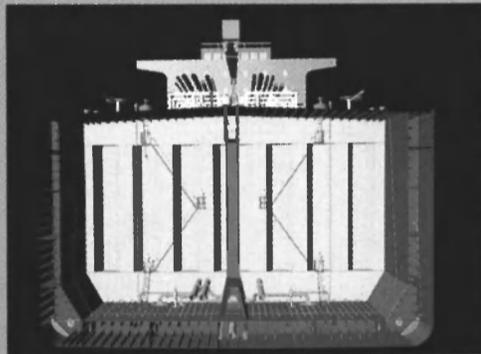


The signing of the contract for Newport News Shipbuilding (NNS) to construct double-hull product tankers for Eletson of Piraeus, Greece took place at a ceremony on Oct. 31, 1994 in Newport News, Va. The event represents the first time since 1957 that a U.S. shipbuilder has received a commercial order from a foreign owner. **John Karastamatis**, president of the Greek shipping firm Eletson Corporation, exchanges pens with Newport News Shipbuilding Chairman and CEO **Pat Phillips** after signing the contract for the construction of the 46,500-ton tankers. Looking on at the ceremony were (left to right): **Bill Fricks**, president and chief operating officer, NNS; Congressman **Herb Bateman** (R-Va.);

and **Gregory Hadjieleftheriadis**, vice president and director, Eletson. Seated between Mr. **Karastamatis** and Mr. **Phillips** is U.S. Secretary of Transportation **Federico Peña**, whose formal approval of the contract's Title XI loan guarantee immediately preceded the contract signing.

The first of two tankers on order will be delivered in 22 months, with the second coming four months later. The contract includes an option for a possible third and fourth ship.

**For more information on Newport News
Circle 89 on Reader Service Card**



Preliminary CAD drawing of the Double Eagle tanker's cross section. The drawing was generated using VIVID, Newport News' own design software.

GEC Alsthom Wins \$6.5 Million Minehunter Engine Supply Order



GEC Alsthom Paxman Diesels won a \$6.5 million order to supply Valenta engines for the Sandown class single role minehunters to be built by Vosper Thornycroft (U.K.) Ltd., for the U.K. Royal Navy. The new order calls for a pair of 6RPA200EM Paxman Valentas as propulsion units for each of the seven new vessels built.

**For more information on Paxman Diesels
Circle 52 on Reader Service Card**

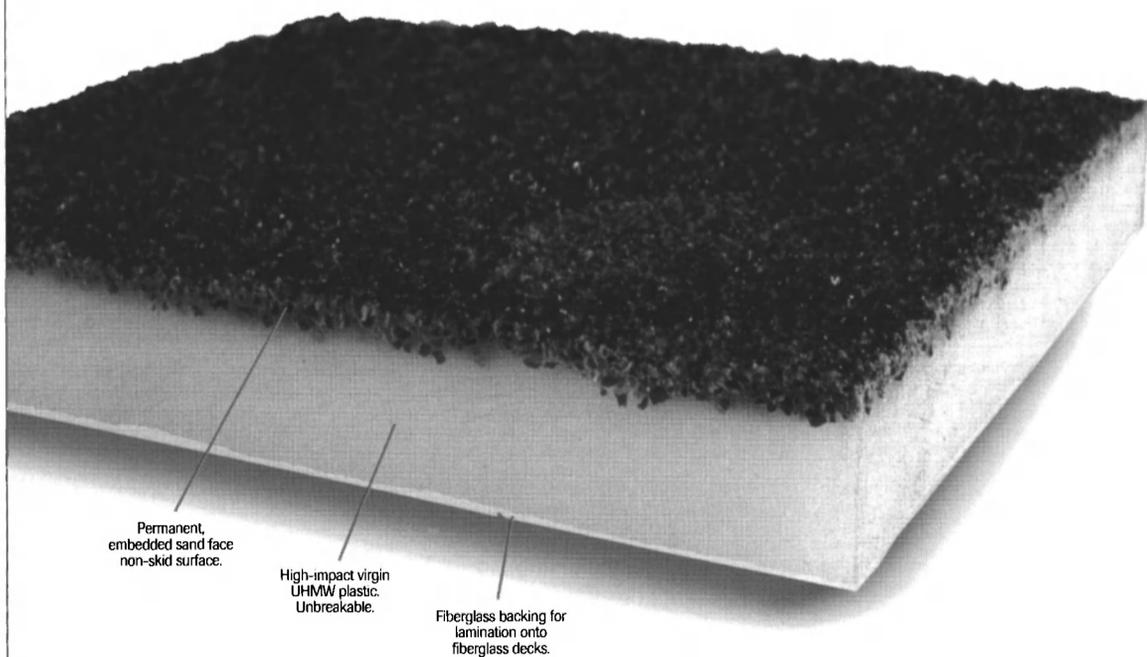
Trinity Wins Canal Barge Order

Canal Barge Company, Inc., New Orleans, and the Trinity Marine Group have agreed on the construction of 10 17,000-barrel tank barges for carriage of clean products and chemicals. The contract, whose terms were not disclosed, is an extension of a previous contract for four identical barges. The barges, to be built at

Trinity's Gulfport, Miss. shipyard, are a mixture of 200-ft. box, and 195-ft. rake barges, each with a 54-ft. beam and 12-ft. depth.

The vessels are state-of-the-art, semi-integrated, double skin barges with full vapor recovery systems, and capable of loading multiple cargoes. Delivery of the barges will begin in April 1995, with the remaining nine vessels following in three-week intervals.

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Seaway Commercialization Considered In Canada

The Canadian Chamber of Maritime Commerce reportedly said it is prepared to enter discussions with the Canadian government to explore the feasibility of "commercializing" the St. Lawrence Seaway System. The chamber said commercializing would involve a major

revamping of the Seaway's operations to make them more efficient. It could also involve an extensive role by the private sector in owning and operating Seaway facilities.

Astilleros Declines To Build OMI Ships

OMI Corp. reportedly said Astilleros Espanoles, the state-run

shipbuilder of Spain, has notified the company it will not proceed with the construction of two chemical/product tankers which were the subject of a previous letter of intent. OMI reportedly said it was investigating its legal rights as well as other construction opportunities.

The vessels were originally scheduled to be delivered in 1996. OMI also had options to acquire two additional vessels.

Avondale Gets \$15.9 M Title XI Guarantee To Modernize, Expand

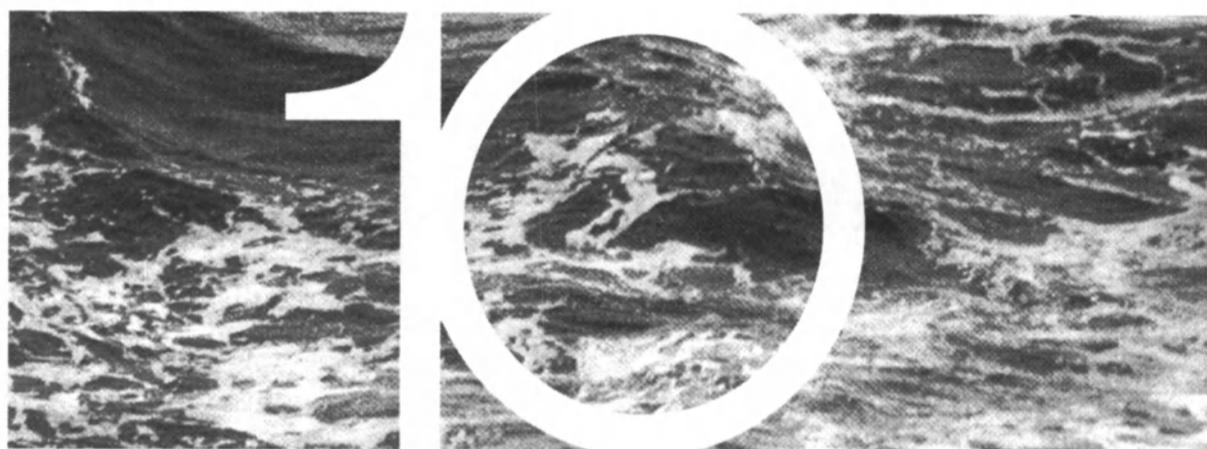
Avondale Industries Inc.'s application for U.S. government guarantee under Title XI of the Merchant Marine Act of 1936 was approved by the Maritime Administration (MarAd). The \$15.9 million guarantee will be used to mark securities to be sold later this year.

The proceeds will be used to fund modernization and expansion at the company's main plant in Avondale, La. This effort is designed to streamline the production methods and facilitate completion of its backlog of contracts.

The modernization effort is intended to improve its productivity and enhance competitiveness for domestic and international shipbuilding opportunities. It is expected that the entire modernization and expansion effort will be completed by the third quarter of 1995.

For more information on Avondale Circle 40 on Reader Service Card

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Contact: Connecticut Maritime Association
Tel: 203 622-4014 Fax: 203 622-1929

Circle 270 on Reader Service Card

THE SHOW PAYS OFF!

"As a result of the show last year, Eletson Corporation has signed a contract worth up to \$150 million, to build up to four oceangoing ships by Newport News Shipbuilding."

