

MARITIME REPORTER

AND
ENGINEERING NEWS

Royal Caribbean

and is set to cast a

Nav/Comm Electronics Review • Oil Spill Techn

FEBRUARY 1999

Cruise Ship Interior Design

Tailoring a ship to withstand the test of time is no easy task

Norwegian Know How

Norway's maritime industry keeps an even keel with a steadfast adherence to technological solutions

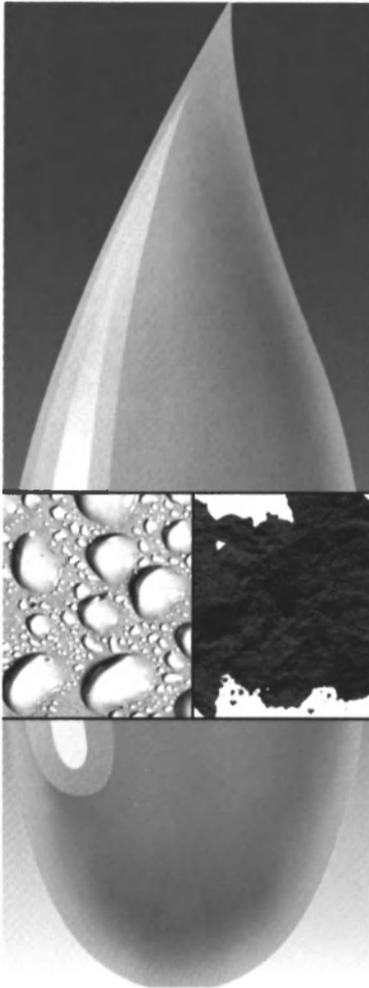
's 142,000-ton Voyager of the Seas will be

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an imposing shadow over the cruise market

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Solutions beyond technology



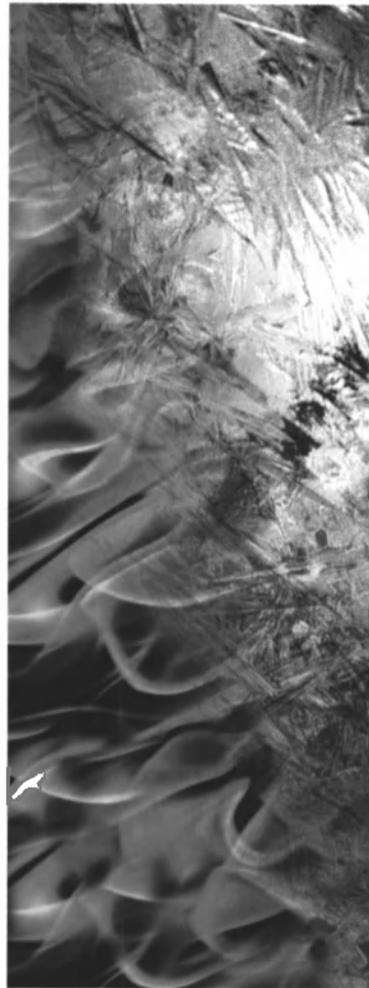
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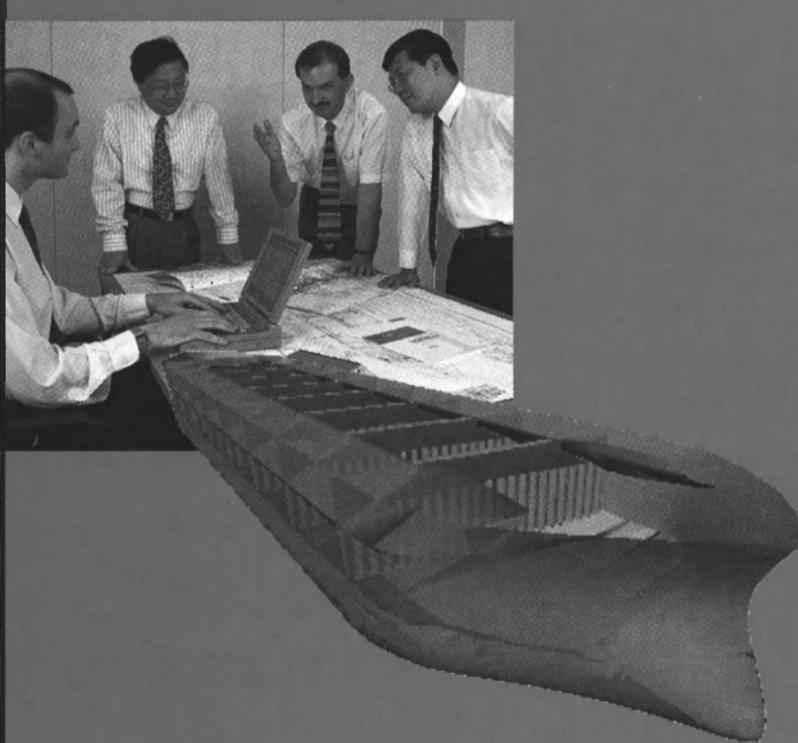
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Pictured on this month's cover is Royal Caribbean's record-breaking Voyager of the Seas. When it comes on line later this year, the 142,000-ton, Kvaerner Masa-Yards built ship will hold the title of the world's largest cruise ship ever. See this month's cruise ship industry coverage, starting on page 24.

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Say what?

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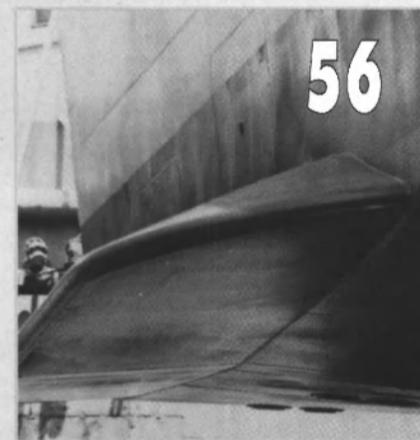
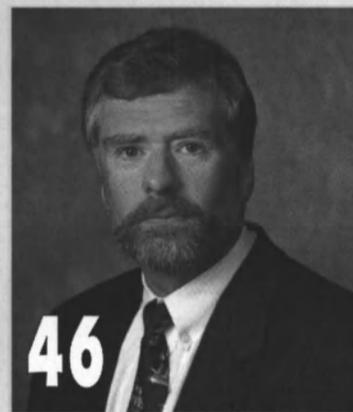
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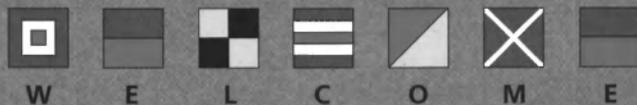
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e-mail: mren@marinelink.com

PUBLISHERS

Charles P. O'Malley
John E. O'Malley
John C. O'Malley

Vice President/Editorial Director
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Production Editor
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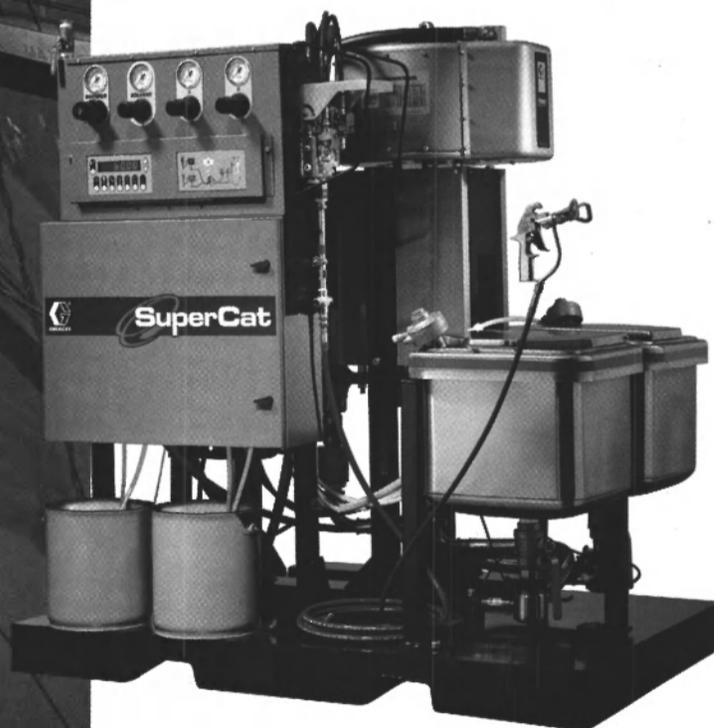
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EDITOR'S NOTE

Glamorous is not a word used to describe the shipbuilding industry. However, like any rule, there are exceptions, and in this case the cruise industry injects a healthy dose of flair and style. Cruise companies have maintained a steady market expansion for nearly the past two decades, and have for the past five years been filling the newbuild coffers at yards in Italy, Finland, Germany and France with a steady stream of expensive ships.



According to statistics from CLIA, there is the potential to add upwards of 47,000 new berths by the end of 2001, should all current contracts and options come to fruition. The ramifications of such an expansion are many, and extend well beyond the confines of traditional shipbuilding, repair and equipment supply. In an effort to foster legions of new cruisers, the cruise shipping companies are expanding their bases of operation up and down the East and West coasts of the U.S., as well as internationally, although Florida still remains the Cruise Capitol of the world.

However, the fleet of newer, bigger and more sophisticated ships is undoubtedly helping to re-shape the ship repair and supply business in the U.S., as U.S. companies will increasingly compete to garner a larger piece of this cash pie.

In addressing a recent MarAd-sponsored conference on challenges facing the ship repair and conversion industry in the U.S., Newport News Shipbuilding's Rebecca Stewart noted that the evolution of cruise ship design and outfitting continues to tax the physical facilities and technical know-how of shipyards and equipment suppliers. Specifically, she noted the increasing usage of advanced propulsion systems (such as the Azipod); the increased usage of advanced materials (to make ships lighter and faster); and the usage of fiber optic communications onboard as areas where a shipyard must be technically capable, to ensure a job is completed correctly and on time.

Something as innocuous as the tools which a shipyard uses can even become problematic, when one realizes that most cruise ships are built outside of the U.S., but most operate in and/or around, and are thus serviced, maintained and repaired in the U.S. (This could change soon, however, pending the finalization of a contract to build a pair of cruise ships at Ingalls Shipbuilding).

This month's cruise coverage (starting on page 24) is designed to provide a balanced view of the current market and future potential, as well as provide insights regarding cruise ship design, repair, management and outfitting.

Gregory R. Franthum

Coming Up In MR/EN in 1999

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Telephone: +561-368-1021; Fax: +561-368-1161
24-hr Tel/Fax: +561-998-0313; Mobile Tel: +561-716-0338

Australia

ANNE MURRAY/YVONNE SANDFORD
World Media Network Pty. Ltd.
Suite 5, Level 1, 89 York St., Sydney, NSW 2000
Australia
Tel: +61 2 9299 5677; Fax: +61 2 9299 6178

Argentina

R. LESLIE RAMSAY
Calle Pellegrini 173
Primer Piso, Departamento C
1009 Buenos Aires, Argentina
Tel: +54 1 394 8821; Fax: +54 1 326 4377

Benelux

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Te: +31 172 230707; Fax: +31 172 230708

Brazil

JOSE DUARTE DOS SANTOS
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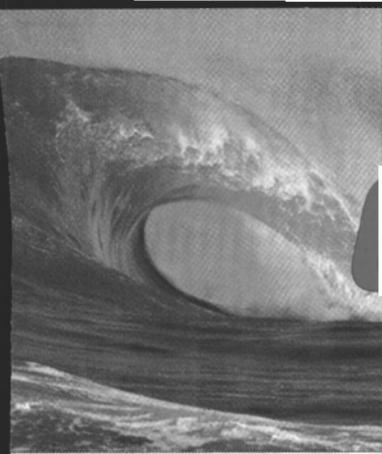
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Symbols of integrity



by David Tinsley,
technical editor

Through the increasing array of notations, optional notations and descriptive notes devised by classification societies, the caliber of a vessel and additional technical measures incorporated by her owner can be more accurately gauged by the wider market.

Although society-specific abbreviations sometimes smack of industry enciphering, a string of letters tells a story and, in a business environment in which quality is ever more the watchword, can denote a level of technical excellence as well as conformity to strict requirements.

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To the uninitiated, ICM(BTs), CSA-1(25) and VCS-2B may seem to be further symbols of an arcane shipping world

dimension to the description of more sophisticated vessels, and recognizes efforts to exceed standards.

To the uninitiated, ICM(BTs), CSA-1(25) and VCS-2B may seem to be further symbols of an arcane shipping world. In fact, they

denote some of the technical attributes of a new type of Suezmax crude oil carrier taking shape in South Korea, under contract to a Swedish company convinced of the intertwining relationship between sound environmental practice and long-term business and asset value prospects.

Stockholm-based N&T Argonaut's two double-hulled, 158,000-dwt tankers due out of the Daewoo yard in July and September 1999, represent an investment of more than \$100 million in a highly advanced design type encapsulating added features to enhance service life and provide long-run environmental protection.

Besides the more standard labels of compliance with the rules of Det Norske Veritas, the prospec-



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INVESTMENT IN DESIGN

tive allocation of ICM(BTs) will denote that each vessel has been built with over-dimensioned steel thicknesses in the load-sensitive, upper portions of the hull.

In conferring the CSA-1(25) notation, the society will demon-

strate that the overall hull structure has been dimensioned for longer service life, with enhanced fatigue strength and advanced, internal painting systems. Coatings will afford corrosion protection throughout the ballast

tanks and to the tops and bottoms of the cargo spaces.

VCS-2B will indicate that each vessel has been equipped to recycle petroleum gases in a closed system back to suitably-equipped loading terminals during cargo loading

operations. In addition, each of the N&T Argonaut vessels will have an OPP-F notation, signifying that the fuel tanks as well as the cargo tanks will be protected by a deep double bottom.

Furthermore, monitoring and protective equipment employed during bunkering will be particularly extensive.

The ESP label, now mandatory for new vessels, will demonstrate that each ship will be subjected to more rigorous, frequent inspection by the classification society during her service life, while the inclusion of EO within the list will confirm the requisite automation and monitoring installations to permit periods of unmanned engine room operation.

The cargo section will be encased by 2.3-m double sides and 2.4-m double bottom, and the double-hulled structure will enable the inner sides of the cargo tanks to be flat and obstruction-free, making them easier to clean. Offering a laden speed of 15.2-knots and daily fuel consumption of 60.5 tons, the 22,920-bhp class is considered especially suitable for sensitive waters such as the Baltic.

The project demonstrates that environmental protection and good economy can go hand in hand over an extended life span. There is indeed a story in the class symbols.

AMCV "Project America" Initiative Moves Forward

McLeod Leaves Carnival To Join American Classic Voyages Co. As CEO

The bid to build cruise ships in the U.S. received a significant bolster with the addition of a proven industry leader to the team. **Roderick K. McLeod**, a 27-year veteran of the cruise industry, has been appointed president and CEO of American Classic Voyages Co.'s "Project America" initiative to construct the largest cruise ships ever built in a U.S. shipyard. McLeod, who will join the Project America team by the end of February, has announced his resignation as Carnival Corporation's senior vice president of marketing. Carnival has announced that Jack Anderson, formerly senior vice-president of marketing and sales for Holland America Line-Westours, will replace McLeod.

Phil Calian, president and CEO of American Classic Voyages Co. (AMCV), said "Rod will be responsible for the building, branding and marketing of our new ships. He will also oversee our plans to reflag an existing vessel, which we will address in greater detail after signing the shipyard construction contract for the first two new ships."

Micky Arison, chairman and CEO of Carnival

Corporation, said, "We wish Rod every success in this venture as we are keenly interested in the return of the U.S. flag to the cruise vacation industry as well as the resumption of passenger shipbuilding in American shipyards."

In October 1998, AMCV signed a letter of intent with Ingalls Shipbuilding division of Litton Industries to build two 71,000-grt passenger cruise ships for the Hawaii market, with options to construct up to four additional vessels. They will be the largest U.S. cruise ships ever built and the largest cruise ships constructed in America in more than 40 years. The two initial ships are expected to cost \$400 million each and the first vessel is anticipated to enter service in late 2002. Details of the ships' design will be included in the final contract, scheduled to be signed by April 1, 1999.

Project America is the result of the U.S.-Flag Cruise Ship Pilot Project Statute passed by Congress in 1997 (PL 105-56), with the goal of revitalizing the U.S.-flag oceangoing cruise ship fleet.

(For more on the rapidly evolving Cruise market, see page 24)

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The Swedish example

Measures implemented by the Swedish authorities to cut atmospheric pollution from ships' engines, not least the pragmatic policy of linking fairway dues with emissions performance, undoubtedly point the way to similar action by other European countries.

While impending Marpol stipulations governing pollutant exhaust emissions will impose a set of international requirements in the shape of limit values, the Swedish initiative goes a stage further in structuring a system of incentives which financially benefits the most environmentally responsive ship operators.

The arrangements provide a tariff rebate for vessels with low nitrogen oxide (NOx) production, while penalizing those with installations generating what are judged as high volumes of harmful emissions.

In addition, Sweden has also stipulated an exceptionally low

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INVESTMENT IN DESIGN

NOx output level of 2-g/kW/h for ferries in regular service between the mainland and the island of Gotland, in the southern Baltic.

While IMO edicts will elevate the industry as a whole to a new level of emissions performance

over time, Sweden's action and the spread of local requirements and regulations elsewhere will make low emissions a competitive factor in the future, influencing design and investment.

For its new monohull fast ferry

ordered in France, local operator Rederi AB Gotland turned again to Siemens' specialist engineering skills in selective catalytic reduction (SCR) technology to ensure compliance with the tough Swedish standard.

Having cut NOx by 90 percent in other applications, the Siemens SINOx exhaust gas cleaning system applied to the 35-knot, stern-ramped Gotland ferry is claimed to have successfully reduced NOx emissions "well below 2-g/kW/h." Installed directly downstream of the four Ruston medium-speed engines and the three auxiliaries, the SCR units convert nitrogen oxides into harmless nitrogen and water vapor.

The specially developed, ceramic honeycomb-type catalyst should last 16,000 hours or more before replacement, and the system fulfills a sound attenuation function as well as meeting the rigorous Swedish anti-pollution requirements.

To get diesel engine NOx emissions down to the maximum prescribed for the Gotland traffic required an additional outlay of an estimated \$1 million in equipment and installation costs, representing some 2.5 percent of the total project investment.

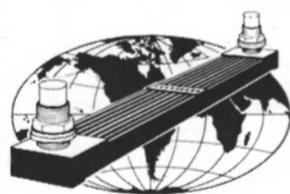
Rederi AB Gotland is now the biggest user of Siemens SINOx system in the marine field, as it had earlier retrofitted a total of 13 units on two RoRo passenger ferries deployed in the same trade, the Thjelvar and Visby.

Siemens' development of the SINOx exhaust gas cleaning system drew on its experience of catalytic reduction of NOx in the stationary diesel field. Its first sea-going application was the system fitted to one of the four main engines of TT-Line's conventional Ro-Pax ferry Nils Dacke in 1995. The ferry's power installation became a focal part of the original German study project, known as CLEAN, into ways of substantially reducing harmful exhaust emissions without penalizing fuel consumption.

While environmental issues increasingly influence the maritime sector, it seems likely that the fast ferry business will attract even more attention in this respect because of its emphasis on coastal or near-sea operations, and because of the comparably large amounts of energy used per transported unit so as to achieve high speed.

The technology drivers and those shipping firms which have taken the technology aboard are well placed for the future.

WHAT DO THESE SIX BOATS HAVE COMMON?

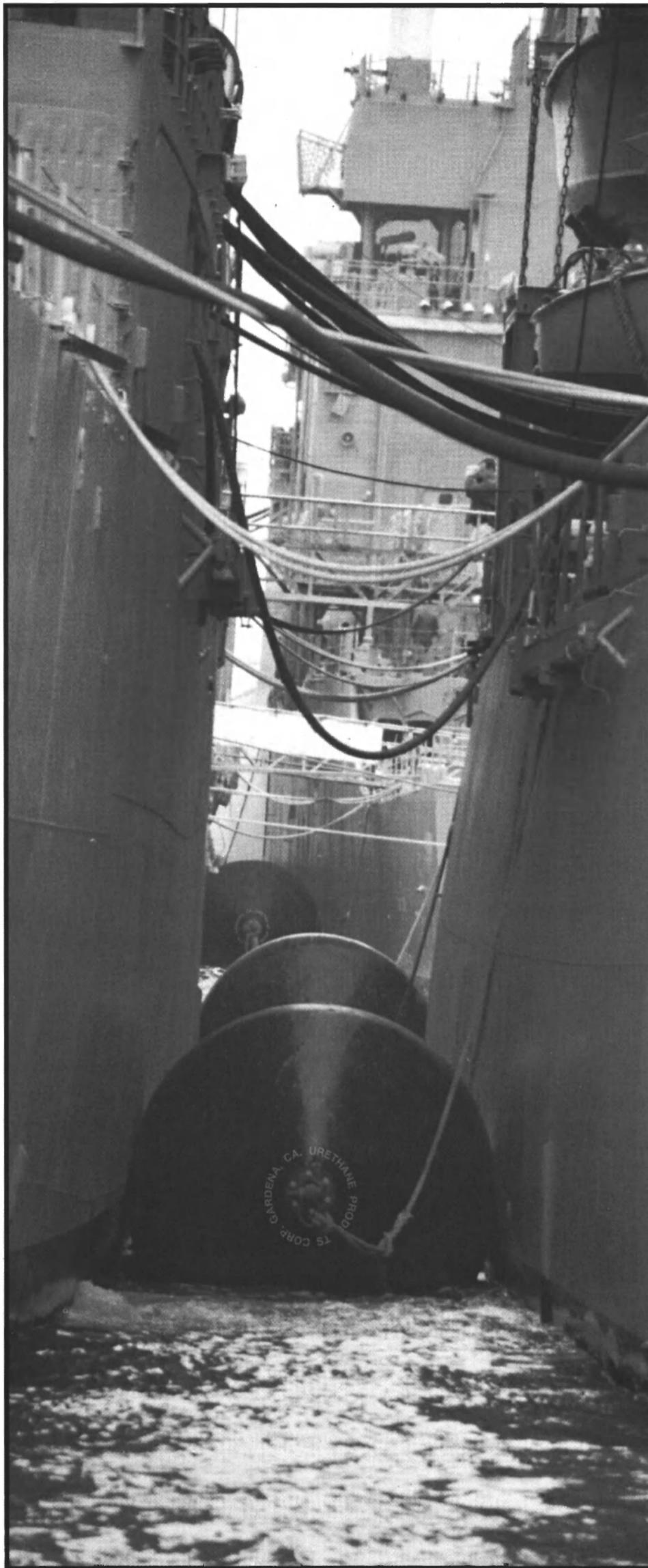


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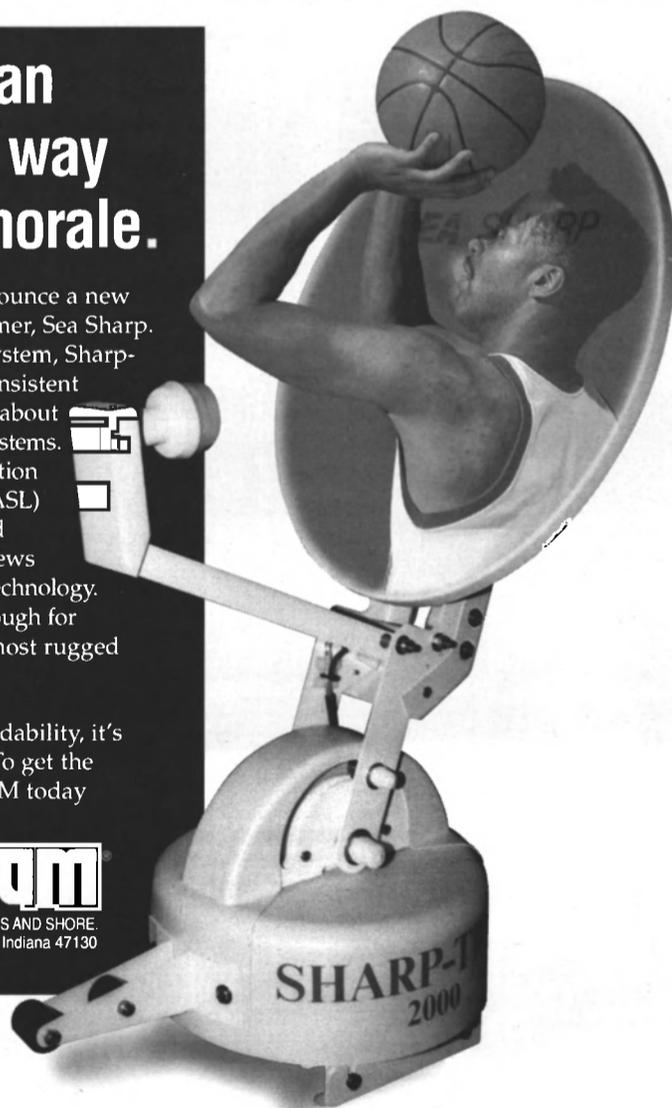
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MARINE FINANCE

**Oslo: December Ended
Slightly Lower**

Following a series of turbulent months, maritime shares at the Oslo Stock Exchange continued to fall during the first half of December before a strong comeback in the second half made the Shipping Index drop only less than one percent in the period. The All Share Index fell by 1.9 percent in December.

But even though shipping & offshore did better than the Oslo market in general during this last month, the maritime sector ended 1998 as the worst performing sector. The Shipping Index lost 45.5 percent for the year while the All Share Index dropped 26.7 percent, concluding the worst year since the start of today's indices in 1983.

As in November, Awilco dominated the offshore list as they saw solid gains for both share classes. Only three other offshore shares ended

December on the positive, while TGS Nopec experienced yet another

weak month. The stock fell by as much as 34.4 percent in the period following a 31.8 percent drop in November. Stolt Comex Seaway also struggled as their stock fell almost 30 percent. With oil prices below \$10 per barrel, a lot of offshore shares fell dramatically during the period, and the smaller companies were particularly hurt. The market capitalization of offshore shares on the SMB List fell by more than 30 percent, including the delisting of Discoverer as they merged with ProSafe. A total of eight shipping shares experience double digit gains in December, with Wabo, First Olsen Tankers and Royal Caribbean Cruises on top. Also NCL Holding, the other cruise share in Oslo next to RCCL, did well as the share rose 19.2 percent. Jinhui Shipping and Transportation dropped all of 30 percent in November, but rebounded nicely this month with a 14.3 percent gain. Problems in Russia sent Nomadic Shipping down all of 41.7 percent, while Belships, Mosvold Shipping and Loki also dropped considerably.

December Winners

Shipping	List	Change
Wabo	Main	+26.1%
First Olsen Tankers	Main	+23.4%
Royal Caribbean Cruises	Main	+22.1%
NCL Holding	Main	+19.2%
Jinhui Shipping and Trans.	Main	+14.3%

Offshore	List	Change
Awilco A	Main	+15.2%
Awilco B	Main	+13.6%
Smedvig B	Main	+3.6%
Siem Industries	Main	+2.3%
Transocean Offshore	Main	+0.1%

December Losers

Shipping	List	Change
Nomadic Shipping	Main	-41.7%
Belships	Main	-30.0%
Mosvold Shipping	Main	-25.0%
Loki	Main	-23.1%
Stolt-Nielsen B	Main	-19.8%

Offshore	List	Change
TGS Nopec	Main	-34.4%
Stolt Comex Seaway	Main	-29.4%
Stolt Comex Seaway A	Main	-25.9%
Petrolia Drilling	SMB	-25.8%
Navis	SMB	-22.6%

Market Summary 1998

New Listings 1998	Sector	Manager
Havila Supply	Offshore	Pareto Fonds og DnB Markets
Northern Offshore	Offshore	Fearnley Fonds
Nortrans Offshore Ltd.	Offshore	Pareto Fonds og DnB Markets
Polar Holding	Offshore	Pareto Fonds og Bergen Fonds
Tanker Navigation	Shipping	Fearnley Fonds
Team Shipping	Shipping	DnB Markets

Delistings 1998

Brøvig Supply: Acquired by GulfMark Offshore Inc.
Marine Drilling Companies (Norway): Acquired by Marine Drilling Companies Inc.
Nordstrom & Thulin B: Merged with Argonaut AB
Sævik Supply: Acquired by Trico Marine

Delistings Resulting From Mergers 1998

Discoverer: Merged with ProSafe
Seateam Technology: Merged with Det Sondenfeldske

World Ship Orderbook Recovery Continues

The total world ship orderbook has continued to recover from the drop seen at the end of the March 1998 quarter. In figures recently published by Lloyd's Register (LR) in its quarterly *World Shipbuilding Statistics*, the total world orderbook grew by 2.1 million gross tonnage (mgt) in the quarter to end-September 1998. It now stands at 57.7 mgt — a rise of nearly four percent against the previous quarter. The orderbook now stands 1.1 mgt higher than at the end of the December 1997 quarter, and shows a 7.2 mgt increase over the same quarter last year. New orders reported in the quarter totaled almost 8.5 mgt, returning to similar levels to those reported in March, June and September 1997, but still well down on December 1997's impressive 11.5 mgt of new orders. This

Delivery schedule of the world orderbook

	Orderbook	1998	1999	2000+
No. of ships	2,727	905	1,340	482
GT (millions)	57.7	9.7	28.9	19.1

quarter's 8.3 mgt of new orders are well above the 5.8 mgt reported in March 1998 and the 6.5 mgt reported in June 1998.

Completions in the quarter remained relatively constant at around 6 mgt. This average has been maintained throughout 1996, 1997 and 1998 to date; although an increase to 6.9 mgt was recorded in March 1998, this fell back to 5.7 mgt in both June and September 1998.

Japan and South Korea continue to dominate the market. Japan has pulled slightly ahead of South Korea with her orderbook now standing at 20.1 mgt, representing almost 35 percent of the total world orderbook. South Korea's total orderbook stands at 18.9 mgt, representing 33 percent of the total world orderbook. Japan's lead over South Korea was helped by securing 10 new orders for crude oil tankers totaling 1.1 mgt, compared with South Korea's 0.9 mgt of new orders for the same ship-type. Although South Korea remains the world's largest builder of vessels of this shiptype, her lead over Japan has been steadily eroded: at the end of the March 1998 quarter, South Korea was contracted to build 54 percent of all crude oil tankers on the world orderbook, with Japanese builders contracted to build 37 percent. By the end of the September 1998 quar-

ter, South Korea's share had fallen to 47 per cent and Japan's share had risen to 46 per cent.

The delivery schedule of the current world ship orderbook shows that some 17 percent is expected to be completed by the end of the

year, with a further 50 percent expected to be completed by the end of the century. Around 38 percent of the 28.9 mgt of ships scheduled for completed in 1999 are either crude oil tankers or oil products tankers. Offshore supply and other offshore vessels also have shown significant increases

in activity since the end of the September 1997 quarter, with an increase of around 45 percent in orders in offshore supply ships. In the category other offshore, which includes floating production, storage and offloading vessels (FPSOs), there has been an increase of more than 66 percent.

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In addition to cruise ships and passenger ferries, Kvaerner Masa-Yards has also expertise in building LNG gas carriers, cable ships, icebreakers and ice-going technology vessels, such as advanced tankers, research vessels and vessels for the offshore oil and gas industry, such as floating oil storage and production vessels.

Kvaerner Masa-Yards Inc. employs about 4,300 people and is part of the Shipbuilding group of Kvaerner ASA, which has thirteen newbuilding yards in Finland, Norway, the UK, Germany, the US, Russia and Singapore.

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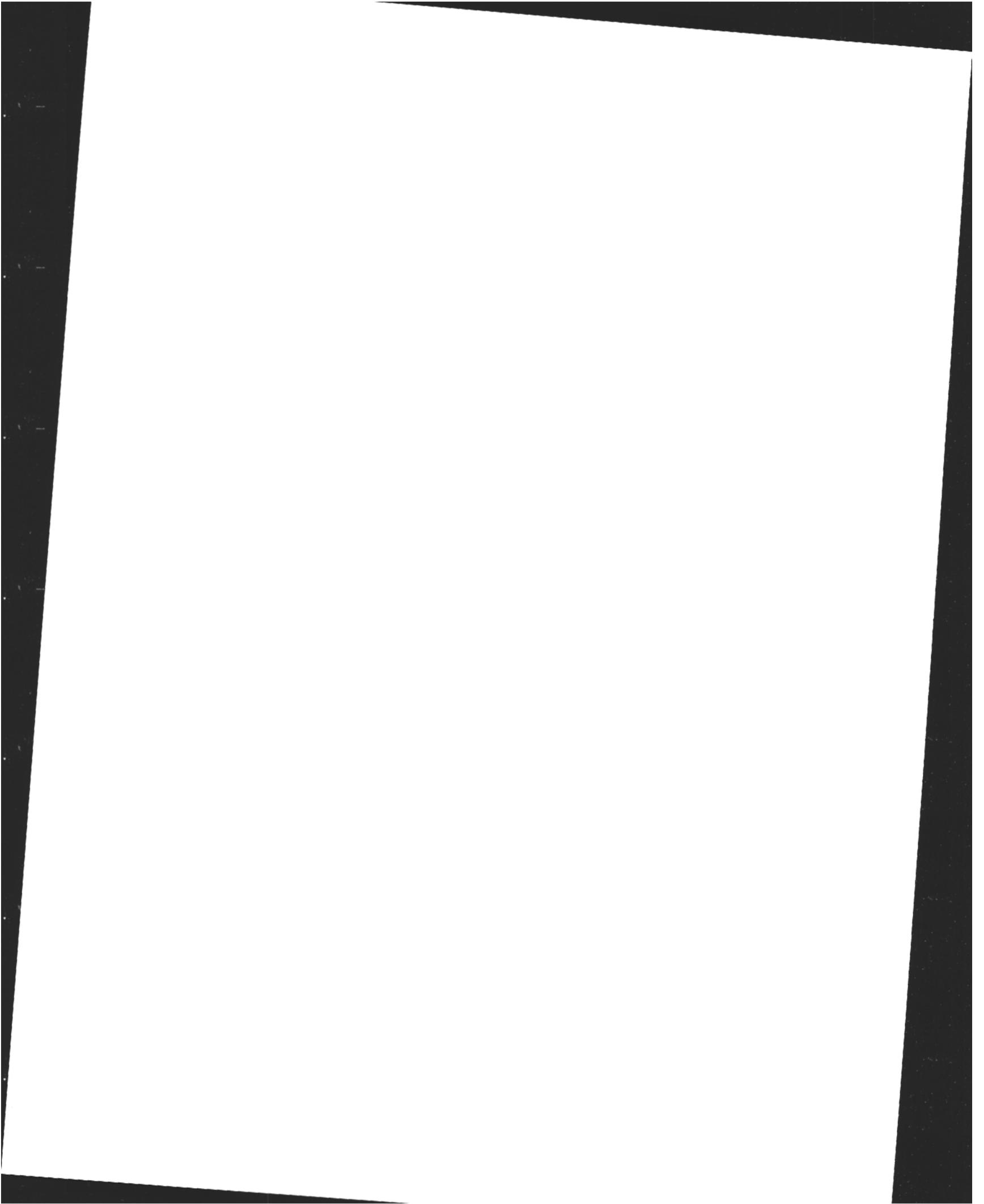
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Consolidation of Power

The U.S. shipbuilding market continues its amazing metamorphosis, as Newport News Shipbuilding and Avondale Industries will combine their considerable resources in \$470-million proposed deal.

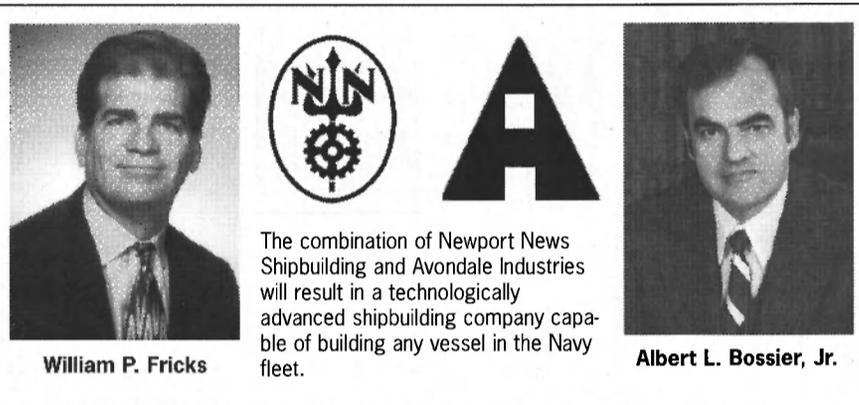
The U.S. shipbuilding industry continued its incredible metamorphosis with the announcement of a proposed merger between Newport News Shipbuilding (NNS) and Avondale Industries, a merger which would — pending shareholder acceptance — create arguably the most powerful combination of maritime resources in the world.

The merger can be viewed as one more indication of how prevailing international business winds have spurred unprecedented levels of mergers, takeovers and consolidations, inside and out of the maritime industry.

Roots of the merger can also be traced, in essence, to the world's continually changing political climate, specifically the death of the Cold War. It was this historic event which precipitated the U.S. Navy fleet drawdown, resulting in far less business for the country's shipbuilders and leading to a host of new alliances and partnerships formed to bid for the remaining navy work. It became, then, only a matter of time before these loose alliances became official mergers and takeovers.

As the companies pointed out in releasing the deluge of data regarding the proposed merger, the \$470 million merger creates a broad-based shipbuilding company capable of designing, building and maintaining every ship in the U.S. Navy fleet. The new company will not only be technically capable, but geographically diverse, with a strong presence on the East, West and Gulf Coasts, a move designed to further enable it to become the full service shipbuilder of choice for the U.S. Navy. Newport News acquired San Diego-based Continental Maritime Industries in December 1997 as the first step in its ongoing strategy to create a comprehensive inventory of services to the Navy's aircraft carrier fleet.

The transaction creates a shipbuilding company — to be known as Newport News Avondale Industries — with estimated 1999 revenues of \$2.6 billion and nearly 24,000 employees.



William P. Fricks

The combination of Newport News Shipbuilding and Avondale Industries will result in a technologically advanced shipbuilding company capable of building any vessel in the Navy fleet.

Albert L. Bossier, Jr.

"The combination of Newport News and Avondale brings together two highly skilled and tremendously capable shipbuilding companies," said **William P. Fricks**, Chairman and CEO of Newport News. "We believe the new company holds immense promise, and we expect to deliver measurable results in the form of higher returns for shareholders, enhanced value for our customers, and increased long term opportunities for employees."

Albert L. Bossier, Jr., Chairman and CEO of Avondale, said: "This merger is about building a stronger combined company. Avondale's experience in the construction of Navy and commercial surface ships complements Newport News' strengths in aircraft carrier and submarine construction, refueling, and overhaul. Together, we can design, build, and maintain every ship in the Navy and Coast Guard fleets."

