MARITIME REPORTER
AND
ENGINEERING NEWS

SPECIAL EDITION

NAVAL TECHNOLOGY & SHIPBUILDING

JULY 15, 1986 DOUBLE ISSUE

Fittings for Hydraulics

Every leak-free connection provides the reliability your hydraulic system demands.

- Sizes — 1/4" to 1"
- End connections...tube, SAE/MS, NPT or *AN*
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VCO — TM Cajon Company

TO CONNECT TUBING TO SAE/MS STRAIGHT THREAD PORTS, USE:


Male SAE/MS Connector


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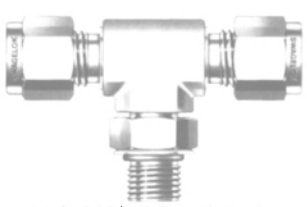
45° Male SAE/MS Elbow/Positionable


90° Male SAE/MS Elbow/Positionable


Male SAE/MS Branch Tee/ Positionable


Male SAE/MS Run Tee/ Positionable

TO REDUCE A SAE/MS PORT, USE:


Reducer

TO CONNECT TWO TUBES OR TWO TUBE FITTINGS TOGETHER, USE:


SWAGELOK to Male *AN* Union


SWAGELOK to Male *AN* Bulkhead Union


SWAGELOK to Female *AN* Adapter

TO PLUG A SAE/MS PORT, USE: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Hex Head Plug

TO ADAPT SAE/MS TO NPT OR *AN* USE:


SAE/MS to Male NPT


SAE/MS to Female NPT


SAE/MS to Male *AN*

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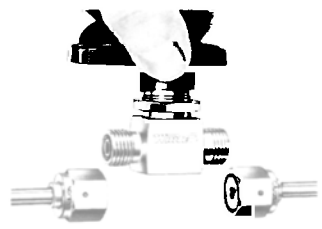
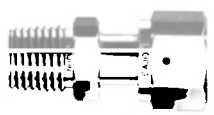
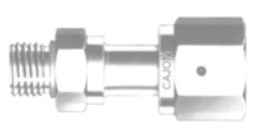
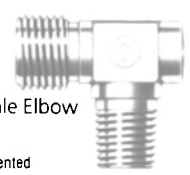

Sequential assembly is not required. The Zero Clearance concept provides easy accessibility to system components and reduces installation and labor costs.


Zero Clearance Male Connector

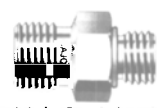

Zero Clearance Female Connector


Zero Clearance SWAGELOK Connector


Zero Clearance Straight Thread Connector


VCO Male Elbow

Patented


VCO Male Straight Thread Connector

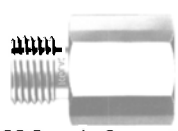

VCO Male Straight Thread Elbow/Positionable


VCO SWAGELOK Connector


VCO SWAGELOK Bulkhead Connector


VCO SWAGELOK Elbow


VCO Male Connector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ON THE COVER

FlightSafety Orders Shiphandling Simulator From Tracor Hydronautics

Tracor Hydronautics, Inc., Laurel, Md., a subsidiary of Tracor, Inc., has received a multimillion-dollar contract from FlightSafety International to provide a shiphandling simulator to support a program for the U.S. Navy's Surface Warfare Officers School in Newport, R.I.

William C. Moyer, Ph.D., group vice president for Tracor Applied Sciences, said the shiphandling simulator will model seven different classes of ships. It simulates a pilothouse, bridge wing, controls, computer-generated visual scenes, radar, and communications. When completed, it will be one of the most advanced naval shiphandling simulators in existence.

The Navy program, to be managed by MarineSafety International, a subsidiary of FlightSafety International, is designed to provide officers attending the Navy's Surface Warfare Officers School with training in shiphandling and ship maneuvering.

William M. Pugh, president of Tracor Hydronautics, said development of the simulator will be performed in Laurel, under the management of **Eugene R. Miller,** technical director.

Tracor, Inc., is an international technological products and services company with headquarters in Austin, Texas.

For free literature containing full information on Tracor,

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ALL MATERIAL FOR EDITORIAL CONSIDERATION SHOULD BE ADDRESSED TO ROBERT WARE, EDITOR

Valmet And Wärtsilä To Merge Shipbuilding Operations In One Group

Two of Finland's biggest shipyards, Wartsila and Valmet, will merge into one shipbuiding group, with Wartsila taking a controlling 70-percent interest. To begin operations in early 1987, the merger will make the new group a market leader in specialty vessels, according to Wartsila president **Tor Stolpe,** who is chairman-designate for the merged operation.

In merging with one of its main shipbuilding competitors and eliminating overlapping operations, Wartsila company officials expect the new shipbuilding group to become more powerful and efficient.

Wartsila already produces about 60 percent of the world's icebreakers and some 30 percent of the luxury cruise liners, and is also a builder of ferries, craneships, and offshore accommodations platforms. Even so, the largest Finnish shipyards (the third is Rauma-Repola) represent only some one percent of world shipbuilding capacity. With only a small domestic market for ships, they have survived by becoming experts in several specialty areas of shipbuilding.

Hartigan Assumes Duties As New President Of BP, North America

Ian G.S. Hartigan recently assumed his duties as president of BP North America Inc., succeeding **J. Colin E. Webster,** who has become an executive vice president of The Standard Oil Company, a 55.5-percent-owned subsidiary of The British Petroleum Company p.l.c.

Mr. **Hartigan** is located at BP North America's New York office. Mr. **Webster** has moved to Standard Oil's offices in Cleveland, Ohio.

Mr. **Hartigan** joined BP in 1969 and became managing director of BP Shipping in 1984. During the last two years he has restructured BP Shipping from a company previously supplying a service to the BP Group into one that is cost-competitive and operating commercially in the international shipping markets.

Dillingham Restructures West Coast Operations— Key Executives Named

A total restructuring of Dillingham Corporation's West Coast maritime transportation operations and the appointment of several key executives was announced recently by **J. Joseph Casey,** company president and chief executive officer.

The restructuring includes the formation of Foss Maritime, a new operating company, which comprises all of Dillingham Corporation's maritime transportation operations on the West Coast consisting of Foss Launch & Tug Co., Pacific Northwest and Alaska; Dillingham Maritime Services, the company's international ocean towing entity, and Pacific Towboat & Salvage Company (PacTow), Long Beach, Los Angeles and San Diego. Foss Maritime offices are located in Seattle.

In making the announcement, Mr. **Casey** stated that **Thomas V. Van Dawark** has been named president and CEO of Foss Maritime.

Bruce Robeson, president of Foss Launch & Tug Co. since 1979, has announced his early retirement to pursue other interests and will be working in a consulting capacity to Foss Maritime. Additionally, **Sidney D. Campbell,** retired chairman of the board of Foss Launch & Tug Co., will be serving on the new Foss Maritime board of directors.

Under the restructuring, Foss Launch & Tug Co. has officially changed its name to Foss Maritime. PacTow, on the other hand, with operations in California, will continue under its current name as part of Foss Maritime.

Dillingham Corporation is a diversified company with major activities in the construction, maritime and liquid petroleum gas industries.

Falmouth Shiprepair Moves Ahead Again With Major New Agreement

Falmouth Shiprepair Limited, an A&P Appledore and Bellway joint venture, recently unveiled one of the most progressive working agreements in the United Kingdom ship repair industry, in an effort to speed up vessel turnaround and provide superior repair service to shipowners.

The new major working agreement calls for the following measures: round-the-clock shift work, as and when required, covering all trades and services; ending traditional snack breaks, which will allow for continuous work; introducing utilization of labor between the four group companies; and reducing the work week from 39 to 37½ hours.

In addition, the flexibility and interchangeability between all trades and sections—a major feature of the highly successful restructuring of 1979—will be enhanced.

As a vote of confidence in the future, Falmouth has approved further investment of £500,000 in various items of plant and capital equipment.

The new package was strengthened by the trade unions reaffirming their approval of ships' crew working on vessels while in port and the use of temporary labor and subcontractors as required.

"The new working agreement is unique in the U.K. ship repair industry and enables us to compete far more effectively with Continental and North American yards," said Falmouth Shiprepair chairman **Peter Nash.**

"We are now in a position to speed up vessel turnaround very significantly and . . . provide the shipowner with the kind of service he expects . . .," he said.

The Falmouth Yard offers exceptional deepwater facilities, and can drydock vessels of up to 100,000 dwt.