Mitsui, IHI Win VLCC Orders

Mitsui Engineering and Shipbuilding Co. Ltd. and Ishikawajima-Harima Heavy Industries (IHI), both of Japan, have received orders for very large crude carriers (VLCCs).

Mitsui received a preliminary order to build a 258,000-dwt, double-hulled VLCC for approximately \$92.6 million from Tomei Kisen KK. Mitsui reportedly said it expected to sign a formal contract by the middle of this month if negotiations went as planned. Separately, IHI won a contract to build a 260,000-ton double-hulled VLCC, which will be chartered by Idemitsu Tanker KK. IHI declined to disclose the financial terms of the contract.

Sea-Land Asks MarAd To Expedite Re-Flag Request

Sea-Land Service Inc. asked the Maritime Administration (MarAd) to expedite its applications to place five of its U.S.-flag vessels under Marshall Islands registry.

All five ships now operate in highly competitive international service between foreign countries.

Sea-Land, one of the largest U.S.-based ocean carriers, applied in June 1993 to re-flag 13 of its U.S.-flag ships. Those applications have been held in abeyance while Congress considered maritime reform legislation that would include operational subsidies. The legislation was approved by the House in 103rd Congress, but failed to pass the Senate.

At press time, MarAd reportedly gave American President Lines (APL), another major U.S. shipper, permission to foreign-flag six containerships being built overseas.

BUYERS DIRECTORY

This directory section is an editorial feature published in every issue for the convenience of the readers of MARITIME REPORTER/Engineering News. A quick-reference readers' guide, it includes the names and addresses of the world's leading manufacturers and suppliers of all types of marine machinery, equipment, supplies and services. A listing is provided, at no cost for one year in all issues, only to companies with continuing advertising programs in this publication, whether an advertisement appears in every issue or not. Because it is an editorial service, unpaid and not part of the advertisers contract, MR/EN assumes no responsibility for errors. If you are interested in having your company listed in this Buyers Directory Section, contact John C. O'Malley at (212) 477-6700.