There will be a five-person executive management committee of the combined company. Bill Fricks will serve as Chairman and CEO. Al Bossier will serve as Vice Chairman while also retaining his position as President and CEO of Avondale. **David J. Anderson** will serve as Senior Vice President and CFO. **Thomas C. Schievelbein** will be Executive Vice President, as well as COO of Newport News. **Thomas M. Kitchen** will be Executive Vice President, and will become COO of Avondale. Bossier and two current outside directors of Avondale will join the company's board.

\$8 Billion Backlog

"Our funded contract backlog

will total nearly \$6 billion," said Fricks. "Total backlog, including options and planned funding, is nearly \$8 billion. Significantly, the combined company's backlog represents a broad spectrum of shipbuilding programs, the majority of which is comprised of long term U.S. Navy programs."

Newport News' backlog includes over \$2.5 billion for aircraft carrier construction, refueling, and life cycle maintenance extending through 2002. Submarine construction programs represent nearly \$1 billion in funded backlog, with an additional \$1 billion expected to be funded in the next three years.

Avondale's funded backlog of \$2 billion includes design and construction of two LPD amphibious assault ships, which are the first of a 12-ship class to be built for the Navy. Avondale also is constructing a series of six RoRo transport ships for the Military Sealift Command, three crude oil carriers for ARCO Marine, a subsidiary of Atlantic Richfield, and is scheduled to deliver the Polar Icebreaker WAGB Healy to the U.S. Coast Guard in mid-1999.

Earlier this year, Avondale established its Maritime Technology Center of Excellence aimed at developing and applying state-of-the-art techniques to ship design and construction. Newport News expects to begin construction in 1999 of the Virginia Advanced Shipbuilding and Carrier Integration Center, a facility intended to exploit innovative technologies in the construction, integration, and life cycle maintenance of future aircraft carriers and other ships in the Navy fleet.

NNS Milestones

1886—NNS founded by railroad magnate **Collis P. Huntington** (pictured) and incorporated as Chesapeake Dry Dock and Construction Company.



1889—The first dry dock was flooded for the official opening. The dock was hailed by the maritime press as "a wonder of the age."

1890—Name changed to Newport News Shipbuilding and Dry Dock Co.



1891—Hull No. 1, the tugboat Dorothy (pictured to the right) was delivered.

1897—The shipyard's first ships for the U.S. Navy — gunboats Nashville, Wilmington, and Helena — were delivered.

1902—A contract was awarded for the first tanker, W.S. Porter. This vessel was the first of 83 tankers built by the yard.

1926—Nine vessels were launched on March 20: three yachts, one dredge, the passenger liner Dorchester, three barges, and a car float. The yard was closed because of the multiple launching, deemed "the most unique multiple launching in the noteworthy history of American shipbuilding."

1933—Ranger, the first U.S. vessel designed and built as an aircraft carrier, was launched.

1942—The shipyard was awarded the Navy "E" pennant for excellence in wartime production.

1945—The shipyard launched the aircraft carrier Midway (Hull 439) — the first of her class with an armored flight deck.

1952—The passenger liner United States (pictured) which set a trans-Atlantic speed record that stands today, delivered.



1961—Enterprise, the world's first nuclear-powered aircraft carrier, delivered.

1968—Conglomerate Tenneco purchased Newport News Shipbuilding on September 4.

1975—Nimitz (CVN 68) the lead ship in its class, delivered.

1996—Newport News Shipbuilding is spun off from Tenneco, once again independent.

January 19, 1999—Newport News Shipbuilding announces plans to merge with New Orleans-based Avondale Industries.

Halter Marine Wins \$53.6 Million U.S. Navy Contract

Halter Marine Inc. won a \$53.6 million contract from the U. S. Navy to build a T-AGS 60 class oceanographic research ship. The vessel will be the sixth of its class, all designed, built or under con-

struction at Halter. The contract also includes spare parts and technical services. Construction will begin in approximately 60 days at Halter's Moss Point, Miss. shipyard and delivery is planned for Dec. 2001.

"This contract is the result of the Navy exercising an option from

a previous contract. This indicates the Navy is pleased with the design, construction, performance and dollar value of the five other T-AGS 60 class vessels designed, built, or under construction by Halter," said John Dane III, chairman, president and CEO of Halter Marine Group, Inc.

T-AGS 60 class ships are designed and constructed to provide multi-purpose oceanographic capabilities for the Oceanographer of the Navy. They perform physical, chemical and biological oceanography; multi-discipline environmental investigations; ocean engineering and marine acoustics; marine geology and geophysics; and bathymetric, gravimetric, and magnetometric surveying. The ships use the latest in oceanographic surveying equipment and other instrument packages with the ability to process and analyze the data onboard using the latest computer technology. The all-steel vessel will be 329 ft. long, with a beam of 58 ft. and a 19 ft. draft at full load displacement of 5,000 long tons. T-AGS 60 class ships are designed with a common bus diesel electric propulsion system consisting of twin screw propellers driven through 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 space for other uses.

Circle 81 on Reader Service Card

Victoria To Provide FPSO For ISIS Field In Tunisia

Victoria Oilfield Development Ltd. of Aberdeen has secured a letter of intent to provide and operate a Floating Production Storage & Offloading vessel (FPSO) for the ISIS field in Tunisia. This will be the first time Victoria's state-of-the-art Tripod Catenary Mooring and loading System (TCMS) has been used with multi-risers, accommodating up to nine risers, production flowlines, water injection, gas lift line and umbilicals.

The FPSO will be converted from an Aframax tanker, provided by Seatramp Tankers Inc., using a modular topside arrangement. Detailed engineering for the conversion and mooring system got underway last month.

Kelvin Hughes Supplying Irish Lights Vessel

Kelvin Hughes has been selected to supply an integrated bridge system (IBS) and hydrographic survey equipment package to the Commissioner of Irish Lights new Aids to Navigation vessel currently being built at Damen Shipyards.

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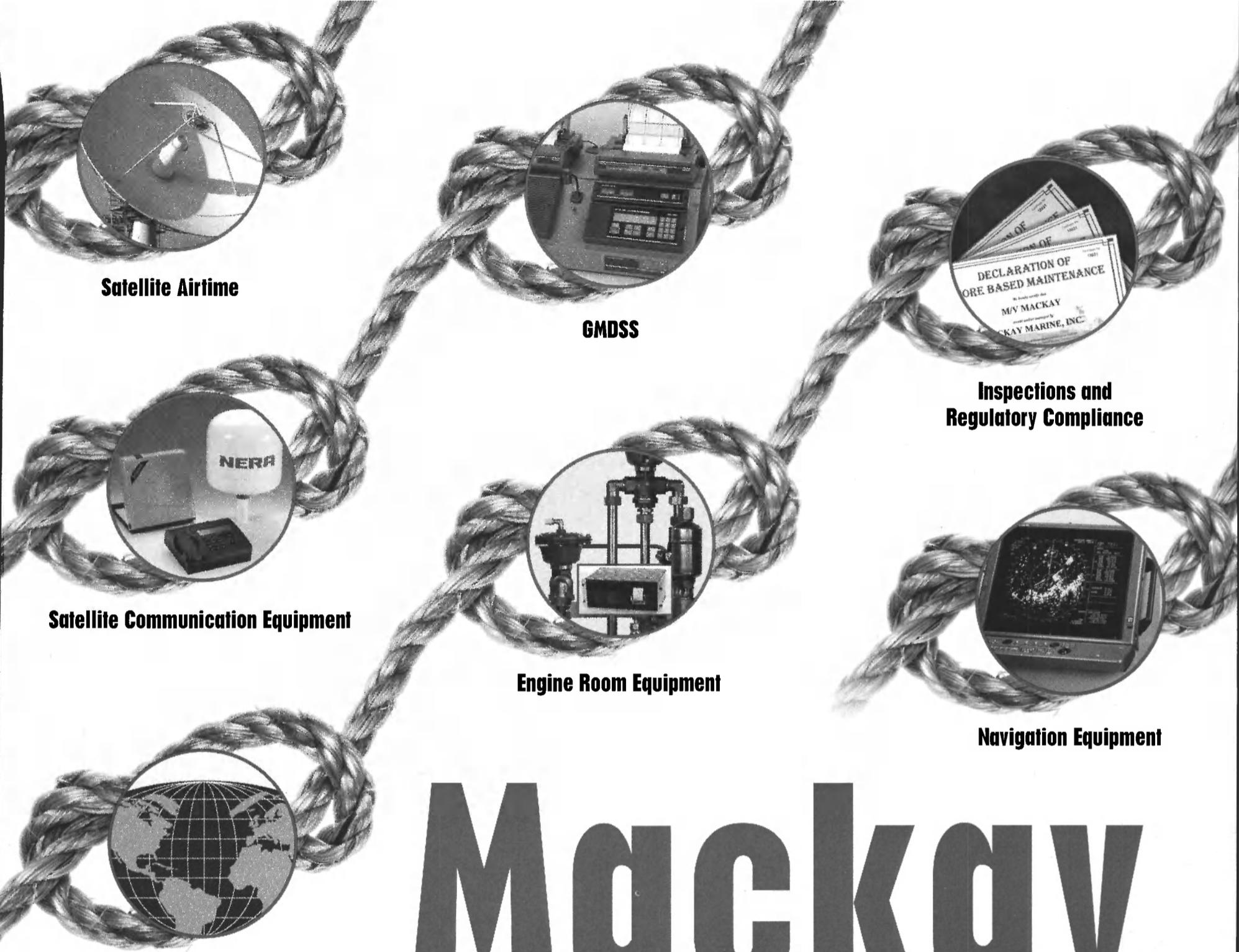
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MARINE FINANCE

USACE Plans Mississippi Fuel Oil Barge

The Marine Design Center of the U.S. Army Corps of Engineers (USACE) is planning to contract for one steel fuel oil barge for service on the Mississippi River and its tributaries.

The approximate dimensions of

the vessel are 195 ft. x 35 ft. (59.4 m x 10.6 m).

Cargo capacity is anticipated at 342,000 gallons.

The vessel will be U.S. Coast Guard certified as Subchapter D Tank Vessels, classed by ABS as Maltese Cross A1 Oil Barge with AMS in River Service and will meet the requirements of OPA-90.

The bid package will be available in February 1999 with bid opening planned for March 1999. Interested parties may contact: U.S. Army Corps of Engineers, Philadelphia District, Wanamaker Building, 100 Penn Square East, Philadelphia, Pa. 19107-3391, Attn: CENAP-CT, Solicitation No. DACW61-99-B-0004.

Litton Supplying Fast Ferry Navigation Electronics

Litton Marine Systems has received an order to supply bridge electronics for a new 57-knot fast ferry under construction at Derektor Shipyard. Equipment to be supplied includes a C.Plath Navigat X MK 1 gyrocompass and Navipilot HSC autopilot.

Circle 83 on Reader Service Card

NORSHIPCO Proceeds With USNS Shasta Contract

Military Sealift Command (MSC) has canceled its stop-work order and given NORSHIPCO permission to proceed with repair and conversion work on USNS Shasta. With options, the total value of the contract is between approximately \$20 million and \$25 million. The work is scheduled to begin around the end of February 1999 and continue until January 2000. Work was originally stopped due to a protest by National Steel and Shipbuilding Co. (NASSCO) about the award of the contract to NORSHIPCO.

Sperry Fin Stabilizers Chosen For Containerships

Sperry Marine, Inc. a Litton Marine Systems company, has received an order from Odena Steel Shipyard to supply fin stabilizers for six new containerships being built for AP Moller. The ships will be fitted with Sperry Gyrofin ship roll stabilizers, which have been upgraded with a newly redesigned digital control system and programmable logic controller. The 55,000-gt containerships are scheduled to be delivered in 2000.

Fincantieri Launches Third Jupiter Ferry

The third fast ferry MDV 3000 Jupiter ordered by Tirrenia was launched in December at Fincantieri's Riva Trigoso shipyard. The first two ships were delivered in May 1998 and successfully operated the Civitavecchia-Olbia route during the summer. The ferries, which can carry 1,800 passengers and 460 cars, have a service speed of more than 40 knots. Four diesel engines and two gas turbines supply 95,000 hp. In the interest of safety, loading and unloading of vehicles takes place through two stern doors, avoiding the installation of bow openings.

Maritime Reporter/Engineering News



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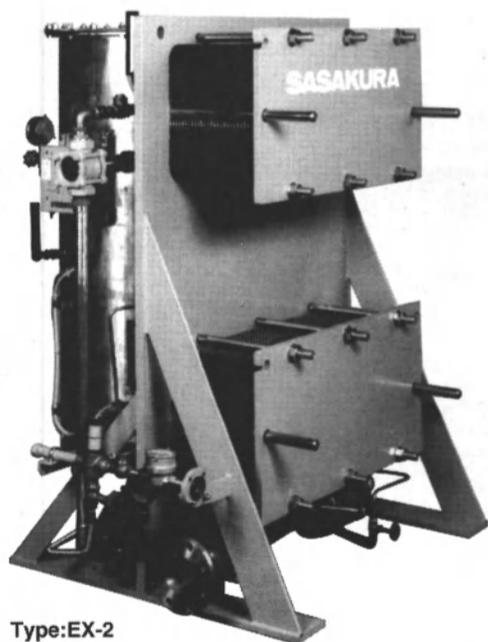
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\$9 Million Contract To Southwest Marine

Southwest Marine Inc. (SWM) has received a \$9.1 million contract from the U.S. Navy for the Regular Overhaul (ROH) of USS Cowpens (CG-63). The work will begin in March and is scheduled to be completed in December 1999. The ROH work package includes drydocking and hull preservation, mechanical and electrical repairs, and modernization.

Logicon Signs Two-Year Navy Contract

Logicon Syscon, a subsidiary of Logicon Inc., has been awarded a two-year U.S. Navy contract to continue providing fleet introduction and logistics support services for Arleigh Burke (DDG-51) class destroyers. The contract is valued at \$12.1 million overall.

FirstWave/Newpark Contracted For Rig Upgrade

Schlumberger/Sedco Forex has contracted FirstWave/Newpark Shipbuilding for upgrades and maintenance work on the offshore semi-submersible drilling rig Bill Shoemaker. The rig was brought into Newpark Shipbuilding's East Pelican Island yard in Galveston, Tex. in December 1998. The company provides repair, conversion, new construction and related services for barges, boats, ships, offshore rigs, and other vessels in the offshore and inland marine industries.

FirstWave/Newpark has also been awarded a contract by Buffalo Marine Services, Inc. for the construction of two tank barges. This contract resulted from the successful completion of a 297 x 54 x 12 ft. (90.5 x 16.5 x 3.6 m) tank barge, 401K, for Buffalo Marine.

Circle 68 on Reader Service Card

Washburn & Doughty, Moran Sign Tug Contract

Washburn & Doughty Associates Inc. have signed a contract with Moran Towing Corp. to build one 92-ft. (28-m) Z Drive Tug (Hull 66) with options for additional tugs. Hull 66 was designed by Washburn & Doughty's vice president Bruce Washburn for ship handling and coastwise towing and will be built to ABS class

Maltese Cross A1, AMS with towing service notation.

Two EMD 16-645-E2 main engines rated at 2,100 hp at 900 rpm will power the vessel. The engines will drive Ulstein Z Drives equipped with stainless steel propellers and kort nozzles. Two

Detroit model 6-71RC "N" generator engines rated at 70kW at 1,200 rpm, 208V 3 phase will be installed onboard. Hull 66 will feature rubber "D" fender fitted on the vessel's sides at the main deck extending between the bow and stern fenders. Viking will supply both bow

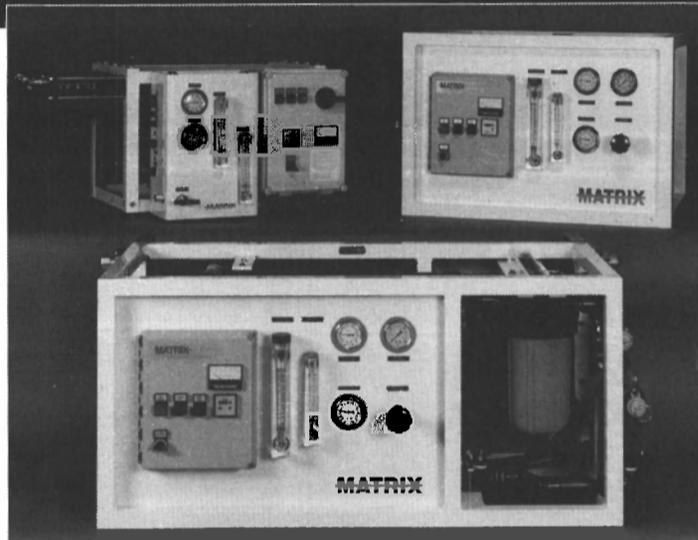
and stern fenders. Moran's new tug will be equipped with a fire monitor system capable of supplying seawater and AFF firefighting foam. The system will have two monitors and consist of an Aurora centrifugal fire pump.

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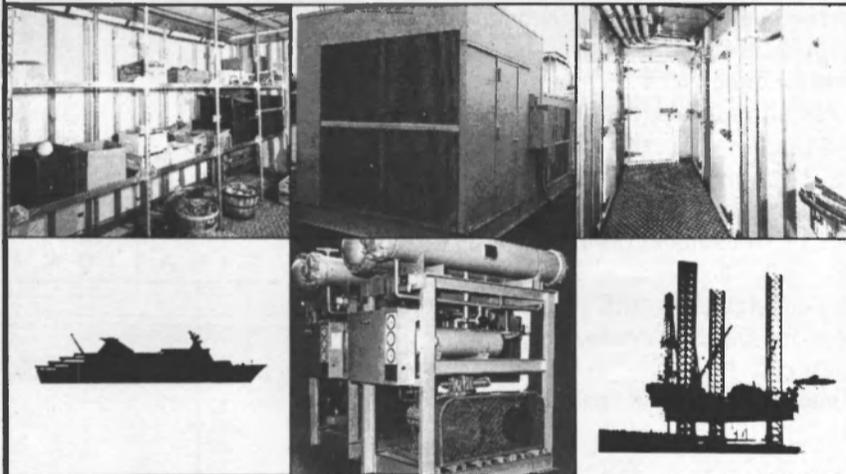
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Crowley Building Three PRTs For Alaska

Crowley Marine Services (CMS) has announced a contract to provide three new 140-ft. (42.6-m) Prevention and Response Tugs (PRTs) for the Alyeska Pipeline Service Company for use in Valdez Harbor and Prince William Sound, Alaska as part of its on-going fleet expansion and revitalization program. The PRTs are general purpose tugs powered by twin Caterpillar 3612B engines generating 10,192 HP driving two Kamewa Aquamaster azimuthing thrusters. The vessels will have oil spill recovery and storage capability for up to 43,000 gallons of recovered oil. Design features include accommodation for up to 16 persons, Schuyler fendering, a Markey TDS-40 towing winch, Step Warmfloor heated decking, and two oil spill recovery skiffs with boom. Each of the three PRTs will be built at Dakota Creek Shipyard in Anacortes, Wash. for Vessel Management Services, a Crowley Maritime Corp. subsidiary which owns and leases vessels to CMS. Guido Perla and Associates will serve as naval architects on the project.

Repair Contract Awarded For Damaged Liner

Royal Caribbean International has awarded the repair contract for its Monarch of the Seas to Atlantic Marine, Inc. The 74,000-ton luxury cruise liner suffered bottom damage recently when it struck a reef in St. Maarten. Repairs will consist of approximately 350 tons of steel replacement, electrical, and machinery repairs and renewals. While the liner is at the yard, routine inspections, repairs, renewals and hull preservation will be undertaken.

Uniservice Moves Office, Appoints Agent

As of January 11, 1999 Uniservice Americas Inc. moved its South Florida office to the following address: Uniservice Americas, South Florida Office, 120 N.E. 20th Street, Miami, Fla. 33137; tel: (305) 572-9000; fax: (305) 572-9001. European Ship Repair has been appointed the new Uniservice Warehousing and Delivery Agent for the South Florida area.

Weeks and T.L. James Join Forces In Gulf

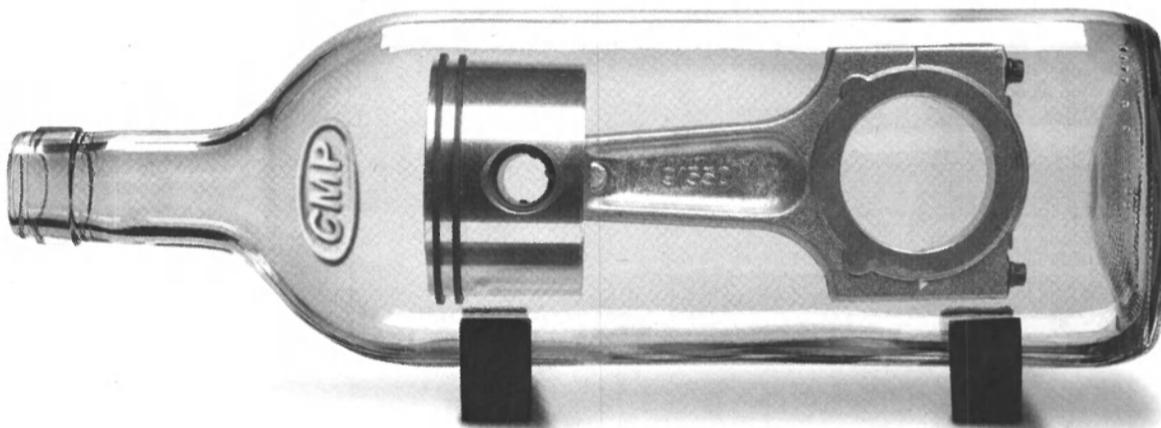
In September 1998, Weeks Marine, Inc. added the Gulf Coast operations of T.L. James to its dredging division. The Gulf Coast operations will continue to be managed by the former T.L. James

staff operating out of its Kenner, La. office. The combination of Weeks Marine's East Coast experience with T.L. James' experience in the maintenance dredging market in the Gulf Coast aims to form a more complete organization in terms of experience, flexibility and service.

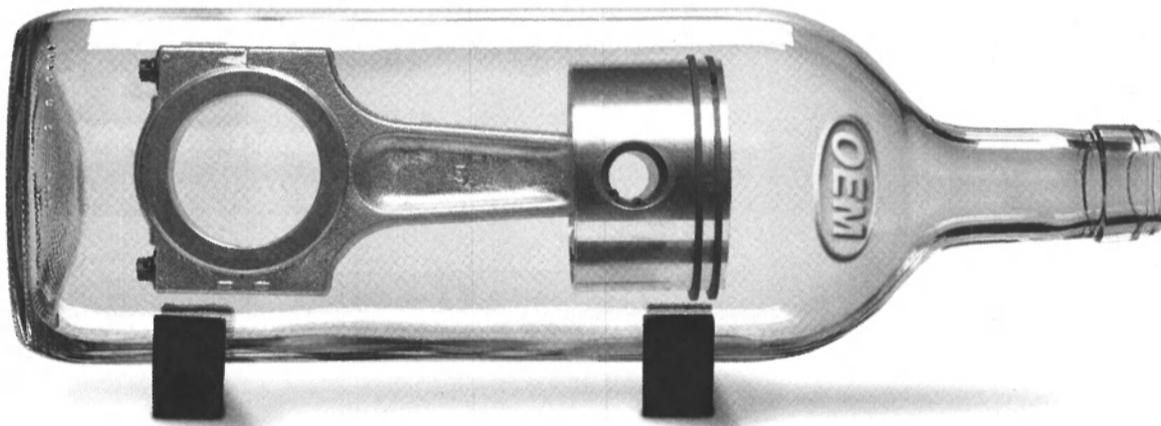
OSII Makes Appointment

Offshore Systems International, Inc. has recently appointed **Vernon Moore** to the position of Sales and Support Engineer. Mr. Moore will be responsible for the support of the Yokogawa Denshikiki Co. Ltd. product line.

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To Cruise Or Not To Cruise, Really, Is Not The Question

Cruise companies are having little problem expanding markets and finding cruise customers. The problem is getting enough ships on line as soon as possible.

Despite the threat of a slowing world economy — and particularly a slowing U.S. economy due to the collaboration of financial fiascos brewing, simmering and boiling in Brazil, Asia and Russia, respectively — cruise companies appear to be better prepared for an economic drawdown than ever before.

The cruise industry has embarked on a fantastic, some

would say fanatical, run for the past five years, and is now poised to add record amounts of new ships to an already relatively modern fleet. In 1999 alone — which is scheduled to include the delivery of the world's largest ever cruise ship, the 142,000 ton, 3,100 passenger Voyager of the Seas for Royal Caribbean from Kvaerner Masa Yards - Turku — there are more

than 15,800 cruise berths scheduled to come on line, followed by more than 33,000 berths combined in 2001 and 2002, if all currently planned contracts are executed.

It is expected that this fleet modernization, combined with the aging demographics of the U.S. — the cruise capitol of the world — will more than adequately buffer any economic downturn, allowing cruise companies to ride their most expensive assets.

Technically, cruise ships have traditionally featured cutting edge marine technology, given the high value and sheer number of their human cargo. And while it is surely impossible to provide 100 percent protection against accidents, it can safely be said that advances in materials, machinery, electronics and training have drastically improved the operational safety and efficiency of cruise ships worldwide.

Feeding The Fire

New York-based Cruise Lines International Association (CLIA) has a lock on providing rosy projections regarding the future of the cruise market. Its members are most all of the significant cruise players who market from the U.S. and Canada, as it represents 97 percent of the North American marketed berths. CLIA tracks the plethora of information regarding potential ridership and cruise fleet expansion which is utilized in short and long-term fleet planning.

According to CLIA, the cruise industry has enjoyed phenomenal growth from 1980, enjoying an average annual growth rate of 7.9 percent. The organization projects that over the next five years, the cumulative market potential for the cruise industry is \$54 to \$97 billion. To put the growth in perspective, in 1980 just 1.4 million passengers purchased cruises, while in 1997 more than five million passengers traveled on cruise ships. CLIA projects that 6.5 to 7 million persons will take a cruise, pointing to statistics which suggest

Welcome Aboard in 1998

Disney's First Cruise Ship Is Magic

At 964 ft. (294 m) long, Disney Magic is one of the longest cruise ships in the world. Built by Fincantieri for Disney Cruise Lines, the ship's design is reminiscent of classic ocean liners of the past, such as the Queen Mary. From this starting point, Disney's team of "Imagineers" created a ship which embodies the trademarks and traditions of everything Disney.

To ensure the fastest delivery possible, Disney Magic was built in two separate sections at two different shipyards. The bow was built at Fincantieri's Ancona yard and then towed to Marghera where it was fused to the rest of the hull.

Disney Magic achieves a maximum speed of 24.5 knots and a service speed of 21.5 knots thanks to a diesel/electric machinery arrangement consisting of two 19 MW General Electric propulsion motors and five 16-cylinder GMT-Sulzer 16ZA40S diesel engines, each featuring an output of 11, 520 kW. The vessel is outfitted with a pair of FP propellers from Lips, Bot Groningen flap rudders, and five Fincantieri thrusters, three in the bow and two in the stern. The ship's captains specifically requested the high-efficiency rudders to ensure top maneuverability at speeds of two to four knots.

Though the vessel's long, slim proportions caused a sacrifice in the number of cabins available, the choice of AC system helped rectify this. Disney chose to use a Carrier main system with individual fan coiled units in each cabin, from Italian manufacturer Atisa. Using this individual unit system helped save space and created room for about 30 cabins.

As the ship's design was aimed at three distinct audiences: children, families and adults, public areas were created which cater to each group. Notably, 15,000 sq. ft. of space is dedicated to children's activities. In addition to the three main restaurants onboard, there is a dinner restaurant exclusively reserved for adult passengers. Separate pools were provided for family use, sports activities and adults.

Circle 80 on Reader Service Card



Royal Caribbean's 142,000 ton Voyager of the Seas promises to make 1999's biggest splash.

NEW CRUISE SHIP CONSTRUCTION LOG

1999

	Addition/ Deletion	Delivery Date	Ship Name	# Lower	Contract/ Planned
Carnival Cruise Lines	A	1999	Carnival Triumph	2,628	C
Disney Cruises	A	Feb-99	Disney Wonder	1,758	C
Holland America Line	A	Feb-99	Volendam	1,440	C
Holland America Line	A	Sep-99	Zaandam	1,440	C
Norwegian Cruise Line	A	Jun-99	Aida	1,200	C
Norwegian Cruise Line	A	Dec-99	Norwegian Sky	1,800	C
Princess Cruises	A	Dec-99	Ocean Princess	1,950	C
Radisson	A	Jul-99	Seven Seas Navigator	490	C
Royal Caribbean Int'l	A	1999	Voyager of the Seas	3,100	C
			CLIA Total	15,806	
			1999 Grand Total	15,806	

2000

	Addition/ Deletion	Delivery Date	Ship Name	# Lower	Contract/ Planned
Carnival Cruise Lines	A	2000	Carnival Victory	2,628	C
Celebrity	A	Jun-00	Millennium	1,900	C
Costa	A	2000	Unnamed	2,100	C
Holland America Line	A	Sep-00	Unnamed	1,380	C
Norwegian Cruise Line	A	2000	Unnamed	2,000	P
Norwegian Cruise Line	A	2000	Unnamed	2,000	P
Radisson	A	Jul-00	Unnamed	690	P
Royal Caribbean Int'l	A	2000	Unnamed	3,100	C
Royal Olympic Cruises	A	2000	Unnamed	800	P
Silversea Cruises	A	Apr-00	Unnamed	396	P
			CLIA Total	16,994	
			2000 Grand Total	16,994	

2001

	Addition/ Deletion	Delivery Date	Ship Name	# Lower	Contract/ Planned
Carnival	A	2001	Unnamed	2,100	C
Celebrity	A	Jan-01	Millennium 2	1,900	P
Norwegian Cruise Line	A	2001	Unnamed	2,000	P
Norwegian Cruise Line	A	2001	Unnamed	2,000	P
Princess Cruises	A	2001	Unnamed	2,600	C
Princess Cruises	A	2001	Unnamed	2,600	C
Royal Caribbean Int'l	A	2001	Unnamed	2,000	P
Royal Olympic Cruises	A	2001	Unnamed	800	P
Silversea	A	Apr-01	Unnamed	396	P
			CLIA Total	16,396	
			2001 Grand Total	16,396	

Source: CLIA

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Uniservice: Innovative Product Keeps Cruise Ships Running

The development of URICLEAN Concentrate was partly due to the shipowners' continual problem of line blockages in Vacuum sanitation systems where uric acid deposits crystallize. When crystallization occurs in these lines the acceleration of line blockages becomes increasingly difficult to control. The result is a snowball effect and 4" lines can become 80-90% blocked and in some cases completely blocked in as little as 90-120 days.

Although Vacuum systems are the best form of waste management on board a vessel, the problem of uric acid deposits continues to plague an industry that continues to expand ship size and passenger numbers. As this continues to grow the obvious result will be more line blockages and costly downtime in repairing these serious problems that ultimately reflect on the vessel and shipowner. The crystallized

deposits formed in Vacuum lines can be simply described as rock-like deposits, with pitted and scarred surfaces which then allow other types of deposits to attach themselves. Vessels are particularly subject to problems in areas where there are 45 - 90 degree turns and lines that run horizontally.

In years past, marine chemical companies presented to the shipowners the idea that if a vessel uses bacteria type products in its sanitation lines, the problem of uric acid deposits would be greatly reduced and/or eliminated.

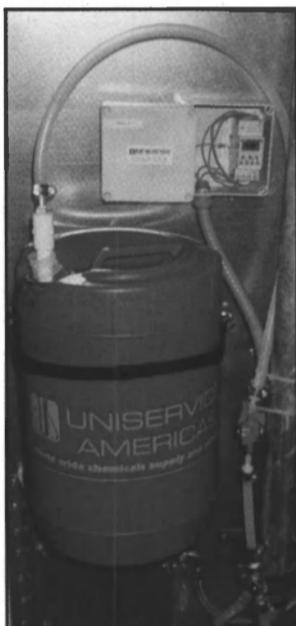
Through extensive studies and research, including those at leading Bio-

logical Institutes, it was determined that bacteria products have virtually no effect on uric acid deposits that exist within a vacuum system. Bacteria can only be effective in biodegradation when retention time is great and the environment is stable. The reality of a vacuum type system is that the vessel has neither! The introduction of bacteria to a sanitation system is of course excellent for a vessel's CHT (Collection Holding Tank), but it has nil effect in cleaning and maintaining a vessel's vacuum sanitation lines.

The first major step Uniservice was able to accomplish in combating uric acid deposits was the development of a unique product called URICLEAN concentrate. This product combines a very unique blend of concentrated cleaning agents that are chemically effective in removal of the crystallized hardened deposits caused by uric acid. As uric acid deposits crystallize within the internals of a sanitation piping system, URICLEAN concentrate effectively starts the softening process of these hard crystallized deposits, and, in a controlled time frame, begins the removal process. Each vessel has a unique system either by piping configuration and/or type of vacuum system used. Keeping this in mind, Uniservice utilizes a management approach in cleaning these systems on-line. It is extremely critical that the removal of the crystallized deposits be accomplished in a controlled time frame in order to avoid greater blockages at lower levels as the crystallized deposits begin to fall off. To clean an existing problem that could reflect 80-90% blockage, the vessel and ship owner should



Uniservice's reference list includes clean, hassle-free piping on many of the industry's top ships, including Horizon.



Uniservice's URICLEAN system was developed to help cruise ship owners avoid costly downtime due to problem build-up in a ship's sanitation piping system.

allow a 90 day clean-up period. If this were allowed to occur within a much shorter period of time, the blockages in lower cabins could increase dramatically as deposits begin to fall away from upper level lines. After the 90 day clean-up period the vessel then can reduce its dosage level greatly and only use a preventive maintenance dosage in order to preclude this serious problem from reoccurring.

Through much trial testing onboard various cruise vessels and with the assistance of shipboard engineers, Uniservice has been able to understand the proper dosage amounts required to effectively remove uric acid deposits, while also maintaining an efficient and effective waste management system.

Initially we recommended that the vessel introduce the product into the heads each time the cabin was cleaned by the hotel staff. This was of course an inexpensive approach to introducing this unique product into the system. However, Uniservice was determined to develop something more accountable and reliable, while trying to avoid adding more work to the ship staff.

With the help and advice of NCL's vessel the m/v Seaward, Uniservice was able to introduce a simple inexpensive dosing unit that is fitted in strategic locations throughout the vessel.

The units are simple, reliable, require easy installation, and can be retrofitted on all existing tonnage. Our Uriclean dosing unit utilizes the ship's vacuum as a way of introducing the product into strategic locations throughout the vessel.

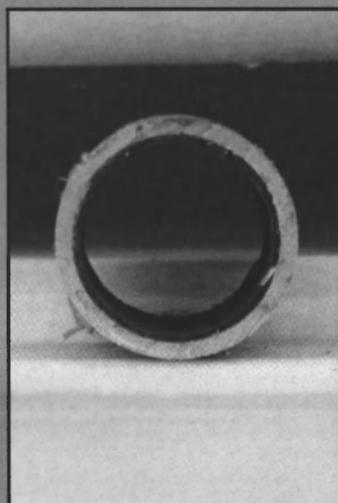
With new tonnage Uniservice can design a dosing system that can be fed throughout the vessel utilizing 2-3 dosing locations from the ship's engine room. This will allow for little requirement from the ship's staff and can be easily monitored and controlled.

For more information about URICLEAN concentrate and our dosing systems, please contact our U.S. headquarters in Slidell, La.

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Now you see it...
...Now you don't!

The development of URICLEAN Concentrate was partly due to the shipowners continual problem of line blockages in Vacuum sanitation systems where uric acid deposits crystallize. Pictured left is piping before treatment; to the right is piping after treatment.





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CRUISE SHIPPING REVIEW

that a cruise vacation is a dream of some 56 percent of adults, and, to date, only 11 percent of the U.S. population has ever cruised.

Meanwhile, the cruise companies have done a remarkably good job of keeping up with demand, as the industry has added new berths at

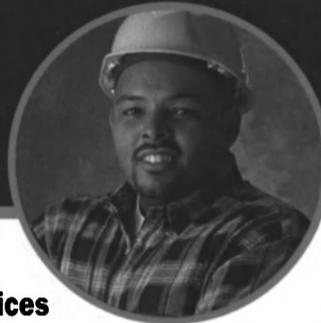
a seven percent (average annual change) clip since 1980. In 1980 there were just 41,073 berths, compared to 118,399 berths in 1997. The cruise ship buying spree is not simply the fodder of industry hype, as, through 2002 the North American industry will add berths

at an average annual rate of 10.4 percent. Significant ships due to come on-line in 1999 include: Carnival Cruise Lines' 2,758 passenger Carnival Triumph; Disney Cruise Line's 2,400 passenger Disney Wonder; First European Cruises' 1,200 passenger Mistral;

Holland America Lines 1,440 passenger Volendam; Norwegian Cruise Line's 2,002 passenger Norwegian Sky; Princess Cruises' 77,000-ton Sea Princess; Radisson Seven Seas' 490 passenger Seven Seas Navigator; and Royal Caribbean's 3,114 passenger Voyager of the Seas.

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Welcome Aboard in 1998

Star Cruises Shines With Superstar Leo



Superstar Leo, the first of four cruise vessels being built at Meyer Werft for Star Cruises, was delivered in September 1998 after completing sea trials in the Netherlands. The 880 ft. (268 m) vessel has a passenger capacity of 2,800 in approximately 1,000 cabins, nearly 70 percent of which are outside cabins.

Superstar Leo is fitted with the integrated navigation and command system Atlas Nacos 45-3 from STN Atlas. The system is designed to provide safe navigation through narrow channels and in heavily-trafficked waters. Radar units on the vessel have high resolution color monitors to aid in symbol interpretation. The vessel is equipped with two FP propellers, two bowthrusters, one stern thruster and two spade rudders. Electric power generation is provided by four MAN B&W 14 V 48/60 diesel generator sets each developing an output of 14,700 kW at 514 rpm and driving an ABB synchronous generator. ABB also provided two electric motors at an output of 20,000 kW each for the vessel's propulsion. Up to 1,800 cu. m. of potable water can be produced on board Superstar Leo within 24 hours. The water is transferred through the ship by five systems serving decks 2 through 12 via a ring line. Vacuum piping from four vacuum systems brings sewage water to four biologically-operated sewage treatment plants. Waste is divided into burnable or non-burnable waste before being shredded and stored in silos for future incineration or transfer to a recycling plant on shore.

Superstar Leo employs a digital telephone system which provides 80 satellite and GSM channels for ship-to-shore and shore-to-ship calls. Each passenger cabin is equipped with a digital credit card telephone. Design features include upper decks designed to imitate house fronts and a 650-seat restaurant featuring a glass wall with a view onto the ship's wake.