For further information and a free color brochure on Falmouth's ship repair services and facilities,

Circle 96 on Reader Service Card

Nippon Kokan To Market Titanium-Clad Steel Plate Produced By Hot Rolling

Commercial production of titanium-clad steel plate by a new hot rolling process has begun at the Fukuyama Works of Nippon Kokan (NKK) in Japan. Clad with pure titanium, the plate features superior corrosion resistance in harsh environments, and is economical because less carbon steel is used as the base plate, according to **Minoro Hashimoto,** president of NKK America Inc., the Japanese company's U.S. subsidiary.

With recent advanced, titanium-clad steel plate applications for chemical tankers, pressure vessels, and other offshore structures that require high anti-corrosion characteristics has been increasing. Previously, these plates had been produced by an explosive bonding process. There had been a limitation on high-performance, titanium-clad plates by a normal hot rolling process because titanium and carbon steel generate brittle metallic compounds when heated in a high-temperature furnace.

The new NKK product is said to have the same properties as the explosive-bonded plate through the use of a unique slab fabrication and clad rolling procedure at Fukuyama's ultra-large, four-story heavy plate rolling mill. The mill has the world's highest rolling load-up to 9,000 tons, according to Mr. **Hashimoto.** NKK has already delivered a sample plate with a thickness of 40 mm (titanium cladding 3 mm).

Available size ranges are 6-40 mm in thickness with a maximum width of up to 3,500 mm; plate will be supplied in a maximum length of 15 meters upon request. ASTM and other specifications are also available upon request.

For further information on NKK's titanium-clad steel plate,

Circle 99 on Reader Service Card

Freeport Shipbuilding Delivers Passenger Vessel To Nassau Cruises

Freeport Shipbuilding & Marine Repair, Inc. of Freeport, Fla., recently completed the excursion/dinner cruise vessel Calypso II for Nassau Cruises Ltd., a Bahamas-based company.

The 550-passenger vessel, with an overall length of 105 feet, beam of 29 feet, and depth of 9 feet 6 inches, is the largest craft that the Freeport yard has produced. She is also the fastest in terms of building time—98 days from the beginning of construction to departure from the shipyard.

Calypso II is designed as a multipurpose vessel, with her primary function transporting passengers from cruise ships to a privately owned island just outside Nassau Harbor. Dinner cruises are another feature, with seating for more than 200 people on the main and second decks. The owner will also offer private charters, cocktail parties, and other services.

The new vessel was designed and built exclusively for the comfort and entertainment of her passengers, with dependability and safety the first two considerations. Initial drawings, establishing the outward appearance and arrangements, were done by **Jim Murray,** president and part owner of Freeport Shipbuilding. The package was then sent to Maritime Design, a Jacksonville-based naval architecture and marine engineering firm headed by **Jim Konopaseck,** to refine the structural aspects as well as the stability and tonnage requirements of the American Bureau of Shipping and the Coast Guard.

CALYPSO II
Major Suppliers

Main engines	Detroit Diesel
Reduction gears	Twin Disc
Propellers	Columbian
Shafting	Aquamet (Armco)
Bow thruster	Wesmar
PTO to power thruster	Twin Disc
Engine silencers	Maxim
Engine mountings	Globe Rubber
Generators (2)	Lima
Generator engines	Perkins
Generator control panel	Simplex
Steering controls	Kobelt
Rudder angle indicator	Wagner
Radar	Furuno
Loran	Sitex
Depth sounder	Datamarine
Internal telephones	Aiphone

Main propulsion is provided by three Detroit Diesel 8V71 and Twin Disc 509 reverse/reduction gears, driving Columbian Bronze Tetradyne propellers via Aquamet 17 shafting. The main engines are supported by Globe Rubber resilient mounts to minimize vibration and engine noise. The engine exhaust systems are fitted with Maxim silencers.

Electric power is produced by two 35-kw Lima generators, each driven by a Perkins model 4.236 diesel. The generator control panel was supplied by Simplex, and is arranged for paralleling the outputs of both generators.

The passengers on the Calypso II have a choice of three decks offering completely different environments. The third or sun deck is open with the exception of wind cloths laced to the handrails around the perimeter. The second deck is designed for those who want to escape the tropical sun but still enjoy being in an open-air atmosphere. This deck includes a full-service bar. The main deck features a spacious enclosed area and also exterior seating along the sides of the enclosed bulkheads. The enclosed area features a full bar identical to the one on the second deck. Food for the dinner cruises may be either catered or prepared on board in the galley that is located below the main deck.

Maneuverability is a critical factor in the vessel's operation due to coming alongside the cruise ships in open waters to load and off-load passengers. Therefore the Calypso II is fitted with a dual electric-driven, hydraulic steering system with three steering and engine control stations, one in the pilothouse and one on each bridge wing. Each station consists of three Kobelt single-lever, air engine control heads, a Wagner rudder angle indicator, and a Wagner elecric jog lever at the outside stations and an orbital helm unit in the pilothouse. Most importantly, the vessel is equipped with a Wesmar T-50 hydraulic bow thruster, operable from each of the three control stations. The 50-hp thruster is powered by a hydraulic pump close-coupled to a Twin Disc power takeoff on the front of the centerline main engine.

A basic, but adequate, electronics package is installed, which includes a Furuno 240 radar, Standard Horizon VHF radiotelephone, Datamarine depth recorder, Sitex EZ7 Loran, and loudhailer. An Aiphone internal telephone system is also installed.

For further information and free literature on the services and facilities offered by Freeport Shipbuilding,

Circle 50 on Reader Service Card

Nilsson Named Member Of Volvo Penta's Board Of Executives

Rolf Nilsson, chief engineer, has been appointed a new member of the Volvo Penta board of executives, which is responsbile for product development, quality, and product responsibility.

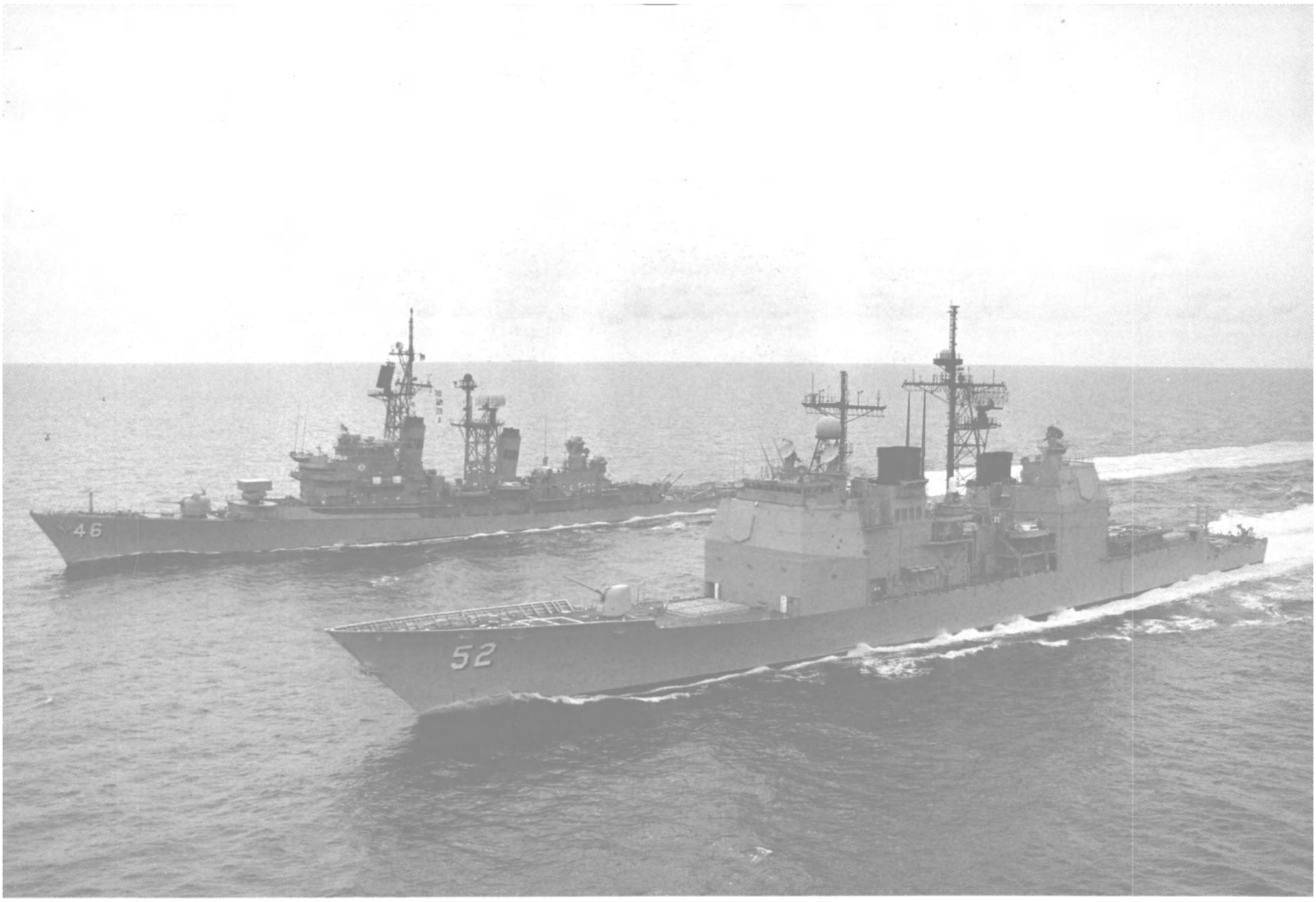
He succeeds former director **Sven-Olof Svantesson,** who has retired but will continue to work on major projects assigned by the board of executives. Mr. **Nilsson** will remain in charge of product development at the Swedish company, a position he took on in 1985.