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First Northern Environmental, Inc. 32 Brill St., Newark, NJ 07105
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Adrick Marine, 141D Central Ave., Farmingdale, NY 11735
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- ASBESTOS ABATEMENT**
Chemplex Environmental Prod., Inc., 3405 Highway 33, Neptune, NJ 07753
- AUCTION**
National Auction Bulletin, Inc., 4419 West tradewinds Ave., Fort Lauderdale, FL 33308-4464
- AUTOMATION**
Automation Products, Inc., 3030 Max Roy, Houston TX 77006
- BALLAST**
Chesapeake Specialty Products, 5055 Northpoint Blvd., Baltimore, MD 21219
Genstar Stone Products, Executive Plaza IV, Hunt Valley, MD 21031
Mineral Research & Recovery Inc., 4565 S. Palo Verde, Ste. 203 Tucson, AZ 85714
- BARGE BUILDING**
Conrad Industries, P.O. Box 790, Morgan City LA 70381
- BASKET STRAINERS**
Beaird Industries, P.O. Box 31115, Shreveport, LA 71130
- BEARING—Rubber, Metallic, Non-Metallic**
B.F. Goodrich, Engineered Polymer Products, 150 Division Dr., Wilmington, NC 28401
Blohm & Voss AG, P.O. Box 100720, D-2000 Hamburg 1, GERMANY;
U.S.A. Reps: Simplex-Turmar Inc., P.O. Box 168, Little Neck, NY 11363p., -0168
Kahlenberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241
Orion Corp., 111 Cedar Creek Rd., Grafton, WI 53024
Orkot Engineering Plastics 2535 Prairie Rd. Unit D Eugene, OR 97402
Thordon Bearings Inc., 3225 Mainway, Burlington, Ont., CANADA L7M 1A6
- BILGE OIL/FUEL ABSORBER**
The Bilge Rat, P.O. Box 4244, Fort Walton, FL 32549
Northstar Marine, 84 Wall Street, Farmingdale, NY 11735
- BOW THRUSTER**
W. Boterman, Hollenbroekerdijk 40, 8031 ER Zwolle, The Netherlands
thrustmaster of Texas P.O. Box 840189 Houston, TX 77284-0189
- BROKERS**
151 Maritime Services, 34062 El Encanto/B, Dana Pt. CA 92629
Captain Astad Company, Inc., P.O. Box 350486, Ft Lauderdale, FL 33335
Emerald Yacht & Ship Brokers, 759 N. Milwaukee St., # 552, Milwaukee, WI 53202
Jack Faulkner, 2419 Caddy Drive, P.O. Box 371, Flossmoor IL 60422
Mowbray's Tug & Barge Sales Corp., 35 De Hart St., Morristown NJ 07960
- BULKHEAD SEALS**
Blohm & Voss AG, P.O. Box 100720, D-2000 Hamburg 1, GERMANY
U.S.A. Reps: Simplex-Turmar Inc., P.O. Box 168, Little Neck, NY 11363-0168
John Crane Marine USA, 1536 Barclay Blvd., Buffalo Grove, IL 60089
- CABINETY**
Fenco, 1901 Route 130, Burlington, NJ 08016
- CABLE ASSEMBLIES**
Times Microwave Systems, P.O. Box 5039, Wallingford, CT 06492
- CABLE CLAMPS- STAINLESS STEEL**
Band-It P.O. Box 16307 Denver, CO 16307
- CABLE PROTECTION**
AT & T Cable Protection, 340 Mt. Kemble Ave., Morristown, N.J. 07960
- CEILINGS, DECORATIVE METAL**
The Gage Corp., 803 S. Black River St., Sparta, WI 54656
- CELLULAR TELEPHONE SERVICE**
Cellnet Corp., 400 Main St., Ste. 800, Stamford, CT 06901-3004
- CHAINS**
Crandall Dry Dock Engineers Inc./Marit Chain, 21 Pottery Lane, Dedham MA 02026
Milligan Marine Supply, 5832 Harvey Wilson, Houston, TX 77020
Washington Chain & Supply Inc., Box 3645, Seattle, WA 98124
Waterman Supply Co., P.O. Box 596, Wilmington, CA 90748
- CHAIRS**
Gasser Chair Co., 4136 Loganway, Youngstown, OH 44505
Shelby Williams Industries, Inc. 150 Shelby Williams Dr., Morristown, TN 37813
Turnbull, Inc., 3818 134th St. N.E., Marysville, WA 98271
- CHEMICALS**
Drew Ameroid Marine, One Drew Plaza, Boonton, NJ 07005
Vecom Refrigeration USA, 1201 Corbin St., Elizabeth, NJ 07201
- CLAMPING—Pipe, Tubes, Hose**
Band-It P.O. Box 16307 Denver, CO 16307
ZSI, 12749 Richfield Ct., Livonia, MI 48150
- CLASSIFICATION SOCIETY**
American Bureau of Shipping, 2 World Trade Center, 106th Fl, New York, NY 10048
- CLEANING CHEMICALS**
Duratech Industries, 1371-3 Church St., Bohemia, NY 11716
- COATING WELDER**
Bug-O-Systems 3003 W. Carson St., Pittsburgh, PA 15204
- COAXIAL CABLES**
Times Microwave Systems, P.O. Box 5039, Wallingford, CT 06492
- COMPACTORS**
International Compactor, 1088 Lighthouse Ln., Hilton Head Island, SC 29928
- COMPOUNDS**
ITW Philadelphia Resins, 130 Commerce Dr, Montgomeryville, PA 18936
- COMPUTER LOFTING**
Barataria Lofting Co., Inc., 1616 Barataria Blvd., Ste. 4, Marrero, LA 70072
- COMPUTERIZED INFORMATION SYSTEMS**
Autoshop Systems Corp., #403, 611 Alexander St., Vancouver, BC, Canada V6A1E
Creative Systems, Inc., P.O. Box 1910, Port Townsend, WA 98368
Intergraph Corporation, 2051 Mercator Drive, Reston, VA 22091-3413
Kockums Computer Systems AB, PO Box 50555, s-202 15 Malmo, SWEDEN
Kockum Sonics, Inc., 819 Veterans Blvd., Suite 201, Kenner, LA 70068
Scientific Marine Services, Inc., 101 State Pl., Suite F, Escondido, CA 92029
TIMSCO, P. O. Box 91360, Mobile AL 36691
- CONDENSERS/SEPARATORS**
Beaird Industries Inc., P.O. Box 31115, Shreveport LA 71130
- CONTROL SYSTEM—Monitoring**
Autronica Marine A/S, Drammensveien 126, N-0277 Oslo 2, NORWAY
Electronic Design Inc., 3020 20th St., Metairie, LA 70002
Engine Monitor, Inc., 179 Hickory Ave. Harahan, LA 70123
IMO Industries, Gems Sensors Division, One Cowles Rd., Plainville CT 06062
MMC International, 60 Inip Dr, Inwood NY 11696
Marine Electric RPD, Inc., 50 Carol St., P.O. Box 1135, Clifton, NJ 07014-1135
Robertson Marine Systems, 3000 Kingman St., Suite 207, Metairie, LA 70006
- Scientific Marine Services, Inc., 101 State Pl., Suite F, Escondido, CA 92029
Teleflex Naval technologies, 205 Church Rd., North Wales, PA 19454
- CONTROL SYSTEM—Steering**
Engine monitor, Inc., 179 Hickory Avenue Harahan, LA 70123
KGW Schweriner, Wismarsche Strasse 380, 19055 Schwerin, GERMANY
Kockum Sonics, Inc., 819 Veterans Blvd., Suite 201, Kenner, LA 70068
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Gulf Coast Fabrication, Inc., P.O. Box 539, Lakeshore, MS 39558
Vancouver Shipyards, 50 Pemberton Ave., N. Vancouver, B.C. CANADA V7P 2R2
- CONVEYOR BELT REPAIR**
Klehma Rubber Engineering, GERMANY
U.S. Rep: Simplex-Turmar Inc., P.O. Box 168, Little Neck, NY 11363-0168
- COUPLINGS**
American Vulkan, P.O. Drawer 673, Winter Haven, FL 33882
Holset Engineering, 1320 Kemper Meadow Drive, Cincinnati, OH 45240
Lo-Rez Vibration Control Ltd., 156 West 8th Avenue, Vancouver, BC CANADA, V5Y1N2
Mapeco Products, 90 Forest Avenue, P.O. Box 382, Locust Valley, NY 11580
Ovako Steel Inc., 1447 New Litchfield St., Torrington, CT 06790
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Bisso Marine Co. P.O. Box 4113, New Orleans, LA 70178
Del Gavio Marine Hydraulics Inc., 619 Industrial Rd., Carlstadt, NJ 07072
Hagglunds Inc, Marine Div. Headq., 50 Chestnut Ridge Rd, Montvale, NJ 07645
Liebherr-Werk Nenzing GES.mbh, P.O. Box 10, A-6710 Nenzing, AUSTRIA
Macgregor USA 20 Chapin Rd., Pine Brook, NJ 07058
Marine Travelift, Inc., 49 E. Yew St., Sturgeon Bay, WI 54235
McElroy Machine & Mfg Co., Inc., P.O. Box 4454, Biloxi MS 39535-4454
J. D. Neuhaus Hebezeuge GmbH, D-5810 Witten, GERMANY
New England Trawler Equipment Co., 291 Eastern Avenue, Chelsea, MA 02150
- CRANES**
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Lakeshore, Inc., P.O. Box 809, Iron Mountain, MI 49801
Morgan Marine, 1300 Nomandy Place, Santa Ana, CA 92705
Pallinger Inc., 8040 Dorchester Rd., Niagara Falls, Ontario, CANADA L2E 6V6
Tech Crane Intl., Inc., 61130 Timberbend Dr., Lacombe, LA 70445
- DECK CAULKING/REPAIR**
Life Industries, Corp., 205 Sweet Hollow Rd., Old Bethpage, NY 11804
- DECK MACHINERY — Cargo Handling Equipment**
Hawboldt Ind., Hwy 3, P.O. Box 80, Chester, Nova Scotia, CANADA BOJ 1JO
Lakeshore Inc., PO Box 809, Iron Mountain, MI 49801
MacGregor-Navire Group, 34 Bedford Rd., Clapham North, London SW4 7HH
Markey Machinery Co., Inc., P.O. Box 24788, Seattle, WA 98124-0788
McElroy Machine & Mfg Co., Inc., P.O. Box 4454, Biloxi MS 39535-4454
New England Trawler Equipment Co., 291 Eastern Avenue, Chelsea, MA 02150
Skookum/Rope Master, P.O. Box 280, Hubbard, OR 97032
Smith Berger Marine Inc., 516 South Chicago Street, Seattle, WA 98108
Willem Pot b.v., P. O. Box 291022, 3001 GC Rotterdam, The Netherlands
- DECK MACHINERY**
AmClyde, 240 E Plato Blvd., Saint Paul, MN 551071609
American Block Co. 6311 Breen Rd, Houston, TX 77086
Hawbolt Ind., Hwy 3, P.O. Box 80, Chester, Nova Scotia, CANADA BOJ 1JO
Lakeshore, Inc., PO Box 809, Iron Mountain, MI 49801
McElroy Machine & Mfg Co., Inc., P.O. Box 4454, Biloxi MS 39535-4454
NEI Clarke Chapman Canada, 1075 N. Service Rd. W., Unit 4, Oakville, Ontario, CANADA L6M 2G2
New England Trawler Equipment Co., 291 Eastern Avenue, Chelsea, MA 02150
Pusnes, PO Box 102, N-4818, Faerik, NORWAY
Skookum/Rope Master, P.O. Box 280, Hubbard, OR 97032
Smith Berger Marine Inc., 516 South Chicago St., Seattle, WA 98108
Waterman Supply Co., P.O. Box 596, Wilmington, CA 90748
- DECK STRUCTURES/ CONTROL CABS**
Carolina Cockpit PO Box 83037, Portland, OR 97283
- DEGREASERS**
Duratech Industries, 1371-3 Church St., Bohemia, NY 11716
- DESALINATION - REVERSE OSMOSIS**
Rochem Separation Systems, Inc., 3904 Del Amo Blvd., Ste. 801, Torrance, CA 90503
Rochem Separation Systems, P.O. Box 156, 54 Rue Agasse, 1211 Geneve 17, SWITZERLAND
- DEPTH SOUNDING EQUIPMENT**
Innerspace Technology, Inc., 36 Industrial Dr., Waldwick, NJ 07463
- DIESEL ACCESSORIES**
General Thermodynamics Corp., 210 South Meadow Rd., P.O. Box 1105, Plymouth, MA 02360
Hatch & Kirk Inc., 601 McFarland Rd., Houston, TX 77011
Kiene Diesel Accessories, 325 S. Fairbanks St., P.O. Box 386, Addison, IL 60101
- DIESEL ENGINE — Spare Parts & Repair**
ABB Industry Oy, 100 Madison Corp. Park Rte.6, Brewster, NY 10509
Alaska Diesel, 4420 14th Ave., NW, Seattle, WA 98107
Caterpillar, Inc., Engine Div., P.O. Box 610, Mossville, IL 61552-0610
Cummins Engine Co., 4500 Leeds Ave., Ste. 301, Charleston, SC 29405-8521
Cummins Mid-South, Inc., 110 E. Airline Highway, Kenner, LA 70062
John Deere, John Deere Rd., Moline, IL 61265
Diesel Engine & Parts Co., 8123 Hillisboro Ave., Houston, TX 77029
Electro-Motive Division-GMC, 9301 W. 55th St., LaGrange, IL 60525
Giro Engineering Ltd, Talisman, Duncan Road, Park Gate, South Hampton, SO3 7BX ENGLAND
Goltens Worldwide, 160 Van Brunt St., Brooklyn, NY 11231
Hatch & Kirk Inc., 601 McFarland Rd., Houston, TX 77011
MAN B&W Diesel AG, Stadtbachstrasse 1, D-86153 Augsburg 1, GERMANY
MAN B&W Diesel A/S, teglholmegade 41, DK-2450 Copenhagen SV, DENMARK
MAN B&W Diesel, 17 State St., New York, NY 10004
MTU of North America, 10450 Corporate Dr., Houston, TX 77478