Circle 56 on Reader Service Card

bers approximately 223 vessels carrying 9.5 million passengers, according to Washington, D.C.-based International Council of Cruise Lines (ICCL). While North America has and will continue to command the lion's share of cruising business, it is obvious that outside of the U.S. is ripe for market expansion. Worldwide, capacity is

calculated to expand almost nine percent annually over the next five years according to ICCL.

Easier Said Than Done

While the cruise industry remains embarked on a period of phenomenal growth, there is

always a handful of interesting, out of the ordinary projects brewing. If even a couple of these projects come to fruition in a given year, the excitement and potential surrounding the cruise market — from the build, supply and service side — would immediately grow

exponentially.

One of the more recent projects which has stirred significant amounts of interest and press coverage is the World of Residencea, which sought to have cruisers purchase, rather than simply rent

(Continued on page 35)

Welcome Aboard in 1998

Welcome To ... Paradise

October 1998 saw the delivery to Carnival Cruise Lines of the eighth and final ship in the Fantasy class, M/S Paradise, built by Kvaerner Masa-Yards' Helsinki New Shipyard. Paradise is the world's first completely non-smoking cruise ship. According to KMY, workers did not smoke aboard the ship at any time during construction. Paradise passengers must sign a contract before boarding proclaiming that they will not smoke on board. Passengers in breach of this contract must leave the ship at the next available port and finance their own trip home. To date the ship has put nine people ashore.

Like her sistership Elation (delivered in February 1998), the 70,400 gt Paradise is fitted with two 14 MW Azipod propulsion units developed by KMY and ABB



Marine. Proposed benefits of this propulsion method include fuel consumption savings; reduced vibration levels; savings in weight, space and construction time; shorter crash stop distances; and greatly improved maneuverability. During sea trials in the Gulf of Finland, an increase in propulsion efficiency of approximately eight percent was reached for both Elation and Paradise in comparison with earlier Fantasy-class vessels. Diesel-electric power for the ships is provided by six Wartsila 12 V 38 medium speed diesel engines with a total power output of 47,520 kW. Each diesel engine drives an ABB 11,000 kVA AC alternator supplying electric power to a main electric high voltage bus bar, from which the main propulsion motors are supplied. The two Azipod units used for Elation and Paradise replace the internal electric propulsion motors, shaft lines, rudders and rudder machinery, and three tunnel stern thrusters which were used on the initial six Fantasy-class vessels.

The design of Paradise's public spaces was inspired by famous passenger ships of the past, including Normandie, Queen Mary and SS United States.

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Cruise Ship Interiors: Pushing The Boundaries

Booming demand for luxury passenger travel in the cruise industry during the past decade has increased commissions for new build and retrofitted vessels, allowing designers to take interiors to new levels of creativity and appeal.

Approximately 26 cruise ships are on order at shipyards for delivery by the year 2003, with an estimated 11 ships to be brought into service this year, for a total of 132 cruising the waterways. The number of cruise ship passengers has doubled since 1990; approximately nine million travel annually around the world.

The importance of raising quality standards and aesthetics while striving to make cruising more affordable is crucial to continuing market growth for the cruise lines.

Established cruise lines are making record investments in their fleets, while newcomers are earning niches in the industry. The competition among operators is primarily focused on the actual vessels and their amenities, and is often most appreciable in the ship's

interior design.

Passengers, who are the real clients of the interior designer, view the ship as their traveling accommodations, retreat for dining, entertainment, recreation, relaxation and nightlife all rolled into one well-planned vessel. The popularity of cruising is obviously the hassle-free, responsibility-free convenience of traveling in pampered style to exotic places. Since the passengers are onboard a significant portion of time, the ship's aesthetics are paramount to travelers, and hence to ship owners.

The trend in new builds is definitely for larger vessels to accommodate more passengers and crew and to provide higher quality and more luxury.

The biggest ship now carries 2,700 passengers, and it is common these days for ships to offer more than 800 staterooms. These large vessels come with three or more dining areas, nightclubs, swimming and sporting pavilions, and usually grand atriums — they are virtual traveling resorts.



Has cruise ship interior design gone to the dogs? Hardly. Disney's Magic and Wonder have pushed the bounds of creativity, based not only on Disney's penchant for detail but also to adequately cater to adults, children and families.

Designers are therefore laden with more interiors to work with, yet more choices with space and materials, and more creative opportunities. As new designs awe passengers, interior designers are continuously challenged to create more innovative compositions and ele-

ments.

The trend for retrofitted cruise ships is to upgrade interiors closer to the standards the public has come to expect, which can be challenging due to a particular ship's inherent limitations. Maritime Services Corp. (MSC) recently completed the retrofit of the casino on board Carnival's Holiday, with only two weeks to change out almost all the finish materials, including carpet, wallcovering and lighting. Time limitations narrowed down the scope of work. MSC had a choice of either removing or redesigning existing "cones"

Voyager of the Seas To Reach New Heights In Interior Innovation

Voyager of the Seas, the first of Royal Caribbean International's new Eagle-class ships, will be the world's largest cruise liner at approximately 140,000 gt and 1,020 ft. (311 m) long.

It has a passenger capacity of 3,840 accommodated in 1,557 staterooms, of which almost half include balconies. However, it is not only the sheer size of the ship which is impressive: Royal Caribbean aimed to make the interior as exciting and innovative as possible. According to CEO and chairman of Royal Caribbean Cruises Ltd. Richard Fain, "When we undertook this massive project, we hoped to exploit the large scale of the vessel by incorporating design concepts and facilities which have never before been possible on a cruise ship."

One of these design concepts is the four-deck high horizontal promenade, the Royal Promenade, which terminates at each end in an 11-deck high atrium called The Centrum. The Royal Promenade is designed as a winding street fronted with specialty shops, restaurants and entertainment areas such as the Spinners gaming arcade



night spots to quiet, intimate nooks. Passengers walking through the

complete with interactive roulette wheel. The street also gives way to La Scala Theater, a 1,350 seat theater modeled after the famous La Scala in Milan. The entrance to Casino Royale may be found along the Royal Promenade, as well as various themed bars and clubs that range from vibrant

area won't be the only ones to enjoy the sights and sounds. For the first time ever, windows in passenger cabins will face something other than the sea: 10 percent of Voyager's cabins will have bay windows overlooking the Royal Promenade.

In addition to the state-of-the-art theater, gaming arcade, casino and national sized sports court, the ship's list of major attractions includes a 900-seat arena dubbed Studio B. Variety shows, game shows and rock and roll concerts are some of the events planned to take place in this arena which features telescopic seating and high-tech broadcasting facilities. However, Studio B has even more to offer. A sliding floor reveals an ice skating rink for passenger enjoyment and for staging ice shows.

Other features of Voyager of the Seas include a variety of dining options including a three-level main dining room and several separate themed restaurants; a collection of smaller areas for passengers who wish to escape the crowds and relax such as a twin-decked library, and the Aquarium Bar featuring 50 tons of glass and water in four aquariums valued at more than one million dollars; Peek-A-Boo Bridge, an area for passengers to observe the officers at work navigating the ship; a wedding chapel; and a children's program that includes designated spaces for teenagers including a day/night club with dance floor. It isn't only the passengers who will be enjoying the new designs — the crew have also benefited from Royal Caribbean's vision. Voyager's crew enjoy a recreation deck, two whirlpools, three dining facilities, a gym, disco, and exclusive space on the two private out-island destinations.

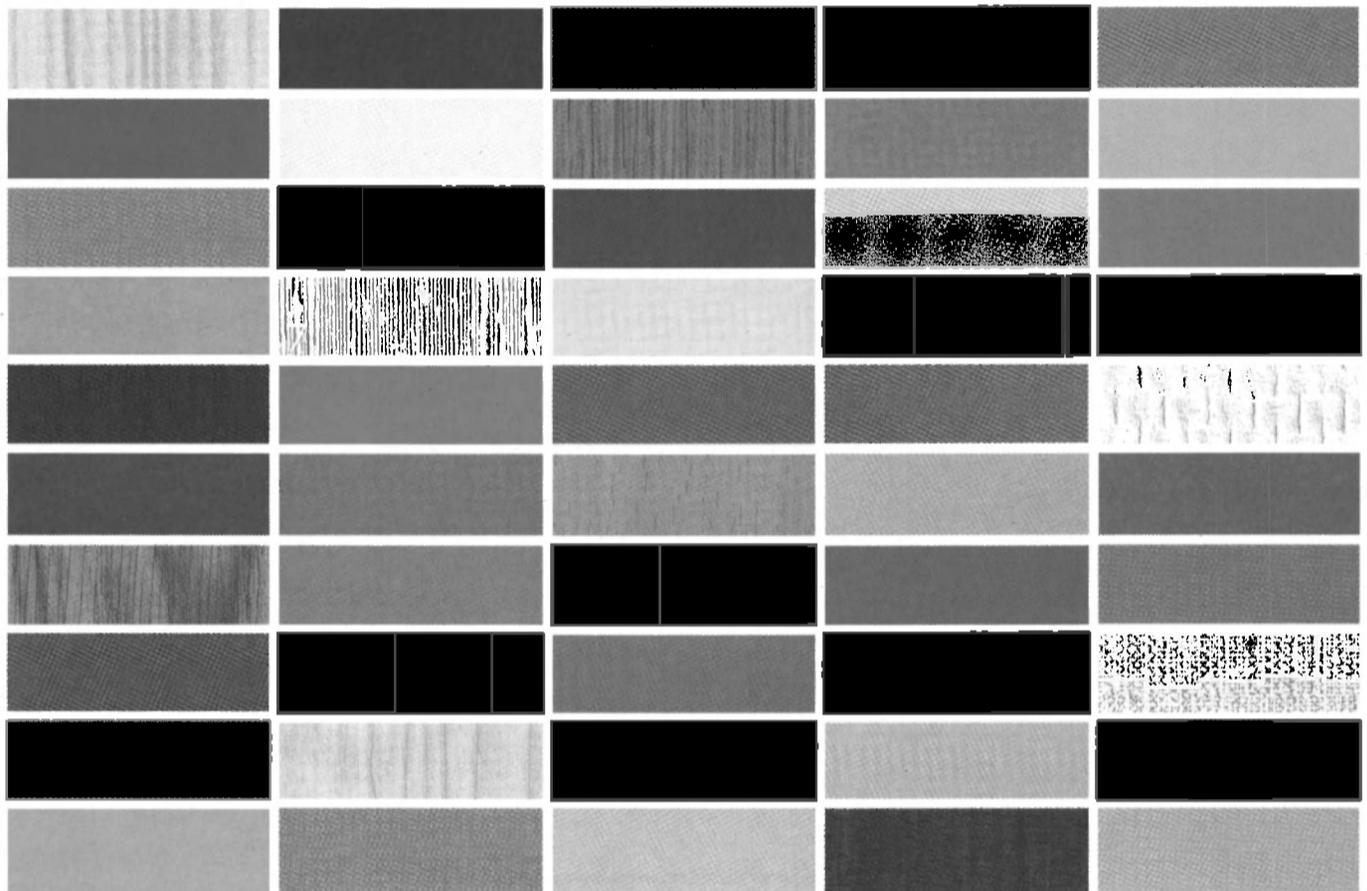


About the Author

Julie Parmentier has worked in the interior design field for 11 years, the past eight of which have been as a marine interior designer. She began her education in architecture at the University of Colorado, and received a B.F.A. in Interior Design from Cornish College in Seattle, Washington. Parmentier has worked at Maritime Services Corporation's design department since 1995, where she works primarily on casino boats, cruise ships and ferries. The department's emphasis is on Design-Build projects, though designers will also work as liaisons between a client's designer and MSC's construction staff.



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CRUISE SHIPPING REVIEW • Interior Design

in the overhead. The designers chose to work with them, as they discovered the sprinkler and air return system were both incorporated into the cones, and thus not allowing for removal in the time frame available. Retrofitting tends to be more challenging than new builds, and short dock periods are common. A ship that is not cruising forgoes significant revenue and revenue enhancement is paramount to good design.

Designers are currently using and exploring the use of new materials, as well as working to take design elements farther. Frosting and coloring glass or bending, coloring and texturing aluminum are examples of innovative design using common and easily maintained materials. Good marine design pushes the limits of materials that were previously thought to be reserved strictly for land.

The demand for materials in the expanding cruise ship market has fortunately earned the attention of many manufacturers, offering designers more choices and better prices. The textile industry is a prime example.

Not long ago, most usable patterned fabrics were printed, or very expensive wool. Now, manufacturers can produce a wide variety of fabrics to meet nearly any requirement. There are many more choices of woven fabrics in a wide array of patterns and textures that are fire resistant and/or flame-retardant and meet the more stringent fire test procedures requirements now being imposed. On most projects, weight factors are not as limiting as one might guess. It is possible to specify and utilize stones like marble and granite if the engineering of that part of the structure can accommodate it. New honeycomb backed stone, for instance, reduces mass and weight in projects where weight is a factor.

It's getting to the point where designers have a total choice of materials, bringing marine design closer to the field of mainstream interior design. In fact, cruise ships are now being appreciated for their interior design, and have been featured in major interior design publications.

Though cruise lines proclaim their vacations are suited to all age groups and lifestyles, cruise ship interior design reflects the fact that each cruise line is catering to

slightly different markets. The Carnival "fun ships" appeal to more active adults, with discos and a more casual environment. Disney's ships are more family-oriented, devoting nearly an entire deck to children's activities, while allowing parents a measure of fun and independence. Princess

indulges the more sophisticated traveler, with refined and elegant interiors. Holland America is sophisticated, as well, but designed to better suit the senior traveler.

Not surprisingly, a return to the classic look is occurring, thanks to the Titanic. Themes abound, and

often many different motifs coexist on a ship to offer variety onboard. Many cruise lines rely on cultural themes such as the use of Egyptian styling on Carnival's Destiny. Themes can be conveyed with decorative ceilings, posts, lighting, and furnishings — all used to create a unique, and often lavish



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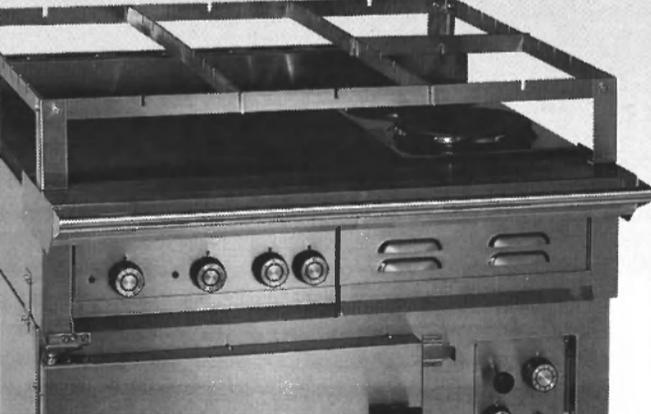
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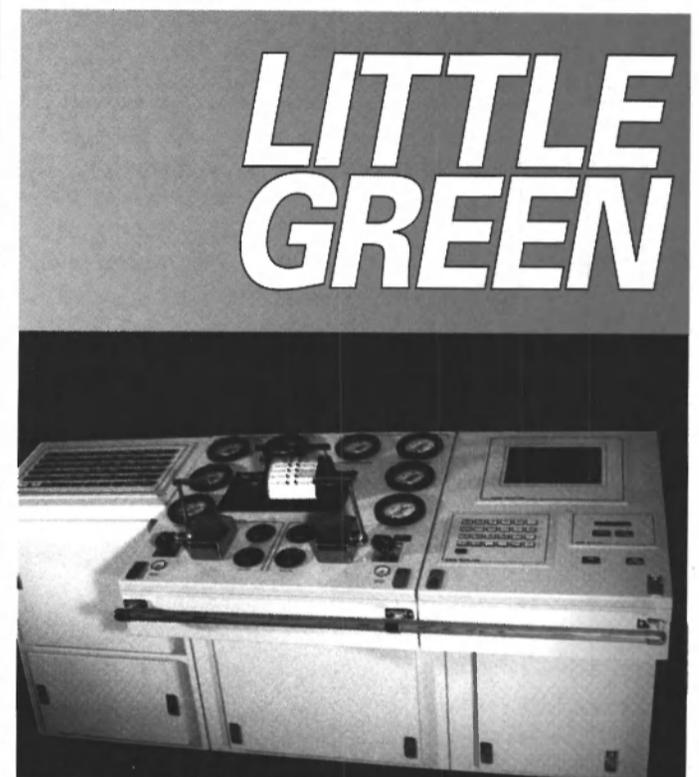
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ambiance.

There are many examples of specialty design in the cruise industry. For example, a recent new build contains a dining room where diners begin their meal surrounded by black and white illustrations, to which colors are gradually added throughout the dining

experience. In the end, ceilings, walls, even tables are enlivened in breathtaking color.

Interior designers are involved in the design process with other specialists, such as engineers, lighting designers, electrical engineers, theater designers, and others. Combining exciting interiors

with appealing exterior and interior lines, while maintaining strict safety and structural integrity is the goal of these collaborative teams.

Cooperation is necessary and highly prevalent in design-build or retrofitting projects. Teams often include clients, builders and

designers. For that reason, it may be beneficial to work with a company that can design and install interiors, fostering uninterrupted communication and more control with fewer people involved. The result is generally improved efficiency and cost savings. Obviously, more retrofits will continue for ships 10 years and older. Many call for refurbishment up to today's standards in materials and design. In many cases, certain ships are required to update for fire and safety regulations by specified dates, making interior renovations completed simultaneously more practical.

Retrofits are distinctive from new design. On ships 15 years old or more, a particular challenge is that not much of the plan is documented on computer files. Design must start from scratch with drawings, fixtures and wiring diagrams. Often the ships' engineers are the only persons who are familiar with the operating systems.

Plans are often labeled in foreign languages as are on board components, and crew are often more fluent in their own language. If the vessel was built recently, most diagrams are documented on computer files, and modifications will become easier in the future.

MSC specializes in retrofitting older cruise ships as well as new building.

The work, however, is neither regional or national work — specialists from all over the world are utilized. In this field, designers must be mobile, since resources are pulled from worldwide sources. MSC is headquartered in Hood River, Oregon, but has satellite offices in Seattle, Washington, Crown Point, Indiana, Fort Lauderdale, Florida, Southampton, U.K., and Malfalcone, Italy. From these locations, personnel in various capacities are dispatched all around the world to meet the needs of MSC's customers.

The popularity of cruising has infiltrated all waterways and affects riverboats to ocean liners. Even in the Columbia River Gorge, in the valley of 17,000 people where MSC is located, 12 cruise lines make approximately 200 calls annually on the Port of Hood River. The continual growth in the industry will naturally keep cruise ship interior design a dynamic and innovative field.

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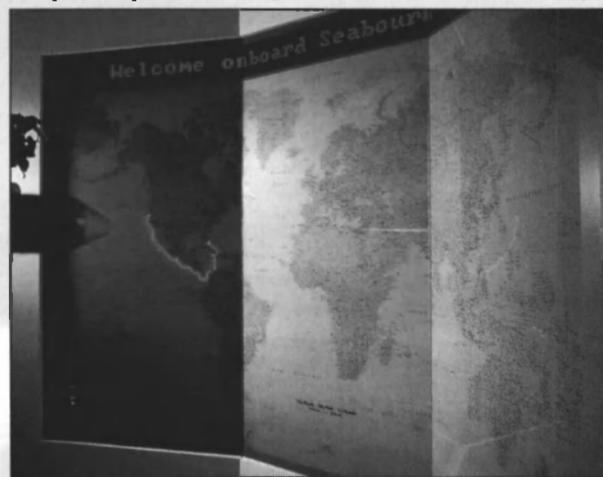
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To Cruise Or Not To Cruise, Really, Is Not The Question

(Continued from page 29)

cabin space. While the project is not dead, adequate financing to support the original large ship size is evidently not possible at this time, and the project has reportedly been scaled down accordingly.

A project perhaps more based in the realm of reality was American Classic Voyages (AMCV) announcement of a letter of intent

to build a cruise ship at Ingalls Shipbuilding in Pascagoula, Miss. While the final contract is still not in hand, pending final detail

analysis, the two-ship project seems a near certainty and will provide Hawaii inter-island service. The letter of intent calls for

Welcome Aboard in 1998

French Style Sailing Greek Waters

R.One is the first in a series of six luxury vessels for Renaissance Cruises being built by Chantiers de l'Atlantique at St. Nazaire. The 30,277-gt R.One offers 10-day cruises in the Aegean and Eastern Mediterranean, working out of Piraeus to Israel, Cyprus, Rhodes, Kusadasi and Crete. On the basis of a double-occupancy, 684-passenger complement, the crew-to-passenger ratio is nearly one-to-two, while the passenger space ratio (PSR), a factor of the vessel's enclosed volume, rates among the largest in the industry for a ship of her size. Although Wartsila NSD has since introduced a new 320 mm-bore medium-speed series, the longer-stroke Wartsila 32, the prime movers ordered for the R.One are of the well-proven Vasa 32 design in its environmentally-attuned Low NOx version. Each of the resiliently-mounted Wartsila diesels has a rating of 4,860-kW at 720-rpm, and operates on 380 cSt heavy fuel oil. The bank of four engines drives a corresponding number of 4.6-MW GEC Alstom alternators located immediately beyond the bulkhead separating the diesel engine compartment from the generator propulsion room. Energy is fed to the pair of Cegelec 6.75-MW propulsion motors positioned forward of the main generators, and acting on the long shaftlines turning the twin propellers. The converter rooms and main switchboard are accommodated at an intermediate level in the generator propulsion room.

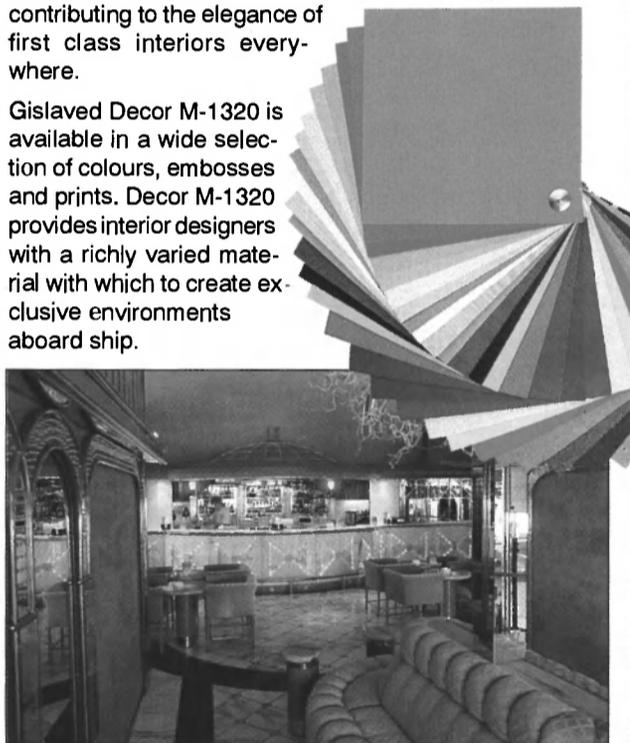
The maximum speed of 18 knots required to fulfill the vessel's regular cruising schedule necessitates only three main generators to be run. The added dimension to the system conferred by the fourth primary genset offers the scope, if required, to make transits at 21 knots, while also providing all requisite power for air-conditioning and ship's services. Having just two of the units engaged, feeding energy to both propulsion motors and thereby turning both shafts, gives an 11-knot capability in good weather.

Shipboard equipment specialist MacGregor was contracted as the turnkey supplier for the provision stores and associated reefer plant for the R.One.

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CRUISE SHIPPING REVIEW

up to four option ships, and would represent the largest U.S. cruise ships ever built.

The endeavor has the proverbial leg up on previous "U.S. build" projects from the fact that it is the result of the U.S.-Flag Cruise Ship Pilot Project Statute passed by Congress more than a year ago. Final contracts for the first pair of 1,900-passenger, \$400-million ships is expected by April, with the first ship entering service in late 2002.

While many in the tight-knit cruise ship building family may question the ability of an inexperienced cruise ship builder to enter the fray profitably, Ingalls is uniquely positioned in its level of experience and facilities. Ingalls president **Jerry St. Pe** points to Ingalls' "unique experience in designing and building sophisticated, highly detailed vessels." He also said that this, combined with the fact that Ingalls built the last two U.S. produced cruise ships, makes the Pascagoula yard ideally suited to produce AMCV's cruise ships.

The project also has the services of industry stalwart **Jon Rusten**, who sits as president of Ocean Development Co., a wholly owned AMCV subsidiary that will manage the shipyard construction.

Rusten most recently served as the director of development and newbuildings for Disney Cruise Lines, where he and the Disney team effectively launched a new cruise company with two high quality ships from Italy's Fincantieri.

James P. Colie & Assoc. Performs "Celebrity" Work

James P. Colie & Associates, a specialist in turnkey marine interior outfitting, has quite a number of significant refurbishments in its portfolio, including recent work on Celebrity Cruises' *Horizon*. The *Horizon* job entailed major interior renovation to almost 2,000 sq. m. of public spaces on four decks. The areas were outfitted with all new finishes and materials, and some will require a complete demolition and rebuild. The Martini bar interior was outfitted with a custom built bar and fine decorative items including fiber optics glass and custom hand painted bar tops. In the Rendez-Vous Lounge, craftsmen installed a custom made bandstand and dance floor as part of the room's total refit. Michael's Club, a cigar bar, was outfitted with cherry woodwork and a decorative faux fireplace. Most areas were designed by Patricia Hayes & Associates, Inc.. The *Horizon* Spa was designed by Syntax Group.

Aboard Princess Cruises' *Regal Princess* James P. Colie & Assoc. workers expanded and refurbished the cafe on the Lido Deck and added a children's center to the deck above. The structural modifications of the cafe expanded its size to 10,000 sq. ft., and the seating capacity to approximately 400. The new interiors were designed and configured by

Teresa Anderson of Princess Cruises and **Giacomo Mortola** of GEM. The ship was dry-docked at Cascade General in Portland, Ore. for the work.

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James P. Colie & Associates recently participated in the refit of Celebrity's *Horizon*. Pictured are before and after photographs of the entrance hallway to the Library, Card Room and Michael's Club.



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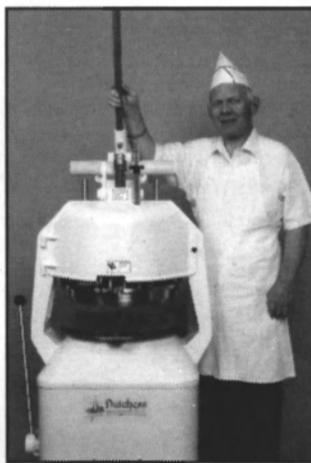
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Cruise Ship Repair: New Size, New Challenges

Today's mega-sized cruise ships not only stretch the imaginations of ship designers, they tax the physical facilities and technical know-how of shipyards and equipment suppliers. Ship repair facilities, for either planned maintenance or emergency work, are another area of maritime forced to consider the dilemmas (and dollars) involved in servicing bigger ships. **Rebecca Stewart**, Newport News Shipbuilding's head of ship repair, addressed the issue of larger ships at the recent ship repair conference hosted by the Maritime Administration in Washington, D.C. Stewart noted that today's cruise fleet features considerable amounts of high technology equipment and systems, including but not limited to advanced azipod propulsion systems, fiber optic communications and new materials, which are designed to make ships lighter and faster.

As shipowners increase demand for faster and better service — attempting to ensure their large investments' idle time is minimized — Stewart maintains that it is critical for a yard to have the physical facilities, scheduling flexi-

Welcome Aboard in 1998

Grand Princess The Grandest Of Them All

Grand Princess is the fifth ship to be built by Fincantieri for Princess Cruises. It has become the flagship of the Grand Class, which includes the two 77,000-gt sister-ships Sun Princess and Dawn Princess, delivered in 1995 and 1997 respectively.

Grand Princess can accommodate more than 2,600 passengers in 1,296 cabins, 700 of which have verandahs. In addition to suites, mini-suites and standard cabins, the ship has 28 wheelchair accessible cabins. It is presently the largest cruise ship operating in the world at a length of 935 ft. (285 m). The vessel has been classified by Lloyd's Register of Shipping as well as Rina of Italy, and is registered Liberian.

Two FP propellers are driven by a Siemens electric propulsion motor with 21 mW maximum output. The propulsion power and the ship's electrical power are provided by six Siemens generators, each producing 11,520 kW, driven by six GMT-Sulzer diesel engines. Grand Princess has achieved a maximum speed of 24 knots, but will cruise at a service speed of 22 knots. The vessel features all the exciting activities today's passengers expect, plus a virtual reality center, blue screen production studio, life-sized chess game, art gallery, and a computerized golf center.

Circle 85 on Reader Service Card

bility, technical expertise and tools to accommodate all of these foreign built ships in order to compete.

Stewart points to her yard's

work on the fire-damaged Ecstasy last summer as an example of NNS' advantages on the cruise ship repair side. Success depended on a well orchestrated work plan, which was accomplished, evidence

of NNS delivering the vessel in 45 days, two days early. Work entailed the removal of 500 to 600 tons of debris and the NNS fabrication of many of the parts.

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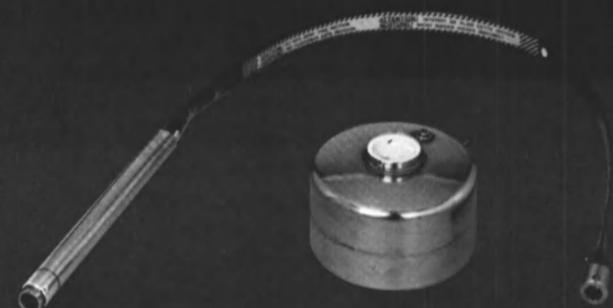
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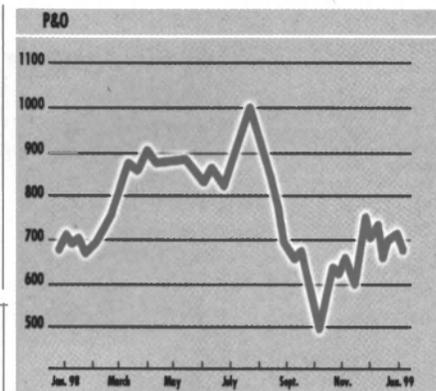
Princess Cruises Helps Steady P&O In '98

While the general shipping market took a considerable beating during the past year — due in large to perennially low freight rates in the oil transport, drybulk and container sectors —

Peninsular & Oriental Steam Navigation Co.'s diversification, particularly its Princess Cruises Division, helped maintain a semblance of stability. As of December 31, 1997, the Princess Cruise Division accounted for 26 percent of the group's net operating assets, a figure which is anticipated to

increase.

It was quite a year for Princess, marked by the introduction of the world's largest cruise ship (for now, at least) in the spring. Although Grand Princess' debut was slightly delayed by last minute, customer-mandated modifications, it has made quite a splash in an industry



which is notorious for its one-upsmanship. The \$430-million ship helped increase Princess Cruises' capacity in the third quarter of 1998, as it ran 100% filled (2,600 berths) for the entire quarter.

	3rd Quarter		Year to Date	
	1998	1997	1998	1997
Princess Cruises	1,230,506	1,129,768	3,234,654	3,041,868
P&O Cruises (U.K.)	352,382	362,840	1,058,186	1,115,160

	3rd Quarter		Year to Date	
	1998	1997	1998	1997
Princess Cruises	1,245,733	1,130,586	3,246,027	3,035,783
P&O Cruises (U.K.)	356,366	366,490	1,036,035	1,076,510

	3rd Quarter		Year to Date	
	1998	1997	1998	1997
Princess Cruises	101.2	100.1	100.4	99.8
P&O Cruises (U.K.)	101.1	101.0	97.9	96.5

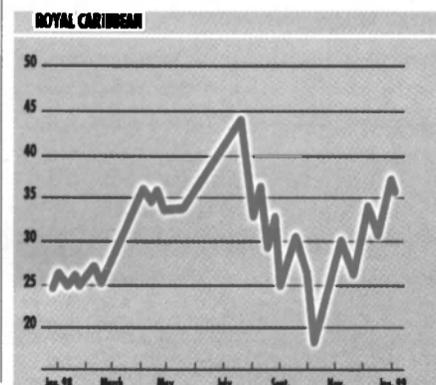
pbd = passenger berth days.

Growing The Goliath

Led by the ubiquitous **Richard Fain**, Royal Caribbean has embarked on a fleet expansion of historic proportions, as it will add four ships and 10,000 berths in the first two years of the new millennium, including the world's first gas turbine powered cruise ship.

It will soon add to its line-up the world's largest cruise ship, regaining the title held by Princess Cruises.

The \$500-million Voyager of the Seas, measuring 1,020 ft. (311 m) and 142,000 tons, is currently under construction at Finland's Kvaerner Masa Yards' Turku facilities and appears to be on schedule for an October 1999 delivery. The company currently has firm contracts for two additional Eagle class ships, but has indicated that its Eagle fleet could number six.



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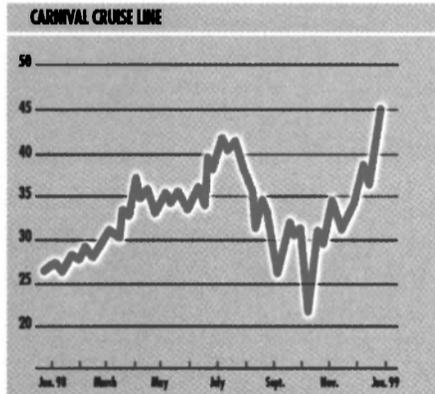
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In a seeming effort to keep cruiseship building yards busy worldwide, Royal recently took up an option with Germany's Meyer Werft to build a second 85,000-ton Vantage class ship for \$350 million. These 2,000 passenger vessels are unique in that they will be powered by gas turbines.

Royal Caribbean is clearly making a play to offer the most modern fleet of vessels in operation, considered a hedge against potential economic downturns.

At \$3 Billion And Heading Up

Carnival Corp. — the largest cruise line in the world based on passengers carried — saw profits soar 42 percent in its fiscal fourth quarter, driven by stronger passenger counts and a majority stake of Cunard, acquired in May, boosted revenues. Profits in the full fiscal year rose to \$835.9 million



from \$666.1 million. Revenues climbed to \$3.01 billion from \$2.45 billion. Total passengers for the year increased to 2.05 million from 1.95 million a year ago.

Net income in the fourth quarter ended November 30 increased to \$220.6 million from \$155.4 million. Revenues surged 39 percent to \$728.6 million from \$524.4 million a year ago. Miami-based Carnival's acquisition of a 68 percent interest of Cunard Cruise Line Ltd. in May spurred the big increase. Without the acquisition, revenues still grew by 14 percent.

The coming year appears rosy for Carnival as well, which introduced the \$300 million, 2,040-passenger Paradise in late 1998 and is set to launch Carnival Triumph this July, followed by Holland America's Volendam in August.

Carnival made news by becoming the first cruise line to offer a 100 percent smoke-free ship. To prove its resolve in ensuring the sanctity of its rules, the company reported that by mid-January, it had put-off

nine passengers for smoking violations. Passengers sign an agreement before boarding Paradise not to smoke, with the realization that smoking will result in being transported to land, forced to find and finance the way back home. As a kicker, the line will now institute a

\$250 "fumigation" penalty for those caught.

Carnival was also involved in one of the more visible and publicized accidents of the year, as the luxury liner Ecstasy — carrying 2,575 passengers and 900 crew — erupted in flames from the stern as it

was leaving the Port of Miami. Carnival Corp. is comprised of Carnival Cruise Lines, Holland America Line; Windstar Cruises; a majority interest in Cunard Line Ltd., which operates Cunard and Seabourn brands; and interests in Costa Cruises and Airtours Plc.

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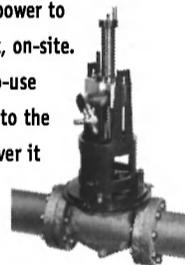
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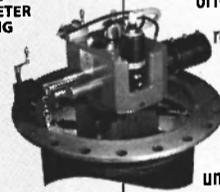
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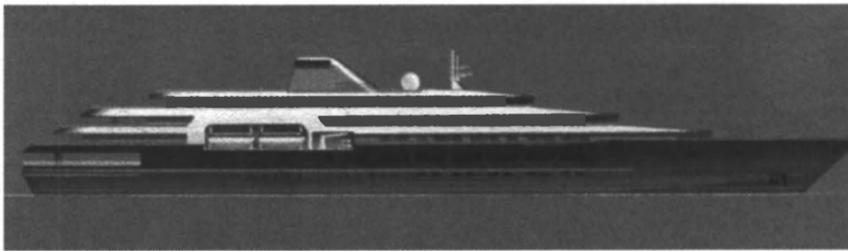
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A Revolution In Cruise Ship Design

Beau Mansfield Design and Sterling Design International are working together in the south of France to develop a new concept in

cruise ship design – one that results in vessels being built more quickly, operating more efficiently and being more cost effective. **Beau Mansfield** developed the new approach by observing the operation and construction of vessels firsthand, as an engineer and construction manager of large motor vessels. “Too often I have seen ships, and worked on them, where the working parts of the vessel have literally been crammed into spaces that were left over after the passenger accommodation areas were finished. Apart from annoying delays faced by the operators, it also results in higher than necessary costs, longer turn rounds, and unnecessary problems for the passengers,” he said.

Mr. Mansfield’s method is to design the ship around the service and running point of view: incorporating innovative servicing and handling facilities to improve efficiency and reduce running costs. He has teamed up with Sterling Design to put the concept to the test with the building of a 460-ft. (140-m) cruise ship for an as yet undisclosed owner. The design should allow daily functions to be performed with minimal effort and without bothering the passengers.

The vessel will have three boarding platforms, one each at port, starboard and stern. The two side platforms connect directly to a lift to the lower deck, which will have a service passageway between the storerooms, freezer facilities and workshops. The stern platform, including a fold out marina, will be used when at anchor to load and unload passengers from the tenders. The tenders will be housed in the stern when not in use and will be picked up simultaneously by a central overhead extending gantry crane. The result of having three separate boarding platforms is that however the ship may be berthed, bulk provisions may be loaded easily and quickly by a small number of crew without interference to the passengers.

Other features of the design include the use of diesel electric propulsion with ABB Azipod drive units; unmanned generator rooms with full monitoring in a separate

(Continued on page 45)

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Cruise Lines Benefit From Quality Third-Party Ship Management

By Jim Barreiro de Leon

By all indications, both the number of cruise ships and their sizes are growing. At this writing, there were an estimated 50 cruise ships on order and that number is expected to increase. Many of the

leading cruise lines have vessels under construction in sizes ranging from 22,000 gt to 142,000 gt. With price tags estimated between \$150 to \$550 million, and the combined cruise newbuilding order-book totaling an estimated \$12.5

billion, cruise ship owners are unquestionably expecting to turn a profit. Preoccupied with the "hardware," they have made sound decisions relating to the selection of architect, consultants and shipyard, but what consideration has

been given to the "humanware" or specifically, their shipboard management once they are ready to sail? For many cruise lines, understanding the value of a high quality, third-party ship manager is a lesson still to be learned.