Franklin Promoted To Vice President At McDermott Marine

Robert E. Howson, president and chief operating officer of McDermott Marine Construction, announced that **James F. Franklin** has been promoted to vice president and general manager, Fabrication and Shipyard Operations based at Bayou Boeuf and Amelia, La.

Mr. **Franklin** has been general manager of the Fabrication Division since November 1984, and Morgan City Shipyard operations since April 1985. His responsibilities include all operations involved in fabricating offshore platforms at McDermott's largest yard and shipyard operations, which include the construction and repair of large tugs, supply boats, barges, dredges, and a wide variety of oceangoing work vessels.

Mr. **Franklin** has been involved in the offshore industry since 1963. He first joined McDermott when Ingram Contractors, Inc., where he had been employed since 1964, was acquired in 1971. Between 1971 and 1980 he managed McDermott fabrication operations in Southeast Asia and Scotland. From 1980 to 1984 he was employed by Raymond Offshore Constructors Inc. and Raymond Fabricators Inc., serving there as vice president-Gulf of Mexico operations and senior vice president-chief operating officer. He rejoined McDermott in 1984.



U.S. NAVY SHIP MAINTENANCE AND MODERNIZATION

By James R. McCaul
International Maritime Associates, Inc.

Each quarter IMA prepares an update on developments in the Navy ship maintenance and modernization market. This article is an excerpt from the most recent update prepared exclusively for publication only in Maritime Reporter.

FY 1987 Budget Request

The President's budget requests $6.4 billion for Navy ship maintenance and modernization. Details are provided in Exhibit 1.

Composition of FY 1987 Overhaul Program

The Navy proposes to fund 37 ship overhauls in FY 1987, the same number as budgeted for this year. The 37 overhauls include:

- One aircraft carrier
- Five ballistic missile submarines
- Eight attack submarines
- Fifteen surface combatants
- Three amphibious ships
- Four auxiliaries, and
- One mine countermeasure ship

Photo: The Navy's newest Aegis guided missile cruiser Bunker Hill (CG 52) on sea trials and the recently overhauled guided missile destroyer USS Preble (DDG 46).
Ingalls Shipbuilding photo.

In addition, 129 selected restricted availabilities and 48 phased maintenance availabilities are proposed for FY 1987. These are significant increases over current SRA/PMA activity.

Work Split

Seventeen of the 37 planned overhauls are currently earmarked for commercial shipyards. The remaining 20 overhauls are to be performed in naval yards.

The number of ship overhauls to be set aside for public/private shipyard competition will affect the final work split. No figure is currently available for the number of ships to be completed between commercial and naval shipyards in FY 1987. However, a Navy directive in January specified that the five scheduled SSBN overhauls are to be competed next year.

Navy Reserve Fleet Maintenance

The Navy plans to spend $153.5 million on reserve ship maintenance in FY 1987. This will fund four overhauls and 16 SRA/PMAs. These figures are provided in Exhibit 2.

MSC Ship Repair and Alteration

Estimated FY 1986 spending by

Exhibit 1—Expenditures For Ship Maintenance and Alteration FY 1985-1987 (in millions of $)

	FY 1985 (revised)	FY 1986 (budgeted)	FY 1987 (proposed)
Scheduled Overhauls	$2,393.4	$2,348.8	$2,312.7
Number of Overhauls	55	37	37
Restricted Availabilites	1,330.7	1,258.7	1,565.1
Number of SRA's	103	104	129
Number of PMA's	17	30	48
Ship Alterations	1,345.2	1,598.2	1,527.7
Intermediate Maintenance	326.9	385.2	380.0
Technical Support	120.7	142.7	147.6
Fleet Outfitting	300.5	350.0	393.6
Inactivations	28.8	—	—
Berthing/Messing	41.4	44.5	40.9
Total	**$5,887.6**	**$6,128.1**	**$6,367.6**

Source: Department of the Navy

MSC for ship maintenance has been cut from $270 million to $203 million. Only 22 overhauls are now planned this year. This is much lower than the 42 overhauls approved in the FY 1986 budget.

MSC has estimated that FY 1987 expenditures for ship maintenance and alterations will be $207 million. This will fund 37 MSC ship overhauls. The FY 1987 estimate is about the same as the current spending estimate for this year.

Public/Private Overhaul Competition

The Navy has earmarked eight ship overhauls for competition between naval and commercial shipyards in FY 1986:

East Coast	West Coast
Spear (AS-36)	**Albert David** (FF-1050)
Mahan (DDG-42)	**O'Callahan** (FF-1051)
Benjamin Franklin (SSBN-640)	**Fletcher** (DD-992)
George Bancroft (SSBN-643)	**Fort Fisher** (LSD-40)

Until selected for the public/private competition, the FF-1050 and -1051 had been scheduled for Long Beach Naval Shipyard. The DDG-42 had been assigned to the Charleston Naval Shipyard. Newport News and Charleston Naval Shipyard had originally been assigned one of the two SSBN overhauls. Each of the other three surface ships had been scheduled for commercial bid. Probably the most critical competition involves the two frigates. Workload will be very low at Long Beach if these jobs are awarded to commercial yards.

Gramm-Rudman funding cuts may impact the surface ships earmarked for this compeition. They are among the few overhauls scheduled for FY 1986 not yet begun or awarded. These job starts may be the only candidates for deferral.

Ship Overhaul Buying-In

In January, the GAO released a study (NSIAD-86-27) of contract cost growth in Navy ship overhauls. The analysis was based on 105 regular ship overhauls completed between October 1982-May 1985.

For each overhaul GAO compared contract award amounts, government estimates and final prices. GAO found that:

- In the 75 fixed price contracts final cost exceeded award price by 63 percent
- In the 30 cost reimbursement contracts final cost exceeded award price by 35 percent.
- 71 of the 75 fixed price contracts were awarded at prices below government estimates
- 24 of the 30 cost reimbursement contracts were awarded at prices under government estimate
- Modifications negotitated under fixed price contracts were made at prices higher than government cost estimates

Exhibit 3 summarizes the cost growth found by GAO in each SUPSHIP office. As shown, cost increases have been particularly great in contracts administered by the San Diego SUPSHIP office.

(continued)

Exhibit 2—Navy Reserve Fleet Maintenance and Alteration Expenditures

	FY 1985	FY 1986 (current est.)	FY 1987 (proposed)
Ship maintenance expenditures (millions)	$122.0	$173.8	$153.5
No. of Job Starts			
Ship overhauls	3	9	4
Selected Restricted Availabilities	17	10	12
Phased Maintenance			4

Source: Department of the Navy

U.S. NAVY

Exhibit 3—Cost Growth In 105 Navy Ship Overhauls, by SUPSHIP Office and Type Contract ($ in millions)

	SUPSHIP	No. of Contracts	Total Award	Total Final Price	Difference Amount	Difference Percent
Fixed Price Contracts	Bath	3	$36.1	$55.9	$19.8	55
	Boston	9	57.6	78.8	21.2	37
	Brooklyn	7	76.7	129.1	52.4	68
	Charleston	6	17.4	27.5	10.1	58
	Jacksonville	2	1.9	3.7	1.8	93
	Long Beach	4	21.8	29.9	8.1	37
	Pearl Harbor	2	12.6	17.1	4.5	36
	Portsmouth	15	122.7	177.8	55.1	45
	San Diego	12	109.8	229.2	119.4	109
	San Francisco	8	110.6	182.3	71.7	65
	Seattle	7	26.7	35.9	9.2	35
	Total	**75**	**$593.9**	**$967.2**	**$373.3**	**63**
Cost Reimbursement Contracts	Bath	5	$99.6	$134.4	$34.8	35
	Boston	1	12.5	21.7	9.2	73
	Brooklyn	5	88.5	112.0	23.5	26
	Pascagoula	7	117.1	158.3	41.2	35
	Portsmouth	2	18.3	27.2	8.9	49
	San Diego	5	75.6	95.8	20.2	27
	Seattle	5	127.4	178.9	51.5	41
	Total	**30**	**$539.0**	**$728.3**	**$189.3**	**35**

Source: General Accounting Office

(continued)

Naval Shipyards

Employment in the eight naval shipyards continues to fall. Total employment was 75,860 in June 1985. By the end of 1985 employment had fallen to 72,490. The Navy now projects that employment must decline to 68,000 during this fiscal year to meet budget objectives.