Markisches Werk GmbH, P.O. Box 1442, D-5884 Halver 1, GERMANY
Motor-Service AB, Box 2115, S-144 04 Ronninge, SWEDEN
Motor Service-Hugo Stamp, 3190 S.W. 4th Ave., Ft. Lauderdale, FL 33315
New Sulzer Diesel, Inc., 200 Park Ave. New York, NY 10166
Ocean Power 571 Central Avenue, New Providence, NJ 07974
Paxman Diesels, P.O. Box 8, Paxman Works, Colchester, Essex, CO1 2HW, ENGLAND
Paxman Diesels USA, (A Div. of Ruston Gas Turbines, Inc.), 15950 Park Row, Houston, TX 77084
Ulstein Bergen AS, PO Box 924, N5002 Bergen, NORWAY
Wartsila Diesel, 201 Defense Highway, Annapolis, MD 21401
- DIVING & SALVAGE**
Bisso Marine Co. P.O. Box 4113, New Orleans, LA 70178
H.J. Merrilue, P.O. Box 23123, New Orleans LA 70183
Muldoon Marine Services, Inc., P.O. Box 3221, Terminal Island, CA 90731
- DOORS - MARINE & INDUSTRIAL**
Insulations, Inc., 1101 Edwards Ave. Harahan, LA 70123
Mapeco Walz & Krenzer, Inc., 90 Forest Ave., Locust Valley, NY 11560
- DRILLING & BLASTING**
Marine Drilling & Blasting, PO Box 10455, Jacksonville, FL 32247-0455
- DRY DOCKS-Design**
Conrad Industries, 1501 Front Street, P.O. Box 790, Morgan City, LA 70381
North Florida Shipyards, P.O. Box 3255, Jacksonville, FL 32206
- ELECTRICAL EQUIPMENT**
Jo-Kell, Inc., 1011 W. 25th St. Norfolk, VA 23517
L. F. Gaubert & Co., Inc., P. O. Box 50500, New Orleans LA 70150
MMC International, 30 Inip Dr, Inwood NY 11696
- ELECTRICAL WIRE DEVICES**
Meltric Corp., 1935 Ace World Wide Lane, Cudahy, WI 53110
- ELECTRONIC DISPLAY**
Kockum Sonics, Inc., 819 Veterans Blvd., Suite 201, Kenner, LA 70068
Scandinavian Micro Systems, P.O. Box 155, N-1411, Kolbotn, NORWAY
- ELECTRONIC INFORMATION SUPPORT**
Scandinavian Micro Systems, P.O. Box 155, N-1411, Kolbotn, NORWAY
- EMERGENCY MEDICAL ASSISTANCE**
International SOS Assistance, 8 Neshaminy Interplex, Ste., 207, Trevose, PA 19053
- EMISSION CONTROLS**
Haldor Topsoe Nymollevel 55, DK-2800, Lyngby, Denmark
Seaworthy Systems, Inc. P.O. Box 965, Essex, CT 06426
- EMPLOYMENT**
Boat Crews, 1 Seine Court, Suite 309, New Orleans, LA 70114
- ENGINEERING SERVICES**
AmClyde, 240 E. Plato Blvd., Saint Paul, MN 551071609
MCR Engineering Co., Inc. 206 Dedham St., Norfolk, MA 02056
Scientific Marine Services, Inc., 101 State Pl., Suite F, Escondido, CA 92029
Seaworthy Systems, Inc. P.O. Box 965, Essex, CT 06426
- ENGINE ROOM LIGHTING**
Pauluhn Electric Mfg. Co., Inc. 1616 N. Main, P.O. Box 53, Pearland, TX 77581
- ENGINE TEST EQUIPMENT**
General Thermodynamics Corp., P.O. Box 1105, 210 S. Meadow Rd., Plymouth, MA 02360
Instruments, Computers, & Controls, Inc., 6942 Haven Creek Dr., Katy, TX 77449
- ENVIRONMENTAL SYSTEMS**
Foss Environmental Services, 7440 West Marginal Way So., Seattle, WA 98108-4141
NWR, Inc., Environmental Systems Division, Box 58626, Salt Lake City, UT 84158
- EPIRBs**
ACR Electronics, Inc., 5757 Ravenswood Rd., P.O. Box 5247, Ft. Lauderdale FL 33310-5247
Alden Electronics, 40 Washington St., Westborough, MA 01581
- EQUIPMENT - Marine**
Bohnet & Associates, 1150 Rue Rochelle, Slidell, VA 70458
- EVAPORATORS**
Alfa-Laval Separation, Inc., 955 Meams Rd., Warminster, PA 18974
Beaird Industries Inc., P.O. Box 31115, Shreveport, LA 71130
NEI Clarke Chapman Canada, 1075 N. Service Rd. W., Unit 4, Oakville, Ontario, CANADA L6M 2G2
- EXPANSION JOINTS (RUBBER, METALLIC)**
Archon Industries, 200 Williams Street, Portchester, NY 10573
- FANS - VENTILATORS - BLOWERS**
Jon M. Liss Associates, Inc., 411 Borel Ave., San Mateo, CA 94402
- FASTENERS**
Jamestown Distributors, 28 Narragansett Ave., P.O. Box 348, Jamestown, RI 02835
Okabe Co., Inc. 645 Forest Edge Drive, Vernon Hills IL 60061
- FENDERING SYSTEMS/BOUYS - Dock & Vessel**
B.F. Goodrich, 150 Division Drive, Wilmington, NC 28401
Kahlenberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241
Milligan Marine Supply, 5832 Harvey Wilson, Houston, TX 77020
Schuyler Mfg. Co., Inc., 16901 Woodinville-Redmond Rd., Woodinville, WA 98072
Seaward International, Inc., Clearbrook Industrial Park, P.O. Box 98, Clearbrook, VA 22624
Ultra Poly Inc., 2926 South Steele, Tacoma, WA 98409
Viking Fender Co., 340 Lehigh Ave., Perth Amboy, NJ 08861
- FIBERS**
Allied Signal, Meyer I Box, 101 Columbia Rd., Morristown, NJ 07962
- FILTER SYSTEMS**
Everpure Inc., 660 N. Blackhawk Dr., Westmont IL 60559
- FIN STABILIZERS**
Blohm & Voss AG, P.O. Box 10 07 20, D-2000 Hamburg 1, GERMANY;
U.S.A. Reps: Simplex-Turmar Inc., P.O. Box 168, Little Neck, NY 11363-0168
- FINANCIAL SERVICES**
Nations Financial, P.O. Box 120013, Stamford, CT 06912-0013
- FIRE DETECTION SYSTEMS**
Autronica Marine A/S, Drammensveien 126, N-0277 Oslo 2, NORWAY
- FLAME CUTTING MACHINE**
Bug-O-Systems 3003 West Carson St., Pittsburg, PA 15204
- FLEXIBLE COUPLINGS**
American Vulk. P.O. Drawer 673, Winter Haven, FL 33882
- GALLEY EQUIPMENT**
Cospolich Refrigerator Co., 949 Industry Rd., Kenner LA 70062
Lang Manufacturing, P.O. Box 905, Redmond, WA 98073
Maritime Services Corp., 3457 Guignard Dr., Hood River, OR 97031
- GANGWAYS, LADDERS**
Wooster Products Inc., 1000 Spruce St., P.O. Box 896, Wooster, OH 44691
- HATCH COVER SEAL RENOVATION**
KIBI Corporation, U.S. Reps: Simplex-Turmar Inc., P.O. Box 168, Little Neck, NY 11363-0168
- HATCHES**
Ami Exchangers Ltd., Apex Workshops, Graythorp Industrial Estate, Hartlepool, Cleveland TS 25 2DF ENGLAND
L.S. Baier, 7527 NE 33rd Dr., Portland, OR 97211
- HEAT EXCHANGERS**
Alfa-Laval Separation Inc., 955 Meams Rd., Warminster, PA 18974
A/S Vesta, P.C. Box 548, DK-9100, Aalborg, DENMARK
U.S Agent: Aalborg Ciseriv Norfolk Inc., P.O. Box 12676, Norfolk, Vi 23541-0676
Aalborg Ciseriv San Francisco Inc., 1295, 67th Street, Emeryville, Ca 94608
Houston, Inc., P.O. Box 906, Angleton, TX 77515
Beaird Industries Inc., P.O. Box 31115, Shreveport LA 71130
Sen-Dure Products, Inc., 6785 N.W. 17th Avenue, Ft. Lauderdale, FL 33309
Tranter Inc, Old Burk Road, Wichita Falls, TX 76307
- HORNS/WHISTLES**
Kahlenberg Bros Co., P.O. Box 358, Two Rivers, WI 54241
Kockum Sonics, Inc., 819 Veterans Blvd., Suite 201, Kenner, LA 70068
- HYDRAULICS**
Bailey Sales Corp., 6431 Baum Dr., P.O. Box 19805, Knoxville, TN 37939
Del Gavio Marine Hydraulics Inc., 619 Industrial Rd., Carlstadt, NJ 07072
Duratech Industries, 1371-3 Church St., Bohemia, NY 11716
Engine Monitor, Inc., 179 Hickory Ave. Harahan, LA 70123
Hamilton Jet, P.O. Box 709, Christchurch, New Zealand
- HYDRO JETTING PUMP UNIT**
Harben, Inc., PO Box 2250, Cumming, GA 30130
- INCINERATORS**
A/S VESTA, P.O. box 548, DK-9100 Aalborg, Denmark
Us Agent: American United Marine Corporation-Pete Lombard, 5 Broadway, It 1, Saugus, MA 01906
Houston, Inc., P.O. Box 906, Angleton TX 77515
- INERT GAS SYSTEMS**
Hiller Systems, 3710 Lakeside Court, Mobile AL 36693
- INSULATION**
Insulations, Inc., 1101 Edwards Ave., Harahan, LA 70123
Maritime Services Corp., 3457 Guignard Dr., Hood River, OR 97301
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ADVERTISER	EQUIPMENT /SERVICE	CIRCLE NO.	ADVERTISER	EQUIPMENT /SERVICE	CIRCLE NO.
A			LIFE INDUSTRIES LIFE CALK 232		
ALLIEDSIGNAL INDUSTRIAL FIBERS	ROPES & FIBERS	200	M		
AMCLYDE	ENGINEERED PRODUCTS	201	MAINE MARITIME ACADEMY	CAREER ADVANCEMENT	233
AMERICAN EAGLE MFG.	ALUMINUM BOATS	202	MAN B & W DIESEL AG	DIESEL ENGINES	280
ASTILLEROS ESPANOLAS	SHIPBUILDING	203	MANLY MARINE CLOSURES LTD.	HATCHES	234
AT & T CABLE PROTECTION	CABLE PROTECTION	278	MARCOM, INC.	SPARE PARTS	235
AURAND MFG.	TOOLS	204	MCELROY MACHINE MFG.	DECK EQUIPMENT	236
AUTOSHIP SYSTEMS CORP.	HULL DESIGN SYSTEMS	205	MEGAPULSE, INC.	NAVIGATION RECEIVERS	237
B			MICROPHOR, INC.	MARINE SANITATION DEVICES	238
BENDER SHIPBUILDING	SHIPBUILDING	206	N		
BISSO MARINE	MARINE CONTRACTOR/SALVAGE	207	NORTHSTAR MARINE	MARINE STRAINERS	262
BRITISH TELECOM	BT SATMAIL	277	NORTHSTAR MARINE	FUEL TREATMENT UNIT	273
BILL BROWN ENTERPRISES	AIR CONDITIONING	208	O		
C			OIL MOP	OIL SPILL RECOVERY EQUIPMENT	268
CAPITOL DIESEL, INC.	ENGINES & GENERATORS	209	ORION CORP.	BEARINGS	239
CHEMPLEX ENVIRONMENTAL PROD.	ASBESTOS ABATEMENT	272	P		
CINCINNATI GEAR CO.	MARINE GEARS	210	PAULUHN ELECTRIC MFG.	MARINE LIGHTING	261
CONNECTICUT MARITIME ASSOC.	'SHIPPING 95' TRADE SHOW	270	PETERSON BUILDERS, INC.	SHIPBUILDING	240
CREATIVE SYSTEMS, INC.	HYDROSTATIC SOFTWARE	211	PTT TELECOM	SATELLITE COMMUNICATIONS	241
CUMMINS MARINE	DIESEL ENGINES	212	TF PURIFIER, INC.	BY-PASS ELECTRIC OIL REFINERS	271
CYGNUS INSTRUMENTS	ULTRA SONIC THICKNESS TESTING	213	R		
D			RAYTHEON MARINE CO.	GPS NAVIGATION EQUIPMENT	242
DAEWOO HEAVY INDUSTRIES	SHIPBUILDING	214	REVERE SURVIVAL PRODUCTS	LIFE RAFTS	279
DEL GAVIO MARINE	MARINE HYDRAULICS	215	ROYAL CHEMICAL	BALLAST & VOID COATINGS	243
E			S		
ELECTRONIC MARINE SYSTEMS	CHARTVIEWER	216	SAMSUNG HEAVY INDUSTRIES	SHIPBUILDING	244
ELLIOTT MARINE, INC.	MARINE SUPPLIES	265	SEA, INC.	SURVIVAL EQUIPMENT	245
EMPRESS RIVERBOAT CASINO CORP.	RIVERBOAT CASINO	275	KARL SENNER	PROPULSION EQUIPMENT	246
EUGENE ERNST PRODUCTS CO.	BOILER PARTS	269	SIFCO SELECTIVE PLATING	PLATING EQUIPMENT	264
ESGARD, INC.	COATINGS	217	SIMRAD	RADAR EQUIPMENT	247
F			S.P. RADIO	SATELLITE TELEPHONE	282
FINCANTIERI	SHIPBUILDING	218	SPERRY MARINE	BRIDGE INTEGRATION	248
J.W. FISHERS MFG.	UNDERWATER METAL DETECTORS	219	SPURS MARINE	LINE, WEED & NET CUTTER	259
FOSS ENVIRONMENTAL	ENVIRONMENTAL SERVICES	276	STORK-KWANT	CONTROLS	249
G			SWAN HUNTER LTD.	SHIPBUILDING	267
L.F. GAUBERT	ELECTRICAL CABLES	221	SWATH OCEAN	BOAT BUILDERS	250
GIBBS & COX	NAVAL ARCHITECTS/MARINE ENGINEERS	222	T		
G.M.D. SHIPYARD	SHIPYARD	223	THRUSTMASTER OF TEXAS	PROPULSION SYSTEMS	251
GOLTENS	DIESEL ENGINE REPAIR & SPARE PARTS SUPPLY	224	TRINITY MARINE GROUP	SHIPBUILDING	252
H			U		
HANJIN HEAVY IND.	SHIPBUILDING	263	THE ULSTEIN GROUP	MARINE PROPELLERS	266
HDW HOWALDTSWERKE	SHIPBUILDING	281	ULTRA POLY, INC.	MARINE FENDERING	274
HOLSET ENGINEERING	MARINE COUPLINGS	225	UNIVERSAL SHELTERS	TEMP-PERMANENT SHELTERS	260
I			W		
IMA ASSOCIATES	BUSINESS REPORT	226	WARTSILLA DIESEL OY	DIESEL ENGINES	254
J			WASHINGTON CHAIN & SUPPLY	CHAINS	255
JEAMAR WINCHES	WINCHES	227	WATERMAN SUPPLY	MARINE EQUIPMENT	253
JEFFBOAT/LOUISIANA DOCK	BARGES	228	WESTERN MACHINE WORKS	HYDRAULIC TOW PINS	256
JIM'S PUMP	PUMP REPAIR	229	WILLARD MARINE, INC.	RIGID INFLATABLE BOATS	257
L			WIRANA USA LTD.	SHIP SALES & PURCHASES	258
LANG MFG.	GALLEY EQUIPMENT	230			
LEEVAAC SHIPYARDS	SHIPBUILDING REPAIRS	231			