Probably the single greatest obstacle for third-party ship managers in winning cruise ship contracts is the trust factor. The best managers know how to develop trust at all levels of the cruise ship operation; from owner and tour operator to concessionaires. This trust is further cultivated through direct, open and honest communication between ship manager and the various other parties. Regardless of the performance specification (i.e., Three-Star, Four-Star, etc.), it is the ship manager's role to assure that the optimum performance standards are met consistently and cost-effectively. In view of increased competition and continually changing passenger demands and market trends, ongoing communications and performance evaluations are especially important. Through the communication process, ideas can be exchanged, and enhancements to the overall product delivery can be implemented quickly and effectively to meet these market demands.

Building A Partnership

The best ship managers operate less like contractors and more like partners to the cruise ship owner/operators. In the best cases, these ship managers are ship owners themselves and therefore have direct knowledge of the issues facing today's cruise ship operators and the liabilities involved. They possess a clear understanding of passenger vessel trends, regulatory matters and market conditions. They know, for instance, that differentiating your cruise ship with unique offerings (e.g., themed restaurants, skywalks, atrium spaces, dramatic staircases, sports/recreational facilities, medical services linking on-board facilities to land-based hospitals, etc.) means more than just gaining attention, but rather gaining the competitive edge. They also understand the cost-to-benefit ratios of these various value-added offerings and how they must be analyzed in the ship's overall budget.

Still, even those management organizations with a proven track

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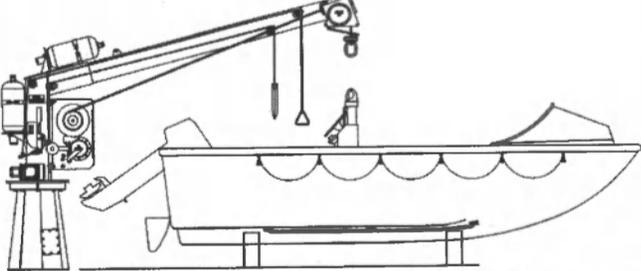
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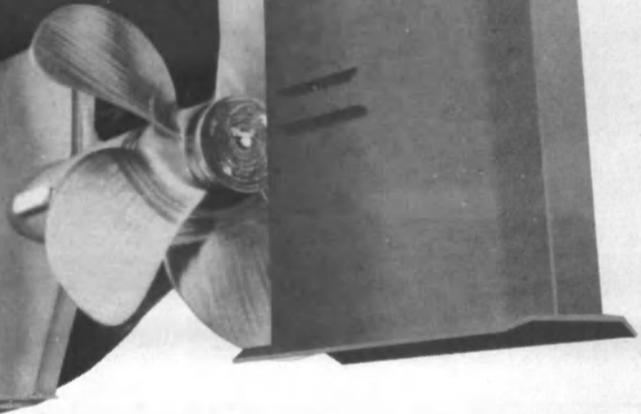


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record as both ship owners and managers, must demonstrate their ability to assume full responsibility for this multi-faceted, floating real estate.

Along with operating standards, the experienced ship manager will guide the cruise ship owner/operator in critical programs to assure successful vessel operations. What immediately comes to mind are standards pertaining to vessel sanitation. A sound "Vessel Sanitation Program" will provide policies and procedures on the correct way to load, store, handle and dispose of various materials and inventories on a cruise ship. These procedures will be in accordance with the standards and regulations of various governing bodies in whose ports the cruise ships will be traveling. For example, the "Vessel Sanitation Program" for passenger vessels entering U.S. ports, will meet the United States Public Health Standards and guidelines put forth by the Center for Disease Control (CDC). In addition, a quality ship manager will be cognizant of vessel sanitation regulations put forth by foreign municipalities and how to achieve compliance.

As part of their "Vessel Sanitation Program," diligent ship managers will incorporate Hazardous Analysis Critical Control Points (HACCP). This HACCP concept consists of a checklist of various places in which materials are handled, including the point of supply, receiving/loading docks, storage areas, ship's galley, etc. All crew members are trained and certified in the "Vessel Sanitation Program" to the same extent they are trained on other critical matters pertaining to vessel safety (i.e., deck and engine hazards, passenger safety, first aid and CPR, etc.).

Brand Quality Assurance

This matter of safety and the cruise ship's overall quality assurance is a key component of the ship manager's role. Not only does the manager assume responsibility for the vessel's high quality and cost-effective performance, but also for the image the vessel projects to the marketplace. Its "brand" is as much a matter of pride for the ship manager as it is for the cruise ship owner/operator. This "branding" will also extend to the ship manager's assistance in design and developing a brand on behalf of a client which also may encompass the

adaptation of an existing brand, perhaps for a leisure resort or hotel.

Integral to the vessel's quality assurance, is the ship manager's focus on ISO 9002 and ISM code compliance. Both of these standards form the foundation of service delivery upon which rests the

customized services which ensure the proper attention to critical details required and specified by the cruise ship owner/operator.

Another important value-added component of the ship manager's role is the ability to recruit, train, motivate and retain a qualified marine staff across all ranks.

Maintaining a skilled and motivated staff is no easy task, particularly in view of today's rapidly growing world fleet and the demanding work conditions. It is the hallmark of a quality ship manager.

Fiduciary Responsibility

The ship manager's role also



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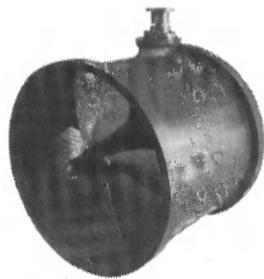
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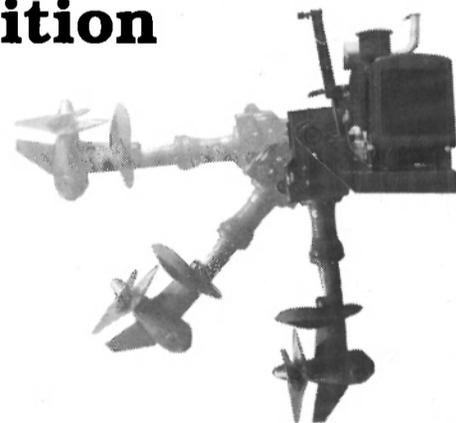
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CRUISE SHIPPING REVIEW • Ship Management

extends to that of a fiduciary. From establishing operating budgets and negotiating contracts, to monitoring expenses and performing detailed cost analyses; the ship manager remains focused on containing costs and enhancing profitability. Monthly operating budgets are prepared and scrutinized

to ensure that the cruise ship owner/operator's fiscal objectives are being met.

Dispelling the Myths

For cruise ship owner/operators who have established a 'partnership' with a high quality ship management firm, any previous mis-

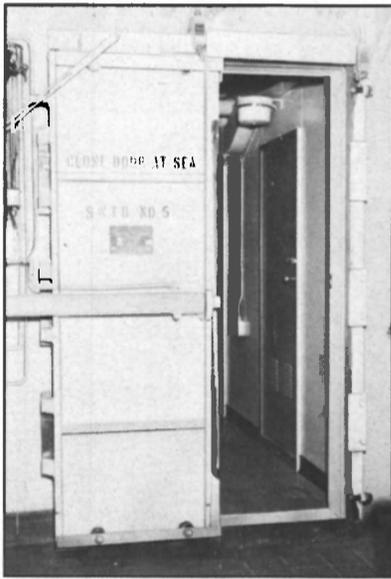
conceptions have been replaced by measurable advantages. For those who haven't, the myths still persist. Some owner/operators mistakenly believe the costs for third-party management are too high.

They fail to recognize that effective ship managers know how to operate a vessel at the lowest pos-

sible costs, without any sacrifice to quality. Others fear a loss of control and don't understand that the best ship managers give their clients all the tools and information they need to stay in complete control. Still others believe they can manage their cruise ship better and more cost-competitively. If, in fact, this latter group had a fully-dedicated, equally-experienced management resource on-board, then perhaps their belief would be well-founded. Unfortunately however, many new cruise ship owner/operators now entering the market, who attempt to manage their vessels themselves, have neither a dedicated team for the task nor the level of experience that third-party ship managers have. Ultimately, the operation becomes unwieldy and ineffective, resulting in a loss of quality both in the cruise ship's operation and related core revenue-producing functions. Outsourcing services to qualified third parties is an accepted and widely used practice across numerous categories of business and industry and for good reason. Cruise ship owner/operators reluctant to outsource their vessel's ship management should focus on the benefits of outsourcing in general and apply them in their consideration of third-party ship management.

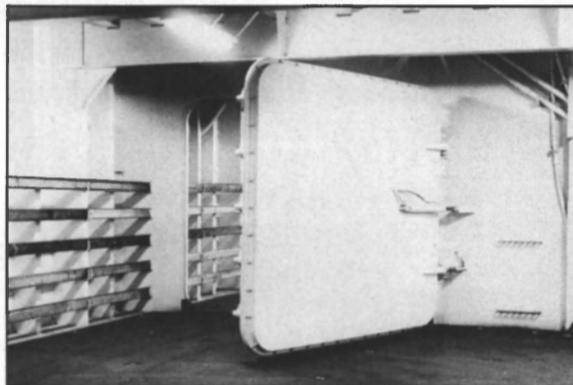
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One Ship Manager For All

A final caveat to cruise ship owner/operators regarding ship management: when seeking out the most qualified and experienced ship manager based on the aforementioned qualifications, don't make the mistake of hiring two managers; one for hotel services and another for deck and engine services. The optimum 'partnership' reflects a one-stop shopping concept. It allows a qualified ship manager to assume full responsibility for all facets of operation. This partnership keep sub-contractors to a minimum so that accountability is firmly placed with the ship manager. The on-board Management benefits from direct lines of communication enabling them to concentrate on product delivery and passenger service.

Mr. Barreiro de Leon is Manager Hotel Operations & Passenger Services for V. Ships Marine, Ltd. (Mineola, N.Y.).

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(Continued from page 40)

control room and on the bridge; a designated storage room for passenger and crew luggage; spare parts storage and inventory system; underwater lighting at the stern and side boarding platforms; and high standards of crew accommodation.

The ship will have a capacity for 200 passengers and more than 100 crew members. Designed for long distance self-sufficient cruising, the vessel will have large storage areas for extra food and drink as well as fuel and water. It will be fully air-conditioned and be fitted with extensive electronic systems including the latest navigation, steering and engine control systems as well as entertainment and communications systems.

"The exterior styling of the vessel has been proportioned so the vessel's length, height and beam are all in harmony to create a balance between classic and contemporary design that is so often overlooked in Cruise Ship design today," said Mr. Mansfield. The details of the interior design and furnishings have not been finalized to date.

Sterling Design International has worked with Chantiers de l'Atlantique in the past on the design of cruise ships, including Star Princess and Nordic Empress. The company, headed by **Joel Bretecher**, also designed the exterior and interior of the 328-ft. (100-m) cruise ship *Le Levant*, recently commissioned at Leroux & Lotz for Compagnie Des Iles du Ponant.

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**Beau Mansfield Design/
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Main Particulars**

The shipbuilder, owner/operator, name, or flag of the vessel cannot be disclosed at the present time.

Country of owner/operator	..... European
Classification	..... Det Norske Veritas
Length, o.a.	..... 460 ft. (140 m)
Length, b.p.	..... 384 ft. (117 m)
Breadth, molded	..... 62.3 ft. (19 m)
GT	..... 9,975
Displacement	..... 6,410 at 5 m draft
Lightweight	..... 5,840 tons
DWT, design	..... 570
DWT, scantling	..... 860 at 5.15 m draft
Speed, service	..... 21 knots
Bunker 464 tons diesel oil
Water ballast 195 tons
Fuel consumption 190 tons
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Main engine type 2 x KVMB 12 / 2 x KRMB 8
Total hp 2 x 2,180 kW / 2 X 1,480 kW
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Norway: Consolidations Continue To Shape Market

By David Tinsley, technical editor

The conditional agreement whereby the Ulstein Group less its shipyard will become part of Vickers, and the takeover of Kvaerner Ships Equipment (KSE) by Hamworthy Marine's parent organization, signal the start of a new era for two leading Norwegian players in the maritime sector.

While its Swedish subsidiary has long been a driving force within the cargo access equipment market, KSE has pursued a policy of internationalization to the extent of having transferred its corporate headquarters from Norway to Singapore in 1996.

Following December's \$57 million purchase by the diversified, U.K.-listed engineering and ports group Powell Duffryn, its future now lies in the newly-created, British-based entity, Hamworthy KSE.

Ulstein's business development has gathered momentum since flotation in October 1997, boosted by a succession of company purchases to strengthen and embellish a broad-based, international man-

ufacturing operation, including an extended North American presence. The \$500 million acquisition by niche engineering specialist Vickers will create a major new force in the global market, Vickers-Ulstein Marine, to be run from Ulsteinvik, the Norwegian company's west coast fountainhead.

Both pairings are characterized by a high degree of product and market complementarity, and both involve concerns which are successful in their own right, having demonstrated innovation as well as resilience in a fiercely competitive, international business scenario.

The KSE transaction is part of the Kvaerner Group's on-going shake-out of what it perceives as non-core activities. It is equally a testament to the will of Powell Duffryn to expand within the marine market by building on Hamworthy's operations, already much developed through selective company and technology purchases over the course of the 1990s.

The impending marriage of interests between Ulstein and Vickers reflects strategic objectives

of both parties. It is in line with the U.K. firm's plan to gain leading market positions in niche engineering sectors offering growth potential, and allies with Ulstein's philosophy of extending the concept of system solutions.

Subject to the completion of due diligence procedures, bank finance, and approval by the relevant U.K., Norwegian and U.S. authorities, Vickers-Ulstein Marine is expected to come into being by the spring at the latest. Ulstein chief executive **Bård Mikkelsen**, who will head up the new force, is unequivocal about the prospective benefits of the link-up.

"It represents a good industrial solution for the ship equipment producing companies," observed Mikkelsen. "Our strategies can be carried forward and we will get a larger marketing and service organization. Additionally, there are opportunities for synergy and technical developments. For example, together with Kamewa, part of Vickers' marine division, we can offer competitive, integrated propulsion solutions."

Ulstein's main strengths are in



Former ABB executive vice president Kjell Almskog moved into his new office as Kvaerner's new president. In an effort to get the behemoth company back on the right track, he let it be known from the outset that there will be a stronger focus on technology.

the fields of propulsion and maneuvering systems, transmissions, steering gear, deck machinery, high-performance rudders and medium-speed diesels. It includes brands such as Ulstein Propeller, Brattvaag, Tenfjord, Frydenbo, and Ulstein Bergen, with Bird-Johnson having added fixed pitch propellers and waterjets to the group's market reach last year, while Ulstein UT-series vessel designs are licensed to yards around the world.

To a high degree, its activities are complementary to those of the U.K. group's Vickers Marine division, spanning the design and manufacture of propellers, thrusters, waterjets, winches, stabilizers, steering gear and hydrodynamic bearings. Vickers encompasses the Swedish-based Kamewa Group, including the Aquamaster and Rauma brand names from Finland, as well as Michell Bearings and motion control specialist Brown Brothers in Britain.

Both Ulstein and Vickers have interests in the turbine field, while Kamewa's joint development of podded propulsion systems in conjunction with electrical engineering specialist Cegelec gives further dimension to the projected new, combined company.

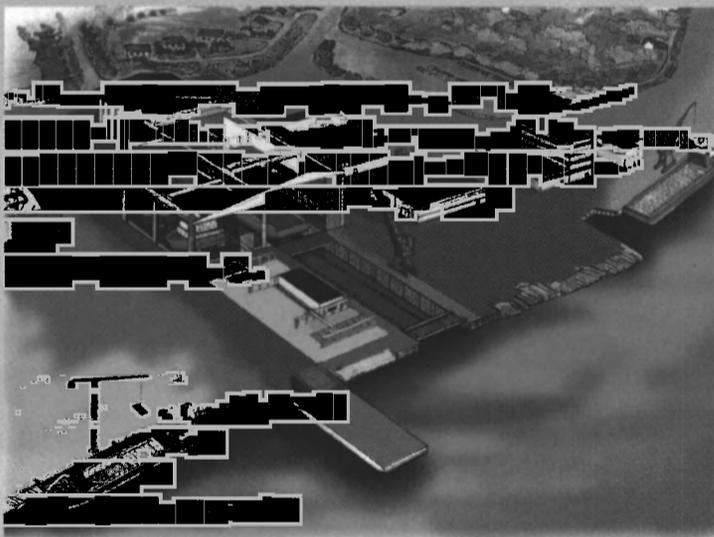
Meanwhile, the merger of KSE's liquid and dry cargo divisions with Hamworthy Marine's three main manufacturing operations has cre-

Ulstein Werft Invests In Productivity Enhancements

Norway's Ulstein Werft has recently embarked on a course of investment with an eye on productivity gains and a broadening of service offerings. A new partly covered building dock and adjacent outfitting hall are the first phase in a development to facilitate improved production methods. In all, \$33 million was invested in the first phase of the major shipyard redevelopment program. This will also include an extension to the building dock at Ulstein Werft and the provision of weather protection over approximately half its length. In addition, two new integral outfitting bays will be provided, and crane capacity significantly increased.

The goal is to increase productivity and efficiency through new and improved production methods, while also improving the working environment. A key emphasis in the strategy is to increase the outfitting content of hull structure units prior to installation in the dock, and subsequently before closing them off with additional blocks. Although some improvements will benefit steel fabrication efficiencies, the principal investment focus centers on improving outfitting efficiencies.

The length of the dock is being extended from 623 ft. (190 m) to 741 ft. (226 m) and the width is being increased from 75.5 ft. (23 m) to 118.1 ft. (36 m). In the full yard development program, the outfitting hall will have five activity positions, but in this first phase only two will be completed. These will be located adjacent to the dock in a dedicated hall measuring 180 ft. (55 m) in length, 155 ft. (47.5 m) wide and 121 ft. (37 m) high. Painting has historically been a problem at the yard during the winter months. Such problems will be eliminated with the proposed investment in the dedicated painting shops. These will receive the steel units as they arrive at the yard. It is intended to fully paint hull sections before lifting them into the dock, including the first coating of antifouling.





With 70 percent of its company's business tied to the offshore market, Ulstein Group's president and CEO Bard Mikkelsen is hopeful that oil companies' ability to recover resources more cost effectively will allow them to hang on and sustain E&P through the ongoing oil price crisis. While this and the Asian financial woes pose near-term dips, Mikkelsen reports that Ulstein Group's performance is on a rising curve. Profitability has been increased across the board and order-books, particularly with propulsion products at Ulstein Propeller, are at record levels.

ated a new force in the international market. KSE's range features liquid cargo handling systems for tankers, inert gas systems, engine room pumps and cargo access equipment for all ship types, while Hamworthy's key areas include shipboard air compressors, centrifugal pumps, waste treatment systems, Svanehoj deepwell cargo pumps, and Schilling high-lift rudders.

Significantly, the takeover excluded Kvaerner Marine Automation, a Norwegian home-grown division with strengths in integrated bridge control systems, as well as Kvaerner Kincaid in Scotland and KSE's Singapore headquarters. KSE was viewed as no longer core to the Kvaerner organization's areas of engagement. Deteriorating financial results for the Kvaerner Group has seen the implementation of a critical review of the composition of activities and an assessment of long-term profit potential within each of the various business areas, covering shipbuilding, construction and engineering. Former ABB executive vice president **Kjell Almskog** moved into his new office on December 7 as Kvaerner president, to lead the work initiated by the board to focus and sharpen the Group's strategy.

Further sales of non-core assets and elimination of debt are key objectives. Mr. Almskog was reported in the group's house journal as stating that "There will be a stronger focus on technology in the future. Those areas where we have no technology, no special capabilities,

no special market position, where we are one out of 27 others, we will let go. You don't get medals for being 27th or indeed second — we've got to be number one."

The Aker Group, meanwhile, is rumored to be looking at possibilities overseas for expanding its

shipbuilding interests. Aker Yards, 51 percent owned by Aker RGI and 49 percent by Aker Maritime, has demonstrated its prowess in both highly-specialized one-off construction and also in series production of high-grade, more populous vessel types. Its field of interest is



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NORWEGIAN MARITIME REVIEW

currently represented by Langsten and Aker Brattvaag in Norway, Aker MTW in Germany and Aker Finnyards in Finland.

Aker Maritime recently won a contract worth around \$175 million to upgrade Statoil's Gullfaks C platform in the Norwegian sector of the North Sea to enable gas pro-

duction to be doubled. A number of group companies in Norway and the U.K. will have key roles to play in the project, including the construction of two modules of approximately 1,000 tons each by the Aker McNulty yard on Tyneside.

Consideration is being given by Aker Maritime as to whether to

merge five of its companies in Norway into a single entity, so as to raise competitiveness and increase the scope to profitably undertake large, offshore-related turnkey projects. The firms under evaluation are Maritime Tentech of Kristiansand, Aker Engineering of Oslo, the Aker Stord and Aker

Verdal fabrication yards, and Oslo-based Aker Marine Contractors.

Since the extensively modernized shipbuilder Ulstein Verft will not become part of Vickers, special arrangements have been drawn up to ensure the continuation of certain strategic and commercial links between the shipyard and the remainder of the Ulstein Group.

Ulstein Verft has a considerable reputation in specialized construction, and no more so than in the offshore support vessel domain. One of the key influences on its



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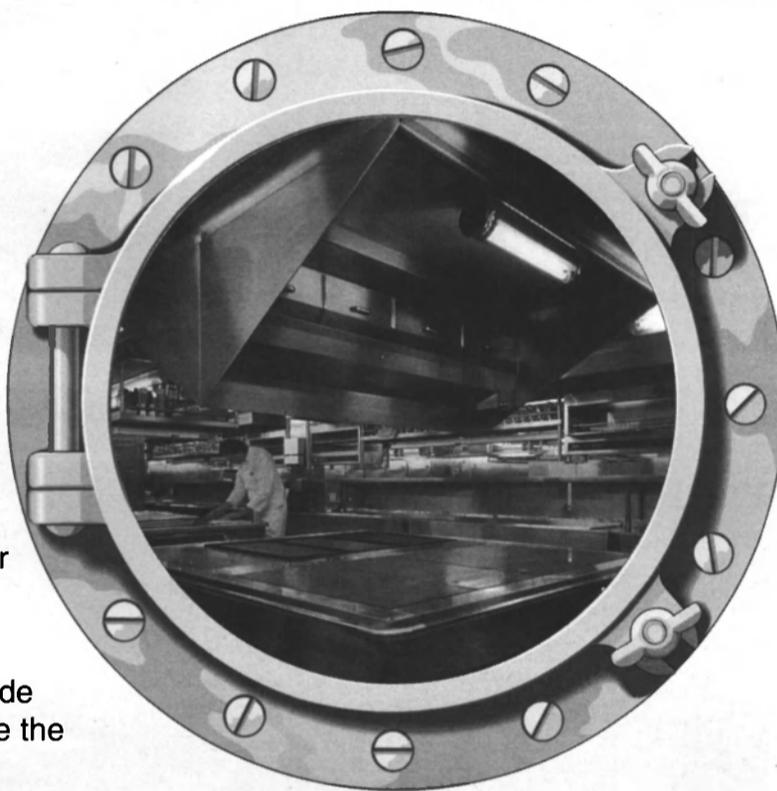
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Production ship know-how

Kvaerner remains at the forefront of production ship technology for the offshore oil and gas industry, and its current workload includes the main responsibility for building and commissioning the world's largest FPSO (floating production, storage and offloading) unit, due to be deployed on Australia's Laminaria field during the 1999 second-half.

The group's currently most extensive FPSO project is the Jotun, which is scheduled to be phased into operation this year by Esso Norway in waters to the west of Stavanger. Outfitting of the Kvaerner Masa-built hull was assigned to the Kvaerner Rosenberg yard at Stavanger. The Norwegian group has also had a major involvement in the Triton FPSO for the Abbot, Razorbill and West Guillemot fields in the British sector of the North Sea. Due to start operations this year, producing 105,000 barrels of crude per day, Triton was converted from a crude oil tanker built by Samsung in South Korea.

The latest and most advanced ship concept emanating from innovative Kvaerner is the floating production, drilling, storage and offloading (FPDSO) vessel. It combines an FPSO role with a complete drilling solution, breaking new ground in offshore ship design through the capability to drill through the turret. According to Kvaerner, the production cost savings from having a drilling capacity on board may amount to around \$0.50 per barrel, enough to provide oil companies with significant operating benefits. "Kvaerner has set itself the goal of being the first supplier of such a vessel, and the technology will hopefully be ready to offer to the market by the end of 1999," said Leif Wanvik, of the concept development department at Kvaerner Oil & Gas.

The group is also constructing what is claimed to be the world's only semi-submersible, gas production platform, Asgard B, expected to be put into production offshore during 2000.

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The cargo unit may serve as a floating storage facility, independently of the propulsion unit which is free to operate elsewhere. While at sea, the two units operate as one ship.

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competitiveness in constructing the UT-series ships that form its staple diet is its familiarity with the group's own equipment, machinery and systems, which helps promote work performance as regards installation and interfacing.

While the \$33 million redevelopment of the Ulsteinvik shipyard will enable the yard to cope with a wider range of vessels, it will most importantly provide the basis for higher productivity and efficiency. Ulstein Verft has long played a pivotal role within the group, not only in attracting contracts which have a multiplier effect throughout the specialized equipment manufacturing activities, but also in constructing and engineering first-of-class vessels conceived by the company's prolific design division. It has always had to demonstrate a competitive capability for the gamut of UT-series offshore and specialized vessel types, regardless of considerable variations in technology and configuration. The building dock at the Ulsteinvik premises is being lengthened from 623 ft. (190 m) to 741 ft. (226 m), and widened from 75.4 ft. (23 m) to 118 ft. (36 m), and is to be enclosed over half its length. The inner part of the building dock will be protected by a hall of 459 ft. (140 m) length and 175 ft. (53.5 m) span, and the adoption of a second, movable gate will enable two vessels to be constructed simultaneously. The program includes two new outfitting bays and the provision of substantially increased craneage capacity.

High-speed power

Greater Norwegian industrial self-reliance in providing high-speed maritime transport solutions is promised through the creation of a facility at the Ulstein Bergen diesel engine works to assemble and test a radical new design of gas turbine. Developed by the group's turbine subsidiary in partnership with Turbomeca of France and Volvo Aero Corporation of Sweden, the Eurodyn radial machine offers important power-to-weight ratio and emissions performance benefits relative to diesel engine prime movers in its target markets.

The 2.3 MW-plus Eurodyn radial gas turbine is expected to have its first commercial service application during the spring of this year, powering the UT905 catama-

ran ferry Ulstein Turbiner chartered by Hardanger Sunnhordlandske (HSD) for the link between Stavanger and Haugesund. Built several years ago by Ulstein as a test and demonstration vessel, the twin-hulled vessel is being outfitted by Oma Baatbyggeri with seating for

206 passengers.

Manufacture and assembly of pre-series Eurodyn engines, due to be carried out over the course of the 1999 first-half, will be used to optimize the build process. Commercial production is to be set in train in the year 2000. The target design power for production

units is 2.6-MW.

Anticipated full load fuel consumption is 240 g/kW-hour, and test cell running indicates that the engine's environmental performance will count strongly in its favor, as it achieved 0.25 g/kW-hour for nitrogen oxide (NOx) emissions compared with an IMO-

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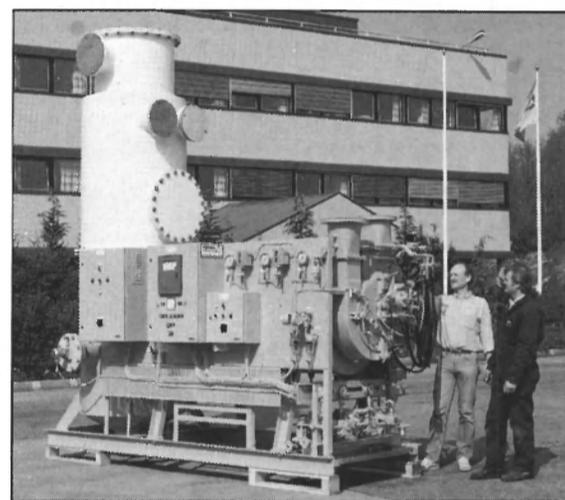
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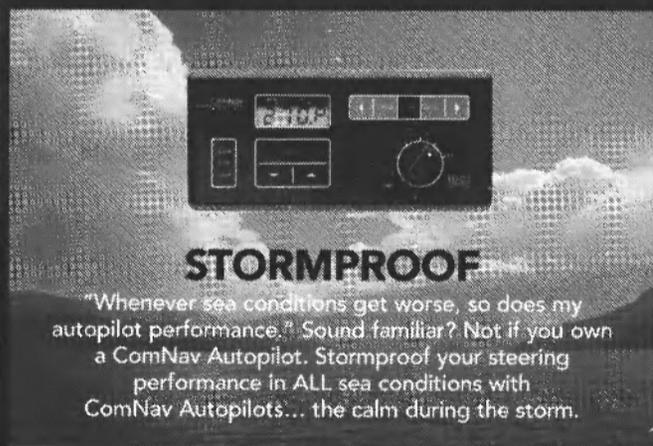
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TECHNOLOGY MARKET REVIEW

prescribed limit of 10 g/kW-hour.

Ulstein's scope of supply, and ultimately that of Vickers-Ulstein Marine, as an integrated maritime production group, stands to be

increased as a result of the Eurodyn development, not least as regards the power and propulsion combinations now available as a result of company alignments

which have brought waterjets into the fold.

Although Ulstein is not planning to re-engage in fast ferry construction, the Norwegian maritime

cluster includes in-depth design, production and operating experience in the field. While Australia's lightweight shipbuilding industry, in particular, poses an increasing market challenge, one of the Scandinavian bastions of high-speed technology, Kvaerner Fjellstrand, has continued to foster business development in both new and established areas.

Two major projects figuring in the 1999 catamaran production program at the Omastrand yard on Hardangerfjord entail a second JumboCat 60-class car-passenger ferry for duties with Nordic Jet Line of Estonia, and a FlyingCat 50 ferry for Malta. The expansion-minded Estonian operator commissioned the 40-knot, JumboCat 60 Nordic Jet on the Tallinn/Helsinki route last year, and early traffic results induced the company to make a commitment to a second such vessel from Kvaerner Fjellstrand.

The stern-ramped, diesel-engined type offers a capacity for 428 passengers and 52 cars, or alternatively two buses plus 40 cars. The 60 m design, the largest produced to date by the Norwegian yard, had made its debut in 1996, when the Solidor 3 entered service with the French company

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Emeraude Lines.

Also at the upper capacity end of the portfolio, a FlyingCat 50 has been ordered by the Maltese company Virtu Ferries in a deal worth approximately \$12 million. Due for handover during the early part of the coming summer season, the 161 ft. (49 m) craft will be deployed between Malta and Sicily, carrying 418 passengers and 21 cars at speeds up to 40 knots.

As with Nordic Jet Line undertakings on a second JumboCat 60, the latest Maltese contract follows earlier, positive experience with a Kvaerner Fjellstrand vessel, since Virtu Ferries had successfully deployed the first FlyingCat 50 last summer in its Sicilian traffic. Propelled by four diesel engines driving waterjets, the design type offers good ride performance through the specification of the Kvaerner motion dampening system (MDS), using active and computer-controlled, submerged foils and flaps.

Design capacity strengthened

Ulstein's takeover last fall of the Alesund-based design house Nordvestconsult (NVC) underscored the commitment to core activities and the home-grown technological base, while also giving further expression to a strategy of broaching new segments of the market. Bringing NVC into the fold gave succor to the group's efforts to broaden the market reach of its activities in design and ship systems technology, given Ulstein's business weighting towards the offshore industry, and NVC's extensive experience in specialized merchant ships and fishing vessels. In addition, it was felt that the combination of expertise and client contacts would create new opportunities for the equipment-manufacturing cluster encompassed by the Ulstein organization. The move has also provided the new Norwegian owner, and hence the Vickers-Ulstein Marine enterprise, with a foothold in the Croatian technical marine field, since NVC's successor, Ulstein Nordvestconsult (UNVC), has acquired a 50 percent stake in the Rijeka-based design firm NVC-Navis Consult. UNVC recently achieved a market breakthrough by signing an agreement with a Japanese yard to provide the design for two 21-knot vehicle carriers with a loading capacity equivalent to 1,400 cars. Although Nordvestconsult is no stranger to contractual owner United European Car Carriers (UECC),

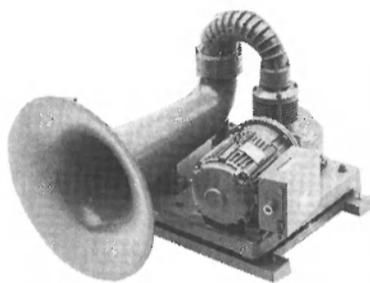
having been entrusted with design responsibility for the operator's six previous newbuilds, the latest project is the first for the Alesund firm from the Japanese shipbuilding industry. Domiciled in the Norwegian coastal town of Grimstad, UECC is of Swedish and Japanese parentage, the two bloodlines being Wallenius and Nippon Yusen Kaisha. The

prospective new additions to its car feedership fleet will be constructed by Tsuneishi Shipbuilding, and are to be deployed in the intra-European traffic in North Sea, Baltic and Mediterranean waters. The high specification for the two ships, besides a comparatively high service speed and the extensive adoption of equipment sourced in

Scandinavia, unusually includes fin stabilizers.

Business relationships forged closer to home by UNVC include a longstanding link with Fosen Mek Verksteder at Rissa, most recently expressed in the design input to the yard's construction of a series of exceptionally fast, conventional passenger RoRo ferries for Minoan Lines of Crete.

HEAVY-DUTY SIGNALS by Kahlenberg

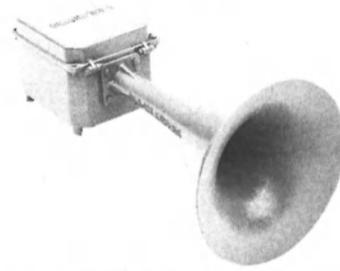


Model S-120 Piston Horn

Chosen for use on aircraft carriers as well as commercial vessels over 200 meters in length, the S-120 utilizes an oscillating piston driven by 7-1/2 horsepower 3 phase 220/440 volt electric motor, producing 143 dB and a fundamental frequency of 94 Hz in 1/3 octave band at one meter.



Kahlenberg Signals were developed to withstand the punishing use of commercial and military service. Their durability has been demonstrated over decades of service on ocean-going vessels ranging from naval warships to commercial vessels. Military specifications have required extensive testing for many of these whistles and the accessories supplied with them, which have proven the exceptional qualities of Kahlenberg design and manufacturing.



Model S-203C S-203 CHT

For vessels over 75 meters in length, this design allows both whistles to exceed 143 dB (1/3 octave band). The S-2036 and S-203 CHT are virtually maintenance free. Durability is ensured by the use of bronze and marine aluminum construction materials through out. For the most extreme cold weather operation, Model S-203 CHT (shown) includes a thermostatically controlled, heated enclosure for both the combination manual/electric valve, and the horn sounding body.

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Mormac Appointments

Andrew P. Langlois has been appointed president of Mormac Marine Group and W. Robert Germain was promoted to president of Mormac Marine Transport. Mormac owns and operates three

tank vessels and manages three tankers and five cargo ships.

USMR To Acquire PACSHIP

United States Marine Repair Inc. (USMR) has agreed to acquire Pacific Ship Repair and

Fabrication (PACSHIP) with headquarters in San Diego, Calif. and additional facilities in the Puget Sound, Wash. area. The acquisition of PACSHIP, with annual revenues between \$25 million and \$35 million, gives USMR a 65 percent share of all the non-nuclear air-

craft carrier repair work in San Diego.

NSA And SCA Merge

The National Shipyard Association (NSA) and the Shipbuilders Council of America will merge. It will be called Shipbuilders Council of America, representing more than 50 companies that own and operate more than 100 shipyards in 20 states.

Bent Glass Design Introduces Marine Glass

Bent Glass Design, Inc. has introduced a new laminated glass product specifically designed for marine applications. Consisting of two pieces of strengthened flat or bent glass permanently bonded together, Marine Glass aims to offer excellent optical quality, as well as moisture, water vapor, chemical and ultraviolet radiation resistance. The new product is available in conical, cylindrical and irregular forms as well as a variety of colors.

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P&O Nedlloyd Christens Fourth Megaship

The last of four megavessels to join P&O Nedlloyd's fleet was christened P&O Nedlloyd Kowloon. The 6,690 TEU ship, built by IHI.

LSC Resignation

The Liberian Shipowners' Council Ltd. (LSC) announced the resignation of its general secretary, Jeremy M. S. Smith.

Fleet Technology

Appoints Four

Fleet Technology Ltd. (FTL) has appointed David Stocks as project manager working on Major Marine programs at FTL. Cody Lyster has joined FTL as a marine engineer. Luksa Luznik and Julie Lafleur, project engineers, will be working in the areas of hydrodynamic and structural modeling, and ice engineering and water hydraulics respectively.

First Sulzer RTA68T-B Engines Ordered

The Sulzer RTA-T line of two-stroke marine diesel engines has been completed with the recent order for six RTA68T-B engines in Poland. They will be installed in two 78,500 cu. m. LPG carriers contracted by the Norwegian owner Bergesen DY AS at Stocznia

Maritime Reporter/Engineering News

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Gdynia SA (with options expected). The six-cylinder engines will each have a maximum continuous output of 17,640 kW at 94 rpm for a service speed of 18 knots. They will be built under license by H. Cegielski of Poznan. The ships are due for delivery in June and December 2000. Further projects involving the RTA68T are under discussion in East Asia including standard Suezmax and Capesize vessels for which the RTA68T is designed to be well suited.

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New Seaway Administrator Sworn In

Albert S. Jacquez has been sworn in as the eighth administrator of the Saint Lawrence Seaway Development Corp. (SLSDC). Mr. Jacquez succeeds Gail C. McDonald, who resigned as the SLSDC administrator in April 1997.

South Seas Steamship Gains Canadian Representative

Greer Shipping Ltd.'s Vancouver office is now serving as Western Canadian agency representative for South Seas Steamship Line (SSS). South Seas was recently purchased by Hamburg Süd/Columbus Line.

Swedish AIS Transponders Delivered To MPA Singapore

GP&C Sweden AB has been awarded a contract for a pilot installation of AIS transponders from the Singaporean main contractor Brown Automation & Consulting Engineering. The end customer, Marine and Port Authority of Singapore (MPA), will introduce AIS transponders in Singapore waters based on the STDMA technology.