Meanwhile, NAVSEA has directed that overtime in the naval shipyards in FY 1986 be reduced by 3.2 million man-hours. A target of a 6.3 percent composite overtime rate has been set for this year, compared to 10.3 percent in FY 1985.

Small Business Set Asides

The Navy has expressed concern to Congress about the impact of setting aside ship maintenance work for small businesses. Mr. **Pyatt** stated in late February that:

> One of the challenges we have in maintaining a national industrial base is proper utilization of both large and small businesses. During the past few years, we have properly relied on the capabilities of small business. Now, we find that small business preferences are operating to the disadvantage of the larger firms. The distribution of work is:

Percentage Small Business Set Aside (ROH/SRA/RATA)

	1981	1985
East Coast	13%	17%
SRA Alone	0	16
West Coast	12	54
SRA Alone	0.5	64

CURRENT NAVY, COAST GUARD & MARAD OVERHAUL, MAINTENANCE & CONVERSION CONTRACTS AT U.S. YARDS

SHIPYARD	TYPE OF WORK	$VALUE	COMP
Alabama Dry Dock	Phased maintenance on USS Lexington (AVT-16)	10,132,000	8/90
Atlantic Marine	Repairs to USS Saratoga (CV-60)	3,500,000	9/86
Bath Iron Works	Overhaul 4 USCG cutters	117,452,000	-89
Bath-Portland	Overhaul DDs Deyo & O'Bannon	44,600,000	86-87
Braswell Shipyards	Maint. on USS Los Alamos (AFDB-7)	3,075,912	8/86
Coastal Drydock	Overhaul USS Shreveport (LPD-12)	10,500,000	86
Charleston Naval Shipyard	Overhaul USS Calhoun (SSBN-630)	—	8/86
	Overhaul USS Jackson (SSBN-634)	—	8/87
	Overhaul USS Sturgeon (SSN-637)	—	9/86
Dillingham Ship Repair	Convert ex-President Polk to craneship	20,500,000	9/86
Electric Boat	Phased maintenance on SSBN-731-3	4,000,000	4/87
General Ship	Maintenance on USS Miller (FF-1091) and USS Valdez (FF-1096)	46,475,000	—
Honolulu Shipyard	Repairs on USS Jason (AR-8)	3,997,504	7/86
	Repairs to USS McInerney (FFG-8)	8,000,000	2/87
Ingalls Shipbuilding	Overhaul USS Simon Lake (AS-33)	15,900,000	7/86
Jacksonville Shipyard	Repairs to USS Saratoga (CV-60)	6,725,000	9/86
Jonathan	Phased maintenance on USS Saganaw	9,900,000	6/90
Long Beach Naval Shipyard	Modernize battleship Missouri (BB-63)	500,000,000	86
	Overhaul USS CLeveland (LPD-7)	—	1/87
	Overhaul USS Schofield (FFG-3)	—	11/86
Mare Island Navy Yard	Overhaul USS Hammerhead (SSN-663)	—	9/86
National Steel	Convert two tankers to hospital ships	336,200,000	86-87
	Phased maintenance on four LSTs	3,500,000	-90
	Overhaul USS Merrill (DD-976)	6,039,000	—
	Overhaul USS Horne (CG-30)	—	—
	Overhaul USS Leahy (CG-16)	—	—
	Maintenance on three LSTs	5,858,543	—
Newport News Shipbuilding	Overhaul USS Daniel Boone (SSBN-629)	12,800,000	8/86
	Overhaul & refuel USS Benjamin Franklin (SSBN-640)	17,063,000	1/87
	Overhaul USS Eisenhower (CVN-69)	276,600,000	1/87
	Prep for overhaul USS George Bancroft (SSBN-643)	19,400,000	3/88
	Prep for overhaul USS Enterprise (CVN-65)	3,075,912	8/86
Norfolk Navy Yard	Overhaul USS Nassau (LHA-4)	—	9/86
	Overhaul USS Memphis (SSN-691)	—	9/86
Norfolk Shipbuilding	Phased maint. on AO-178, 179, 186	38,900,000	—
	Overhaul USS Coloosahatchee (AO-98)	3,478,000	—
	Overhaul USS Iwo Jima (LPH-2)	16,167,222	2/87
Northwest Marine	Overhaul USS Cushing (DD-985)	12,300,000	7/86
Pearl Harbor Navy Yard	Overhaul USS Skate (SSN-578)	—	86
	Overhaul USS Omaha (SSN-692)	—	86
Pennsylvania Shipbuilding	Phased maint. on USS Patterson (FF-1061)	5-10 mil/yr	—
	Maint. on USS Oliver Hazard Perry (FFG-7)	4,861,747	7/86
Philadelphia Navy Yard	SLEP on Independence (CV-62)	240,000,000	—
	Modernization of Wisconsin (BB-64)	469,000,000	87
Portsmouth Navy Yard	Overhaul USS Bolivar (SSBN-641)	—	12/86
	Overhaul USS Greenling (SSN-614)	—	7/86
	Overhaul USS James K. Polk (SSBN-645)	135,000,000	87
Puget Sound Navy Yard	Overhaul USS Ranger (CV-61)	—	86
	Overhaul USS Texas (CGN-39)	—	12/86
	Repair & overhaul USS Nimitz (CVN-68)	—	89
Service Engineering	Overhaul USNS Spica (T-AFS-9)	10,700,000	—
	Phased maint. on AE-29, 32-34	4,154,000	86-89
Southwest Marine	Overhaul USS Dubuque (LPD-8)	10,000,000	—
	Repairs to USS Kansas (AOR-3) and Wichita (AOR-1)	41,600,000	—
	SRN on 4 16/26 class ships	—	—
	Overhaul USS Cayuga (LST-1186), USS Racine (LST-1191) and USS Schenectady (LST-1185)	35,000,000	87-89
	SRA work on USS Durham (LKA-114)	3,187,000	7/86
Todd-Galveston	Convert two C-5s to T-AVBs	55,000,000	86-87
Todd-San Pedro	Maintenance on USS Vincennes (CG-49)	3,750,000	—
	Overhaul USS Ingersoll (DD-652)	13,500,000	12/86
Todd-Seattle	Phased maintenance on AOEs	6,000,000	86-90
	Overhaul eight USCG cutters	234,903,000	-90
USCG Yard-Curtis Bay	SLEP for 14 buoy tenders	8,500,000	—
	Major maintenance on 16 WMECs	—	—

Our policies need to, and indeed do, take into account a reasonable distribution of work between these two facets of the private sector.

This expression of concern is likely the forerunner of policy initiatives to reduce the number of jobs set aside for small businesses.

Homeport Policy

Congress had considerable interest in the Navy's homeport during last year's appropriations process. Several versions of homeport policy directives were voted through the House and Senate. In its final version Congress told the Navy to bid on a coastwide basis 25 percent of short term maintenance and repair work.

The Navy continues to oppose change in homeport policy—but there are indications that political pressures will be too great to ignore.

Strategic Homeporting

The General Accounting Office has questioned the Navy's plan to develop additional homeports. In a March appearance before a congressional subcommittee, a GAO official stated:

> Our review leads us to an overall conclusion that the Navy needs to better demonstrate the strategic benefits of new homeports and to prepare more definitive and complete cost estimates as a basis for proceeding further.
>
> Based on analysis of Navy cost data GAO found it would be "considerably less costly to accommodate the two carrier groups and three battleship groups in existing homeports than to establish new homeports for them." ■

MAJOR NAVY CONTRACTS

April 1

General Dynamics Corporation, Convair Division, San Diego, Calif., is being awarded a **$9,998,450** cost-plus-fixed-fee contract for design efforts to support the Tomahawk cruise missile. Work will be performed in San Diego, and is expected to be completed in November 1986. The Joint Cruise Missiles Project Office, Washington, D.C., is the contracting activity (N00032-86-C-6130).