The listings above are an editorial service provided for the convenience of our readers.

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Interior Design Intl, 701 Dexter Ave N., Ste. 307, Seattle, WA 98109

INTERIORS
Hopeman Brothers, 435 Essex Ave., Waynesboro, VA 22980
Insulations, Inc., 1101 Edwards Ave., Harahan, LA 70123
Maritime Services Corp., 3457 Guignard Dr., Hood River, OR 97031

JOINER—Watertight Door—Paneling—Ceiling System—Decking
Hopeman Brothers, Inc., P.O. Box 820, Waynesboro, VA 22980
Insulations, Inc., 1101 Edwards Ave., Harahan, LA 70123
Maritime Services Corp., 3457 Guignard Drive, Hood River, OR 97031
Walz & Krenzer, Inc., 90 Forest Ave. Locust Valley N.Y. 11560

KEEL COOLERS
R.W. Fernstrum & Co., 1716 Eleventh Ave., Menominee, MI 49858
Kahlenberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241
The Walter Machine Co., Inc., 84-98 Cambridge Avenue, Jersey City, NJ 07307

LIFEBOATS/RAFTS
American Eagle Mfg., Inc., 780 Pearle Jensen Way, LaConner, WA 98257
Boston Whaler, Inc. Commercial Products Div., 1149 Hingham St, Rockland, MA, 02370
Caley Ocean Systems, Mayor Avenue, East Kilbride, Scotland, G74 4PU
Dunlop-Beaufort Ltd., 12351 Bridgeport Rd., Richmond, B.C., CANADA V6V-1J4
Fr. Fassmer GMBH & Co., D-2876 Berne 2, Wese, GERMANY
Norsafe AS, P.O. Box 115, N-4818 Faervik, Norway
Ocean Power 571 Central Avenue, New Providence, NJ 07974
Sea, Inc., 7030 220th S.W., Mountlake terrace, WA 98043
Willard Marine Co., Inc., 1250 N. Grove St., Anaheim, CA 92806
Zodiac of North America, P.O. Box 400, Stevensville, MD 21666

LIFESAVING ESQUIPMENT
Dunlop-Beaufort Ltd., 12351 Bridgeport Rd., Richmond, B.C., CANADA V6V-1J4
Steams Manufacturing, P.O. Box 1498, St. Cloud, MN 56302

LIGHTING EQUIPMENT—Lamps, Fixtures, Searchlights
ACR Electronics, Inc., 5757 Ravenswood Rd., P.O. Box 5247, Ft. Lauderdale, FL 33310-5247
Glamox, 44 Austin Street, P.O. Box 13522, St. John's, NF CANADA A1B 4B8
Golten Marine, 160 Van Brunt St., Brooklyn, NY 11231
Kockum Sonics, Inc., 819 Veterans Blvd., Suite 201, Kenner, LA 70068
Julian A. McDermott, 1639 Stephen St., Ridgewood, NY 11385
Pauluhn Electric Mfg. Co., Inc., 1616 N. Main, P.O. Box 53, Pearland, TX 77581
Francis Searchlights/Slam Supply Co., 4415 6th N.W., Seattle, WA 98107

LIQUID LEVEL GAUGES
Eugene Ernst Products Co., 116 Main St., Farmingdale, N.J. 07727

LIQUID LEVEL INDICATORS
Midland Mfg. Corp., 7733 Gross Point rd., Skokie IL 60076-0226

LIQUID OVERFILL PROTECTION SYSTEMS
E.R.L. Marine Products, P.O. Box 1026, New Albany, IN 47151-1026
Midland Mfg. Corp., 7733 Gross Point rd., Skokie IL 60076-0226

LOGISTICS
Chand Corporation, 157 Hwy 654, Mathews, LA 70375
Newport News Shipbuilding, Logistics & Technical Services, 12129 Jefferson Ave., Newport News, VA 23603
GED, 4646 N. Witchduck Road, Virginia Beach, VA 23455
VL Logistics Consultants, Inc., 3420 Bienville Blvd., Ocean Springs, MS 39564

LOW-SMOKE CABLES
Times Microwave Systems, P.O. Box 5039, Wallingford, CT 06492

LUBRICANTS
Texaco, International, 2000 Westchester Avenue, White Plains NY 10650

MACHINERY MAINTENANCE, REPAIR, OVERHAUL, AND TESTING
Del Gaudio, 619 Industrial Rd., Carlstadt, NJ 07072
Golten Marine Company Inc., 160 Van Brunt Street, Brooklyn, NY 11231
New England Trawler Equipment Co., 291 Eastern Avenue, Chelsea, MA 02150

MACHINERY MONITOR AND CONTROL SYSTEMS
Electronic Marine Ssystems, 800 Ferndale Pl., Mahway, NJ 07065