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AIMU Chairman Elected

James A. Zrebiac, chairman of International Marine Underwriters, a member of the CGU Insurance Group, was elected chairman of the Board of Directors of the American Institute of Marine Underwriters (AIMU).

NASSCO Completes Drydock Extension

National Steel and Shipbuilding Company (NASSCO) has completed the 200-ft. (61-m) extension to its floating drydock. The \$20 mil-

lion project expanded the drydock to a length of 785 ft. (239 m), which will allow it to accommodate larger ships. The extension was a requirement for starting work on a \$490 million contract for the U.S. Navy.

De Poli Shipyards Earns ISO Certificate

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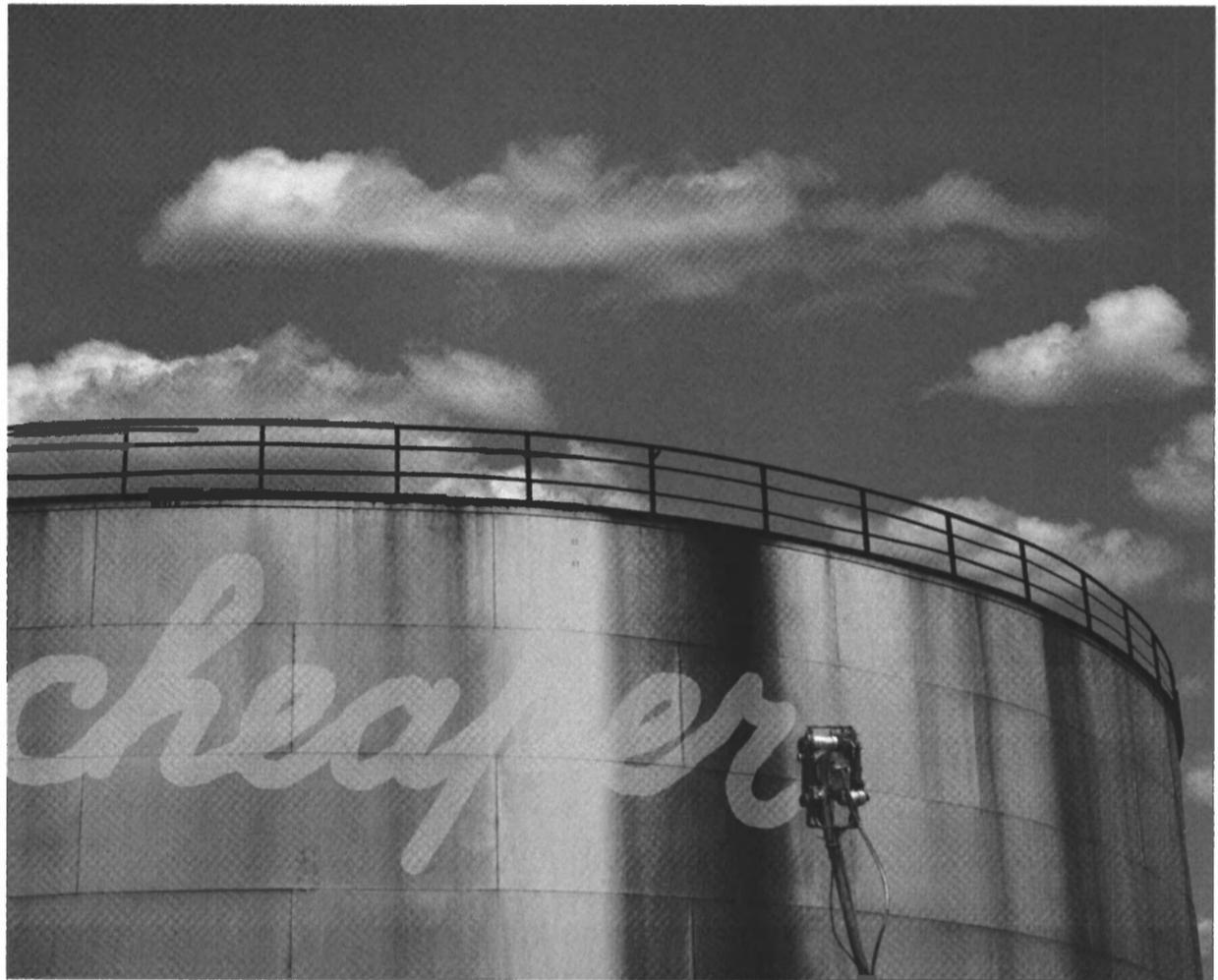
to UNI EN ISO 9001:1994 standards by RINA, the Italian Register of Shipping.

STCW Team Chartered

RADM Robert C. North, the Assistant Commandant for Marine Safety and Environmental Protection, has chartered an STCW Implementation Focus and Coordination Team to monitor the

progress of an coordinate efforts to implement the provisions of the International Convention on Standards for Training, Certification and Watchkeeping for Seafarers, 1978, as amended in 1995 (STCW Convention).

The team will develop a coordination plan which will explain how the U.S. Coast Guard (USCG) will monitor and coordinate the steps being taken in the U.S. through



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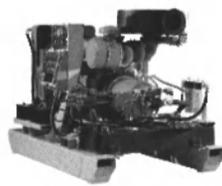
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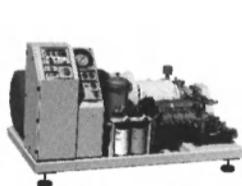


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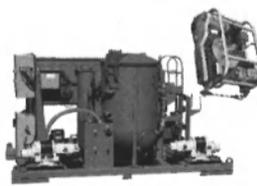
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the implementation period to give the STCW Convention full and complete effect. The team's leader is Capt. **Bob Skewes**.

Autoship Complete Systems Installed

Autoship Systems Corporation has installed two complete systems of The AutoSHIP Works at Guangzhou Marine Engineering of

China and Estalerios Sao Jacinto of Portugal. The complete package consists of the full suite of CAD marine design programs, including Autoship, Autohydro, Autopower, Autobuild and Autoplate — providing the shipyards with an integrated suite of design programs for their naval architecture departments.

Circle 61 on Reader Service Card

SNAME Appoints Executive Director

Phillip B. Kimball has been appointed executive director of the Society of Naval Architects and Marine Engineers (SNAME). Mr. Kimball has been a member of SNAME for 31 years, serving as volunteer chairman of the New York Metropolitan Section, and as a member of the Ship Technical

Operations and National Planning Committees.

New Container Vessels Introduced

Turkish Cargo Line has chartered two full container vessels for its Turkey express container service from the East Coast to the Mediterranean. The ships, the M/V. Izzet Incekara and M/V. Cumhuriyet 75, are recently built cellular vessels with a capacity of 860 TEUs per ship. The Turkish flag vessels, which were built in Istanbul in 1996, will be deployed along with the M/V. Bitlis to provide sailings directly to Turkey.

Gibbs & Cox

Achieves ISO 9001

The Washington and New York offices of Gibbs & Cox, Inc. have been certified to ISO 9001:1994 — Quality Systems-Model for Quality Assurance in Design, Development, Production, Installation and Servicing — by ABS Quality Evaluations, Inc.

GE Marine Engines

Appoints Manager

GE Marine Engines has appointed **Read Tuddenham** as manager of Marine Applications and Ship Integration. Mr. Tuddenham will work on ship-board propulsion application development and evaluation for GE's naval propulsion programs as well as initiatives underway for GE's increased role in the cruise ship industry.

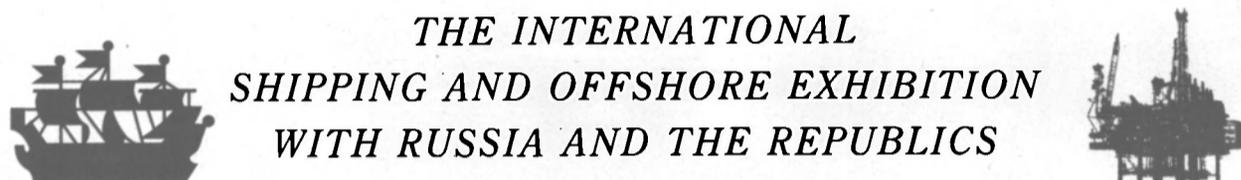
Virginia Companies

In Joint Venture

Fuji Trading (America) of Newport News, Va. has announced the formation of a venture with Bay Diesel Corp. of Chesapeake, Va. to provide parts and service for Mitsubishi Heavy Industries (MHI) large bore (UE) series marine engines and (MET) turbochargers.

Whesoe Varc Supplying Korean LNG Carriers

Whesoe Varc is supplying level gauging systems for two liquefied natural gas (LNG) carriers being built by Hyundai Heavy Industries. The instrumentation — to be delivered to Hull 1156 at the start of 1999 and Hull 1157 in June 1999 — is based on well-proven gauges which have been



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specially designed for cryogenic applications. They will allow the LNG tanks to be monitored to an accuracy of 7.5 mm during loading and unloading operations, providing a local digital readout, and both graphical and digital displays of tank status in the cargo control room.

Circle 10 on Reader Service Card

Inmarsat-C Terminals Fitted Reaches 50,000 Mark

Inmarsat has commissioned its 50,000th Inmarsat-C terminal, to be installed in a Chinese vessel the Da Long belonging to the Shekou Shipping and Transportation Co.

RTM Star Center To Assist Army Corps Of Engineers

The U.S. Army Corps of Engineers of Vicksburg, Miss. has signed a letter of agreement with RTM Star Center of Ft. Lauderdale, Fla. for a ship simulation study of the Cape Fear River and Wilmington Harbor, Wilmington, N.C. The object of the study is to verify that proposed improvements for the harbor and river channel will allow larger ships to safely access the port. The study calls for container ships, tanker/bulk vessels and cargo ships to make numerous simulation runs under various weather and tide conditions along sections of Cape Fear and in Wilmington Harbor.

Circle 11 on Reader Service Card

Sonsub Vessel Hull Launched in Norway

The hull of Sonsub International's new Inspection, Maintenance, Repair and Subsea Construction vessel, to be named Polar Prince, was launched in early January in Flekkefjord, Norway. The vessel, designed and owned by Rieber Shipping A/S has been chartered by Sonsub International on a long-term basis, and will begin duty in May 1999.

New Director Ship Repairs At Todd

Spiro Risvas has recently joined Todd Pacific Shipyards Corp. as director of Commercial Ship Repair. Mr. Risvas will be responsible for Todd's commercial ship repair operations, concentrating on the improvement of the general operating systems and procedures.

IMSA Acquires New Member

The International Marine Software Associates (IMSA) has added SPAR Associates, Inc. of Annapolis, Md. to its list of member companies.

SPAR specializes in Perception/Estimate production management software. SPAR's PERCEPTION is a PC Windows-

based client/server system of proven application software modules that can operate interdependently or on an integrated basis.

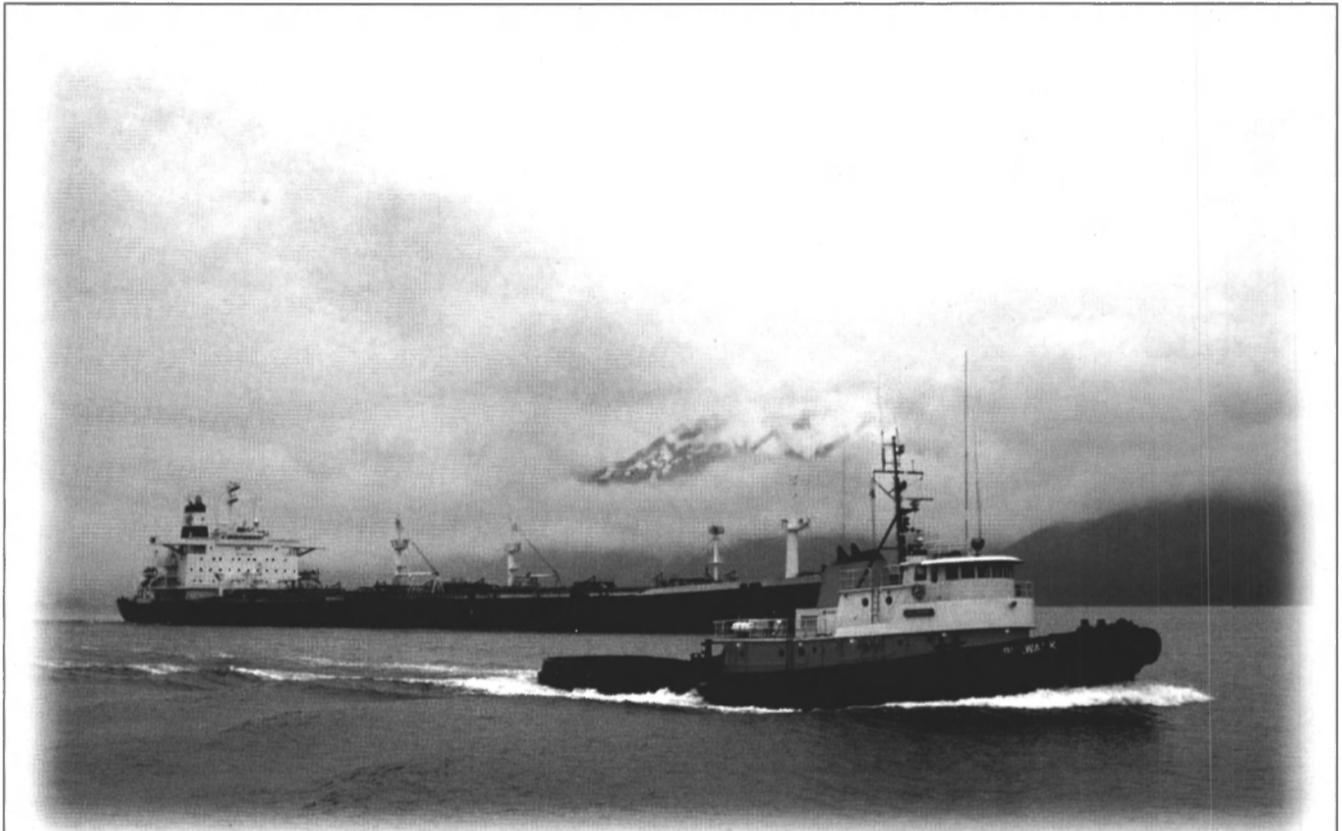
Golden Ocean Appoints Financial Advisor

Golden Ocean Ltd. has appointed Chase Securities, Inc. as its financial advisor. Golden Ocean Group is an international owner,

operator and manager of VLCCs and dry bulk carriers.

The company currently owns and operates a fleet of 15 modern vessels and focuses on purchasing newbuilding VLCCs for long-term charter.

Chairman of the group Fred Cheng expects the relationship with Chase Securities to open up strategic opportunities available in the market.



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Tug escorts and double bottoms help safeguard the environment but the best safeguards you don't see - they are trained people.

Competent mariners who have been afforded the opportunity to practice operating procedures and react to emergencies can and do prevent mistakes before they happen.

This is why ARCO, BP, Crowley and other responsible carriers, have worked with MSI San Diego to develop an interactive simulator training program for tanker escort operations where tanker, escort tug and emergency response vessel operators interact with Port, Coast Guard and VTS stations.

For the past year, MSI has been conducting joint, monthly courses for tug and tanker operators who must train together as a team.

Whether aboard a tanker, an escort tug, a response vessel or ashore at a terminal or VTS station, it takes coordinated skills to assure a safe passage. When quick reaction counts, each participant must know his job and understand that of the others.

A full program of joint courses is scheduled for 1998. Even now, MSI is preparing a simulator response model for ARCO's new Millennium Tanker for use in future training.

For a complete list of courses, ship models and geographic/hydrographic port databases, please call us at any of the following locations:

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Stern Flap System Dubbed Technical Breakthrough

Proven 14% fuel savings helps nab prestigious EPA Award

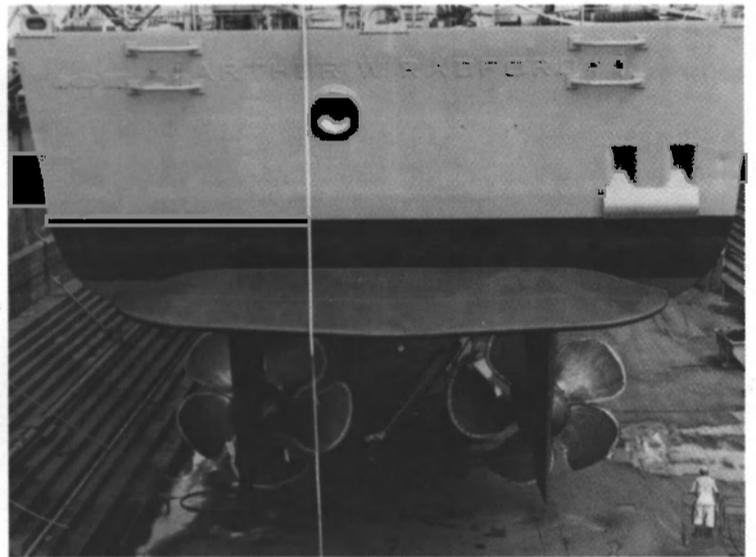
Technical innovation in the name of saving money and maintenance has become somewhat of a cliché in many industries, leaving many with the impression that the message is more marketing hype than real world results.

An innovation which is solidly in the latter category was recently honored by the U.S. Environmental Protection Agency for its role in conserving fuel, thus reducing pollutants. Specifically, the U.S. Navy's CG-47/DD-963 Stern Flap R&D Team has received one of the

EPA's 1998 Climate Protection Awards, as it was singled out for "Technical Breakthroughs in Ship Energy Efficiency" demonstrating powering improvements and significant fuel savings deriving from installation of new stern flaps on Navy ships.

The modification is an extension of a hull bottom surface at the rear of a vessel. The Carderock Division team determined the appropriate shape via model ship tests in the David Taylor Model Basin. Trials on USS Arthur W. Radford (DD-968) (pictured), a Spruance Class destroyer, have shown a reduction in required power up to 14 percent resulting in a projected annual fuel savings of 4,400 barrels per ship. This equates to approximately \$240,000 per year in fuel savings, as well as a .75 knot increase in speed. Radford is the destroyer also being used to demonstrate the new composite mast recently announced.

While the flap has been trialed on a number of different ship types, both real and model simulated, and the performance of the stern flap varies based on hull form and



Above & Left: Stern flap on USS Arthur W. Radford

speed, it has proven itself as an invaluable aid to propulsion power and efficiency.

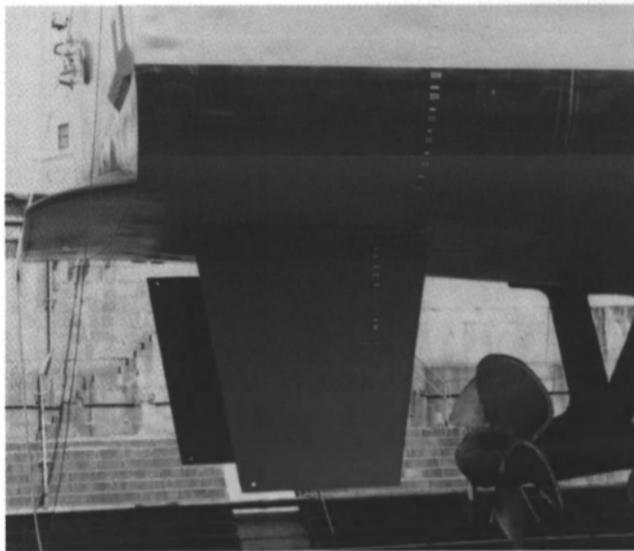
An Evolving Revolution

The advent of the stern flap solution to fuel savings and performance enhancing can hardly be termed a new development, at least in terms of publicity surrounding the system. For the past decade, the U.S. Navy have been investigating, at model scale, the potential powering improvements due to stern flaps, as low cost retrofits on many ship designs. It is interesting to note here that flap performance is optimized where the ship expends the most power.

While the fuel savings and power enhancing aspects of the stern flaps are truly amazing, from a business stand point they are outstanding performers as well, as predicted annual fuel savings will repay the flap retrofit costs in less than a year.

A stern flap is simply an appendage which reduces the power required to propel a ship through the water. It is a relatively small extension of the hull bottom surface aft of the transom. The critical parameters for stern flap design geometry are the flap angle, referenced to an extension of the local centerline buttock angle, flap chord length and flap span across the transom.

Flap design is dictated, ultimately, by the hullform design and the mission requirements of the ship. The stern flap's critical para-



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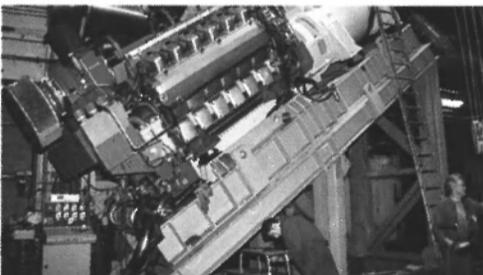
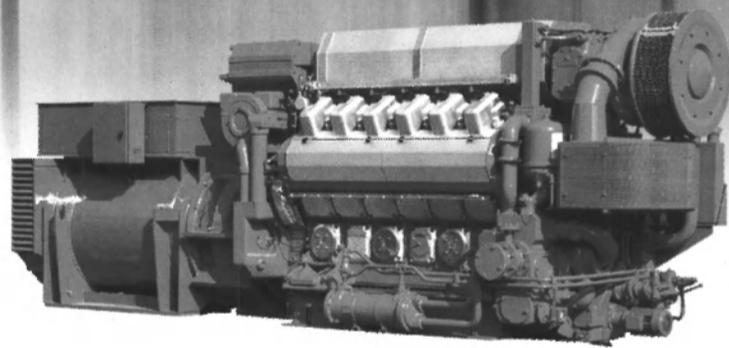
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MARINE ENGINEERING



Left:
Dominic Cusanelli led the Stern Flap R&D team.

Bottom:
The David Taylor Model Basin is the home for some of the world's most advanced maritime model testing.



meters, which are optimized through model testing, greatly influence the performance potential. Compromises must be reached between high speed and low speed stern flap performance, the relative importance of which is indicated by the particular ship's speed/time/operations profile.

In terms of propulsion interaction, in general, delivered power reductions averaged a few percent greater than resistance reductions during all model tests with stern flaps. An examination of model data from the CG 47 and DD 963 experiments showed an improvement in propulsive efficiency on average between 2 to 2.5 percent, and a reduction in wake factor of as much as 1.5 percent at certain speeds.

The increased pressure under the hull, due to the stern flap, can also serve to suppress propeller cavitation and reduce thrust breakdown losses at higher speeds.

The stern flap effect, combined with the reduced propeller loading, can provide additional powered improvement by way of increased propeller efficiency.

Stern flaps have been retrofit to two O.H. Perry (FFG 7) class frigates; two Cyclone (PC 1) class patrol coastals; as well as the A.W. Radford. All ships have experienced improved powering performance and fuel savings, and have reported not adverse impacts due to the stern flaps.

EPA presented the award during the Earth Technologies Forum in Washington, D.C. Winners came from eight countries and one international environmental leadership partnership.

The Carderock Team was headed by **Dominic Cusanelli** (pictured) of the Hydromechanics Directorate, and included **Lowry Hundley**, who was in charge of the ship performance trials; **Gabor Karafiath**, who provided technical direction; and **Steven Chun**, who provided technical support. The Carderock Division provides research, development, test and evaluation for U.S. Navy ships and submarines. With its unique facilities and advanced computer design, it has become known as the place "Where the Fleet Begins."

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Latest System Tests On Naval Engine Completed

The WR-21 intercooled recuperated (ICR) advanced-cycle gas turbine ship propulsion engine, being developed for naval warship applications by a team led by Northrop Grumman Corp., has successfully completed the eighth in a series of 10 planned full system tests.

Test results to date have projected a 22 percent saving in annual fuel, compared to conventional gas turbine engines used on naval destroyers.

The main distinguishing feature of the WR-21 is the recuperator located downstream of the turbine that recovers energy from the exhaust gas to increase fuel efficiency. This will allow a ship greater range for a given fuel capacity, or reduced fuel storage requirements for a given range.

The latest batch of tests, which took place at the U.K.'s Defense Evaluation and Research Agency test facility, lasted about 260 hours and were designed to test the WR-21's high-pressure turbine, engine control and combustor systems and other system components. The final test at the facility is set to begin in February and run through June 1999. This will lead to a 500-hour endurance test of the WR-21 in the fall at the U.S. Navy's test facility in Philadelphia, Penn. The U.K. and France have both invested in the development of the new engine.

Proteus, SPAR Develop Software Link

Proteus Engineering, working together with SPAR Associates, Inc., developed a live link between the MAESTRO structural modeling system and SPAR's ESTIMATE shipyard cost estimating software. This new ability reportedly allows a ship's structure to be very rapidly modeled for finite element structural analysis and optimization within MAESTRO, and the same model can be intelligently grouped for transfer to the ESTIMATE system.

The designer or cost estimator can then receive immediate and accurate feedback on labor and material costs while in the MAESTRO modeling system. The structural model parts are grouped according to their type of structure, so that appropriate cost estimating relationships (CERs) can

be applied. Each group has Zone designation (bow, stern, deck, machinery, midbody, or other), and a subassembly designation within that Zone, with choices such as double-bottom-3-D-curvature, side-double-curvature, deck-internal, etc.

This allows cost and man-hours per unit weight or length to be applied in a realistic fashion.

After the grouping is complete, the model is submitted to ESTIMATE, which very quickly returns cost information.

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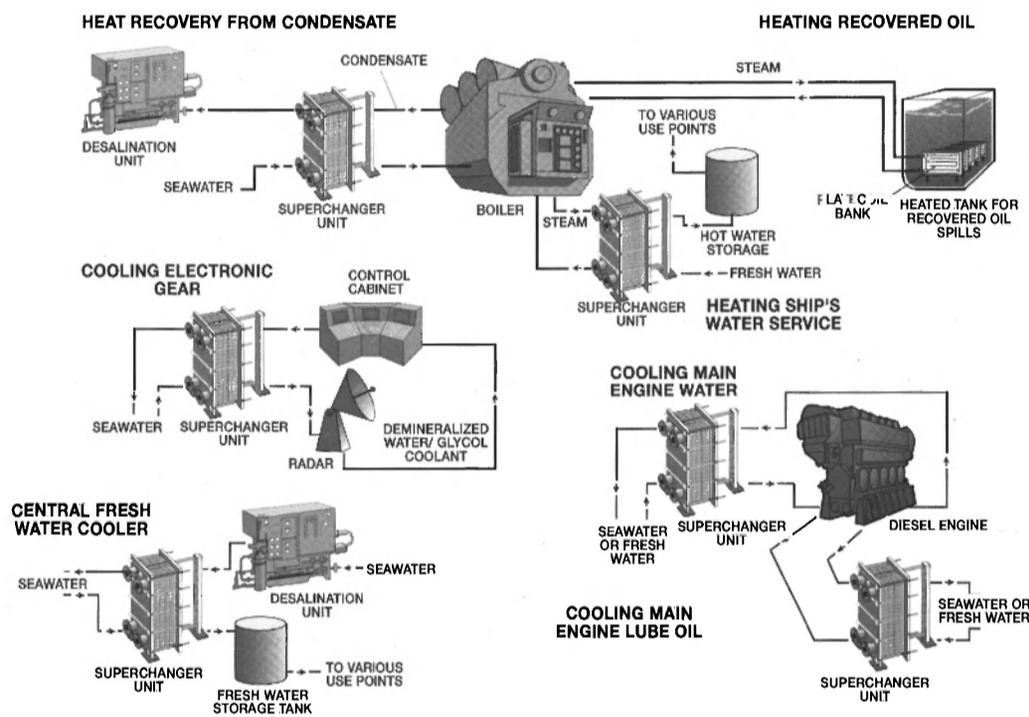
Shipbuilding Information Exchange Program Demonstrated

As traditional heavy, labor intensive industries increasingly look to software solutions and

(Continued on page 63)

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H E A T ▲ E X C H A N G E R S

Quality and Ingenuity Catapult Hose-McCann Into Year 2000



Established in 1936, Hose-McCann Telephone Co., Inc. has been known throughout the marine industry as the pioneer of Sound Powered Telephones and a leader in shipboard communication systems. Based in Deerfield Beach, Florida, Hose-McCann

continues to design and manufacture safe, reliable and rugged communication systems for maritime use.

High quality products and superior customer service has earned Hose-McCann honors such as "Blue Ribbon Vendor" for the U.S. Navy and Defense Department Gold Medallist for "Automated Best Value". Commitment to quality processes in manufacturing, distribution and documentation has recently led Hose-McCann to becoming an ISO 9001 Registered company. "Hose-McCann employees strive to offer the best products and provide the best service in our industry," says President and CEO Joan Grande-Butera.

Hose-McCann is a communications "superstore", manufacturing and distributing marine communication equipment such as Integrated Voice Communication Systems, Automatic Dial Telephone Switchboards, Sound Powered Telephones, Intrinsically Safe Sound Powered Telephones, Navigation Light Panels, Public Address and General Alarm Systems, as well as all the peripheral equipment associated with these systems.

RESEARCH & DEVELOPMENT

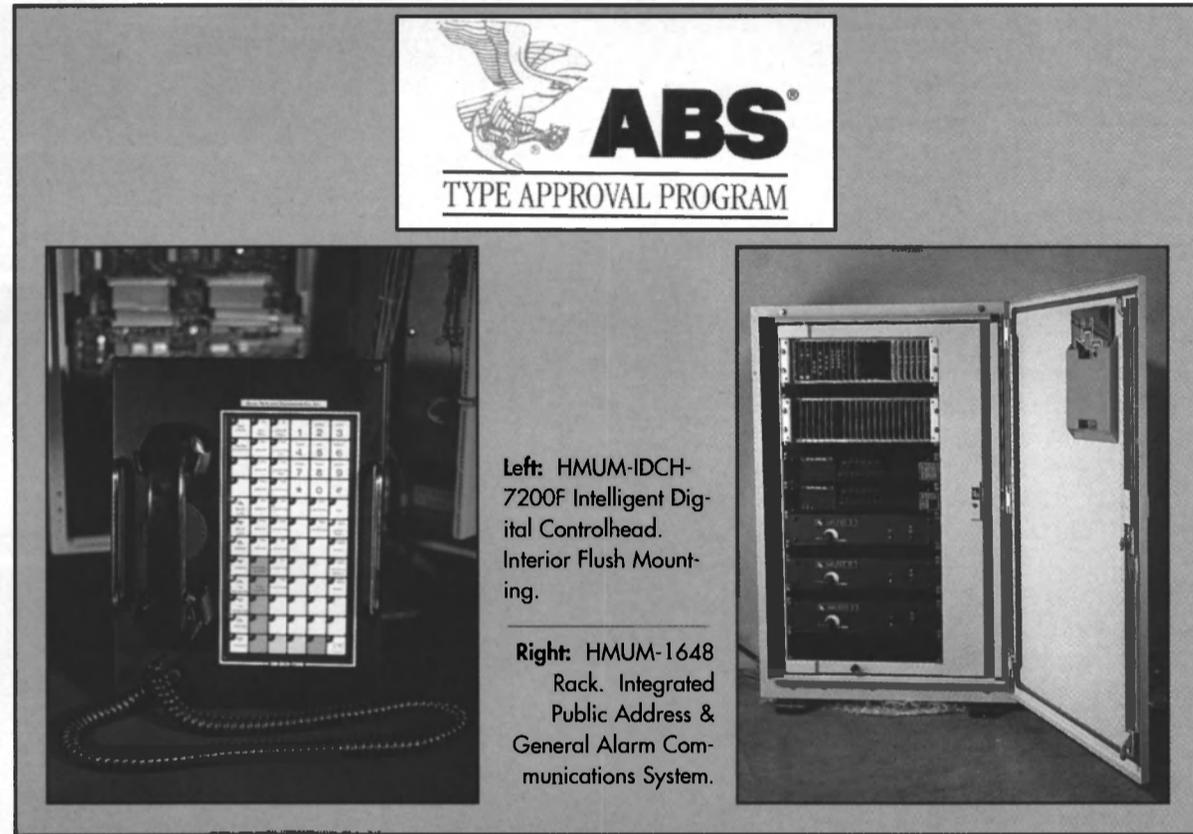
"An integral part of our business is to stay on the cutting edge of technology and lead the industry in quality improvements," says Grande-Butera, "Research and Development teams are busy improving established product lines and developing new products to meet the demands of the next millenium." Besides constantly improving their Sound Powered Telephone product line to include Intrinsically Safe and Back-lit Sound Powered Telephones, Hose-McCann is breaking new ground by re-designing speakers for music quality sound output to satisfy all locations, including hazardous. These new speaker styles have been designed to complement the Integrated Public Address / Entertainment / General Alarm System that Hose-McCann now offers.

Through a unique partnership with United Marine Communications of Canada, Hose-McCann has expanded its manufacturing capability to include fully integrated systems with unparalleled redundancy and supervision capabilities. The HMUM-RACK-1648 Series Integrated Public Address / General Alarm System was the first and so far the only system of its kind to be ABS Type Approved.

INTEGRATED COMMUNICATION SYSTEMS

The HMUM-1648 family of interior communications systems is a series of compact and highly versatile systems for marine applications. A single HMUM-1648 system cabinet houses power supply, monitor panel, single or dual switching/control sections and as many as five dual-channel amplifiers easily covering a broad range of Public Address, Loudhailer and Talkback functions. The addition of alarm tone generator cards, continuous supervision features and redundant components throughout the system allows the HMUM-1648 Series to meet and exceed US Coast Guard regulations governing redundancies in General Alarm applications.

Designed exclusively for use with Hose-McCann's Integrated Public Address Systems, the Intelligent Digital Controlhead is a modern microprocessor controlled station unit providing bridge users with centralized



Left: HMUM-IDCH-7200F Intelligent Digital Controlhead. Interior Flush Mounting.

Right: HMUM-1648 Rack. Integrated Public Address & General Alarm Communications System.

access to multi-line telephone, public address, Loudhailer, Talkback, radio, satellite and cellular communications systems. Control of alarm signals as well as other functions is also possible through the array of illuminated multi-function keys provided. All communication systems are thus provided access in a single flush mounted unit saving precious console space while maintaining modern console design.

The Controlhead provides the user all the advantages of digital use while its function is as reliable as having each push button hard wired to its respective task. In addition, the Controlhead monitors and visually signals for any failure in the systems it governs. When used in conjunction with any of Hose-McCann's Integrated Public Address Systems, "auto fault detection" is incorporated in such a way that if a PA amplifier or speaker were to fail, a visual as well as an audible indication is shown on the Controlhead. The user is given the opportunity to identify and repair the specific problem repair while the redundant components function in place of the failed. Ideal for the cruise ship industry, Hose-McCann also offers Integrated Entertainment Systems that provide ship-wide music through the public address system. When integrated in this fashion, Public Address and Alarm announcements automatically over-ride the music. Custom designed speakers enable control of the music volume, while the alarm system stays fully functional, saving cost and space of additional speakers. Integrated TV Distribution Systems and Closed Circuit Television Systems are also available.

Hose-McCann's Wireless Headset System provides clear, reliable, handsfree and therefore, convenient communications between control locations and crew working in hazardous or high noise areas. High reliability, good range and exceptional clarity make this system ideal for a broad range of vessel and rig applications. Communication between all parties in the system is full-duplex on a single conference plane. When integrated with the Public Address System, emergency announcements are heard by the headset users alerting them to emergency situations. Special headset noise cancellation technology assures strong, clear performance even in high noise

environments, such as the engine room, loading and crane areas or drill platforms, where hands-free intercommunication is a must. Independent Wireless Headset Systems are also available.

CUSTOMIZATION

All Hose-McCann systems can be fully customized to meet shipyard specifications. The company offers qualified engineers to lay out and design systems both for new construction vessels and conversion projects. "Conversion projects spark new developments in our systems," says Grande-Butera. Back-lit Sound Powered Telephones were developed to meet the new illumination requirements of the US Coast Guard Regulations. Digital Message Storage and Delay circuits have been incorporated into the Hose-McCann 1648 Series Public Address System to drastically diminish the echo quality usually found in car decks on vessels such as ferries. Developed for the often limited space available on conversion projects, the 2200 Series is a smaller version of the 1648 Series Public Address Systems. The 2200 Series Integrated Public Address System offers the same features, internal architecture and redundancies found in the 1648 Series in a more compact cabinet design. Each Hose-McCann Public Address System has its own unique characteristics.

Hose-McCann is providing Sound Powered Telephone equipment and Integrated Public Address / General Alarm / Dial Telephone Systems for a wide range of customers, including: U.S. Navy, U.S. Coast Guard, Army, Military Sealift Command, Mexican Navy and other military organizations world wide. In addition to its military customer base, Hose-McCann products can be found aboard all varieties of commercial vessels and oil production platforms circling the globe. With the diverse product line available, it is a wonder that a shipyard would need to go any farther than Hose-McCann Telephone Co., Inc. This company is truly a "communications superstore" with an emphasis on quality, reliability and ingenuity. Please contact our sales professionals, to see what Hose-McCann can do for you.

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AMSTERDAM

MARINE ENGINEERING

(Continued from page 59)

information technology in order to save time and money, it is interesting to note that a consortium of U.S. shipyards and CAD system developers have successfully demonstrated an exchange of shipbuilding data between its members. The prototype translators were based upon the STEP (Standard for the Exchange of Product model data) standards for the shipbuilding industry being developed within ISO. These translators are designed to enable shipyards and ship design companies to exchange detailed ship design information between dissimilar design systems.

The consortium includes Computervision Corp., Electric Boat Corp., Ingalls Shipbuilding, Intergraph Corp., Kockums Computer Systems Inc., Newport News Shipbuilding, The University of Michigan, Avondale Shipyards and Advanced Management Catalyst Inc. (facilitator).

National Steel and Shipbuilding Company, participating through Kockums Computer Systems, and the Naval Surface Warfare Center, Carderock Division are providing additional technical support to the consortium. MariSTEP is sponsored by the Defense Advanced Research Projects Agency (DARPA).

In the initial implementation effort, five shipbuilding environments enhanced their internal systems' product model data and developed translators to support the export and import of shipbuilding data. In this first phase, Intergraph Corporation, Newport News Shipbuilding and Kockums Computer Systems successfully exchanged ship molded forms and compartmentation data. Intergraph based its translation on its ISDP system, Newport News, its VIVID system, and Kockums, its TRIBON system. Electric Boat (EB) and the team of Ingalls Shipbuilding and Computervision (CV) exchanged ship piping, with EB using its CATIA based system, and with the Ingalls and CV team using PTC's DIMENSION III product. Application areas and corresponding ISO STEP Shipbuilding Application Protocols (APs) are Ship Molded Forms (AP 216), Ship Arrangements (AP 215), and Ship Piping (AP 217).

In the next phase of the project, the teams will switch implementation targets so that by the end of 1998, all five shipbuilding environments will have compatible translators for exchanging ship molded forms, compartmentation, and piping data.