General Electric Company, Fitchburg, Mass., is being awarded a **$4,459,747** modification to a previously awarded firm-fixed-price contract for one integrated base ship service turbine generator set. Work will be performed in Fitchburg, and is expected to be completed in October 1986. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-85-C-4313).

Kollmorgen Corporation, Electro-Optical Division, Northampton, Mass., is being awarded a **$10,573,914** firm-fixed-price contract for type 18 B/D periscope sets and ancillaries for Sturgeon (SSN-637) and Los Angeles (SSN-688) class submarines. Work will be performed in Northampton, and is expected to be completed in Febru-

(continued)

NAVY

CURRENT NAVY & COAST GUARD VESSELS UNDER CONTRACT AT U.S. YARDS

SHIPYARD / NAVY NUMBER	NAME	APPROX. CONTRACT $	CONTRACT DEL'Y DATE
Atlantic Marine			
MK IV patrol boats (3)	unnamed	4,155,500	NA
Avondale Industries			
T-AO-187	Henry J. Kaiser	123,900,000	9/86
T-AO-188	Joshua Humphreys	117,000,000	12/86
T-AO-189	unnamed	116,000,000	5/87
T-AO-190	unnamed	116,000,000	9/87
T-AO-193	unnamed	116,000,000	8/88
T-AO-195	unnamed	101,000,000	1/89
LSD-44	unnamed	166,000,000	7/88
LSD-45-46	unnamed (2)	306,800,000	88-89
LSD-47-48	unnamed (2)	300,000,000	89-90
Bath Iron Works			
FFG-59	Kauffman	89,300,000	10/86
CG-51	Thomas S. Gates	305,300,000	1/87
CG-58	unnamed	252,800,000	6/88
CG-60-61	unnamed (2)	383,600,000	89
CG-63-64	unnamed (2)	386,600,000	NA
DDG-51	Arleigh Burke	321,900,000	2/89
Bell Aerospace			
LCAC-7-12	unnamed (6)	102,000,000	NA
LCAC-13-24	unnamed (12)	197,000,000	NA
Bender Shipbuilding			
LCM-8 type	unnamed (4)	3,000,000[3]	—
Bethlehem-Sparrows Point			
T-AGS-39-40	unnamed (2)	132,000,000	87-88
Boeing Marine			
APH	unnamed	6,900,000[1]	6/87
Patrol boats (Thailand-2)	unnamed	112,000,000	—
Bollinger Shipyard			
WPB1-309	Aquidneck	5,000,000	87
WPB-1310	Mustang	5,000,000	87
WPB-1311	Naushon	5,000,000	87
WPB-1312	Sanibel	5,000,000	87
WPB-1313	Ebisto	5,000,000	87
WPB-1314	Sepelo	5,000,000	—
WPB-1315	Matinicus	5,000,000	—
WPB-1316	Nantucket	5,000,000	—
Robert E. Derecktor			
WMEC-907	Escanaba	37,700,000	86
WMEC-908	Tahoma	37,700,000	—
WMEC-909	Campbell	30,160,000	—
WMEC-910	Thetis	30,160,000	—
WMEC-911	Forward	30,160,000	—
WMEC-912	Legare	30,160,000	—
WMEC-913	Mohawk	30,160,000	—
General Dynamics/Electric Boat			
SSN-724	unnamed	70,121,000	5/87
SSN-725	unnamed	70,121,000	10/87
SSN-751-2	unnamed (2)	560,200,000	88
SSN-754-5	unnamed (2)	649,000,000	—
SSN-21	unnamed	28,900,000[2]	—
SSBN-733	Nevada	401,000,000	10/87
SSBN-734	unnamed	523,700,000	88
SSBN-735	unnamed	531,600,000	89
SSBN-736	unnamed	500,870,000	90
SSBN-737	unnamed	616,400,000	90
SSBN-738	unnamed	674,100,000	12/91
SSN-760-63	unnamed	1,032,667,000	2/91
Halter Marine			
T-AGOS-13-14	unnamed (2)	28,500,000	88
Litton/Ingalls			
CG-52	Bunker Hill	332,000,000	7/86
CG-53	Mobile Bay	332,000,000	2/87
CG-54-56	unnamed (3)	926,100,000	87-88
CG-57, 59	unnamed (2)	325,500,000	88
CG-62	unnamed	238,600,000	89
CG-65	unnamed	242,600,000	90
LHD-1	Wasp	1,365,700,000	3/89
LHD-2	unnamed	38,877,000[2]	—
Lockheed-Gulfport			
LCAC	unnamed (2)	24,800,000	88
Lockheed-Seattle			
LSD-43	Fort McHenry	271,500,000	6/87
Marinette Marine			
MCM-2	Defender	46,000,000	8/86
MCM-4	Champion	42,000,000	—
TWR	unnamed (5)	13,000,000	86
YP Yard Patrol Craft	unnamed (20)	59,700,000	86-87
Moss Point Marine			
LCU	unnamed (2)	8,600,000	9/86
Norfolk Shipbuilding			
Logistic Support	(Army-4)	80,000,000	89
Newport News Shipbuilding			
CVN-71	Theodore Roosevelt	1,300,000,000	9/86
CVN-72	Abraham Lincoln	1,550,000,000	12/89
CVN-63	George Washington	1,550,000,000	12/91
SSN-721	Chicago	225,000,000	6/86
SSN-722	Key West	225,000,000	6/87
SSN-723	Oklahoma City	225,000,000	87
SSN-750	Newport News	278,000,000	87
SSN-753	unnamed	319,000,000	88
SSN-756,8-9	unnamed (3)	779,500,000	89-90
SSN-21	unnamed	28,900,000[2]	—
Pennsylvania Shipbuilding			
T-AO-191-2	unnamed (2)	222,000,000	89
T-AO-194	unnamed	97,500,000	90
Peterson Builders			
ARS-52	Salvor	70,000,000	86
ARS-53	Grapple	33,900,000	87
MCM-1	Avenger	64,400,000	86
MCM-3	Sentry	57,900,000	87
MCM-5	unnamed	57,900,000	88
RMI, Inc.			
SWCM	unnamed	11,250,000	—
Tacoma Boatbuilding			
T-AGOS-9	Assertive	12,500,000	NA
T-AGOS-10	Invincible	12,500,000	NA
T-AGOS-11	Dauntless	12,500,000	NA
T-AGOS-12	Vigorous	12,500,000	NA
Missile ships (2-Indonesia)	unnamed	143,000,000	—
Todd Pacific-San Pedro			
FFG-60	R.M. Davis	89,900,000	10/86
FFG-61	unnamed	96,100,000	11/88

Legend: 1—long-lead procurement; 2—design contract; 3—under subcontract from Twin City Shipyard

Reliable Combustion Engineering waste heat recovery boilers are helping the Navy cut the cost of turning seawater into drinking water aboard the *Ticonderoga* (CG-47) class guided missile cruisers.

And that's not all our waste heat recovery boilers do. They generate high-quality saturated steam for ship's heating as well as steam for the galley, laundry and de-icing system.

Annual projected fuel savings for a CG-47 class ship is estimated at more than $200,000. (Based on three waste heat boilers per ship, operating an average of 5,000 hours a year, with a steam usage of 7,000 pounds per hour; fuel at $20 per barrel.)

Achieving savings like these obviously requires high reliability. And our boilers have proven they can deliver. With over 80,000 accumulated operating hours aboard the *Ticonderoga, Yorktown, Vincennes,* and *Valley Forge* and at the NAVSSES test facility in Philadelphia, our equipment has operated without a single boiler-related failure.

What's more, the boilers are designed with maintenance in mind by incorporating ample access to the gas and water sides. This has contributed to the excellent operating record.

Powerful ideas like our waste heat recovery boilers are typical of Combustion Engineering's commitment to the U.S. Navy.

For more information, write:
Combustion Engineering, Inc.
Dept. CEP1-MR
P.O. Box 500
Windsor, CT 06095-6052

COMBUSTION ENGINEERING

Circle 206 on Reader Service Card

MAJOR NAVY CONTRACTS

(continued)

ary 1988. Two bids were solicited and two offers were received. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-86-C-4113).

Newport News Shipbuilding and Dry Dock Company, Newport News, Va., is being awarded a **$55,000,000** modification to a previously awarded cost-plus-fixed-fee contract for Los Angeles (SSN-688) class submarine design agent and planning yard services. Work will be performed in Newport News, (91 percent); Asheville, N.C. (4 percent); Philadelphia, Pa. (3 percent), and Milwaukee, Wisc. (2 percent), and is expected to be completed September 30, 1986. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-70-C-0238).