MARINE ACCESSORIES
Sen-Dure Products, Inc., 6785 N.W. 17th Avenue, Ft. Lauderdale, FL 33309

MARINE ACCOMMODATIONS
Directions in Design Inc, 633 Emerson, Suite 100, St. Louis, MO 63141
Hopeman Brothers, P.O. Box 820, 435 Essex Ave., Waynesboro, VA 22980
Jamestown Metal Marine Sales, Inc., 4710 Northwest Second Ave., Boca Raton, FL 33431
Maritime Services Corp., 3457 Guignard Dr., Hood River, OR 97031

MARINE BATTERIES
Rae Storage Battery Mfg. Co. Inc., 51 Daming Rd., Berlin, CT 06037

MARINE CEILING
The Gage Corp., 803 S. Black River St., Sparta, WI 54656
Hydro-Aluminium, Vik Verk, N-5880 VIK I SOGN, Norway

MARINE DECKING
Selby, P.O. Box 1600, Sapulpa, OK 74067

MARINE ELECTRONICS
Frank L. BeierRadio, 2001 Ridgelake Drive, Metairie, LA 70001
Kockum Sonics, Inc., 819 Veterans Blvd., Suite 201, Kenner, LA 70068
Saab Marine Electronics AB, Box 13045, 402 51 Göteborg, SWEDEN
Scientific Marine Services, Inc., 101 State Pl., Suite F, Escondido, CA 92029

MARINE ELEVATORS
Alimak Elevator Co., 1100 Boston Ave., Bridgeport, CT 06601

MARINE ENGINEERS
CDI Marine Co., 4040 Woodcock Dr., Suite 200, Jacksonville, FL 32207

MARINE FENDERS
Viking Fender Co., 340 Lehigh Ave., Perth Amboy, NJ 08861

MARINE FIRE PROTECTION
Hiller Systems, 3710 Lakeside Court, Mobile, AL 36693

MARINE FURNITURE
Directions in Design, 633 Emerson, Ste. 100, St. Louis MO 63141
Engineered Data Products, P.O. Box 565, Woodbury, NJ 08906-7565
Jamestown Metal Marine Sales, Inc., 4710 NW Second Ave. Boca Raton, FL 33431
Maritime Services Corp., 3457 Guignard Dr., Hood River, OR 97031

MARINE GEARS
Cincinnati Gear Co., 5657 Wooster Pike, Cincinnati, OH 45227

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

MARINE INTERIORS
Johnson Construction Specialties, Inc., 3420 Rusk P.O. Box 1360 Houston Texas 77251

MARINE PLUMBING
Bill Brown Enterprises, Inc., 4995 Ocean Pines, Berlin, MD 21811

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

MARINE SHIP MANAGEMENT
BarbaArkton, 1810 Chapel Ave. West, Cherry Hill, NJ 08002

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

METAL PRODUCTS
Engineered Data Products, P.O. Box 565, Woodbury, NJ 08906-7565

MONITOR CONTROL ALARM
Egine Monitor, Inc., 179 Hickory Ave. Harahan, LA 70123
Tracor Marcon, 800 Ferndale Pl., Rahway, NJ 07065

MULTI-CABLE PENETRATION DEVICE
NMP, 12437 E. 60th St., Tulsa, OK 74153

NAVAL ARCHITECTS, MARINE ENGINEERS, SURVEYORS
Advanced Marine Enterprises, Inc., 1725 Jefferson Davis Hwy., Arlington, VA 22202
CDI Marine Co., 4040 Woodcock Dr., Suite 200, Jacksonville, FL 32207
Childs Engineering Corp., Box 333, Medfield, MA 02052
Crandall Dry Dock Engrs., Inc., 21 Pottery Ln., Dedham, MA 02026
Crane Consultants, 15301 First Ave S., Seattle WA 98148
C.R. Cushing, 18 Vesey St., New York, NY 10007
Arthur D. Darden, 3200 Ridgelake Dr., Suite 403, Metairie LA 70002
DeJong & Lebat, Inc., 1734 Emerson Street, Jacksonville, FL 32207
Design Associates Inc., 14360 Chef Menteur Highway, New Orleans, LA 70129
Diversified Technologies, 812 Live Oak Dr., Chesapeake VA 23320
Encon Mgmt & Engineering Consultant Services, P.O. Box 7760, Beaumont, TX 77706
GHH Inc. (Ind. Measurement Consultants), P.O. Box 1836, Newport News, VA 23601
Gibbs & Cox, Inc., 50 West 23rd St., New York, NY 10010
John W. Gilbert & Assoc., Inc., 66 Long Wharf, Boston, MA 02110
The Glosten Assoc. Inc., 600 Mutual Life Bldg., 605 First Ave., Seattle, WA 98104
Guido Perla & Assoc., 4039 21st Ave., Ste. 300, Seattle, WA 98199
Morris Guralnick Associates, Inc., 130 Sutter St., Ste. 400, San Francisco, CA 94104
C. Raymond Hunt Associates, 69 Long Wharf, Boston MA 02110
Hydrocomp, Inc., 45 James Farm-Lee, P.O. Box 865, Durham, NH 03824
JH Inc., No. 4 Executive Campus, Culbert Blvd. & Route 70, P.O. Box 5031, Cherry Hill, NJ 08034
R.D. Jacobs & Associates, 11405 Main St., Roscoe, IL 61073
James S. Kroger, 799 Brickelli Plaza Ste. 701, Miami, FL 33131

Rodney E. Lay & Associates, 13891 Atlantic Blvd., Jacksonville, FL 32225
MCA Engineers, Inc., 2960 Airway Ave., #A-103, Costa Mesa, CA 92626
Alan C. McClure Associates, Inc., 2600 South Gessner, Houston, TX 77063
McElroy Machine & Mfg Co., Inc., P.O. Box 4454, Biloxi, MS 39535-4454
John J. McMullen Associates, Inc., 1 World Trade Ctr, Ste 3000, N.Y.N.Y. 10048
Fendall Marbury, P.O. Box 2321, Annapolis, MD 21401
Marine Design & Operations, Inc., 226 Chestnut St., Roselle Park, NJ 07204
Marine Management Systems Inc., 102 Hamilton Ave., Stamford CT 06902
Marine Power Associates, 1010 Turquoise St., Ste 217, San Diego, CA 92109
Maritech, Seacraft, Bay Road, Newmarket, NH 03857
Maritime Design, Inc., 3020 Hartley Rd., Jacksonville, FL 32257
R.J. Mellusi & Co., 71 Hudson St, New York, NY 10013
Nautical Designs, Inc., 2101 S. Andrews Ave., Suite 202, Ft Lauderdale FL 33316
Ocean Motions Co., P.O. Box 130, 49 Shore Drive, Barrington, RI 02806-0130
Olsen Marine Surveyors Co., P.O. Box 283, Port Jefferson, NY 11777
QED Systems Inc., 4646 Witchduck Rd., Virginia Beach, VA 23455
M. Rosenblatt & Son, Inc., 350 Broadway, New York, NY 10013 and 620 Fulson St., Ste. 301, San Francisco, CA 94107
Sargent & Herkes, 225 Baronne St., Suite 1405, New Orleans LA 70112
Scientific Marine Services, Inc., 101 State Pl., Suite F, Escondido, CA 92029
Sea School, 10812 Gandy Boulevard, St. Petersburg, FL 33702
Seaworthy Systems Inc., P.O. Box 965, Essex, CT 06426; 17 Battery Pl., New York, NY 10004; P.O. Box 975, Barnegat Light, NJ 08006; 2 Skyline Pl., 5203 Leesburg Pike, Suite 700, Falls Church, VA 22041;
50 Vashell Way, Orlinda, CA 94563
George G. Sharp, Inc., 100 Church St., New York, NY 10007
R.A. Stearn, Inc., 253 N. 1st Ave., Sturgeon Bay, WI 54235
A.K. Suda & Ass., 3004 19th St., Metairie, LA 70002-4989
TIMSCO, P. O. Box 91360, Mobile AL 36691