Brass Works Relocated

Amcast Industrial Corp., a manufacturer of technology-intensive metal products, has purchased Lee Brass Company. Lee Brass makes cast brass products for residential, commercial and industrial plumbing systems. In a related action,

Amcast has decided to phase out brass operations at Flag Brass in Pennsylvania. The company expects the consolidation to have long-term benefits for all of its marine and other industrial customers.

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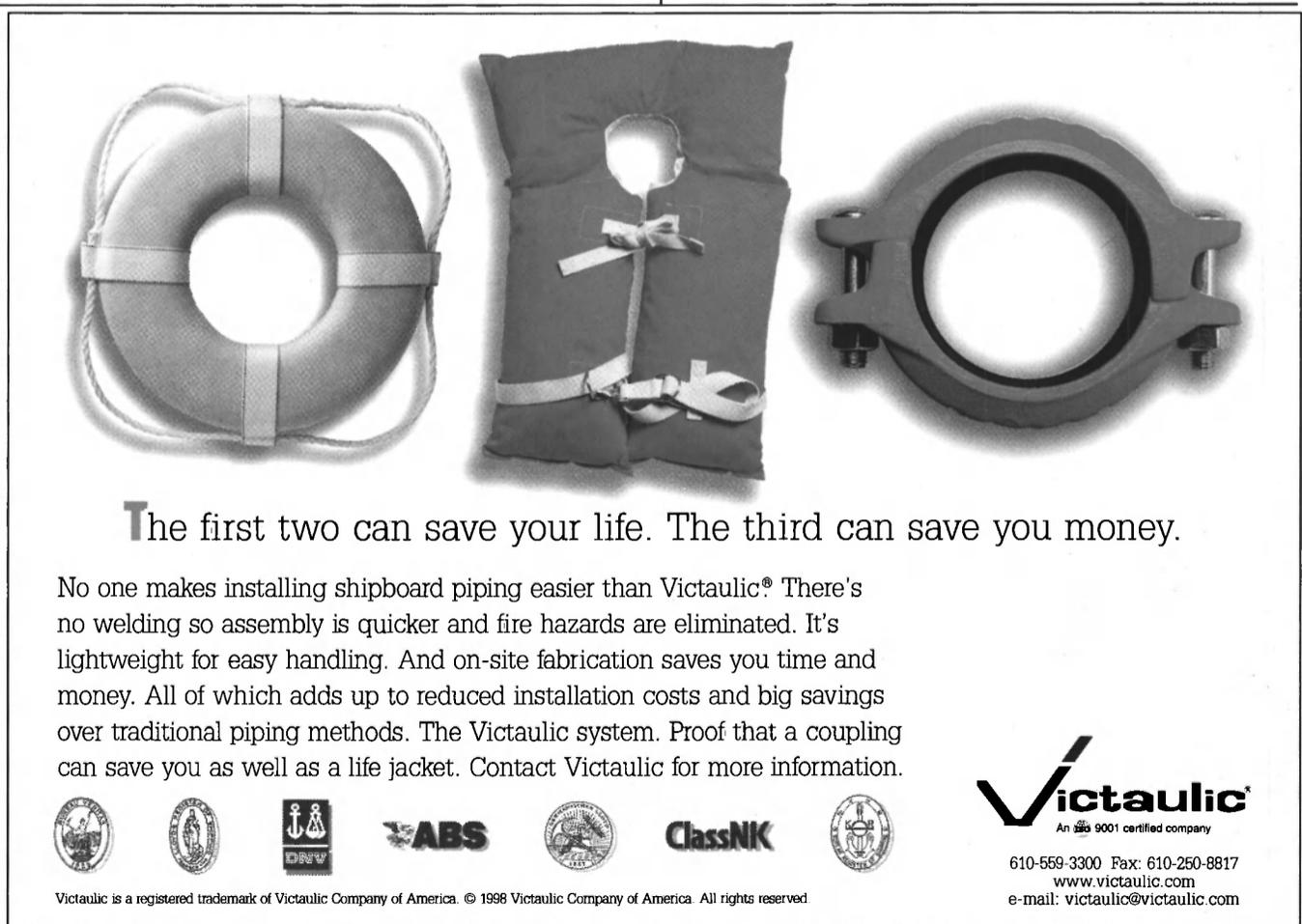
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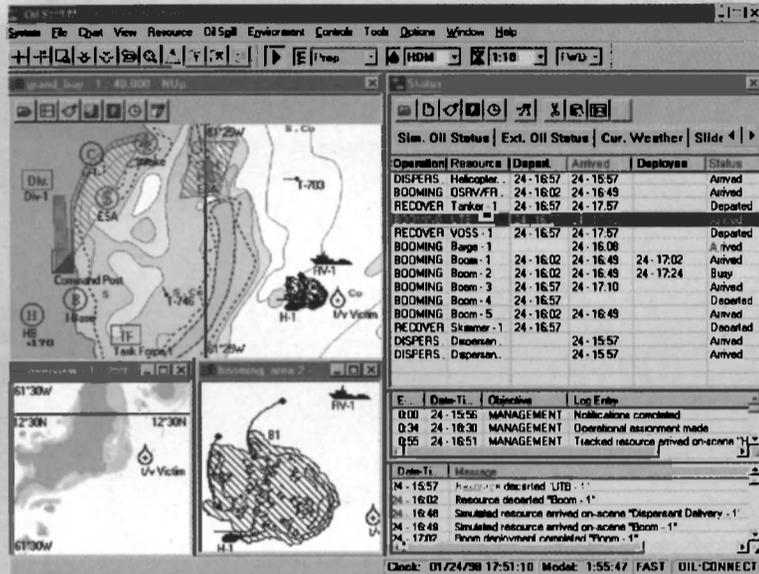
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OilGuard 2000 Designed To Help Crews Minimize Oil Damage

The trial version of a new Transas product, OilGuard 2000, was officially released by the company last fall. OilGuard 2000 is designed as the information system that may be beneficially used in any Oil Spill Response Center. The system provides facilities for command center exercise planning, conduct and analysis, pursuant to the requirements of OPA90, MARPOL 73/78, OPRC90.

Development of the OilGuard 2000 has been inspired by the contract with the U.S. Coast Guard (USCG) for a "Pollution Incident Simulation Control and Evaluation System" (PISCES). This contract was won by Transas in September 1996.

After the successful FAT and SAT passed in the first half of 1998, the Transas' OilGuard 2000 appeared in the company's product line as a commercial product based on the PISCES software. OilGuard 2000 uses a precise hydrodynamic model of the oil-spill which is integrated in a cartographic shell based on vectorized nautical charts. The model is capable of most realistic representation of all significant processes that take place in an oil-spill including oil spread characteristics, evaporation, sinkage into the water column, burning; and interaction with coastline, booms, skimmers and chemical dispersants. The model takes into account the continuously changing field of currents and other hydro-meteorological information. The OilGuard 2000 provides the user with a unique analyzing tool. Apart from the contin-



uous record of the model-related events and movements of the oil spill response participants, the program is provided with facilities for comprehensive report preparation. The modern concept of open architecture software is implemented with the OilGuard 2000, which makes the system easily adaptable to the particular requirements of any user. The OilGuard 2000 operator does not have to possess special computer skills other than the basic MS Windows user skills. The system can therefore be used immediately by subject area specialists. The minimum hardware required for the OilGuard 2000 is a Pentium 2000 with 64 MB RAM.

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Companies Team To Offer Oil Clean-up Solution

Kvichak Marine, Marco Pollution and Hyde Products have teamed together to introduce the Convertible 38-ft. OSRV, a fast response boom boat, stationary skimmer and advancing skimmer all in one package.



Built by Kvichak for Clean Sound Cooperative in Edmonds, Wash., Widgeon is the fifth pollution control vessel built by Kvichak for Clean Sound. It is, however, the first vessel of its kind, in that it incorporates two different oil skimming systems into one skimming platform. The new vessel type was designed to set new standards in performance and flexibility, designed for fast response, and safe, effective operation in harbor, near shore and offshore environments.

Oil recovery equipment is fully integrated into the hull of the vessel and features a patented LORI Recovery Channel design. With the side doors and sweeping boom deployed, the 38 x 12-ft. (11.5 x 3.6 m) all-aluminum OSRV becomes a 19-ft. (5.8-m) wide oil slick processing system. The vessel can advance at speeds up to three knots for maximum open-water oil encounter rates. When stationary, the Marco Flow Induction system creates a powerful inflow of surface water to draw oily water through the recovery channel.

Circle 73 on Reader Service Card

Liquid Waste Technology Acquired

Liquid Waste Technology has been acquired by an affiliate of Ellicott International, the world's largest producer of cutter suction dredges. LWT is a leading designer and maker of portable small dredges, especially those equipped with remote controlled operation and automation capabilities. LWT is known for its automated and radio remote controlled dredges, using Bottom Sense to protect pond bottoms and liners; Solids Sense to maintain delivery of constant solids density; and other options such as Radio Remote Sense, Auto Sense

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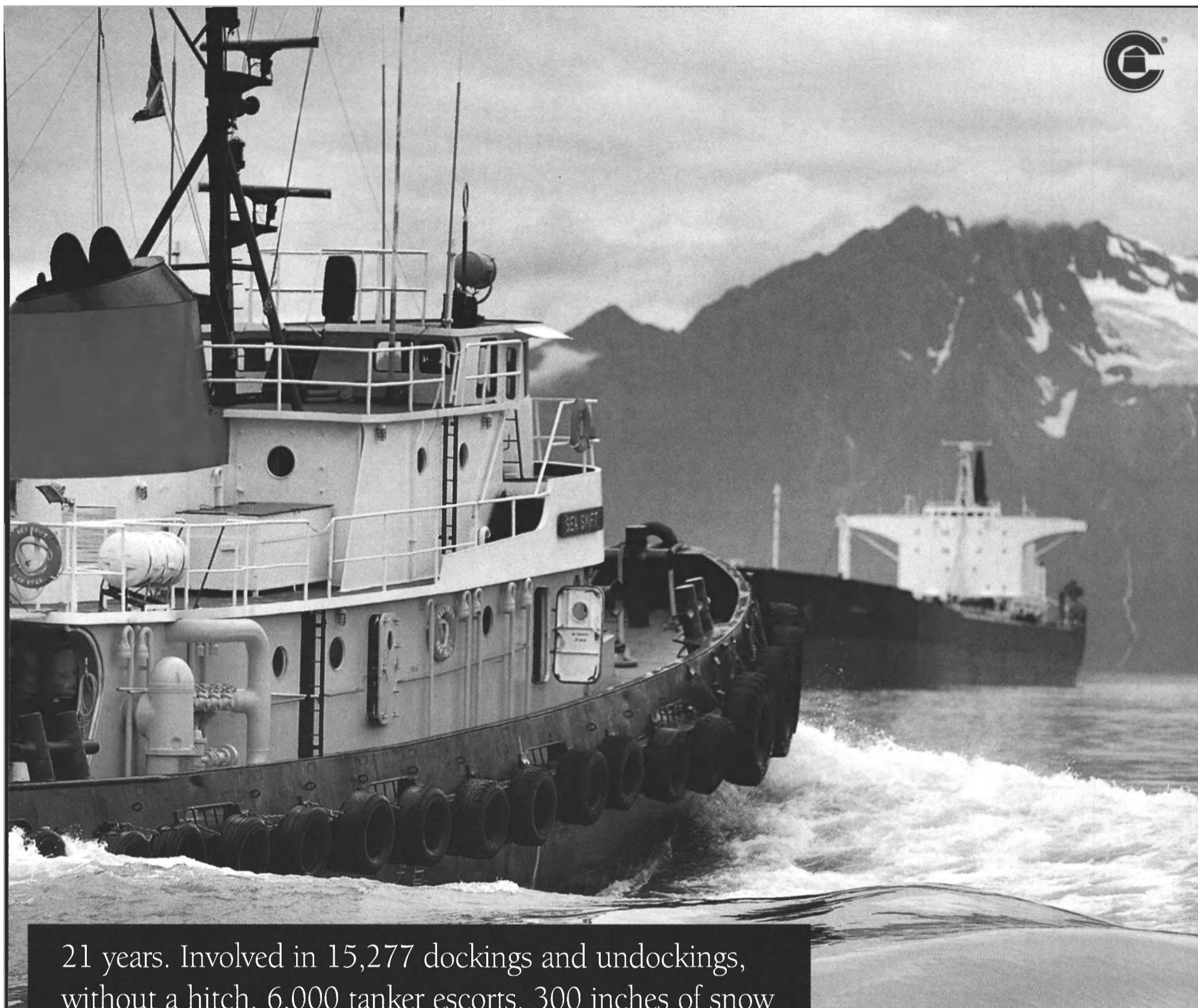
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21 years. Involved in 15,277 dockings and undockings, without a hitch. 6,000 tanker escorts. 300 inches of snow annually. Nobody said it would be easy.

Having to work in an area where the annual snow fall is 25 feet, where winds can exceed 70 knots, and tides ebb and flow in the 17-foot range is far from ideal for conducting sensitive maritime maneuvers. However, Crowley Marine Services, as always, managed not only to overcome the adverse conditions but excel. Our commitment to Alaska covers over four decades. ISO and ISM certified, CMS's record of ship assist, tanker escort and oil spill cleanup experience in Valdez is second to none. Crowley's fleet in Valdez consists of five tugs, one manned skimmer and two manned barges. In addition we manage ten barges and small skimmers.

Crowley's alliance with Alyeska Pipeline Service Company includes management of marine assets, docking and undocking of vessels, oil spill prevention and maintenance of response equipment. To further that end, two enhanced tractor tugs, 153 feet in length, with cycloidal propulsion units, the most powerful ever built, will be deployed in 1999 in Valdez specifically for Alyeska. Crowley experience. It's what's making the difficult seem easy.

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Port of London Prepared For The Worst

The Port of London has not had a major oil spill in more than 40

years, but with more than 28,000 ship movements a year, the authorities are not taking their good fortune for granted. The formation of the Thames Oil Spill Clearance Association (TOSCA) is a joint venture between the Port of London



Authority (PLA) and the oil industry to provide a fast response to oil spills in the tidal Thames. TOSCA has a fleet of craft which are designed to cope with oil spills of up to 50 tons. One of the latest TOSCA vessels is Respond, built by RTK Marine.

The above photograph shows the vessel in operation to remove oil from the river's surface. Built of glass reinforced polyester, Respond's landing craft design, with a bow ramp and heavily built underwater hull, means it can be beached easily when operations require.

Red Fox Environmental Services Acquired

A manufacturer of marine sanitation devices, land-based waste water and sewage treatment systems, and industrial trash compactors, Red Fox Environmental Services, Inc. has been acquired by Beldon E. Fox, Jr., D. Glenn Richardson, and Jason P. Gondron, Sr. Red Fox Environmental is a U.S. and foreign government contractor, as well as an oilfield service and marine service equipment manufacturer with corporate offices in Lafayette, La. and sales and engineering offices in Houston, Tx. Three new international branch offices have been established as the following: Red Fox Europe in Leipzig, Germany; Red Fox Chile in Vina del Mar, Chile; Red Fox Asia in Ho Chi Minh City (Saigon), Vietnam. Further offices are planned for Mexico, Egypt, Brazil and Venezuela.

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Desmi Saves Offshore Norwegian Operation

The Norne oil field in Norway was shut down in early 1998 because it was found that the oil spill skimmers held on standby were not able to handle the heavy waxy oil produced in the field. Oil from Norne is apparently more viscous than other crude currently produced in Norway, and the Norwegian pollution control agency is legendary worldwide for its strict environmental regulations (not to mention field operator Statoil's stringent policies).

Ro-Clean Desmi was able to provide a solution in the form of the Desmi DOP250 pump. This Archimede's screw pump is designed to handle high viscosity capacity, and was chosen after extensive testing by Statoil.

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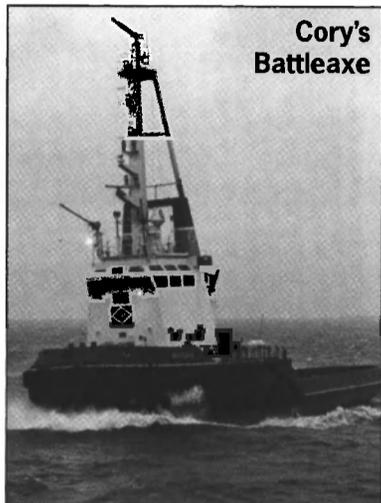
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Cory Towage Adds Coastal, FiFi Tugs

Cory Towage Ltd. has expanded its coastal towage capability with the introduction of the dedicated coastal tug Battleaxe. At 121 ft. (37 m) long, 3,800 bhp Battleaxe provides 54 tons bollard pull. The vessel has twin screw controllable pitch propellers encased in independent Kort nozzles for improved bollard pull and features a deepsea towing winch and three fire-fighting monitors to aid in coastal work.

Battleaxe will be available for projects throughout Europe. She is designed for a variety of work from barge handling or buoy loading in the North Sea to construction projects and the towing of dead vessels. Previously named Elsie, the tug was until recently operating in the Central American region and was initially purchased from associate company Shetland Towage in 1996 to operate in Panama. Cory Towage has added to its Mersey fleet with the arrival from Japan of the 48-ton bollard pull stern drive tug Ashgarth. The vessel is the renamed and recently modified 3,600 bhp azimuthing stern drive FiFi tug Senho Maru.

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Shell Commits To Yard In Repair Arrangement

Shell International Trading and Shipping (Stasco), one of the U.K.'s major tanker operators, has signed an Evergreen Alliance Agreement with Sembawang Shipyard, one of Singapore's big three repair yards, committing the repair and maintenance of Shell's Far East fleet for the foreseeable future. The agreement was signed over the Christmas period at Shell Mex by **Heng Chiang Gnee**, Managing Director of Sembawang Shipyard.

The agreement is the first time that Shell has committed itself to one shipyard for general repairs operations, previously repairing ships on a ship-by-ship basis with yards in both the Far East and Middle East. Other major compa-

nies to have signed this type of agreement include Chevron with Jurong Shipyard Ltd. and Portugal's Lisnave, which was signed some five years ago.

A spokesman for Shell said, "The decision to sign an Evergreen Alliance Agreement with Sembawang followed a detailed mapping of the fleet's trading patterns, the objective being to increase productivity in refitting Shell-owned and managed tankers. We are also looking to sign a similar agreement with a yard in Europe for those ships in the Shell fleet trading in the northern-southern European area. The agreement has been designated 'Evergreen' as there is no definite

date of completion, the agreement also being non-exclusive as we have to reserve the right to drydock tankers in the Shell fleet at other yards in case of emergency.

"Shipyards in Singapore were contracted but Sembawang, where many of the Shell fleet have been drydocked over recent years, were able to demonstrate the response most aligned with Shell's objectives. It is likely that some six to eight tankers will be due for scheduled drydockings during 1999. There is one tanker, the 46,851-dwt Hatasia currently under repair at Sembawang, and many of the initiatives in the new alliance, especially involving health, safety and the environment, which is a joint Shell/Sembawang document, will be initiated."

Heng Chiang Gnee added:

"The shipyard will benefit from lower internal repair cost from economies of scale and operational efficiency from better forward planning of the committed work. We see this as the future direction for shipyards to develop long-term goals and working closely with alliance companies to meet higher quality and service standards. Sembawang is excited by the challenges which this alliance brings."

Apart from the Shell contract, Sembawang is currently involved in two FPSO contracts, one involving the outfitting of the newbuilding Northern Endeavour, which will be operated by Australia's Woodside Petroleum, and the former VLCC Proster 11, which is being converted for Monaco's Single Buoy Moorings (SBM).

Another example of the trend



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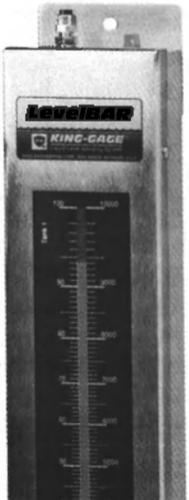
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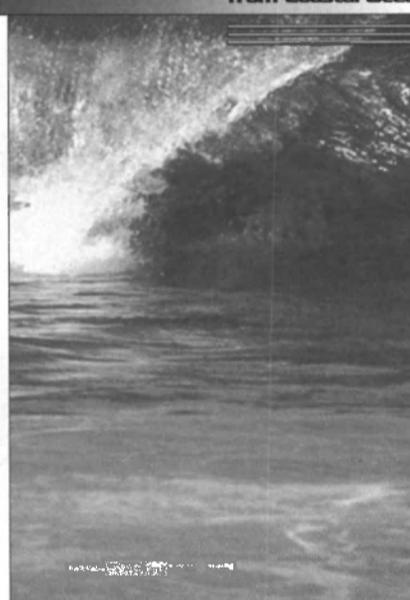
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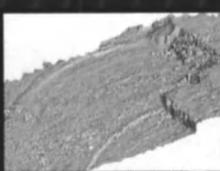
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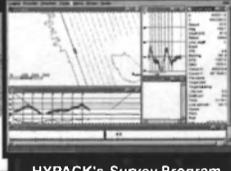
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SHIP REPAIR & CONVERSION

towards block bookings was London's Andrew Weir, which will complete a four-ship deal with France's Arno Dunkerque during February. All four ships were due for mid-term drydocking.

Italian shipbuilding and repair specialist, T. Mariotti, has been awarded a contract to modify the Japanese-built, 17,113-grt Italian-registered passenger RoRo ferry Victory, owned by Italian ferry operator Grimaldi. The contract price has not yet been announced, but it is understood that the total value will be around \$50 million.

Cammell Laird (Gibraltar) Ltd. has announced that inquiries are still at an all-time-high, with the latest coming from Maersk USA. Over the Christmas period, 13 ships were undergoing repairs, including Shell's 298,308-dwt

VLCC Myrina and P&O Nedlloyd's 47,442-dwt containership Cardigan Bay.

Sweden's Oresundsvaret has been awarded the contract to repair Stena Line's 38,756-grt Swedish passenger RoRo ferry Stena Scandinavia, which was expected to arrive at the yard during late January 1999.

Norshipco Nabs Argent Marine Contract

Argent Marine Services of Yorktown, VA recently signed on with Norfolk Shipbuilding and Drydock Corp. (Norshipco) to reactivate the LNG carrier Southern. The vessel is scheduled to arrive in the yard this month, and undergo gas trials in October to begin operating under a time charter to Shell Bermuda (Overseas) Ltd.

FPSOs: The Next Big \$ Deal?

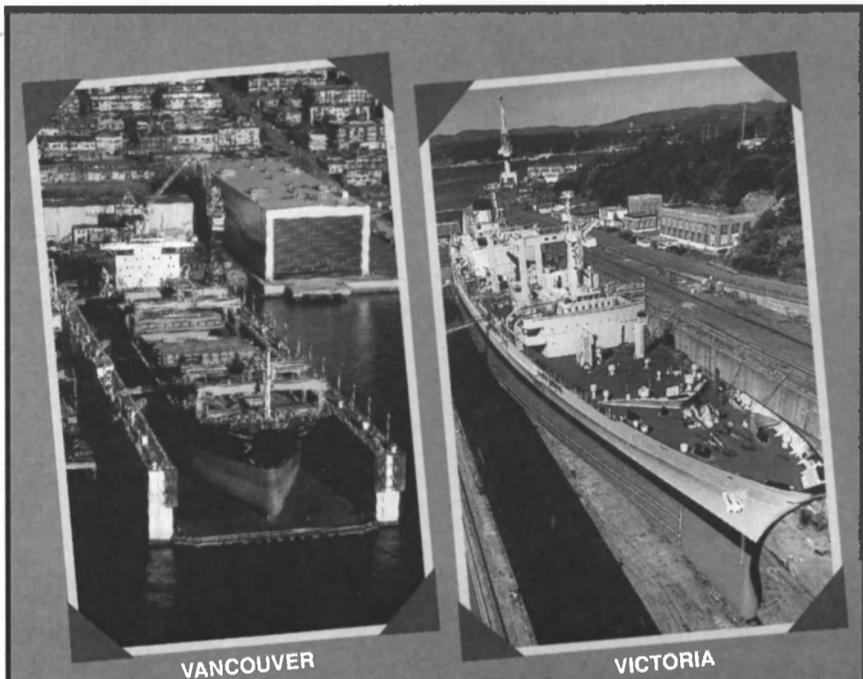
The face of ship repair and conversion in the U.S. is drastically different than just five years ago, and the transformation is far more than cosmetic.

Consolidation of companies — a trend which is hardly confined to the maritime market — has left fewer, larger players. Stiff competition from shipyards around the world has created tremendous price pressures, which has left the field even thinner, yet arguably stronger. Combine the above with a consistent investment in labor saving technologies, and the result is a viable, competitive and flexible ship repair and conversion base, which is multi-dimensional in its ability to juggle complex naval work with time-sensitive commercial jobs. Executives from many of the country's leading shipyards and supply organizations gathered in Washington, D.C. last week to discuss challenges facing the industry.

While sentiments regarding near-term prospects in the ship repair and



U.S. ship repair and conversion yards are hopeful that the Minerals Management Service will soon allow FPSO's in the Gulf of Mexico.



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The OECD agreement will be done early. We are not going to let it wait until the end of the session. I would rather have it decided based on merit — either way — in February, rather than have it put off by stall tactics at the end of a session.

— *Senator John Breau*x

conversion market are hardly bullish, several of the speakers discussed the opportunities that would be created if and when Floating Production, Storage, and Offloading Systems (FPSO) are allowed to operate in the Gulf of Mexico.

Currently, FPSOs are not allowed to be used in the GOM. But as offshore exploration and production continues to move farther offshore and into deeper waters, the use of these innovative production platforms seems a natural "next step," one which would be embraced by U.S. repair and conversion yards.

The FPSO topic was a large part of the Minerals Management Service (MMS) agenda at its meeting in mid-November, and MMS support is necessary to proceed, as Congress gave MMS responsibility for oversight of the deep-water research at the Offshore Technology Research Center. The MMS has increasingly seen its role expanded into global issues, following the trend of globalization in the offshore segment, and as a result is now studying the results of FPSO use in other countries.

Chuck Schoennagle is the Gulf of Mexico regional deputy director, and he has his hands full with the many diverse activities in the Gulf, especially the deepwater activities. MMS considers it a major challenge to not only keep abreast of the technological changes, but to respond to them in a timely manner. To adequately evaluate potential environmental effects from FPSO's, steps are being taken to procure a contract for preparation of a NEPA document to assess the effects of using FPSO's, and it is hoped that the contract will be signed by spring 1999. This document is being paid for by industry through the Deepstar consortium. The first application for an FPSO was filed by Texaco for their Fuji prospect.

BMI Off To A Good Start

The creation/resurgence of Baltimore Marine Industries is one of the more compelling turnaround stories of the past year. BMI, which is the successor of BethShip's Sparrows Point yard, has quickly emerged as a fierce yet fair competitor for ship repair business on the U.S. east coast. **David Watson**, the company's president, was an invited speaker at MarAd's conference on ship repair and conversion in Washington, D.C.

BMI was effectively born again in August of 1997, when New York based Veritas Capital bought the yard for a little under \$20 million. Although the search for a new owner and the ultimate deal turned out to be a quasi industry-wide soap opera, once the money was secured is when the real work began.

By the time Veritas Capital came along,

February, 1999

Watson said that the old Sparrows Point yard has effectively been shut down, with just 25 employees remaining, including a maintenance staff of four. When work to re-open the yard began, the challenge was formidable because of the need to recruit talent quickly, and effectively re-create the shipyard, 65 percent of which had been mothballed.

Watson credits the new owner's simple, hands-off approach with enabling BMI to become a quick success, as to date BMI has had 35 drydockings and 11 afloat repairs. A recent, prestigious contract to arrive at the yard (January 18) was the \$5 million award for work on the Allied Towing Barge ATC23. Work on the

chemical barge will entail renewing 900 tons of double bottoms, structural work and coatings, inside and out. The new owners made it simple, they said grow the business and make a profit." BMI formulated a plan to diversify its business so that it would not wither and die in a prolonged ship repair recession. The yards plan calls for business to be split in the following manner: Repair and Conversion, 50 percent; Barge Construction, 28 percent; Industrial Construction, 22 percent. New barge construction, the double-hulling of existing single hull barges and industrial construction are all business areas starting up or planned to start in the near future.

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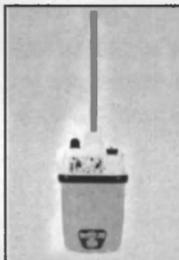
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NAVIGATION & COMMUNICATION ELECTRONICS

ACR Electronics: RapidFix 406 EPIRB

ACR Electronics offers the RapidFix 406, a 406 MHz EPIRB with GPS interface. According to the company, the RapidFix 406 is the next generation of EPIRB, providing an entirely new functionality to the satellite-aided search and rescue system by using a GPS NMEA 0183 interface to add latitude/longitude coordinates to the emergency signal transmitted by the unit. The unit measures 3.7 x 7.2 x 4.3 in., and weighs two lbs.



Circle 23 on Reader Service Card

ARINC: Providing Electronic Aids With JPS

ARINC, Inc. and Jacobsen Pilot Services, Inc. (JPS) have begun the second phase of their joint program to provide improved electronic aids for piloting and navigation in the Long Beach, Calif. port area. Ship-to-shore and ship-to-ship data link capability will be enhanced. The companies will determine the best

technologies for integrating radar video, radar targets, standard AIS and the accurate AIS icons on a single electronic chart display. The Automatic Information/Identification System (AIS) uses high frequency spread spectrum technology that covers the ports of Los Angeles and Long Beach and approaches to the harbors.

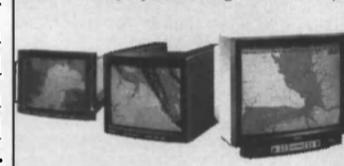
Circle 24 on Reader Service Card

Barco: ECDIS Display Devices

Barco's line of maritime displays provides the required color stabilization and calibration capabilities to render ECDIS colors comparable with the fixed colors on nautical paper charts. The new monitors in the product line, ECDIS ICD 319, Orion 16 and ECDIS ICD 321 feature calibration and stabilization capabilities, ambient light control, quick degauss functions and an advanced electronic monitoring facility.

Circle 25 on Reader Service Card

Maritime Displays for Navigational Safety



C-MAP: C-MAP NT Features Detailed Information

C-MAP NT offers a variety of information in every C-Card. Available information includes Quick Info, pop-up windows of detailed nav-aid and object information; Port Info, travel guides of up-to-date marine and port services everywhere; and Tide Info, predictions of past, present and future tides. Customization of the charts – adding details, shading applicable depth areas, or darkening contour lines – is all possible.

Circle 26 on Reader Service Card



CORETEC: Ship Predictor System

CORETEC has developed several innovative products and services designed to increase safety to life and the environment and improve the efficiency of operations during marine and offshore activities. The ship Predictor System



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Circle 327 on Reader Service Card

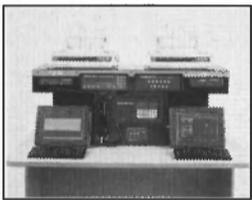
(SPS) is a marine navigational aid based on Artificial Intelligence and state-of-the-art maneuvering techniques for short-term prediction of ship maneuvering in confined waterways and harbors.

Circle 27 on Reader Service Card

Datamarine: GMDSS Console

Datamarine offers the Sea 300-A3 GMDSS Console System for Sea Area A3.

The user-friendly system features a radio telex mode, MF/HF DSC



Controller, DC Printer, MF/HF DSC Watch Receiver, Inmarsat-C Transceiver, Qwerty Keyboard, MF/HF Message Terminal, MF/HF Single Sideband Radiotelephone, Power Supply/Battery Charger Status Panel and Inmarsat-C Message Terminal.

Circle 28 on Reader Service Card

Furuno: New Radar Series

The FR 7062/7112/7252 series X-band radars, available from Furuno, is offered in a variety of power levels and range scales. The units feature highly visible eight-level target video gradation for added clarity and definition. Each radar comes with a standard four or six ft., 24 rpm open array antenna. The FR7062 is a 6kW model; the FR7112 is a 12kW model, and the FR7252 is a 25kW model.



Circle 29 on Reader Service Card

Horizon Marine Electronics: Submersible VHF Handheld Radio

Horizon Marine Electronics, a division of Standard Communications, has introduced a new VHF handheld radio that is truly submersible. The HX350S can withstand submersions up to one meter for 30 minutes. In addition, the VHF is capable of transmitting five Watts, and is



supplied with an 1100mAh NiCad battery which allows more than 10 hours operation on a single charge, a 110VAC and 12VDC trickle charger enabling the battery to be charged from shore or ship power.

Circle 30 on Reader Service Card

Kelvin Hughes: Nucleus2 ECDIS

Two types of Kelvin Hughes ECDIS are now available: Nucleus2 6000 ECDIS and Nucleus2 5000 ECDIS. The first is designed for integrated bridge sys-

tems and is complaint with all classification society notations including DNV W1 and LR IBS. The latter is a compact unit which is fully type



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approved and suitable for all vessels not required to meet classification society notations for the one man bridge operation.

Circle 31 on Reader Service Card

Kockum Sonics: Marine Range

Kockum Sonics's complete marine product range includes Tyfon marine signaling equipment, SHIMS ship management systems, LoadRite cargo planning system and Levelmaster level gauging systems.

The Levelmaster systems include Levelmaster-Calm, a modular flexible system based on an electro-pneumatical measurement method, but analogue sensors can also be utilized.



In addition, Levelmaster KSL 450 is a software program for presentation of levels, temperatures and pressures, running on Windows 95/NT.

Circle 32 on Reader Service Card

Kongsberg Norcontrol: Bridgeline Workstations

SeaMap 10 ECDIS and DataBridge 10 radar/ARPA workstations have been designed with consistent user interfaces and functional integration. Common features include autopilot remote control, curved EBL for maneuver planning, shared routes and mariner's notes, common chart database and estimation of position. Databridge 10 provides radar video to the SeaMap. Redundancy for safety backup and ease of operation was the main design objective for the new units.

Circle 33 on Reader Service Card

KVH: Small Marine Antenna

The new KVH TracVision 45 is, according to the company, the smallest fully stabilized satellite television system available. Measuring under 50 cm. in diameter, the compact design uses a three-axis digital gyro sensor and pedestal design, and measures every movement of the vessel, moving the antenna in exactly the opposite direction. The antenna operates up to 100 miles offshore.



Circle 34 on Reader Service Card

Marine Management Systems: Fleet Manager Enterprise

Version 6.5 of the Fleet Manager Enterprise software was introduced by Marine Management Systems, Inc. The new version provides a comprehensive package for fleet management and enables shipping companies to better manage shipboard maintenance, inventory, communications, email, vessel reporting and personnel.

Version 6.5 increases ease of navigation

within the program, achieves database independence, maximizes long-term maintainability and incorporates modern Windows controls.

Circle 35 on Reader Service Card

Naval Electronics: New TV Antenna

Naval Electronics of Tampa offers a new PR-420 high performance TV antenna for Ships at Sea. The PR-420 is at the head of a new line of Marine TV Antenna Systems, manufactured in Tampa. The PR-420 incorporates innovative designs to increase performance and reliability in a new robust package.



Circle 36 on Reader Service Card

Navionics: Si-Tex Plotter is Compatible

Navionics and Si-Tex have announced Si-Tex's new electronic charting system, EZ-Chart, will use Navionics cartography. The plotter features a six in. diagonal monochrome LCD display screen, 320 x 240 resolution, internal GPS and is compatible with Navionics' postage stamp-sized Nav-Chart cartridges.



Circle 37 on Reader Service Card

NetSea: MaxSea Navigator

The MaxSea brand of navigation software, produced by I&M and distributed by NetSea Inc., now supports both vector and raster cartography.

The software has offered raster compatibility with Maptech ChartPack and ChartKit, NOAA and NDI charts; now it also able to support C-Map NT vector cartography for Windows. The software utilizes TrueView technology to combine charts of varying scales to display a seamless chart image.

Circle 38 on Reader Service Card

Newmar: Charger Line

Newmar has added a new range of models to its Phase Three charger line, incorporating a number of new features and options.

The new chargers feature three-phase "smart" charging, recommended by battery manufacturers. The newly



introduced models range from 20, 40, 70 amp at 12 volt output and 20 and 35 amp at 24 volt output.

An optional monitor panel allows remote observation of charge status.

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Offshore Systems

International: EM Speed Log

The Yokogawa EML500HV1 Electromagnetic Speed Log from Offshore Systems International, Inc. (OSII) has been selected by the

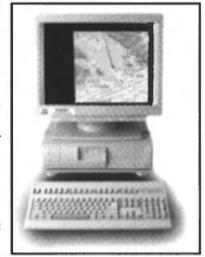
U.S. Coast Guard and Bollinger Shiyard. Up to 60 sets will be fitted over the next two years on the new series of 87 ft. (26.5 m) coast guard cutters. The IMO compliant EML500 Series EM Log is configurable for all types of vessels. OSII

has also won a \$700,000 contract to deliver a radar display and tracking system to the Canadian Coast Guard for the new Marine Communication and Traffic Services Centre in Vancouver.

Circle 40 on Reader Service Card

Offshore Systems Ltd.: ECPINS NG-Nav

Offshore Systems Ltd.'s (OSL) ECPINS NG-Nav, is based on its trademark ECPINS software. Key features in the new package include a user-friendly menu structure, rapid chart load and display with automatic and/or manual chart updates, and high quality vector and raster chart presentation. OSL has expanded its dealer network by signing Seacoast Electronics. Seacoast has five offices throughout the eastern seaboard and Florida.



Circle 41 on Reader Service Card

O'Gara Satellite Networks: Small Fixed Satellite Phone

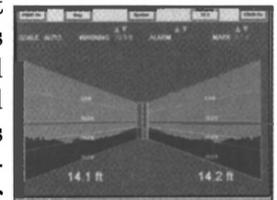
O'Gara Satellite Networks offers the O'Gara Worldfone Liberator, a slim handset that works with the Worldfone Marine antenna. It can be used to make worldwide voice, fax and email calls from a boat, as well as from a vehicle with the Worldfone Voyager aerial. The handset is placed wherever convenient below deck, and the base unit – a little larger than a video cassette – can be stowed in small spaces.



Circle 42 on Reader Service Card

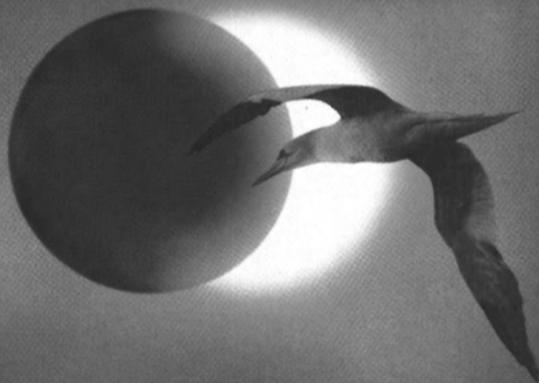
Pinpoint Systems: Dual Channel Wireless Depthsounder

Pinpoint Systems offers a dual channel wireless depth sounder which features 2.4 ghz direct sequence spread spectrum; dual 200 khz "intelligent" transducers; simultaneous port and starboard depth display; 3-D bottom view; 110 VAC or 10-36 VDC power supply; night color screen display; auto or manual range settings; and a shallow water alarm.