Rockwell International Corporation, Autonetics Marine Systems Division, Anaheim, Calif. is being awarded an **$11,955,000** modification to a previously awarded fixed-price-incentive contract for Electrically Suspended Gyro Navigators (ESGN) for various submarines. Work will be performed in Anaheim, (90 percent), and El Paso, Tx. (10 percent), and is expected to be completed November 30, 1987. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-85-C-4366).

April 2

Hughes Aircraft Company, Ground Systems Group, Fullerton, Calif., is being awarded a **$7,674,312** delivery order under a basic ordering agreement to furnish 530 end items for component repair services for system support to SLQ-17A, SPS-39A and SPS-52 surveillance radar equipment used on board ships. Work will be performed in Anaheim, and is expected to be completed March 31, 1987. The Navy Ships Parts Control Center, Mechanicsburg, Pa., is the contracting activity (N00104-84-G-A037).

Sperry Corporation, Defense Products Group, Great Neck, N.Y., is being awarded a **$25,037,000** firm-fixed-price contract for MK-92 Mod 1 fire control systems for U.S. Coast Guard ships. Work will be performed in Great Neck (80 percent), and Clearwater, Fla. (20 percent), and is expected to be completed in September 1988. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-86-C-5440).

April 3

Sippican Ocean Systems Incorporated, Marion, Mass., is being awarded a **$13,056,664** firm-fixed-price contract to furnish 11,741 AN/SSQ-77A sonobuoys with packaging and associated data. Work will be performed in Marion, and is expected to be completed September 30, 1987. Three bids were solicited and three offers were received. The Naval Avionics Center, Indianapolis, Ind., is the contracting activity (N00163-86-C-0202).

April 4

Computer Sciences Corporation, Defense Systems Division, Moorestown, N.J., is being awarded a **$3,435,287** modification for incremental funding to a previously awarded cost-plus-award-fee contract for the design, development and test of battle group tactical training software based on the Naval Warfare Gaming System (NWGS) applications program baseline. Work will be performed in Moorestown, and is expected to be completed May 31, 1988. The Space and Naval Warfare Systems Command, Washington, D.C., is the contracting activity (N00039-84-C-0025).

April 7

Charles Stark Draper Laboratory, Cambridge, Mass., is being issued an **$11,500,000** modification to a previously awarded cost-plus-fixed-fee contract for design and development of a MK-6 guidance system for the Trident missile program. Work will be performed in Cambridge, and is expected to be completed September 30, 1987. This modification provides a portion of the FY-86 funds for this incrementally funded contract. The Strategic Systems Program Office, Washington, D.C., is the contracting activity (N00030-84-C-0036).

Interstate Electronics Corporation, Anaheim, Calif., is being issued a **$3,000,000** modification to a previously awarded cost-plus-incentive-fee/cost-plus-fixed-fee contract for development and production of test instrumentation equipment for the Trident missile program. Work will be performed in Anaheim, and is expected to be completed in October 1989. This modification provides a portion of the FY -86 funds for this incrementally funded contract. The Strategic Systems Program Office, Washington, D.C., is the contracting activity (N00030-84-C-0090).

April 8

York Industries, York, Pa., is being issued a **$4,294,000** firm-fixed-price contract for 19 A/W 37T-2(V)1 mobile engine test systems and associated technical data for shipboard use. Work will be performed in York, and is expected to be completed in February 1989. Seventy-six bids were solicited and nine offers were received. The Naval Regional Contracting Center, Philadelphia, Pa., is the contracting activity (N00140-86-C-9458).

Johns Hopkins University, Applied Physics Laboratory, Laurel, Md., is being awarded a **$23,231,430** modification to a previously awarded cost-plus-fixed-fee contract for research in strategic/tactical systems, space science, geophysics, biophysics, energy conversion, microelectronics and robotics. Work will be performed in Laurel, and is expected to be completed December 31, 1986. This contract combines purchases for the U.S. Navy (82 percent), the U.S. Air Force (7 percent), the U.S. Coast Guard (1 percent), the U.S. Army (5 percent), and the Defense Nuclear Agency (5 percent). The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-85-C-5301).

Jacksonville Shipyard Incorporated, Jacksonville, Fla., is being awarded a **$6,725,013** modification to a previously awarded firm-fixed-price contract for ship repairs to USS Saratoga (CV-60). Work will be performed in Jacksonville, and is expected to be completed September 9, 1986. Two bids were solicited and two offers were received. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-85-H-8171).

April 10

Raytheon Company, Missile Systems Division, Lowell, Mass., is being awarded a **$67,825,306** firm-fixed-price contract for 3,425 guidance control sections for the AIM-9M Sidewinder missile. Work will be performed in Lowell, and is expected to be completed in June 1988. Two bids were received. This contract combines purchases for the U.S. Navy (52 percent), the U.S. Air Force (39 percent), and for Canada (7 percent), and Australia (2 percent), under the Foreign Military Sales program. The Naval Air Systems Command, Washington, D.C., is the contracting activity (N00019-86-C-0168).

April 11

Raytheon Company, Equipment Division, Wayland, Mass., is being awarded an **$8,845,000** cost-plus-fixed-fee contract for engineering services for the MK-74 guided missile fire control system. Work will be performed in Wayland, Mass., (67.5 percent), West Germany (0.3 percent), Italy (14.1 percent), Japan (2.3 percent), Australia (9.3 percent), France (2.3 percent), and Taiwan (4.2 percent). Work is expected to be completed in August 1987. This contract combines purchases for the U.S. Navy (67.5 percent), and for Italy (14.1 percent), Australia (9.3 percent), West Germany (0.3 percent), Japan (2.3 percent), France (2.3 percent), and Taiwan (4.2 percent) under the Foreign Military Sales program. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-86-C-5330).

April 14

Vitro Corporation, Silver Spring, Md., is being awarded a **$7,768,414** cost-plus-fixed-fee contract for design engineering support of SSN/SSBN operational submarines and for new construction programs. Work will be performed in Silver Spring, and is expected to be completed November 30, 1986. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-86-C-2051).

AT&T Technologies Incorporated, Greensboro, N.C., is being awarded a **$16,877,800** modification to a previously awarded cost-plus-fixed-fee contract for oceanographic research. Work will be performed in Greensboro, N.C., and is expected to be completed July 31, 1986. The Space and Naval Warfare Systems Command, Washington, D.C., is the contracting activity (N00039-86-C-0016).

April 15

Gould Defense Systems Incorporated, Ocean Systems Division, Cleveland, Ohio, is being awarded a **$22,824,300** fixed-price-incentive contract for Advanced Capability (ADCAP) MK-48 torpedoes. Work will be performed in Cleveland, and is expected to be completed April 30, 1990. Two bids were solicited and two offers were received. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-86-C-6162).

Newport News Shipbuilding and Drydock Company, Newport News, Va., is being awarded a **$12,521,311** cost-plus-fixed-fee contract for advance planning and preparation for the complex overhaul of USS Enterprise (CVN-65). Work will be performed in Newport News, and is expected to be completed September 30, 1986. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-86-C-2078).

Norfolk Shipbuilding and Drydock Corporation, Norfolk, Va., is being awarded a **$16,167,222** firm-fixed-price contract for the regular overhaul of USS Iwo Jima (LPH-2). Work will be performed in Norfolk, and is expected to be completed February 16, 1987. Twenty-one bids were solicited and eight offers were received. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-85-H-8195).

Hughes Aircraft Company, Ground Systems Group, Fullerton, Calif., is being awarded a **$163,900,000** modification definitizing a previously awarded letter contract into a cost-plus-incentive-fee/award-fee contract for initial production of Advanced Capability (ADCAP) MK-48 torpedoes. Work will be performed in Fullerton, and is expected to be completed in April 1989. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-85-C-6098).