NAVIGATION & COMMUNICATIONS EQUIPMENT
American Radio Corp., 914 164th St. S.E. B-1698, Mill Creek, WA 98012
Autronica Marine A/S, Drammensveien 126, N-0277 Oslo 2, NORWAY
CAST, Inc., 5450 Katella Ave., Los Alamitos, CA 90720
Cellnet Corp, 400 Main St, Stamford, CT 06901-3004
ComNav Marine Ltd., 1420 Frances St., Vancouver, BC, CANADA V5L 1Y9
Comsat Maritime Services, 950 L'Enfant Plaza SW, Washington DC 20024
Electronic Marine Systems, 800 Ferndale Pl., Rahway, NJ 07065
Furuno U.S.A., 271 Harbor Way, S. San Francisco, CA 94080
Hose-McCann, 1241 W. Newport Center Dr., Deerfield Beach, FL 33442
ICS Electronics Ltd., Unit V, Rudford Industrial Estate, Ford, Arundel, West Essex, UK
Mackay Communications, 300 Columbus Circle, Edison, NJ 08837
Marine Electric RPD, Inc., 50 Carol St., P.O. Box 1135, Clifton, NJ 07014-1135
Matrix Technologies, Inc., 342 Pennywell Rd., St. Johns, N.F., CANADA A1C 5J2
Megapulse, Inc., 8 Preston Court, Bedford MA 01730-2380
Negrin Marine Consultants, 840 Bond Street, Elizabeth, NJ 07201
Norwegian Telecom, P.O. Box 6701, Oslo 1, NORWAY
Pauluhn Electric Mfg. Co., Inc., 1616 N. Main, P.O. Box 53, Pearland, TX 77581
RD Instruments, 9855 Businesspark Ave., San Diego, CA 92131
Raytheon Marine Co, 46 River Road, Hudson, NH 03051
SPD Technologies, 13500 Roosevelt Blvd., Philadelphia, PA 19116
Scandinavian Micro Systems P.O. Box 155, N-1411, Kolboton, NORWAY
SGC, Inc. P. O. Box 3526 Bellevue, WA 98009
Simrad, 19210 33rd Avenue West, Lynnwood, WA 98036
Simrad Robertson, 10801 Hammyrly, Suite 100, Houston, TX 77043-1923
Sound Propeller, 1608 Fairview Ave. E., Seattle, WA 98102
Sperry Marine Inc., 1070 Seminole Trail, Charlottesville VA 22901
Standard Communications, P.O. Box 92151, Los Angeles, CA 90009
Summer Equipment Ltd., 24 West 4th Ave., Vancouver V5Y 1G3, CANADA
Trimble Navigation, 585 North Mary Avenue, P.O. Box 3642, Sunnyvale, CA 94086
Waterway Communications System, Inc. 453 E. Park Pl., Jeffersonville, IN 47130

OIL COOLERS
Sen-Dure Products, Inc., 6785 N.W. 17th Avenue, Ft. Lauderdale, FL 33309

OIL—Marine—Additives
Mobil Oil Corporation, 3225 Gallows Road, Fairfax, VA 22037-0001
Texaco, International, 2000 Westchester Avenue, White Plains NY 10650

OIL SPILL CONTAINMENT
Foss Environmental, 7440 W. Marginal Way S., Seattle, WA 98108-4141

OIL SPILL KIT
First Northern Environmental, Inc. 32 Brill St., Newark, NJ 07105

OIL SPILL RESPONSE MANAGEMENT SERVICES
Gallagher Marine Systems 1020 N. Fairfax St., Alexandria, VA 22314

OIL/WATER SEPARATORS
ACS Industries 17211 Industry Rd., Houston TX 77275
Alfa-Laval Separation, Inc., 955 Mearns Rd., Warminster, PA 18974-0556
Blohm & Voss AG, P.O. Box 10 07 20, D-2000 Hamburg 1, GERMANY;
U.S.A. Reps: Simplex-Turmar Inc., P.O. Box 168, Little Neck, NY 11363-0168
Fast Systems, 3240 North Broadway, St. Louis, MO 63147
MMC International, 60 Inip Dr, Inwood NY 11696
National Fluid Separators, 827 Hanley Industrial Ct., St. Louis, MO 63144
Nelson Industries, Highway 51 West, Stoughton, WI 53589
Ocean Power 571 Central Avenue, New Providence, NJ 07974

PAINT—COATING—CORROSION CONTROL
Corrosel, Inc., 1045 12th Ave. NW-F5A, Issaquah, WA 98027
Devoe Coatings 4000 Dupont Circle, Louisville, KY 40207
Esgard, Inc., P.O. Drawer 2698, Lafayette, LA 70502
Jamestown Distrib., 28 Narragansett Ave., P.O. Box 348, Jamestown, RI 02835
Hempel Coatings, Foot of Curie Avenue, Wallington, NJ 07057
Microphor, Inc., Marine Div., 452 E. Hill Rd., P.O. Box 1460, Willis, CA 95490
Royal Chemical, 2705 Concord Road, Belle Chasse, LA 70037
Sigma Coatings, 8979 Market St., Houston, TX 77029, 330 Rover Rd., Harvey, LA 70059, 1100 Adams St., Hoboken, NJ 07030
UT Technologies Ltd., Box 31114, Robie St. RPO, Halifax Nova Scotia Canada B3K5T9

PAINT REMOVAL
White Metals, Inc., 6300 Midvale, Houston, TX 77087

PIPE FITTINGS/CONNECTING SYSTEMS
Lokring Corp., 396 Hatch Drive, Foster City, CA 94404

PLATING EQUIPMENT
SIFCO, 5708 SCHARF RD., CLEVELAND, OH 44131-1394

POLLUTION CONTROL/ PRODUCTS/MARINE SERVICES
Foss Environmental, 7440 W. Marginal Way S., Seattle, WA 98108-4141
Oil Mop, Inc., 221 Rue De Jean, Lafayette, LA 70508

POLLUTION PACKER COMPACTORS
TFC Corporation, 77415 Cahill Rd., Minneapolis, MN 55439

POLLUTION RESPONSE COURSE
Compliance system, Inc., 26 east Bryan St., Savannah, GA 31401

PORT SERVICES
Port of Portland, 5555 N. Channel Ave., Portland, OR 97217

PROPULSION EQUIPMENT—Bowthrusters, Diesel Engines, Gears, Propellers, Shafts, Turbines
Avondale Industries, Harvey Quick Repair, P.O. Box 116, Harvey, LA 70058
American Air Filter, P.O. Box 35690, Louisville, KY 40432
ABB Drives Inc., P.O. Box 372, Milwaukee, WI 53201-0372, USA
ABB Industry Oy, P.O. Box 185, 00381 Helsinki, FINLAND
ABB TURBOCHARGER, INC, 1460 Livingston Avenue, N. Brunswick, NJ 08902
Aquamaster-Rauma Ltd., Box 220, SF-26101, Rauma, FINLAND
Aquamaster-Rauma Inc., 2315 North Woodlawn Ave., Ste. 103, Metarie, LA 70001
Bird Johnson Company, P.O. Box 1528, Pascagoula, MS 39567
Brunvoll A/S, P.O. Box 370, N-6401, Molde, Norway
Caterpillar, 100 NE Adams Street, Peoria, IL 61629-2320
Cincinnati Gear Co., 5657 Wooster Pike, Cincinnati, OH 45227
Fincantieri, Diesel Engines Div—GMT, Bagnoli della Rosandra 334, Trieste, ITALY
GE Naval & Drive Turbine Systems, 186 Boulder Dr., Fitchburg MA 01420
Golten Marine Company, 160 VanBrunt St., Brooklyn, NY 11231
Holset Engineering, Inc., 1320 Kemper Meadow, Ste. 500, Cincinnati, OH 45240
Kahlenberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241
Krupp MaK, 7555 Danbro Crescent, Mississauga, Ontario, CANADA L5N 6P9
Kobelt Manufacturing, 11720 Horseshoe Way, Richmond, BC Canada V7A 4V5
LIPS B.V., P.O. Box 6, 5151 RP Drunen, The Netherlands
LIPS U.S.A. Inc., 3617 Koppens Way, Chesapeake, VA 23323
Lohmann & Stolterfoht, P.O. Box 1860, D-58408 Witten, Germany
Mapeco Products Inc., 90 Forest Ave., Locust Valley, N.Y. 11560
Markisches Werk, P.O. Box 1442, D-5884 Halver GERMANY
MAN B&W Diesel, 17 State St., New York, NY 10004
MAN B&W Diesel A/S, Ostervej 2, DK-4960 Holeyb, DENMARK
MAN B&W Diesel A/S, Alpha Diesel, Niels Juel Vej 15, DK-9900
Frederikshavn, DENMARK
MAN B&W Diesel GmbH, Stadtbachstrasse 1, D-86153 Augsburg 1 GERMANY
MTU of N.A., 10450 Corporate Dr., Sugar Land, TX 77478
New Sulzer Diesel, Ltd., CH-8401, Winterthur, SWITZERLAND

North American Marine Jet, P.O. Box 1232, Benton, AR 72015
Orion corp., 111 cedar Creek Rd., Grafton, WI 53024
Rolla SP Propellers SA, Via Silva 5, P.O. Box 251, 6828 Balerna SWITZERLAND
Rolla SP Propellers USA, 4030 Mustang Road, Melbourne, FL 32934, USA
Karl Senner Inc., 25 W Third, Kenner LA 70062
Schottel-Werft, Manizer Strasse 99, D-56322 Spay/Rhein, GERMANY
Schottel North America, Inc., 1505 Corbin Ave., Hammond, LA 70403
Siemens Electric Ltd., 1180 Courtney Park Rd., Mississauga, ONTARIO
Sound Propellers, 1608 Fairview Ave. E. Seattle, WA 98102
Stewart & Stevenson, 1400 Drestrehan, P.O. Box 8, Harvey LA 70059-0008
Thrustmaster of Texas, 12227-K FM 529, Houston, TX 77041
Ulstein Bergen Diesel A/S, P.O. Box 924, N-5002, Bergen, NORWAY
J. M. Voith GmbH, Marine Division, Postfach 1940, D-7920, Heidenheim/Brenz, GERMANY U.S. Rep: Voith Schneider America Inc., 121 Susquehanna Ave., Great Neck, NY 11021
Oy Wartsila Ab, Vasa and Abo Divisions, P.O. Box 244, SF65100 Vasa, FINLAND