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NAVIGATION & COMMUNICATION ELECTRONICS

Q-Mar: Sailsafe

Sailsafe software from Q-Mar was developed and designed to provide automatic operation requiring a minimum of operator intervention. It works with electronic charts which can be imported, manipulated and displayed in both vector and raster formats.



Sailsafe monitors vessel progress, displays

and records voyage logs, and continuously measures cross-track errors.

Circle 44 on Reader Service Card

Raytheon Electronics: IBS BridgeControl

Raytheon Electronics' new BridgeControl System line features completely compatible subsystems, flexible design, easy installation and operations. It aims to improve safety, efficiency and operational economy through the

functional integration of Radar, ECDIS and Track Controller. Raytheon's product line includes the Pathfinder/ ST MK2 ARPA Radar & ECDIS, depth sounders, gyromcompasses, autopilots, GMDSS systems and fully integrated navigation systems.

Circle 45 on Reader Service Card

Scandinavian Micro Systems: ScanDisplay

Scandinavian Micro Systems (SMS) offers ScanDisplay, a system providing information automatically to passengers via the ship's onboard TV system, and through large electronic wall maps (EWM) positioned around the ship. The system uses an interface with the ship's navigation and weather systems. The video system is comprised of one, two or three TV channels, depending upon how much and what type of information the cruise line wishes to display. Information about the ship's position, upcoming ports of call, World Time, weather and onboard amenities is available.



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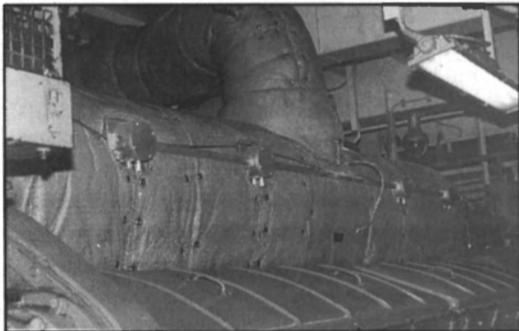
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Sea: VHF/DSC Radiotelephone

The Sea 7157 VHF/DSC radiotelephone from Sea, Inc. incorporates digital selective calling (DSC). The DSC is GMDSS compliant and supports direct dial for ship-to-shore telephone calls through automated marine coastal stations.

Circle 47 on Reader Service Card

SKANTI: Scansat-B 9900

The SKANTI Scansat-B 9900 fulfills all requirements for an Inmarsat-B system. Features include up to five handsets with individual phone numbers; integrated distress key in the handset holder; data and fax interface at 9600 bps; dual receiver signal reception (one for communication and one for satellite tracking); ruggedized antenna.



Circle 79 on Reader Service Card

Sperry Marine: VMS-ECDIS, Oil Rig NavCom

Sperry Marine, Inc. has supplied its VMS-ECDIS system to the submarine USS Hyman G. Rickover, allowing access to Digital Nautical Charts from the cartographic database of the National Imagery and Mapping Agency (NIMA). Sperry has also won a contract to supply telecommunications systems for two new semisubmersible oil rigs under construction for Ocean Rig ASA by Friede Goldman. The installations will include Ku- and C-band and



Inmarsat-B satellite terminals; a complete GMDSS console; lifeboat radios; UHF and VHF radios; aeronautical communications; meteorological instruments; and marine and drilling CCTV.

Circle 48 on Reader Service Card

Thrane & Thrane: Inmarsat C/Mini-M Product

TT-3000CM Capsat GMDSS Dual Mode System is a combination of Inmarsat C GMDSS/Fishery and Maritime Mini-M. The compact unit facilitates compliance with the satellite part of GMDSS requirements for A3 areas as well as for fishery requirements. The system also offers voice, fax and data facilities.



Circle 49 on Reader Service Card

Transas: GMDSS Simulators

Transas GMDSS simulators provide the user with the essential elements necessary for training under the Global Maritime Distress and Safety System. The TGS-3000 Compact version includes real control panels to allow the trainee workplace to reflect onboard conditions



and send distress alerts without the danger of activating live alert signals. Transas simulators meet the requirements for a GMDSS Simulator.

Circle 50 on Reader Service Card

Watercom: Sea Sharp Satellite System

The Sharp-Trac 2000 auto-tracking mini satellite system for boats, is designed to operate at drift in calm waters, at anchor or

at buoy, or at dock or in slip. Available from Watercom, the system automatically stows itself when the receiver is shut off, and provides UHF/VHF signal through its piggy-backed antenna.

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Coltec Receives \$12 Million Engine Order

Coltec Industries has received an order of more than \$12 million for four engines to be used on the second ship in the U.S. Navy's Landing Platform Dock (LPD) program. Coltec also has options valued at more than \$110 million for additional propulsion engines

scheduled to be built through 2006, pending approval of funding to build additional ships. The four Colt-Pielstick PC2.5 diesel engines being built at Coltec's Fairbanks Morse Engine Division, each capable of generating 10,400 hp, are scheduled for delivery to Avondale Industries in 2000.

Royal Caribbean Takes Up Vantage Ship Contracts

Royal Caribbean Cruises Ltd. exercised its option with Meyer Werft shipyard in Papenburg, Germany, to build a second 85,000-ton Vantage class vessel for Royal Caribbean International at a contract cost of approximately \$350

million. This second Vantage class ship will be a sister to the 2,000-guest vessel currently under construction in Papenburg. The first Vantage ship is scheduled to be delivered in February, 2001; the second in June, 2002. Both will be built to Panamax standards, enabling them to transit the Panama Canal, and will be powered by gas turbines.

With rotating propulsion pods mounted under the hull, the Vantage class ships will be extremely fast for vessels of this size, enabling them to offer some unusual itineraries. The gas turbines powering the Vantage ships are designed to be extremely quiet and vibration free. The reduced

space required by these small but powerful turbines means additional onboard space will be available for public areas, guest accommodations and activity centers.

Circle 53 on Reader Service Card

Cory To Supply ORV

Cory Towage has been awarded a contract by the Mersey Docks and Harbour Company to supply and operate an Oil Recovery Vessel (ORV) for operation on the River Mersey, its ports and terminals, as well as the Manchester Ship Canal. The ORV has been ordered from Ro-Clean Desmi Ltd. and will be built by OMI Ltd. at Cosens Engineering shipyard in the south of England. The vessel, to be named Pollgarth, will be delivered in July for use by the Mersey Oil Spill Consultative Committee. The 61 ft. (18.5 m) catamaran will be able to collect up to 50 tons of oil an hour and discharge to facilities on shore.

New Vessel Will Patrol Waters Surrounding Isle Of Man

Souter Marine Ltd. has been awarded a contract to supply a 65.6 ft. (20 m) fishery patrol vessel for the Isle of Man Government's department of Agriculture, Fisheries and Forestry. Designed by TT Boat Design Ltd., the vessel will patrol the territorial waters of the Isle of Man, monitoring fishing activities and enforcing Sea Fisheries legislation.

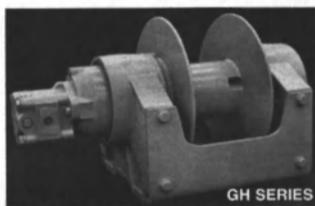
The steel-hulled vessel will be powered by twin Caterpillar 3408C marine diesel engines through Reintjes WAF 143 gearboxes. A 20 ft. (6 m) Delta Rigid Inflatable boat, capable of speeds up to 30 knots, will be available for stern launching. The patrol vessel will be designed to perform extended patrol periods of 48 hours at a continuous cruising speed of 12 knots without the need to refuel. It is due for delivery in November 1999.

AMO To Design Alaskan LNG Barges

Argent Marine Operations (AMO) has been contracted by Alaska Intrastate Gas Company (AIG) to design, develop, construct and operate barges to transport liquefied natural gas (LNG) from Prince Rupert, British Columbia to the Alaska

BRADEN Gearmatic

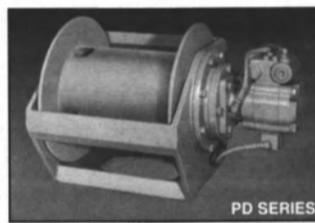
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panhandle, Gulf of Alaska and Kodiak region. The barges will be specially designed by AMO for the demanding conditions of the Canada to Alaska trade. According to **Jay Gottlieb** of Argent Marine Companies, of which AMO is a unit, "Because of the increasing availability of LNG on a world-wide basis, the development of smaller scale secondary markets for importation of LNG is becoming more feasible. AMO's barge design can deliver transportation economics which will prompt more sponsors to consider projects using LNG as an energy source where smaller scale has previously been an obstacle."

Todd Pacific Wins Navy Contract

Todd Pacific Shipyards, a wholly-owned subsidiary of Todd Shipyards, has been awarded a contract for the repair and maintenance of three aircraft carriers. The work scope includes providing non-nuclear hull machinery and electrical (HME) maintenance on USS Abraham Lincoln, USS Carl Vinson and USS John C. Stennis. The work will be carried out at Puget Sound Naval Shipyard (PSNS) in Bremerton, Wash. The contract is worth approximately \$100 million and will create 200 jobs in the Bremerton area. Work on USS Abraham Lincoln is expected to begin in April.

National Park Ferry Receives Caterpillar Re-Power

Caterpillar's Engine Products Division will be repowering Ranger III, a 125-passenger ferry serving Isle Royale National Park in Lake Superior. With new Cat 3508B engines, the historic 40 year old vessel will gain an estimated 30 percent speed increase while reducing emissions and improving access to service and parts.

The 165 ft. (50 m) Ranger III is operated by the National Park Service, serving several destinations in Isle Royale National Park from its home port in Houghton, Mich. The repower is scheduled to coincide with the end of the ferry's operating season in November, prior to the vessel's five-year American Bureau of Shipping survey. The Ranger III's existing Bird Johnson/KaMeWa controllable pitch propellers will be retained, and their control systems integrated with the electronically controlled Cat 3508B engines. Hydraulic drives on the front of the 3508Bs will power a new bow thruster. While the vessel is in drydock, tail shafts will be reconditioned, the hull will be sandblasted and repainted, and handicapped access to the vessel will be improved.

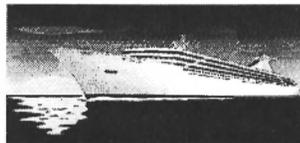
Mobil Joint Venture Company Takes Delivery of New Double-Hull Tanker

SAMOCO, a joint venture company owned 50/50 by Mobil Shipping and Transportation Company (MOSAT) and Saudi Maritime Holding Company, took delivery of a new double-hull VLCC. The vessel was delivered by Sumitomo Heavy Industries. "We are pleased to add this state-of-the-art ship to Mobil's international fleet," said **Gerhard Kurz**, MOSAT president. "The Osprey is the third double hull VLCC to enter Mobil's service in recent years and is a reflection of Mobil's commitment to safety."

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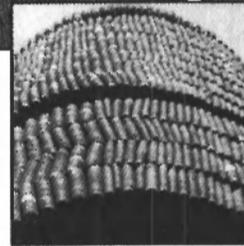
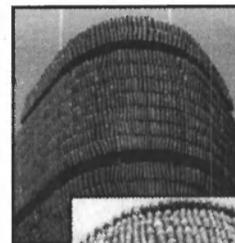
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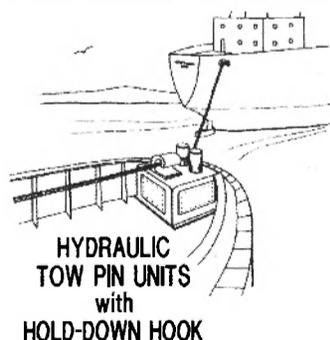
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- Length: 78', Width: 26.5', Draft: 2.5'
- Tonnage: 91 gross tons
- Cruise Speed: 25-26 knots with 150 passengers
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- Main Engines: (4) 550 hp Luggar 6140AL
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NEW & NOTABLE

TNSW, Meyer Werft Deliver First Gas Tanker



The first of two gas tankers ordered by the Norwegian owner Solvang ASA was delivered on December 11, 1998. The ship was built in cooperation between Meyer Werft Shipyard and Thyssen Nordseewerke. Clipper Viking, at an overall length of 480 ft. (146 m), marks Meyer Werft's comeback into the gas tanker newbuilding market. The vessel can reach a speed of 18 knots and is able to transport ethylene, LPG or vinyl chloride monomer, ammonia and propylene oxide in three tanks. The second tanker will be conveyed from TNSW to Meyer Werft for final outfitting at the beginning of March and is scheduled to be delivered to Solvang ASA in mid 1999.

Circle 2 on Reader Service Card

Clipper Viking Main Particulars

Classification	Det Norske Veritas
Length, o.a.	480 ft. (146 m)
Breadth, molded	67.3 ft. (20.5 m)
Depth, to main deck	45.3 ft. (13.8 m)
Draft, design (Ethylene)	25.3 ft. (7.7 m)
Draft, design (VCM)	32 ft. (9.7 m)
DWT, at VCM draft	13,500
Speed, trial at Ethylene draft, 90% MCR	.17 knots
Cruising range, VCM draft	12,000 nm
Cargo tank volume	12,500 cu. m.
Main engine	MAN B&W 6L50 MC
Propeller	Lips
Auxiliary diesel engines	MAN-Holeby/Siemens
Anchor/mooring winches	Hatlapa
Lifeboat	Fassmer
Spade rudder	Becker
Steering gear	Porsgrunn
Bow thruster	Lips
AC	Heinen & Hopman
Oil-free compressors	Sulzer
Refrigerant compressors	Sabroe
Nitrogen production plant	Carbotech

Winninghoff Delivers Pilot Boat To Harbor Services

Harbor Services, Inc., a support organization for the Canaveral Pilots Association of Port Canaveral, Fla. has taken delivery of a 40 ft. pilot boat of welded alu-



minum by Winninghoff Boats, Inc. Designed by Bill Preston of Marine Design, Inc., this boat is an updated version of a pilot boat design that Preston has been perfecting since 1976, incorporating improvements in equipment, systems and construction methods along the way. The most significant changes on this 1998 version are the use of foam fendering, the addition of a second helm station and the creation of NC cutting files for hull and superstructure components.

Circle 3 on Reader Service Card

Pilot Boat Main Particulars

Delivery	September 1998
Length, o.a.	40 ft. (12 m)
Breadth	12 ft. (3.6 m)
Draft	4.5 ft. (1.4 m)
Displacement	17,400 lbs
Top speed	22 knots
Propulsion engine	Detroit Diesel 8V92TA
Transmission	Twin Disc DD511V
Shafting	Aquamet
Propeller	Hall & Stavert
Steering system	Hynautic
Rudder	H & H Propeller, Inc.
Controls	Kobelt/Morse
AC	Technicold, Rich Beers Marine, Inc.
Fendering	Viking Fender Co.
Hatches and doors	Freeman Marine, Inc.
Heat	Maradyne
Paints	Ameron
Seating	Bostrom
Thermal and acoustical insulation	Soundown, Inc.
Trim Tabs	Boat Leveler Co.
Windows	Beclawat Manufacturing, Inc.
Wipers	Wynn Marine Ltd., In-Mar Systems, Inc.

Seacraft Shipyard Delivers Luxury Dive Yacht

Seacraft Shipyard Corp. of Amelia, La. have delivered the M/V Cayman Aggressor IV to



Aggressor Fleet Ltd. The 110 ft. (34 m) aluminum luxury dive yacht was designed by Seacraft Shipyard and is Cayman Island Shipping Registry certified. Two 12V71TI main engines, closed coupled to a pair of Twin Disc 514, 2.5:1 transmissions enables the Cayman Aggressor IV to cruise at 12 knots. The propeller shafts and rudders are stainless steel and were fabricated at Seacraft's machine shop. Electricity is supplied by one 30 kW and one 40 kW generator. The aft dive deck features storage lockers for diving gear, air and nitrox fill stations, fresh water dip tank, and two access ladders.

Circle 5 on Reader Service Card

NASSCO Delivers Second Sealift Newbuild



National Steel and Shipbuilding Company (NASSCO) has delivered USNS Sisler to the U.S. Navy. This is the second Sealift New Construction ship built by NASSCO under the Strategic Sealift Program. Originally contracted to be delivered in May 1999, the ship was completed under target cost and accepted by the Navy six months ahead of schedule. All seven Sealift ships awarded to NASSCO are being named for U.S. Army Medal of Honor recipients. USNS Sisler is named after U.S. Army First Lieutenant **George "Ken" Sisler**, a posthumous recipient of the Medal of Honor for his

heroic actions in Vietnam in 1967. The first new construction ship, USNS Watson (pictured), was delivered in July 1998. The third ship, USNS Dahl, was launched in October 1998 and remains under construction at a NASSCO pier. The fourth ship is under construction at NASSCO.

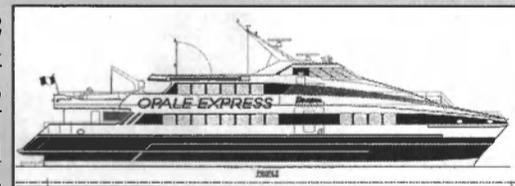
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USNS Sisler Main Particulars

Flag	U.S.
Classification	ABS
Length, o.a.	950 ft. (289.5 m)
GT	72,718
Displacement	62,823 LT
Speed, service	24 knots
Cargo capacity	393,660 sq. ft.
% high tensile steel	.60% (plate)
Main engine	General Electric LM 2500 Plus
Propellers, Bowthrusters	Bird Johnson
Thruster engines	Bird Johnson
Generator engines	Caterpillar
Generators	Caterpillar
Motor starters	Point Eight
Fin stabilizers	Blume
Couplings	Waukesha
Reduction gears	General Electric
Engine controls	General Electric
Steering controls	C.S. Controls
Deck machinery	Edgewater Marine
Shafting	Bird Johnson

Austal Delivers Second Fast Ferry To French Caribbean

Austal Ships has delivered its second high speed catamaran under contract to Compagnie Chambon for its French Caribbean fast ferry operation, L'Express des Iles. The 131 ft. (40 m) Opale Express will join the 157 ft. (48 m) ferry Jade Express, also built by Austal Ships. With a speed of 35 knots and a carrying capacity of 302 passengers, the twin deck aluminum Opale Express is powered by two MTU 16V 396TE74L engines and will provide interisland service



between Point a Pitre on Guadeloupe, Marie Galante and Les Saintes.

The vessel features part of the Austal "Ocean Leveller" ride control system, incorporating interceptors aft with the exclusion of T-foils forward due to shallow draft restrictions at some of the island ports-of-call.

Circle 7 on Reader Service Card

Opale Express Main Particulars

Flag	French	Speed, service	35 knots	Steering controls	Kamewa
Classification	Bureau Veritas	Cargo capacity	9 tons	Deck machinery	Muir, Windlass
Contract date	May 1998	Bunker	12,900 L	Coatings	International Paints
Float out date	September 1998	Main engines	MTU 16V 396	VHF radio	Sperry
Delivery date	October 1998	Total HP2 x 1,980 kW at 1,940 rpm		SSB radio	Sperry
Length, o.a.	131 ft. (40 m)	Auxiliary engines	MTU 6R 099 TE51	Radar	Kelvin Hughes
Length, b.p.	121 ft. (36.9 m)	Waterjets	Kamewa	Compass	C-Plath
Breadth, molded	35.4 ft. (10.8 m)	Emergency generator	Deutz, Fin stabilizers	GPS	Leica
Draft, design	4.3 ft. (1.3 m)	Austal		SATNAV	Inmarsat-C
DWT, design	48.6 tons	Couplings	Thomas	Air conditioning	Austal
GT	449 tons	Reduction gears	Reintjes	Lifeboats	Zodiac
Complement	7	Engine controls	MTU	Liferafts	Viking
Passengers	304			Fifi system	Salwico

BUYERS DIRECTORY

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

ADHESIVES

Adtech Marine Systems, 815 W. Shepherd St., Charlotte, MI 48813

AIR CONDITIONING AND REFRIGERATION -

Repair & Installation, Equipment & Services
 ABB Flakt Marine, Box 1043, S-436 21 ASKIM SWEDEN
 Adrick Marine, 81 Mahan St., West Babylon, N.Y. 11704
 Bailey Refrigeration Co., 2323 Randolph Ave., Avenel, NJ 07001
 Carrier Transicold, P.O. B. 4805, Syracuse, NY 13221
 Refrigeration Resources, 210 Westside Ave., Jersey City, NJ 07305
 Adrick Marine, 81 Mahan St., West Babylon, N.Y. 11704
 Bailey Refrigeration, 2323 Randolph Ave., Avenel, NJ 07001
 Unitor Ship Service Inc., 2375 West Esther Street, Long Beach, CA 90813
 Stork Canada, 47 boul. Marie Victorin, Candiac, Quebec, Canada, J5R 1B6

AIRHORN/SIGNALLING EQUIPMENT

Kahlenberg Marine, P.O. Box 358, Two Rivers, WI 54241

ALARMS, FACTORY MUTUAL-APPROVED

Dastar Marine Products Inc., Unit 100 18 Gostick Pl., N. Vancouver, Canada V7M3G31
 SELCO 353 A Asbury Commons Dr., Atlanta, GA 30338

ALUMINUM BOATS

American Eagle Mfg., P.O. Box 597, La Conner WA 98257
 Munson Mfg., P.O. Box 597, La Conner WA 98257

ANCHORS AND CHAINS

All Alpha Int'l., Inc. P.O. Box 498985, Cincinnati, OH 45249
 Crandall Dry Dock Engineers Inc., P.O. B. 505804, MA 02150
 G.J. Wontelboer Jr. BV, P.O.B. 5003, 3008 AA Rotterdam, Nether
 Marit Chain, 230 Avenue Desandrouins, 59300 Valenciennes
 FRANCE

Washington Chain Inc., Box 3645, Seattle, WA 98124
 Waterman Supply Co., P.O. Box 596, Wilmington, CA 90748
 Willem Pot, P.O.B. 29102, 3001 GC Rotterdam

AUCTIONEERS

Plant & Machinery, P.O. Box 19100, Houston, TX 77224

MACI Auctioneers, 2334 Willis Rd., Richmond, VA 23230

AUTOMATION SYSTEMS

Electronic Design, 3020 20th St., Metairie, LA 70002-4911

AUTOPILOT SYSTEMS

Mackay Communications, 2721 Discovery Dr., Raleigh, N.C.
 27616-1851

ComNav Marine, 1915 Stainsburg Ave., Vancouver, B.C.
 CANADA

BALLAST

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

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

BASKET STRAINERS

Beard Industries Inc., 601 Benton Kelly St., Shreveport,
 LA 71106-7198

BATTERY CHARGERS

Newmar, 2911 West Garry Ave., Santa Ana, CA 92663

BEARING—Rubber, Metallic, Non-Metallic

Blohm & Voss Industrie GmbH P.O. B. 100720, D-2000
 Hamburg 1, GERMANY;

Simplex-Turmar Inc., P.O. B. 168, Little Neck, NY 11363-0168
 U.S.A. Reps:

Railko Ltd., Loudwater, High Wycombe, Bucks
 Hampshire ENGLAND HP1090V

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

Orion Corp., 1111 Cedar Creek Rd., Grafton, WI 53024

Duramax Marine, 16025 Johnson St., Middlefield, OH 44062

Thordon Bearings Inc., 3225 Mainway, Burlington, Ont.,
 CANADA L7M 1A6

NTN Bearing, 1600 E. Bishop Court, Mt. Prospect, IL 60056

Vesco Plastics, P.O. B. 40647, Cleveland 2022 SOUTH
 AFRICA

BILGE SYSTEMS

Nelson Div., Exhaust & Filtration Sys., Hwy. 51 West, P.O.
 Box 428, Stoughton, WI 53589

BLOCKS & RIGGING

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

BOAT SHAFTING

Western Branch Metals, 2401 Wesley St., Portsmouth, VA 23707

BOAT RENTAL

Edison Chouest, P.O. Box 309, Galliano, LA 70354

BOILERS

B & D Marine & Boilers Inc., P.O. Box 71687, Charleston,
 SC 29415

BRIDGE WIPERS

In-Mar Systems, Yellowstone Street, Kenner, LA 70064

BROKERS

151 Maritime Services, 34062 El Encanto/B, Dana Pt. CA
 92629

Captain Astad Company, Inc., P.O. Box 350486, Ft
 Lauderdale, FL 33335

Jack Faulkner, 2419 Caddy Lane, P.O. Box 371, Flossmoor
 IL 60422

Mowbray's Tug & Barge Sales Corp., 35 De Hart St.,
 Morristown NJ 07960

BULKHEAD SEALS/PANELS

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

Blohm & Voss Industrie GmbH, P.O. B. 100720, D-2000
 Hamburg 1, GERMANY

Panel Specialists, Inc./Thermax, 3115 Range Rd., Temple,
 TX 76501

Railko Ltd., U.S.A. Reps: Simplex-Turmar Inc., P.O.B. 675,
 Tonawanda, NY 14151-0675

Rox Corp., 12402 E. 60th St., Tulsa, OK 74146-6922

CABLE TRANSIT SYSTEMS

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

O-Z Gedney • Nelson Firestop, P.O. B. 726, Tulsa, OK 74101

Rox Corp., 12402 E. 60th St., Tulsa, OK 74146-6922

CAD/CAM SYSTEMS

Albacore Research, 4196 Kashtan Place, Victoria, B.C. Canada
 V8X4L7

All Alpha Int'l., Inc. P.O. B. 498985, Cincinnati, OH 45249

Autoshop Systems Corp., #403, 611 Alexander St.,
 Vancouver, BC, Canada V6A1E

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

IMSAs, 13 Jenkins Court, Suite 200, Durham, NH 03824

Kockums Computer Systems AB, PO Box 50555, S-202 15
 Malmo SWEDEN

Scientific Marine Services, Inc., 101 State Pl., Suite F,
 Escondido, CA 92029

TIMSCO, P.O. B. 91360, Mobile, AL 36691

Ship Motion Associates, 10 Danforth St., Portland, ME 04101-4567

CARGO MONITORING & CONTROL SYSTEM

Ian-Conrad Bergan, Inc., 3409 Gulf Breeze Parkway,
 Gulf Breeze, FL 32561

Radio-Holland USA, 8943 Gulf Freeway, Houston, TX 77017

CHAINS

Columbus McKinnon Corp., 140 John James Audobon Pkwy,
 Amherst, NY 14228

New England Marine & Industrial, 200 Spaulding Trunpike,
 Portsmouth, NH 03801

Washington Chain, P.O. Box 3645, Seattle, Wa. 98124

Crane Heatex, 17 Grandview Ave., W. Orange, NJ 07052

CHARGE AIR COOLERS

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

Unitor Ship Service Inc., 2375 W. Esther St., Long Beach, CA
 90813

CLASSIFICATION SOCIETY

Det Norske Veritas, 70 Grand Ave., Riveredge, N.J. 07661

CLEATS

Washington Chain, P.O. Box 3645, Seattle, Wa. 98124

CLUTCHES

Haley Clutch and Coupling Corp., 1820 Hwy. 1 North,
 Greenville, MS 38702

COATINGS / CORROSION CONTROL / PAINT

Eureka Chemical Co., 234 Lawrence Ave.,
 South San Francisco, CA 94080

Corrosel, Inc., 8114 304th Ave., SE, Preston, WA 98050

GMA Garnet, 6124 114th Ave., N.E. Kirkland, WA 98033

Flexible Decking, 2708 N. Australian Ave. Ste. 9, West Palm Beach,
 FL 33407

Mascoat Products, 3500 E. T.C. Jester, Suite N, Houston, TX
 77018

TMT Services Corp./RUSTECO, P.O.B 11398, Torrance, CA90510

Nace Int'l, 1440 South Creek Dr., Houston, TX 77084

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

Esgard, Inc., P.O. Drawer 2698, Lafayette, LA 70502

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

Jamestown Distrib., P.O. Box 348, Jamestown, RI 02835

Graco, Inc., P.O. Box 1441, Minneapolis, MN 55440-1441

Hempel Coatings, 6901 Cavalcade St., Houston, TX 77028

Sigma Coatings, P.O. Box 816, Houston, TX 77029, 330
 Harvey, LA 70059,

Atlantic Systems Supply Co., 1100 Adams St., Hoboken, NJ 07030

TNO Institute of Industrial Technology, P.O.B. 3, 2600 AA
 Delft, Netherlands

Boatlife, 2081 Bridgeview Dr., N. Charleston, SC 29405

Unitor Ship Services Inc., 2375 West Esther Street, Long
 Beach, CA 90813

COMMERCIAL DIVING COMPANIES

Cruzan Diver's Inc., 300 Strand St., Frederiksted Sterco, Virgin
 Islands 00840

COMMUNICATION AUTOMATION

International Communications, 813 Diligence Dr. Ste 120,
 Newport News, Va. 32606

COMMUNICATIONS SERVICE

Hose McCann, 1241 W. Newport Gender, Deerfield Beach,
 FL 33442

ICG Satellite Services, 8400 NW 52nd St., Suite 110,
 Miami, FL 33166

Maritime Telecommunications Networks, Inc., 8400 NW 52nd
 St., Suite 110, Miami, FL 33166

Ascorm Tateco AB, Eppendorfer Weg 234, D-20251 Hamburg,
 GERMANY

AT & T Maritime Services, 412 Mt. Kemble Ave 5170, Morristown,
 NJ 07960

Comsat Maritime Services, 6560 Rock Spring Drive, Bethesda, MD
 20817-1146

Watercom, 458 E. Park Place, Jefferson, IN 47130

COMPOSITES PROCESSING

Composite Technology Consultants, Inc.
 12310 Northwinder Row, Bayonet Point, Fla. 34667

COMPOUNDS

ITW Philadelphia Resins, 130 Commerce Dr,
 Montgomeryville, PA 18936

COMPRESSOR PARTS

CMP Corporation, P.O. Box 15199, Oklahoma City, OK 73155

COMPUTER LOFTING

Barataria Lofting Co., Inc., 1616 Barataria Blvd., Ste. 4,
 Marrero, LA 70072

COMPUTER / COMPUTER SOFTWARE

Autoshop Systems Corp., #403, 611 Alexander St., Vancouver,
 BC, CANADA V6A1E

Chand Corporation, 157 Hwy 654, Mathews, LA 70375

Coast Oceanographics, Inc., 11-G Old Indian Trail,
 Middlefield, CT 06455

Sener, C/Severo Ochoa, 4 Parque Tecnologico de Madrid,
 28760 Tres Cantos - Madrid SPAIN

Intelec Corp., 2150 Boggs Rd., Deluth GA 30096

Lloyd's Register, 100 Leadenhall St., London, England EC3A 3BP

Ship Motion Associates, 10 Danforth St., Portland, ME 04101

Azonix Corp., 900 Middlesex Tpke., Billerica, MA 01821

Proteus Engineering, 301 Pier One Rd., Stevensville, MD
 21666

CONDENSERS/SEPARATORS

Beard Industries Inc., P.O. Box 31115, Shreveport LA 71130

CONSTRUCTION MATERIALS

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

CONSULTANTS

Homblower Marine, Pier 3 Ferryboat Santa Rosa, San Francisco,
 CA 64111

CONSOLE - GMDSS

Mackay Communications, 2721 Discovery Dr., Raleigh, N.C.
 27616-1851

CONTROL SYSTEM - Monitoring/Steering

Engine Monitor, Inc., 179 Hickory Ave. Harahan, LA 70123

GEC ALSTHOM Diesels Inc., 10801 Kempwood Drive, Suite 1
 Houston, TX 77043-1412

Ian-Conrad Bergan, 3409 Gulf Breeze Pkwy, Gulf Breeze, FL
 32561

MMC International, 60 Inip Dr, Inwood NY 11096

Robertson Marine Systems, 3000 Kingman St., Suite 207,
 Metairie, LA 70006

Scientific Marine Services, Inc., 101 State Pl., Suite F,
 Escondido, CA 92029

Kobelt Mfg Co., Ltd., 8238-129 St, Surrey, B.C. V3W0A6

Stork-Kwant BV, P.O.B. 23, 8600 AA Sneek, Netherlands

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

AutoNav Marine Systems Inc., 55A Clipper St., Coquitlam,
 B.C., Canada V3K 6X2

Kockum Sonics, Inc., 819 Veterans Blvd., Suite 201, Kenner,
 LA 70068

CONVERSIONS & REPAIRS

Vancouver Shipyards, 50 Pemberton Ave., N. Vancouver, B.C.
 CANADA V7P 2R2

COOLERS/FREEZERS

Western Engineers, 2112 SE 8th Ave., Portland, OR 97214

COUPLINGS

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

Centa Corp., 8185 Cass Ave., Darien, IL 60561

Haley Clutch and Coupling Corp., 1820 Hwy. 1 North,
 Greenville, MS 38702

Fetterolf Corp., P.O. Box 103, Skippack, PA 19474

Lo-Rez Vibration Control, Ltd., 186 West 8th Ave., Vancouver,
 B.C. V5Y 1N2

American Vulcan, P.O. Drawer 673, Winter Haven, FL 33882

MMC Int'l, 60 Inip Drive, Inwood, NY 11096

Renold Hi-Tec, 512 W. Crescentville Rd, Cincinnati, OH 45246

CRANE-HOIST-DERRICK-WHIRLEYS

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

Holly Hoist Corp., P.O. Box 86, St. Clair Shores, MI 48080-0086

Edgewater Machine & Fabricators, P.O. Box 358, Edgewater, FL
 32132-0358

Marine Travellit, Inc., 49 E. Yew St., Sturgeon Bay, WI 54235

McElroy Machine & Mfg Co., Inc., P.O. Box 4454, Biloxi MS
 39535-4454

New England Trawler Equipment Co., 291 Eastern Avenue,
 Chelsea, MA 02150

Liebherr-Werk Nenzing GMBH, A-6710 Nenzig/Austria,
 Tschalanga 3, P.O. Box 10

Xtek, Inc., 11451 Reading Road, Cincinnati, OH 45241

CRANKSHAFT DEFLECTION ANALYZER

FCS, Inc., 22 Main St., Centerbrook, CT 06409

CRANKSHAFT REPAIR

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

CUSTOM CLOSURES

Walitz & Krenzer, 91 Willenbrock Rd., Oxford, CT 06478

CYLINDER LINERS

Silsan A.S., P.O. Box 127, TR-01210 Adana, Turkey

DAVIT SYSTEMS

Holly Hoist Corp., P.O. Box 86, St. Clair Shores, MI 48080-0086

Welin Lambie N.A. Inc., 18 Ridgcrest Drive, Bridgewater Nova
 Scotia, Canada B4V 3 V8

DECK MACHINERY - Cargo Handling
 Equipment

Lake Shore Inc., P.O. Box 809, Iron Mountain, MI 49801, 1

Luber-Finer, Inc., 200 South 4th St., Albion, FL 62806-1313

FIN STABILIZERS

Blohm & Voss Industrie GmbH, P.O. Box 10 07 20, D-2000 Hamburg 1, GERMANY
Raikko Ltd.: U.S.A. Reps: Simplex-Turmar Inc., P.O.B. 675, Tonawanda, NY 14151-0675

FIRE & SAFETY PRODUCTS

Nautical Safety Products, P.O. Box 590462, Houston, TX 77259
IMSSCO, 2040 Harbor Island Dr., Suite 201A, San Diego, CA 92101
Nautical Safety Products, P.O. Box 590462, Houston, TX 77259
Insulations, Inc., Rt. 5, 12360 Leisure Road, Baton Rouge, LA 70807
Unitor Ship Service Inc., 2375 West Esther Street, Long Beach, CA 90813
Grinnell Fire Protection, 835 Sharon Drive, Westlake, OH 44145
Grinnell, 835 Sharon Drive, Westlake, OH 44145
Panel Specialists, Inc./Thermax, 3115 Range Rd., Temple, TX 76501

FLUID HANDLING EQUIPMENT

Graco, Inc., P.O. Box 1441, Minneapolis, MN 55441

FRESH WATER GENERATOR

Sasakura Engineering, 7-32 Takeshima, 4-chome, Nishiyodogawa, KY, Osaka555, Japan

FUEL CONSERVATION

Instruments Computer & Controls, Inc., 70 South Bow Rd., Hookset, NH 03106

FUEL DECONTAMINATION

Fuel Dynamics, 707 Muller Dr., #110, Cape Canaveral, FL 32920
Environmental Solutions Int'l, 11002 Raccoon Ridge, Reston, VA 20191-4911

GALLEY EQUIPMENT

Cospolich Refrigerator Co., 949 Industry Rd., Kenner LA 70062
Jamestown Metal Marine Sales, Inc., 4710 Northwest Second Ave, Boca Raton, FL 33431
Lang Manufacturing, P.O. B. 905, Redmond, WA 98073
Marine Accommodations, Inc., 3830 Williamsburg Park Blvd., Building 7, Jacksonville FL 32257

GANGWAYS, LADDERS

Nautical Safety Products, P.O. Box 590462, Houston, TX 77259-0462
SlipNot Safety Flooring, 2545 Beaufait St., Detroit, MI 48207
Wooster Products Inc., 1000 Spruce St., P.O. Box 896, Wooster, OH 44691

GEARS & GEAR REPAIR

Haley Marine Gears International, Inc., 2600 N. Concord Belle Chasse, LA 70037
Nico Marine Specialties, 39 Louisiana St., West Wago, LA 70094
The Falk Corp., PO Box 492, Milwaukee, WI 53201-0492
Marine Gears, P.O. Box 689, Greenville, MI 38702
Centofanti Marine Systems, Inc., P.O. Box 660, West Elizabeth, PA 15088-0660
Cincinnati Gear Co., 5657 Wooster Pike, Cincinnati, OH 45227

GENERATOR

Alaska Diesel, 4420 14th Ave., NW, Seattle, WA 98107
Baylor Co., 500 Industrial Blvd., Sugarland, TX 77478
Insulude Recycling B.V., Deccaweg 3, 1042 AT Amsterdam, NETHERLANDS

GMSS

International Communications, 813 Diligence Dr. Ste 120, Newport News, Va. 32606
Furuno USA, Inc., 271 Harbor Way, S. San Francisco, CA 94080

Radio-Holland USA, 8943 Gulf Freeway, Houston, TX 77017
Sea, Inc., 7030 220th S.W. Mt. Lake Terrace, WA 98043

HATCHES AND DOORS

Freeman Marine Equipment, 28336 Hunter Creek Rd., Gold Beach, OR 97444

HEAT EXCHANGERS

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

Beaird Industries Inc., P.O. Box 31115, Shreveport, LA 71130
Computeube - A Division of Britannia Heat Transfer, Ltd., 15-20 Colleshill Industrial Estate, Station Road, Colleshill, Birmingham B46 4P UK