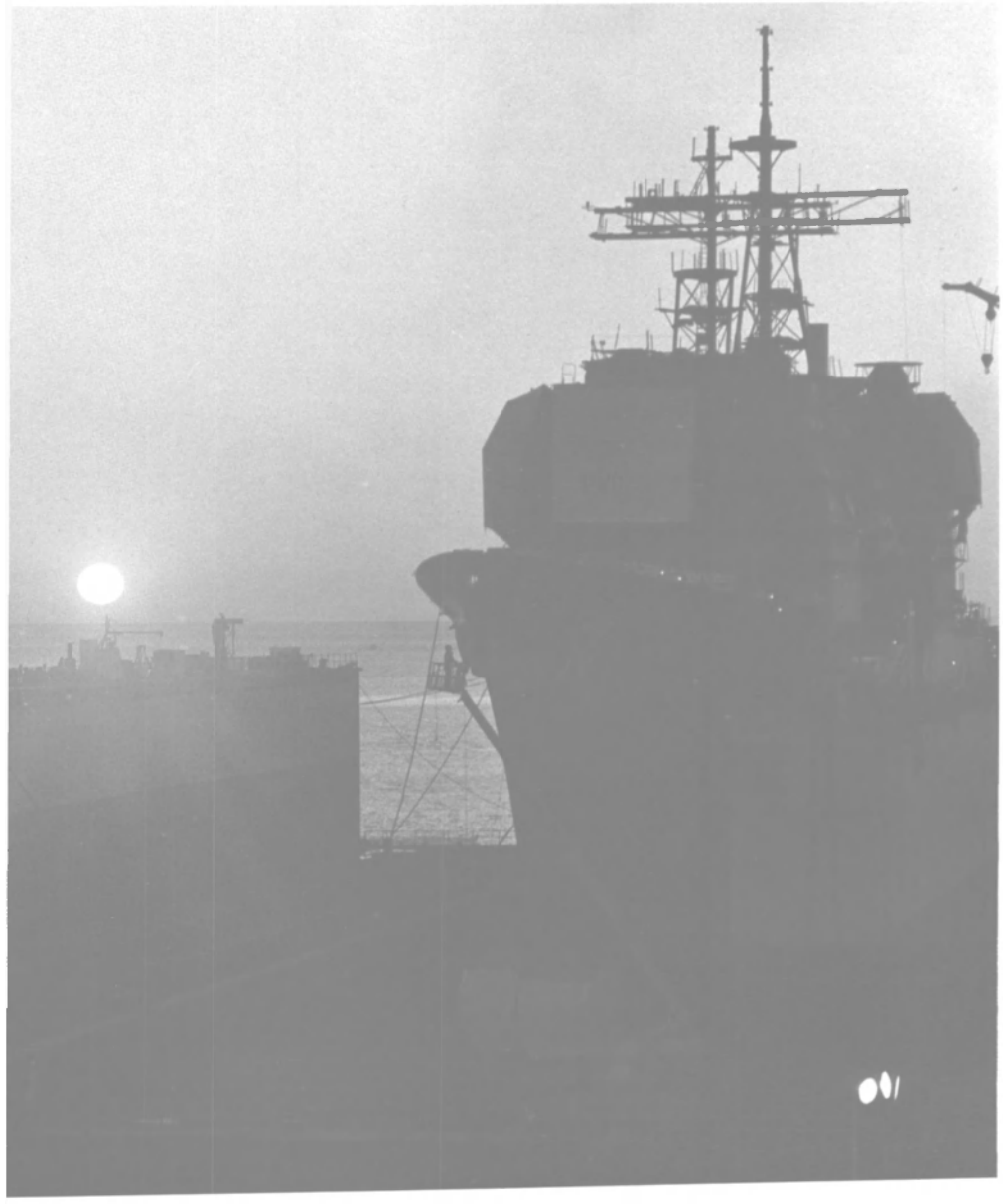
Tracor Applied Sciences, Rockville, Md., is being awarded a **$6,365,796** cost-plus-fixed-fee contract for engineering support for submarine programs. Work will be performed in Rockville, and is expected to be completed November 30, 1986. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-86-C-2053).

April 16

General Electric Company, West Lynn, Mass., is being issued a **$4,310,000** delivery order under a basic ordering agreement for 12 line items in support of the numeric stock objective for main reduction gears used in ships. Work will be performed in Lynn, Mass., and is expected to be completed June 7, 1987. The Navy Ships Parts Control Center, Mechanicsburg, Pa., is the contracting activity (N00104-85-G-0334).

April 18

Harris Corporation, Syosset, N.Y., is being awarded a **$14,300,000** modification exercising an option provision in the third program year of a three-year multi-year basic contract for an additional four AN/USM-407(V) avionic test sets in support of the F/A-18 aircraft. This modification increases the value of Lot I under the basic contract



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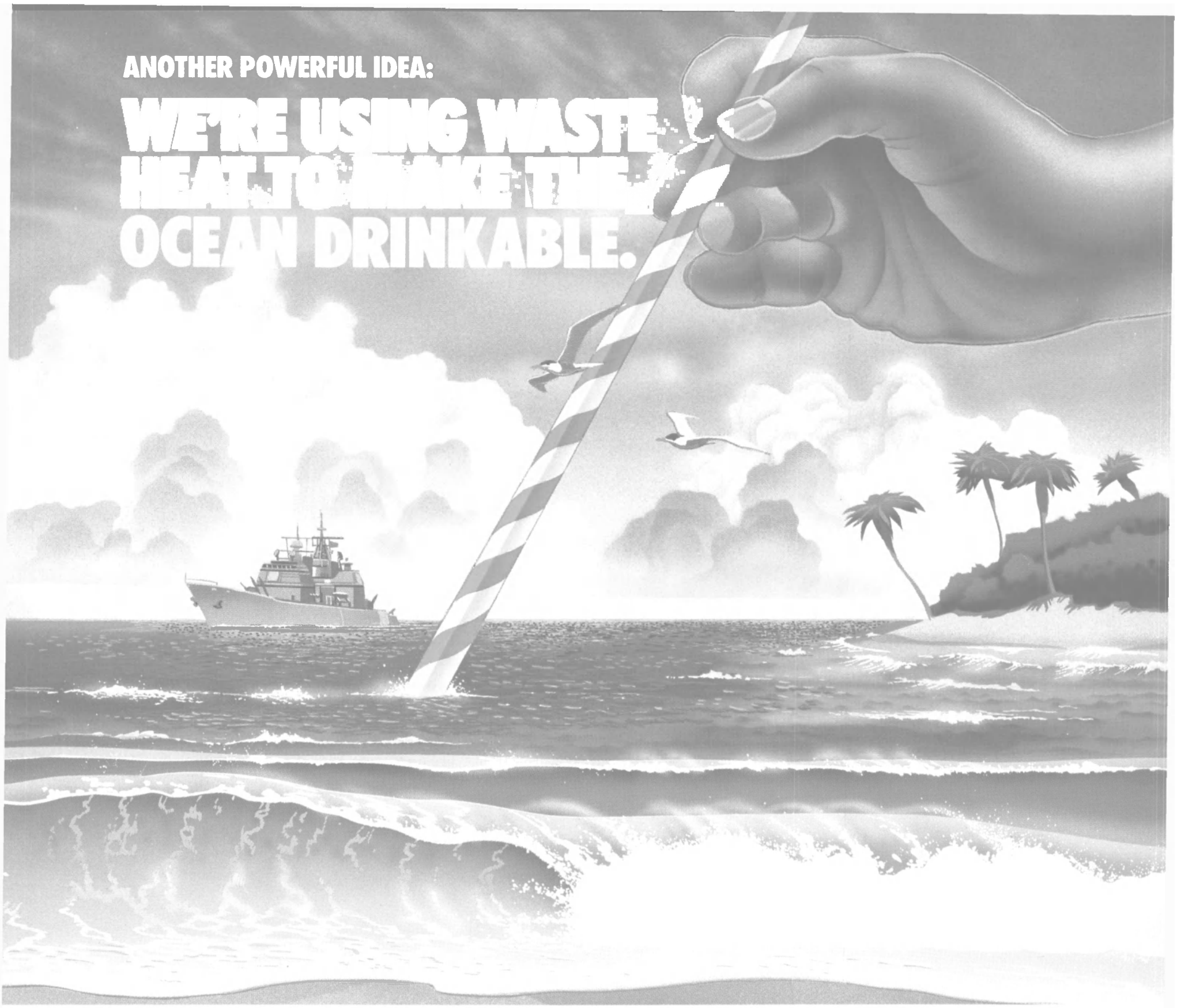

Reliable Combustion Engineering waste heat recovery boilers are helping the Navy cut the cost of turning seawater into drinking water aboard the *Ticonderoga* (CG-47) class guided missile cruisers.

And that's not all our waste heat recovery boilers do. They generate high-quality saturated steam for ship's heating as well as steam for the galley, laundry and de-icing system.

Annual projected fuel savings for a CG-47 class ship is estimated at more than $200,000. (Based on three waste heat boilers per ship, operating an average of 5,000 hours a year, with a steam usage of 7,000 pounds per hour; fuel at $20 per barrel.)

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What's more, the boilers are designed with maintenance in mind by incorporating ample access to the gas and water sides. This has contributed to the excellent operating record.

Powerful ideas like our waste heat recovery boilers are typical of Combustion Engineering's commitment to the U.S. Navy.