PUMP—Repair—Drives
Allweiler Marine Inc., USA Rep., 14812 S.E. 62nd court, Bellevue, WA 98006
Allweiler Marine Inc., Postboks 149, 1351 rud, NORWAY
Del Gaudio, 619 Industrial Rd., Carlstadt, NJ 07072
Frank Mohn Houston, Inc., P.O. Box 1586, La Porte, TX 77572-1586
Gilkes, Inc., PO Box 628, Seabrook, TX 77586
Jim's Pump Repair, 48-55 36th St., Long Island City NY 11101
Jerry B. Leach Co., Box 71, 647 State Rd., Cheraw, SC 29520
Leisritz Corporation, 165 Chestnut Street, Allendale, NJ 07401
Vila Motivator, 566 Parker St., Newark, NJ 07104

REFRIGERATION EQUIPMENT/SERVICES
Adrick Marine, 141D, Central Ave., Farmingdale, NY 11735
Bailey Refrigeration Co., 2323 Randolph Ave., Avenel, NJ 07001

REMOTE VALVE OPERATORS
American United Marine Corp., 5 Broadway, Rt 1, Saugus, MA 01906
Elliott Manufacturing, P.O. Box 773, Bing
Teleflex, Inc., 771 First Ave., King of Prussia, PA 19406

RIGIN INFLATABLE BOATS
American Eagle, 780 E. Pearle Jensen Way, LaConner, WA 98257

ROPE—Manila—Nylon—Hawesers—Fibers
Allied Signal Inc., Fibers Division, 1411 Broadway, New York, NY 10018
American Mfg. Co., 200 southpark Rd., Lafayette, LA 70508-3609

RUDDER BUSHES
Vesco Plastics, P.O. Box 40647, Cleveland 2022, South Africa

RUDDER STOCK SEALS
Blohm & Voss AG, P.O. Box 100720, D-2000 Hamburg 1, GERMANY
U.S.A. Reps: Simplex Turmar Inc., P.O. Box 168, Little Neck, NY 11363-0168
John Crane Marine USA, 1536 Barclay Blvd., Buffalo Grove, IL 60089

SAFETY LIGHTING
Datrex, Inc., P.O. Box 1150, Kinder, LA 70648-1150

SANITATION DEVICE—Pollution Control
Byrne, Rice & Turner, Inc., 1172 Camp Street, New Orleans, LA 70130
Elech International Corp., 1110 Industrial Blvd., Sugarland, TX 77478
Envirovac Inc., 1260 Turret Dr., Rockford, IL 61111
Fast Systems, 3240 North Broadway, St. Louis, MO 63147
Microphor, Inc., 452 E. Hill Rd., P.O. Box 1460, Willis, CA 95490
Ocean Power 571 Central Avenue, New Providence, NJ 07974
Research Products Blankenship, 2639 andjon Dallas, TX 75220

SATELLITE COMMUNICATIONS
British Telecom, Room 203, 43 Bartholomew Close, London EC1A 7HP
Comsat Mobile Communications, 22300 Comsat Dr., Clarksburg, MD 20871-9475
Norwegian Telecom, Postboks 6701 St. Olavs Plass, N-0130, Oslo, Norway
PTT Telecom Netherlands P.O. Box 30150-2500 JD The Hague, NETHERLANDS
Singapore Telecom, 15 Hill Street, Telephone House, 2nd storey, Singapore 0617

SCALE MODELS
Markilect, PO Box 225, Oconomowoc, WI 53066
Scale Reproductions, 16346 County Road 13, Fairhope, AL 36532
Sturgeon Bay Model Shop, 187 N Ninth Ave., Sturgeon Bay WI 54235

SEALANTS
Boatlife, Inc., Div. of Life Ind., 205 Sweet Hollow Rd., Old Bethpage, NY 11804

SEALS
John Crane Marine USA, 1536 Barclay Blvd., Buffalo Grove, IL 60089

SELF UNLOADING SYSTEM REPAIR
Klehma Rubber Engineering, GERMANY
U.S. Rep: Simplex-Turmar Inc., P.O. Box 168, Little Neck, NY 11363-0168

SHIP REPAIR
European Ship Repair 120 NE 20th St. Miami, FL 33137
Golten Marine Company, 160 Van Brunt St., Brooklyn, NY 11231

SHIPBOARD COMMUNICATIONS
Hose-McCann, 1241 West New Newport Center, Deerfield Beach, FL 33442

SHIPBUILDING EQUIPMENT
NEI Synchron, Inc., 8970 S W 87th Ct., Miami FL 33176

SHIPBUILDING—Repairs, Maintenance, Drydocking
Amfels, Inc., P.O. Box 3107, Brownsville, TX 78523
Astilleros Espanoles, S.A. Ochandiano, 14-16 28023 El Plantio SPAIN
Atlantic Marine, Inc., P.O. Box 3202, Mobile, AL 36652
Avondale Industries Inc., P.O. Box 50280, New Orleans LA 70150
Bender Shipbuilding & Repair, P.O. Box 42, Mobile AL 36601
Bisso Marine Co., P.O. Box 4113, New Orleans, LA 70178
Bollinger Lockport & Larose, P.O. Box 250, Lockport, LA 70374-0250
Boston Whaler, Inc. Commercial Products Div., 1149 Hingham St., Rockland, MA 02370
Caridoc, P.O. Box 1147 Port Of Spain, Trinidad, W.I.
Chris-Marine AB, P.O. Box 9025, S-2000 39, Malmö, SWEDEN
Conrad Industries, 1501 Front Street, P.O. Box 790, Morgan City, LA 70381
Fincantieri SpA Cantieri Navali Italiani, Via Cipro 11, 16129 Genoa ITALY
G.M.D. Shipyards, PO Box 050221, Brooklyn, NY 11205
Gold Coast Yachts, Inc., Box 1980 Kingshill, St. Croix, U.S.V.I. 00851
Golten Marine Company, 160 Van Brunt St., Brooklyn, NY 11231
Gulf Coast Fabrication, Inc., P.O. Box 539, Lakeshore, MS 39558
HDW, Kiel, Germany, USA Rep.: Roland Marine Inc., 90 Broad St., NY, NY 10004
Hall Buck Marine, P.O. Box 35, Baton Rouge, LA 70816
Hitachi Zosen, Hitachi Shipbuilding & Engineering Co., 1-1-1 Hitotsubashi
Chiyoda-Ku Tokyo 100 Japan
Hike Metal Products & Shipbuilding, Box 698, Wheatly, Ont., Canada N0P 2P0
IHI, Tokyo Chuo Bldg., 6-2, Chiyoda Tokyo 100 Japan
Intermarine (USA), Inc., 301 N. Lathrop Ave., Savannah, GA 31402
Jacksonville, Shipyards, 750 E. Bay St., Jacksonville, FL 32202
Jeffboat, Inc., P.O. Box 610, Jeffersonville IN 47130
Kvaerner Masa-Yards Oy, Box 132, SF-00151, Helsinki, FINLAND
Kvichak Marine, 615 N 34th St, Seattle, WA 98103
Leevac Shipyards, P.O. Box 1190, HWY 90 East, Jennings, LA 70546
Lindenau GmbH, Skagerakerufer 10, Postfach 9093 D-2300 Kiel, Friedrichsort GERMANY
Lisnave, Apartado 2138, 1103 Lisbon, Codex PORTUGAL
Marco, Inc., 2300 W Commodore Way, Seattle, WA 98199
Motor-Service AB, Box 2115, 144 04 Ronninge, SWEDEN
Munson Manufacturing, 150 West Dayton, Edmonds WA 98020
Newport News Shipbuilding, 4101 Washington Ave., Newport News, VA 23607
Nichols Brothers Boat Builders, 5400 South Cameron Rd., Freeland, WA 98249
North Florida Shipyards, Inc., P.O. Box 3255, Jacksonville, FL 32206
Peterson Builders, Inc., 101 Pennsylvania Ave., Sturgeon Bay, WI 54235-0650
PDT, 750 Middle Ground Blvd., Newport News, VA 23606-2528
Thomas Marine, 37 Bransford Street, Patchogue, NY 11772
Samsung Heavy Ind., 25, 1-ka, Bongrae-dong, Chung-ku, Seoul, Korea
SeaArk, P.O. Box 210, Monticello AR 71655
SeaFab, P.O. Box 1651, 4111 Cedar St. Pascagoula, MS 39567
Service Marine Industries, P.O. Box 3606, Morgan City LA 70381
Skipperliner Shipyards, 621 Park Plaza Dr, Dept 21, LaCrosse WI 54601
Steiner Shipyards, Inc., P.O. Box 742, Bayou la Batre, AL 36509
Swath Ocean, 979 G Street, Chula Vista, CA 92011
Trinity Marine Group, Box 3029, Gulfport, MS 39505-3029
Westport Shipyard, P.O. Box 308, Westport, WA 98595
Willard Marine, Inc., 1250 N. Grove St., Anaheim, CA 92806
Zidell Marine Corp., 3121 S.W. Moody Street, Portland, OR 97201
Zodiac of North America Inc., Thompson Creek Rd., P.O. Box 400, Stevensville, MD21666

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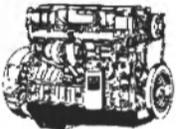
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