Crane Heatex, 17 Grandview Ave., West Orange, NJ 07052
Tanter, Inc., 1054 Claussen Rd., Augusta, GA 30907-3215

HEAT TRANSFER FLUID

Paratherm Corp., 1050 Colwell Rd., Conshoocken, PA 19428

HOISTS

Holly Hoist Corp., P.O. Box 86, St. Clair Shores, MI 48080-0086

HORNS/WHISTLES

Airchime Mfg. Co. Ltd., 5478 267th Street, Gloucester Industrial Estate, Langley, B.C. Canada V4W 3S8
Kahlenberg Bros Co., P.O. Box 358, Two Rivers, WI 54241
Kockum Sonics, Inc., 933 Industry Rd., Ste105, Kenner, LA 70062

HYDRAULICS

Cunningham Marine Hydraulics Co., 201 Harrison St., Hoboken, NJ 07030

Engine Monitor, Inc., 179 Hickory Ave. Harahan, LA 70123
Hamilton Jet, P.O. Box 709, Christchurch, NEW ZEALAND

Offshore Inland, Inc. 3521 Brookdale Drive, Mobile, AL 36618
Ultra Hydraulics Limited, Cheltenham Road East, Gloucester, GL2 9QN, ENGLAND

Demaree Infatables Boats, 410 Oak St., Friendsville, MD 21531
Ocean Technical Services Inc., 1140 Peters Rd., Harvey, LA 70058-1705

HYDRAULIC SYSTEM FLUSHING

Consolidated Fluid Power, 155 Wright Ave., Dartmouth, N.S. Canada B4C 3M1

HYDRAULIC TRAINING

Consolidated Fluid Power, 155 Wright Ave., Dartmouth, N.S. Canada B4C 3M1

INFLATABLES

Ocean Technical Services Inc., 1140 Peters Rd., Harvey, LA 70058-1705

Zodiac of North America, P.O. Box 400, Thompson Creek Road, Stevensville, Sparks, MD 21152

INSULATION

Blohm & Voss Light Insulation, Bartels & Laders GmbH, Nordereibstrasse 1S, 20457 Hamburg GERMANY
Panel Specialists, Inc./Thermax, 3115 Range Rd., Temple, TX 76501

Insulations, Inc., 1101 Edwards Ave., Harahan, LA 70123
Mascoat Products, 3500 E. T.C. Jester, Suite N, Houston, TX 77018

Pacor, Inc., P.O. Box 107, Westville, NJ 08093x
Superior Energies Inc., P.O. Drawer 386, Groves TX 77619

INTEGRATED MONITORING SYSTEMS

Datastar, Unit 100, 18 Gostick Place, N. Vancouver, BC Canada

INTERIORS

Custom Ship Interiors, Inc., P.O. Box 882, Solomons, MD 20688
Hopeman Brothers, P.O. Box 820, 435 Essex Ave., Waynesboro, VA 22980

Insulations, Inc., Rt. 5, 12360 Leisure Rd, Baton Rouge, LA 70807
Jamestown Metal Marine Sales, Inc., 4710 NW Second Ave, Boca Raton, FL 33431

Marine Accommodations, Inc., 3830 Williamsburg Park Blvd., Building 7, Jacksonville FL 32257

Maritime Services Corp., 3457 Guignard Drive, Hood River, OR 97031

James P. Colie & Associates, 2116 Sherman St., Hollywood, FL 33020

ISOLATORS

Lo-Rez Vibration Control, Ltd., 186 West 8th Ave., Vancouver, B.C. V5Y 1N2

JET BOWTHRUSTERS

Thrustmaster of Texas, P.O. Box 840189, Houston, TX 77084-0189

JOINER - Watertight Door—Paneling—Ceiling System—Decking
All Alpha Intl., Inc. P.O. Box 498985, Cincinnati, OH 45249

Branton Ind., 1101 Edwards Ave., Jefferson, LA 70181
CustomShip Interiors, Inc. P.O. Box 882, Solomons MD 20688

Hopeman Brothers, Inc., P.O. Box 820, Waynesboro, VA 22980

Insulations, Inc., 1101 Edwards Ave., Harahan, LA 70123

Marine Accommodations, Inc., 3830 Williamsburg Park Blvd., Building 7, Jacksonville FL 32257

Maritime Services Corp., 3457 Guignard Drive, Hood River, OR 97031

Panel Specialists, Inc./Thermax, 3115 Range Rd., Temple, TX 76501

Walz & Krenzer, 91 Willenbrock Rd., Unit B4, Oxford CT 06478

KEEL COOLERS

R.W. Femstrum & 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

LASER ALIGNMENT

Boiland Industrial & Consulting Services, P.O.B. 91360, Mobile, AL 36691

LIFEBOATS/RAFTS

American Eagle Mfg. Inc., 780 Pearle Jensen Way, LaConner, WA 98257

Avon Marine, 11215 Young River Ave., Fountain Valley, CA 92708

DBC Marine Safety Systems, 12351 Bridgeport Rd., Richmond, B.C. CANADA V6V1J4

Norsafe AS, P.O. Box 115, N-4818 Faervik, Norway

Edgewater Machine & Fabricators, P.O. Box 358, Edgewater, FL 32132-0358

Viking Life Saving Equipment, 1625 N. Miami Ave., Miami, FL 33136

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

Zodiac of North America, P.O. Box 400, Stevensville, MD 21666

LIFESAVER EQUIPMENT

MGI International, 119-225 West 1st St., North Vancouver, B.C. CANADA

Stearns Manufacturing, P.O. Box 1498, St. Cloud, MN 56302

LIFT EQUIPMENT

JLG Industries, Inc., JLG Drive, McConnellsburg, PA 17233-9533

LIGHTING SYSTEMS / EQUIPMENT

ACR Electronics, Inc., 5757 Ravenswood Rd., Ft. Lauderdale, FL 33310-5247

Archway Marine, 4501 Swan Ave., St. Louis, MO 63110

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

Kockum Sonics, Inc., 933 Industry Rd., Ste105, Kenner, LA 70062

Pauluhn Electric Mfg. Co., Inc. P.O. Box 53, Pearland, TX 77588

Francis Searchlights/Stam Supply Co., 4415 6th N.W., Seattle, WA 98107

LIQUID OVERFILL PROTECTION SYSTEMS

E.R.L. Marine Products, P.O.Box 1026, New Albany, IN 47151

King Engineering Corp., P.O. Box 1228, Ann Arbor, MI 48106

LOGISTICS

VL Logistics Consultants, Inc., 3420 Bienville Blvd., Ocean Springs, MS 39564

MACHINERY MAINTENANCE, REPAIR, OVERHAUL, AND TESTING

Golten Marine Co. Inc., 160 Van Brunt St., Brooklyn, NY 11231

Mackay Communications, 2721 Discovery Dr., Raleigh, N.C. 27604-1851

Maritime Power 200 Henderson St., Jersey City, NJ 07302

MANAGEMENT SYSTEMS & SERVICE

Homblower Marine, Pier 3 Ferryboat Santa Rosa, San Francisco, CA 94111

PCS Marine, 174 Colonnade Road S., Nepean, Ontario K2E715

MARINE ACCOMMODATIONS

Marine Accommodations, Inc., 3830 Williamsburg Park Blvd., Building 7, Jacksonville FL 32257

MARINE BUILDING SUPPLIES

King Wholesale Supply, Co., Inc., P.O. Box 4002, New Orleans, LA 70178-4002

MARINE CEILING

Hydro-Aluminium, Vik Verk, N-5880 VIK I SOGN, Norway

Insulations, Inc., Rt. 5, 12360 Leisure Road, Baton Rouge, LA 70807

Panel Specialists, Inc., 3115 Range Rd., Temple, TX 76501

MARINE CONSULTANTS

PCS Marine, 174 Colonnade Road S., Nepean, Ontario K2E715

Resolution Management, 11 Eves Drive Suite 140, Marlton, NJ 08053

Homblower Marine, Pier 3 Ferryboat Santa Rosa, San Francisco, CA 94111

Boiland Industrial & Consulting Services, P.O.B. 91360, Mobile, AL 36691

MARINE DECKING

Hopeman Brothers, Inc., P.O. Box 820, Waynesboro, VA 22980

Insulations, Inc., Rt. 5, 12360 Leisure Road, Baton Rouge, LA 70807

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

Flexible Decking, 2708 N. Auslinian Ave. Ste. 9, West Palm Beach, FL 33407

SlipNot Safety Flooring, 2545 Beaufait St., Detroit, MI 48207

MARINE DRILLING & BLASTING

Marine Drilling & Blasting, Inc., P.O. Box 18098, Beverly Hills, CA 90209-4098

MARINE ELECTRONICS

Frank L. Beier Radio, 2001 Ridgeway Dr., Metairie, LA 70001

Autronica USA, 234 Industrial Pkwy, Northvale, NJ 07647

Kockum Sonics, Inc., 933 Industry Rd., Ste105, Kenner, LA 70062

Saab Marine Electronics AB, Box 13045, 402 51 Goteborg, SWEDEN

Advanced Marine Technology, 2003 Western Ave., Suite 725, Seattle, WA 98121

Marine Electric & Process Control, 3931 Leary Way NW, Seattle, WA 98107

ACR Electronics, Inc., 5757 Ravenswood Rd., P.O. Box 5247, Ft. Lauderdale, FL 33310-5247

Scandinavian Micro Systems, P.O. Box 155, N-1411, Kolboten, NORWAY

Scientific Marine Services, Inc., 101 State Pl., Suite F, Escondido, CA 92029

MARINE EQUIPMENT

Lake Shore Inc., P.O. Box 809, Iron Mountain, MI 49801, 1150

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

Waterman Supply, P.O. Box 596, Wilmington, CA 90748

Maritime Power Corp., 200 Henderson St., Jersey City, NJ 07302

Boindat & Associates, 1150 Rule Rochelle, Sidel, VA 70458

Sardana Americas Bkg., 502 Empire St., Montreal, Greenfield Park, J4V1V7, Canada

MacGregor, 20 Chapin Road, Unit 1012, NJ 07058

McElroy Machine, P.O. Box 4454, Biloxi, MS 39535-4454

Commercial & Marine Products, 3924 Forest Dr., #11, Columbia, SC 29204

MARINE FINANCING

Debis Financial Services, 201 Merrit 7, Suite 70, Norwalk, CT 06856

Bank Corp., 3 Riverway Ste, 1900 Houston, TX 77056

MARINE SEATING

Stidd Systems Inc., P.O. Box 87, 220 Carpenter Drive, Greenport, NY 11944

MARINE SHAFTING

Western Branch Metals, Inc., 2401 Wesley St., Portsmouth, VA 23707

Kahlenberg Bros, P.O. Box 358, Two Rivers, WI 54241

MARINE SURPLUS SALES

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

MARITIME TRAINING & SCHOOLS

Calhoun MEBA Engineering School, 27050 St. Michaels Road, Easton, MD 21601

GSI Marine, 4016 Strawberry Road, Suite B, Pasadena, TX 77504-3050

Marine Safety Int'l., Marine Terminal Laguardia Airport, NY 11371

Calhoun MEBA Engineering School, 27050 St. Michaels Road, Easton, MD 21601

MECHANICAL PUMP SEALS

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

METERS

Seko USA, 2508 Lakebrook Ct., Atlanta, GA 30360

MONITORS

Intercolor Corp., 2150 Boggs Rd., Deluth GA 30096

MONITORING SYSTEMS

Mackay Communications, 2721 Discovery Dr., Raleigh, N.C. 27616-1651

Datatar Marine Products Inc., Unit 100 18 Gostick Pl., N.Vancouver, Canada V7M3G3

MOORING LINES

Phillystran, Inc., 151 Commerce Drive, Montgomeryville, PA 18936-9628

MOTOR PROTECTION EQUIPMENT

Marine Sale Electronics, 37 Staffem Dr., Concord, Ontario L4K CANADA

NAUTICAL JEWELRY

Nautical Gold Creations, 23731 Madison St., Torrance, CA 90505

NAVAL ARCHITECTS, MARINE ENGINEERS, SURVEYORS

Band, Lavis, & Associates, 900 Ritchie Hwy, Suite 203, Severna Park, MD 21146

Northeast Technical, P.O. Box 38189, Olmstead Falls, Ohio, 44138

Advanced Marine Enterprises, Inc., 1725 Jefferson Davis Hwy., Arlington, VA 22202

Bay Engineering, 253 N. First Ave., Sturgeon Bay, WI 54235

Donald L. Blount, 2550 Elmser Ave., Ste. K, Norfolk, VA 23513

C. Baxter & Associates, P.O. Box 9006, Mobile, AL 36609

CDI Marine Co., 9550 Regency Square Blvd. Ste. 400, Jacksonville, FL 32225

Childs Engineering Corp., Box 333, Medfield, MA 02052

Crandal Dry Dock Engrs., Inc., P.O. Box 505804, Chelsea, MA 02150

Crane Consultants, 15301 First Ave S., Seattle WA 98148

C.R. Cushing, 18 Vesey St., New York, NY 10007

CT Marine, 56 Crooked Trail, Rowayton, CT 06853

Cunningham & Walker, 1762 Providence Hollow Lane, Jacksonville, FL 32223

Arthur D. Darden, 3200 Ridgeway Dr., Suite 403, Metairie LA 70002

DeJong & Lebet, Inc., 1734 Emerson Street, Jacksonville, FL 32207

Design Associates Inc., 14360 Chef Menteur Highway, New Orleans, LA 70129

Designers & Planners, 2120 Washington Blvd. Ste.200, Arlington, VA 22204

Encon Mgmt. & Engineering Consultant Services, P.O. Box 7760, Beaumont, TX 77706

GHM Inc. (Ind. Measurement Consultants), P.O. Box 1836, Newport News, VA 23601

Gibbs & Cox, Inc., 50 West 23rd St., New York, NY 10010

Heger Dry Dock Engineers, Inc., P.O.B. 6605, Holliston, MA 01746

John W. Gilbert & Assoc., Inc., 199 State St., Boston, MA 02109

The Glosten Assoc. Inc., 600 Mutual Life Bldg., 605 First Ave., Seattle, WA 98104

Guido Perla & Assoc., 720 3rd

MAN B&W Diesel A/S, Alpha Diesel, Niels Juels Vej 15, DK-9900
Frederikshavn, DENMARK
MAN B&W Diesel GmbH, Stadtbachstrasse 1, D-86153
Augsburg 1 GERMANY
Orion Corp., 1111 Cedar Creek Rd., Grafton, WI 53024
Oy Wartsila Ab, Vasa and Abo Divisions, P.O. Box 244,
SF65100 Vasa, FINLAND
S&S Propellers, 26-15 123rd St., Flushing, N.Y. 11354
Schottel (Baylor), 500 Industrial Blvd., Sugarland, TX 77478
Karl Senner Inc., 25 W Third, Kenner LA 70062
Schottel-Werft, Manizer Strasse 99, D-56322 Spay/Rhein,
GERMANY
Schottel North America, Inc., 500 Industrial Blvd., Sugar Land, TX
77478
Siemens Electric Ltd., 1180 Courtneypark Rd., Mississauga,
ONTARIO
Stewart & Stevenson, 1400 Destrehan, P.O. Box 8, Harvey
LA 70059-0008
Thrustmaster of Texas, P.O. Box 840189-12227 IFM 529,
Houston, TX 77284-0189
Ulstein Bergen Diesel A/S, P.O. Box 924, N-5002, Bergen,
NORWAY
Ultra Hydraulics Limited, Cheltenham Road East, Gloucester,
GL2 9QN, ENGLAND
Voith Hydro Marine Technology, P.O.B. 1125, D89509,
Heidenheim, GERMANY
Marine Propulsion Inc., 1505 Corbin Ave., Hammond, LA 70403
The Cincinnati Gear Company, 5657 Wooster Pike,
Cincinnati, OH 45227
Renold Hi-Tec, 512 W. Crescentville Rd., Cincinnati, OH 45246
U.S. Rep: Voith Schneider America Inc., 121 Susquehanna Ave.,
Great Neck, NY 11021

PUMP—Repair—Drives
Scardana Americas Bkg., 502 Empire St., Greefield Park, J4V1V7
Canada
Gilkes, Inc., PO Box 628, Seabrook, TX 77586
Hamworthy Marine, Inc., 1129 Hospital Dr. Ste 3C,
Stockbridge, GA 30281
Marine Electric & Process Control, 3931 Leary Way NW, Seattle,
WA 98107
Kraissl Co., 299 Williams Avenue, Hackensack, NJ 07061
Vila Motivator, 566 Parker St., Newark, NJ 07104
Alfa Tec Inc., 4027 21st Ave. West, Seattle WA 98199

RADARS—ARPS
Furuno USA, Inc., 271 Harbor Way, S. San Francisco, CA
94080
Radio-Holland USA, 8943 Gulf Freeway, Houston, TX 77017

REFR COMPRESSORS
CMP Corporation, P.O. Box 15199, Oklahoma City, OK 73155

REFRIGERATION COMPRESSOR REPLACEMENT PARTS
CMP Corporation, P.O. Box 15199, Oklahoma City, OK 73155

REMOTE VALVE OPERATORS
Elliott Manufacturing, P.O. Box 773, Binghamton, NY 13902

RH PROPELLSION
Boll Filter, 15 International Dr., East Granby, Ct., 06206
Goltens, 160 Van Brunt St., Brooklyn, NY 11231

RIGID INFLATABLE BOATS
Avon Marine, 11215 Young River Ave., Fountain Valley,
CA 92708
Willard Marine, Inc. 1250 N. Grove St., Anaheim, CA 92806
Zodiac of N. America Thompson Creek, P.O. Box 400,
Stevensville, MD 21666

ROPE—Manila—Nylon—Hawsers—Fibers
American Mfg. Co., 200 Southpark Rd., Lafayette, LA 70508
Bayer AG, D-41538, Dormagen, GERMANY
Phillystran, Inc., 151 Commerce Drive, Montgomeryville, PA
18936-9628
Puget Sound Rope, 1012 Second St., Anacortes, WA 98221
Pelican Rope Works, 4001 Carriage Dr., Santa Ana,
CA 92704
Rasmussen Equipment Co., P.O. Box 81206, Seattle,
WA 98108

RUDDER BEARINGS & BUSHES
Duramax Marine, 16025 Johnson St., P.O. Box 67, Middlefield, OH
44062-0067
Thordon Bearings, Inc., 3225 Mainway, Burlington, Ontario
Canada L7M 1A6
Vesco Plastics, P.O. Box 40647, Cleveland 2022, South Africa

SAFETY PRODUCTS
Viking Life Saving, 1625 N. Miami Ave., Miami, FL 33136
Welin Lambie N.A., Inc., 18 Ridgecrest Drive, Bridgewater Nova
Scotia, Canada B4V 3V8
New England Marine & Industrial, 200 Spaulding Turnpike,
Pompano, NH 03801
Nautical Safety Products, P.O. Box 590462, Houston, TX 77259

SANITATION DEVICE—Pollution Control
Byrne, Rice & Turner, Inc., 1172 Camp Street, New Orleans,
LA 70130
Excaltch 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
Headhunter Inc., 214 SW 21st Terrace, Fort Lauderdale, FL 33312
AlfaTec, Inc., 4027 21st Ave. West, Seattle, WA 98199
Owens Mfg., Hwy 92, Youngsville, LA 70592

SATELLITE COMMUNICATIONS
Boatrac, Inc., 6440 Lusk Blvd. #D-201, San Diego, CA
92121-2758
Furuno USA, Inc., 271 Harbor Way, S. San Francisco, CA
94080
KVH Industries, Inc., 110 Enterprise Center, Middleton, R.I.
02842-5268
ICG Satellite Communications, 8400 NW 52nd St., Suite 110,
Miami, FL 33166
Mackay Communications, 2721 Discovery Dr., Raleigh, N.C.
27604-1851
Iridium N.A., 8449 S.River Pkwy, Tempe, AZ 85284
Norwegian Telecom, Postboks 6701 St. Olavs Plass, N-0130,
Oslo, Norway
PTT Telecom, Station 12, P.O. Box 30150-2500 JD The
Hague, NETHERLANDS
Radio-Holland USA, 8943 Gulf Freeway, Houston, TX 77017
Singapore Telecom, 15 Hill Street, Telephone House, 2nd
Storey, Singapore 0617
Telstra Mobile Satellite & Radio Services, 79 St. Hilliers Rd.,
Auburn NSW 2144, AUSTRALIA
Comsat Maritime Services, 6560 Rock Spring Drive, Bethesda, MD
20817-1146

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

SEALS
John Crane Marine, USA, 1536 Barclay Blvd, Buffalo Grove,
IL 60089
Blöhm & Voss Industrie GmbH, P.O. Box 10 07 20, D-20457
Hamburg, GERMANY
Duramax Marine, 16025 Johnson St., Middlefield, OH 44062
Circle Seal Controls Inc., 2301 Wardlaw Circle, P.O. Box 3300
Corona, CA
U.S.A. Reps: Simplex-Turmar Inc, P.O. Box 168, Little Neck,
NY 11363-0168

SEATING
H.O. Bostrom, 818 Progress Ave., Waukesha, WI

SHAFT HORSEPOWER MEASURING SYSTEM
FCS, Inc., 22 Main Street, Centerbrook, CT 06409
Instruments Computers & Controls, 70 South Bow Rd.,
Hookset, N.H. 03106

SHAFT SEALS
Duramax Marine, 16025 Johnson St., Middlefield, OH 44062

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

SHIP VALUATION
Capt. E.S. Geary, P.O. Box 1246, Fajardo, P.R. 00738

SHIPBUILDING—Repairs, Maintenance, Drydocking
American Eagle Mfg., 780 Pearle Jensen Way, La Conner
WA 98257
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
Atlantic Marine, Inc., 8500 Heckscher Dr., Jacksonville, FL 32226
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
Blount Marine, 461 Water St., Warren, R.I. 02885
Bollinger Lockport & Larose, P.O. Box 250, Lockport, LA 70374-
0250
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
Eastern Shipbuilding Group, 2200 Nelson Street, Panama City,
FL 32402
Fincantieri SpA Cantieri Navali Italiani, Via Cipro 11, 16129 Genoa
ITALY
GMD Shipyard, Flushing Ave. & Cumberland, Brooklyn, NY 11205
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
Halter Marine Group, Inc., 13085 Industrial Seaway Rd, Gulfport,
MS 39503
Hitachi Zosen, Hitachi Shipbuilding & Engineering Co., 1-1-1
Hitatsubashi Chiyoda-Ku Tokyo 100 Japan
In-Place Machining Co., Inc. 929 North Buffum Street, Milwaukee,
WI 53212-3793
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
Leovac Shipyards, P.O.Box 1190, HWY 90 East, Jennings, LA
70546
Lindenau GmbH, Skagerrakler 10, Postfach 9093 D-2300 Kiel,
Friedrichsort GERMANY
Motor-Service AB, Box 2115, 144 04 Ronninge, SWEDEN
Munson Hammerhead, 780 Pearle Jensen Way, La Conner WA
98257
Newport News, 4101 Washington Ave., Newport News, VA
23607
Peterson Builders, Inc., 101 Pennsylvania Ave., Sturgeon Bay,
WI 54235-0650
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 Shipyard, Inc., P.O. Box 742, Bayou la Batre, AL 36509
Swath Ocean, 979 G Street, Chula Vista, CA 92011
Talleres Navales del Golfo, Isote San Juan de Ulva S/N, 91800
Veracruz, Ver. Mexico
Washburn Doughty, P.O. Box 296, E. Boothbay, ME 04544
Westport Shipyard, P.O. Box 308, Westport, WA 98599
Willard Marine, Inc., 1250 N. Grove St., Anaheim, CA 92806
Zodiac of North America Inc., Thompson Creek Rd., P.O. Box 400,
Stevensville, MD21666
Friede Goldman, 525 E. Capitol Street, Suite 402, Jackson, MS
39201
Tampa Bay Shipbuilding, 1130 McClosky Blvd., Tampa, FL
33605
Ocean Technical Services Inc., 1140 Peters Rd., Harvey, LA
70058-1705
Belmont Metals, Inc. 356 Belmont Ave., Brooklyn, NY 11207
Goltens Worldwide, 160 Van Brunt St., Brooklyn, NY 11231

SHIPYARD/CABLES
Baltimore Marine Industries, 600 Shipyard Rd., Baltimore, MD
21219-2599
American Shipyard Corp., One Washington St., POB
570, Newport, R.I. 02840-0943
Anixter Wire & Cable, 2617 Edenboro Ave., Metairie, LA
70002
G.M.D. Shipyard, Flushing Ave./Cumberland, Brooklyn, NY

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

SHOWERS AND FAUCETS
Scanmix Corp., 230 Bartlett St., Lewiston, ME 04240

SHRINKWRAP CONTAINMENT
Hipp Plastic Wrap, 4070 Kearny Mesa Rd., Sand Diego,
CA 92111

SILENCERS
Stalex Inc., 7850 Tranmere Dr., Mississauga, Ontario L5S1L9
Applegate Industrial, 1440 Government Street, Baton Rouge, LA
70802
Beaird Industries Inc., P.O. Box 31115, Shreveport LA 71130
Nelson Division, Exhaust & Filtration Systems, Hwy. 51
West, P.O. Box 428, Stoughton, WI 53589

SIMULATION TRAINING
Houston Marine Training Services, 5728 Jefferson Hwy,
New Orleans, LA 70123
Applied High Technology, 4 Place Dee Commerce
Brossard, Suite 201 Quebec Canada J4W-3B3
Marine Safety, Marine Air Terminal, Laguardia Airport, NY 11371

SKILLED LABORERS
Ameniforce, 650 E. 27th St., Jacksonville, FL 32206

SOUND CONTROL
Soundcoat, One Burt Dr., Deer Park, NY 11729

STAIRMASTER SAFETY TREADS
SlipNot Safety Flooring, 2545 Beaufait St., Detroit, MI 48207
Wooster Products, Inc., 1000 Spruce Street, Wooster, OH 44691

STEERING GEARS/STEERING SYSTEMS
A. Van der Velden B.V. Rotterdam, P.O.B. 2061, 2930 AB
Krimpen a/d Lek, NETHERLANDS
Cunningham Marine Hydraulics Co., 201 Harrison St.,
Hoboken, NJ 07030
Summer Equipment, 24 West 4th Ave., Vancouver, B.C.
V5Y1G3
Kobelt Manufacturing Co., Ltd., 8238-129 street, Surrey, B.C.
V3W0A6
Jastram Engineering, 485 Mountain Hwy N., North
Vancouver, B.C. CANADA V7J 2L3

STERN TUBE BEARINGS/ BUSHES
Blöhm & Voss, Industrie GmbH, P.O.B 100720, D-20457,
Hamburg GERMANY
IHC Lagarsmit, P.O.B. 5 - 2960 AA Kinderdijk - HOLLAND
Railko Ltd., Loudwater, High Wycombe, Bucks Hampshire
ENGLAND HP109QV

Duramax Marine, 16025 Johnson St., P.O. Box 67, Middlefield, OH
44062-0067
Thordon Bearings, Inc., 3225 Mainway, Burlington, Ontario
Canada L7M 1A6
Vesco Plastics, P.O. Box 40647, Cleveland 2022, South Africa

STERN TUBE SEALS
Blöhm & Voss Industrie GmbH, P.O. Box 10 07 20, D-20457
Hamburg, GERMANY
Duramax Marine, 16025 Johnson St., P.O. Box 67, Middlefield, OH
44062-0067
U.S.A. Reps: Simplex-Turmar Inc, P.O. Box 168, Little Neck,
NY 11363-0168
IHC Lagarsmit, P.O.B. 5 - 2960 AA Kinderdijk - HOLLAND
John Crane Marine USA, 1536 Barclay Blvd., Buffalo Grove, IL
60089

STORAGE/WORKSHELTERS
Poly-Steel Shelters, 1209 E. Ocean Blvd., Stuart, FL 34996

STRAINERS
Kraissl Co., 299 Williams Ave., Hackensack, NJ 07061

STUD/BOLT TENSIONERS
Superbolt, P.O. Box 683, Carnegie, PA 15106

SURFACE PREP TOOLS
Aurand Mfg., 1210 Ellis St., Cincinnati, Ohio 45223
Graco, Inc., P.O. Box 1441, Minneapolis, MN 55440-1441
Flow International Corp., 23500 64th Ave. S., Kent, WA 98032

SURGE SUPPRESSOR
Engineered Data Products, P.O. Box 565, Woodbury, NJ 08096

TANK LEVELING INDICATORS
Bergan Tank, 3409 Gulf Breeze Pkwy, Gulf Breeze, FL 32561
ERL Marine Products div, PO Box 1026, New Albany, IN
47151-1026
Ian-Conrad Bergan, 3409 Gulf Breeze Parkway, Gulf Breeze, FL
32561
Kockum Sonics, Inc., 933 Industry Rd., Ste105, Kenner, LA 70062
MMC International, 60 Inip Dr, Inwood NY 11096
Prime Mover Controls, 3600 Gilmore Way, Burnaby V5G 4R8
CANADA
Saab Marine Electronics AB, P.O. Box 13045, S-402 51
Goteborg SWEDEN
Technical Marine Service, 6040 North Cutter Circle, Portland,
OR 97217
Electronic Marine Systems, 800 Femdale Pl., Rahway, N.J. 07065
King Engineering, P.O. Box 1228, Ann Arbor, MI 48106
Auxitrol, 168 Bureaux de la Colline, 92213 Saint-Cloud Cedex,
France

TANK LIQUID LEVEL GAUGES
Headhunter, Inc., 214 SW 21st Terrace, Fort Lauderdale, FL
33312
King Engineering Corp., P.O. Box 1228, Ann Arbor, MI 48106
Kockum Sonics, Inc., 933 Industry Rd., Ste105, Kenner, LA 70062

TESTING SERVICES
Wyle Laboratories, 7800 Govern's Dr. S.W., Huntsville, AL 35807
Fleet Technologies, 311 Legget Dr., Kanata, Ont, K2K 1Z8
Canada

THICKNESS TESTING
Cygnus Instruments, 1993 Moreland Parkway, Suite 202,
Annapolis, MD 21401
M.A.C.E., 5910 N.E. 15th Ave., Fort Lauderdale, FL 33331

TOILET SYSTEMS
Headhunter, Inc., 214 SW 21st Terrace, Fort Lauderdale, FL
33312

TORSIONAL VIBRATION SPECIALISTS
M.A.C.E., 5910 N.E. 15th Ave., Fort Lauderdale, FL 33331
T.W. Spaetgens, 186 W. 8th Ave., Vancouver, BC, CANADA,
V5Y 1N2
Vibranalysis Engineering Corp., 9300 Gamebird, Houston,
TX 77034

**TOWING—Barges, Vessel Chartering, Lighterage,
Salvage, etc.**
Jack Faulkner, 2419 Caddy Lane, Flossmoor IL 60422

TRANSMISSIONS
ZF Marine 3131 SW 42nd St., Ft. Lauderdale, FL 33312

TURBOCHARGERS
ABB Turbocharger Co., 1460 Livingston Ave., North
Brunswick, NJ 08902

ULTRASONIC TESTING
Coast Diving Services, P. O. Box 1548, San Pedro CA 90733
M.A.C.E., 5910 N.E. 15th Ave., Fort Lauderdale, FL 33331

UNDERSEA CABLE CHARTS
AT&T Undersea Cable, 340 Mt. Kemble Ave, Morristown, NJ
07960

UNDERWATER EQUIPMENT/SERVICES
South Texas Underwater Divers, 2921 16th Ave. North,
Texas City, TX 77590
J.W. Fisher, 65 Anthony St., Berkley, MA 02779

VACUUM EQUIPMENT
Vector Technologies, 6820 N. 43rd St., Milwaukee, WI 53209

VACUUM TOILET SYSTEM
Envirovac Inc., 1260 Turret Dr., Rockford, IL 61111
Fast Systems, Inc., 3240 N. Broadway, St. Louis, MO 63147
Jets Vacuum Sewage System, P.O. Box 14, N-6060 Hareid,
NORWAY

VACUUM CONVEYORS
Vector Technologies, 6820 N. 43rd St., Milwaukee, WI 53209

VALVE CONTROL SYSTEM
Elliott Mfg., P.O. Box 773, Binghamton, NY 13902

VALVES AND FITTINGS
Cla-Val Co., P.O. Box 1325, Newport Beach, CA 92663
ERL Marine Products Div., PO Box 1026, New Albany, IN 47151
Ian-Conrad Bergan, 3409 Gulf Breeze Pkwy, Gulf Breeze, FL
32561
Fetterolf Corp., P.O. Box 103, Skippack, PA 19474
Leslie Controls, 12501 Telecom Dr., Tampa, FL 33637
Loeffler Corp., 201 E. Lincoln Hwy., Pennel, PA 19047-4097
MMC International, 60 Inip Dr, Inwood NY 11096
W&O Supply, 3465 Evergreen Ave., Jacksonville, FL 32206

VAPOR RECOVERY CONTROLS
Electronic Marine Systems, 800 Femdale Pl., Rahway, N.J. 07065
E.R.L. Marine Products, P.O. Box 1026, New Albany, IN 47151
Ian-Conrad Bergan, Inc., 3409 Gulf Breeze Parkway, Gulf
Breeze, FL 32561
Refrigeration Resources, 210 Westside Ave., Jersey City, NJ
07305

VENTILATION SYSTEMS / PRODUCTS
ABB Flakt Marine, Box 1043, S-436 21 ASKIM SWEDEN
Novenco Hi-Press A/S, P.O. Box 310, Roskildevej 325A, DK-
2630 Taastrup, DENMARK
Dry Air Technologies, 313 N. Oak St., Burlington, WA 98233

VIBRATION ANALYSIS
SPM Instrument, Inc., 359 N. Main Street, P.O. Box 89,
Marlborough, CT 06447
Stork Canada, Inc., 47, boul Marie-Victorin, Quebec,
Canada, J5R1B6
Vibranalysis Engineering Corp., 9300 Gamebird, Houston,
TX 77034

VIDEO
Moxie Media Inc., 800 Distributors Row Sde B, Harahan, LA
70123

WASTE WATER TREATMENT
Envirovac, 1260 Turret Drive, Rockford, IL 61111
RGF Environmental Group, 3875 Fiscal Court,
W.Palm Beach, FL 33404
Red Fox Environmental Services, P.O. Box 53809, Lafayette, LA
70508-2529

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

WATER PURIFIERS
Reverse Osmosis of South Florida, 12301 SW 133 Court, Miami
Florida, 33186
AlfaTec, Inc., 4027 21st Ave. West, Seattle, WA 98199
Alfa-Laval, Desalt A/S, Stamholmen 93, DK-2650 Hvidovre,
Copenhagen, DENMARK
Alfa-Laval Separation Inc., 955 Meams Rd., Warrminster, PA
18974
Beaird Industries Inc., P.O. Box 31115, Shreveport LA 71130
Boll Filters, 15 Infi Drive, East Granby, CT 06206
Lifestream Water Purification Equip., 16611 Gemini Lane,
Huntington Beach, CA 92647

WEATHER INSTRUMENTS
Aanderaa Instruments, Fanaveien 13B, 5050 Nesttun,
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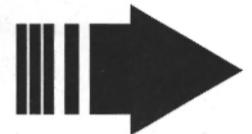
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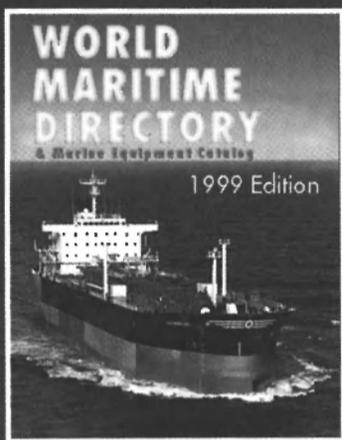
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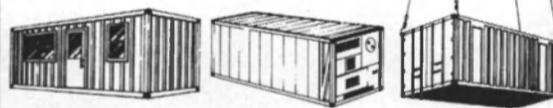
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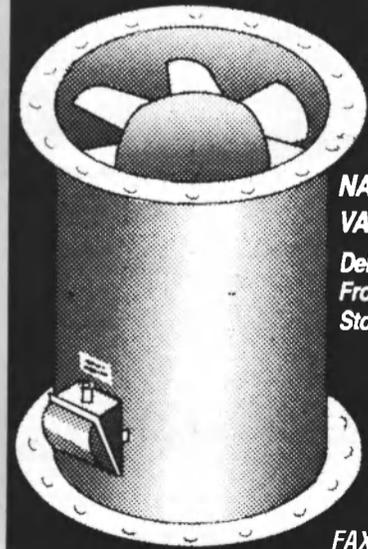
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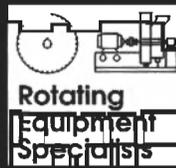
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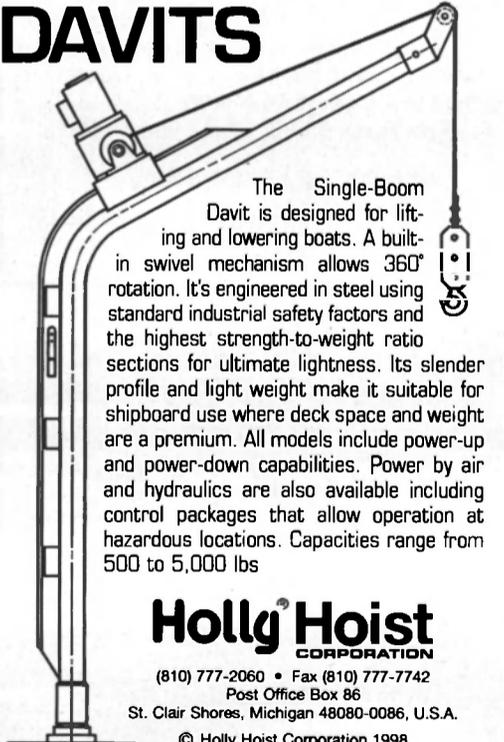
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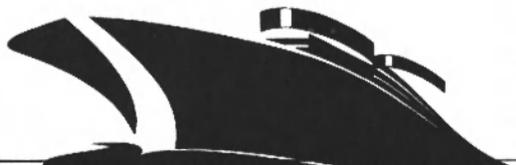
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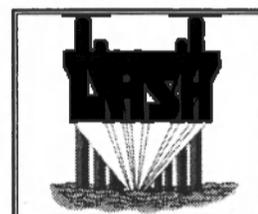
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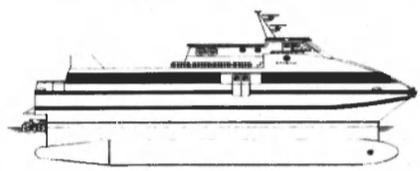
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