For more information, write:
Combustion Engineering, Inc.
Dept. CEP1-MR
P.O. Box 500
Windsor, CT 06095-6052

COMBUSTION ENGINEERING

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MAJOR NAVY CONTRACTS

(continued)

ary 1988. Two bids were solicited and two offers were received. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-86-C-4113).

Newport News Shipbuilding and Dry Dock Company, Newport News, Va., is being awarded a **$55,000,000** modification to a previously awarded cost-plus-fixed-fee contract for Los Angeles (SSN-688) class submarine design agent and planning yard services. Work will be performed in Newport News, (91 percent); Asheville, N.C. (4 percent); Philadelphia, Pa. (3 percent), and Milwaukee, Wisc. (2 percent), and is expected to be completed September 30, 1986. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-70-C-0238).

Rockwell International Corporation, Autonetics Marine Systems Division, Anaheim, Calif. is being awarded an **$11,955,000** modification to a previously awarded fixed-price-incentive contract for Electrically Suspended Gyro Navigators (ESGN) for various submarines. Work will be performed in Anaheim, (90 percent), and El Paso, Tx. (10 percent), and is expected to be completed November 30, 1987. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-85-C-4366).

April 2

Hughes Aircraft Company, Ground Systems Group, Fullerton, Calif., is being awarded a **$7,674,312** delivery order under a basic ordering agreement to furnish 530 end items for component repair services for system support to SLQ-17A, SPS-39A and SPS-52 surveillance radar equipment used on board ships. Work will be performed in Anaheim, and is expected to be completed March 31, 1987. The Navy Ships Parts Control Center, Mechanicsburg, Pa., is the contracting activity (N00104-84-G-A037).

Sperry Corporation, Defense Products Group, Great Neck, N.Y., is being awarded a **$25,037,000** firm-fixed-price contract for MK-92 Mod 1 fire control systems for U.S. Coast Guard ships. Work will be performed in Great Neck (80 percent), and Clearwater, Fla. (20 percent), and is expected to be completed in September 1988. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-86-C-5440).

April 3

Sippican Ocean Systems Incorporated, Marion, Mass., is being awarded a **$13,056,664** firm-fixed-price contract to furnish 11,741 AN/SSQ-77A sonobuoys with packaging and associated data. Work will be performed in Marion, and is expected to be completed September 30, 1987. Three bids were solicited and three offers were received. The Naval Avionics Center, Indianapolis, Ind., is the contracting activity (N00163-86-C-0202).

April 4

Computer Sciences Corporation, Defense Systems Division, Moorestown, N.J., is being awarded a **$3,435,287** modification for incremental funding to a previously awarded cost-plus-award-fee contract for the design, development and test of battle group tactical training software based on the Naval Warfare Gaming System (NWGS) applications program baseline. Work will be performed in Moorestown, and is expected to be completed May 31, 1988. The Space and Naval Warfare Systems Command, Washington, D.C., is the contracting activity (N00039-84-C-0025).

April 7

Charles Stark Draper Laboratory, Cambridge, Mass., is being issued an **$11,500,000** modification to a previously awarded cost-plus-fixed-fee contract for design and development of a MK-6 guidance system for the Trident missile program. Work will be performed in Cambridge, and is expected to be completed September 30, 1987. This modification provides a portion of the FY-86 funds for this incrementally funded contract. The Strategic Systems Program Office, Washington, D.C., is the contracting activity (N00030-84-C-0036).

Interstate Electronics Corporation, Anaheim, Calif., is being issued a **$3,000,000** modification to a previously awarded cost-plus-incentive-fee/cost-plus-fixed-fee contract for development and production of test instrumentation equipment for the Trident missile program. Work will be performed in Anaheim, and is expected to be completed in October 1989. This modification provides a portion of the FY -86 funds for this incrementally funded contract. The Strategic Systems Program Office, Washington, D.C., is the contracting activity (N00030-84-C-0090).

April 8

York Industries, York, Pa., is being issued a **$4,294,000** firm-fixed-price contract for 19 A/W 37T-2(V)1 mobile engine test systems and associated technical data for shipboard use. Work will be performed in York, and is expected to be completed in February 1989. Seventy-six bids were solicited and nine offers were received. The Naval Regional Contracting Center, Philadelphia, Pa., is the contracting activity (N00140-86-C-9458).

Johns Hopkins University, Applied Physics Laboratory, Laurel, Md., is being awarded a **$23,231,430** modification to a previously awarded cost-plus-fixed-fee contract for research in strategic/tactical systems, space science, geophysics, biophysics, energy conversion, microelectronics and robotics. Work will be performed in Laurel, and is expected to be completed December 31, 1986. This contract combines purchases for the U.S. Navy (82 percent), the U.S. Air Force (7 percent), the U.S. Coast Guard (1 percent), the U.S. Army (5 percent), and the Defense Nuclear Agency (5 percent). The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-85-C-5301).

Jacksonville Shipyard Incorporated, Jacksonville, Fla., is being awarded a **$6,725,013** modification to a previously awarded firm-fixed-price contract for ship repairs to USS Saratoga (CV-60). Work will be performed in Jacksonville, and is expected to be completed September 9, 1986. Two bids were solicited and two offers were received. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-85-H-8171).

April 10

Raytheon Company, Missile Systems Division, Lowell, Mass., is being awarded a **$67,825,306** firm-fixed-price contract for 3,425 guidance control sections for the AIM-9M Sidewinder missile. Work will be performed in Lowell, and is expected to be completed in June 1988. Two bids were received. This contract combines purchases for the U.S. Navy (52 percent), the U.S. Air Force (39 percent), and for Canada (7 percent), and Australia (2 percent), under the Foreign Military Sales program. The Naval Air Systems Command, Washington, D.C., is the contracting activity (N00019-86-C-0168).

April 11

Raytheon Company, Equipment Division, Wayland, Mass., is being awarded an **$8,845,000** cost-plus-fixed-fee contract for engineering services for the MK-74 guided missile fire control system. Work will be performed in Wayland, Mass., (67.5 percent), West Germany (0.3 percent), Italy (14.1 percent), Japan (2.3 percent), Australia (9.3 percent), France (2.3 percent), and Taiwan (4.2 percent). Work is expected to be completed in August 1987. This contract combines purchases for the U.S. Navy (67.5 percent), and for Italy (14.1 percent), Australia (9.3 percent), West Germany (0.3 percent), Japan (2.3 percent), France (2.3 percent), and Taiwan (4.2 percent) under the Foreign Military Sales program. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-86-C-5330).

April 14

Vitro Corporation, Silver Spring, Md., is being awarded a **$7,768,414** cost-plus-fixed-fee contract for design engineering support of SSN/SSBN operational submarines and for new construction programs. Work will be performed in Silver Spring, and is expected to be completed November 30, 1986. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-86-C-2051).

AT&T Technologies Incorporated, Greensboro, N.C., is being awarded a **$16,877,800** modification to a previously awarded cost-plus-fixed-fee contract for oceanographic research. Work will be performed in Greensboro, N.C., and is expected to be completed July 31, 1986. The Space and Naval Warfare Systems Command, Washington, D.C., is the contracting activity (N00039-86-C-0016).

April 15

Gould Defense Systems Incorporated, Ocean Systems Division, Cleveland, Ohio, is being awarded a **$22,824,300** fixed-price-incentive contract for Advanced Capability (ADCAP) MK-48 torpedoes. Work will be performed in Cleveland, and is expected to be completed April 30, 1990. Two bids were solicited and two offers were received. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-86-C-6162).

Newport News Shipbuilding and Drydock Company, Newport News, Va., is being awarded a **$12,521,311** cost-plus-fixed-fee contract for advance planning and preparation for the complex overhaul of USS Enterprise (CVN-65). Work will be performed in Newport News, and is expected to be completed September 30, 1986. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-86-C-2078).

Norfolk Shipbuilding and Drydock Corporation, Norfolk, Va., is being awarded a **$16,167,222** firm-fixed-price contract for the regular overhaul of USS Iwo Jima (LPH-2). Work will be performed in Norfolk, and is expected to be completed February 16, 1987. Twenty-one bids were solicited and eight offers were received. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-85-H-8195).

Hughes Aircraft Company, Ground Systems Group, Fullerton, Calif., is being awarded a **$163,900,000** modification definitizing a previously awarded letter contract into a cost-plus-incentive-fee/award-fee contract for initial production of Advanced Capability (ADCAP) MK-48 torpedoes. Work will be performed in Fullerton, and is expected to be completed in April 1989. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-85-C-6098).

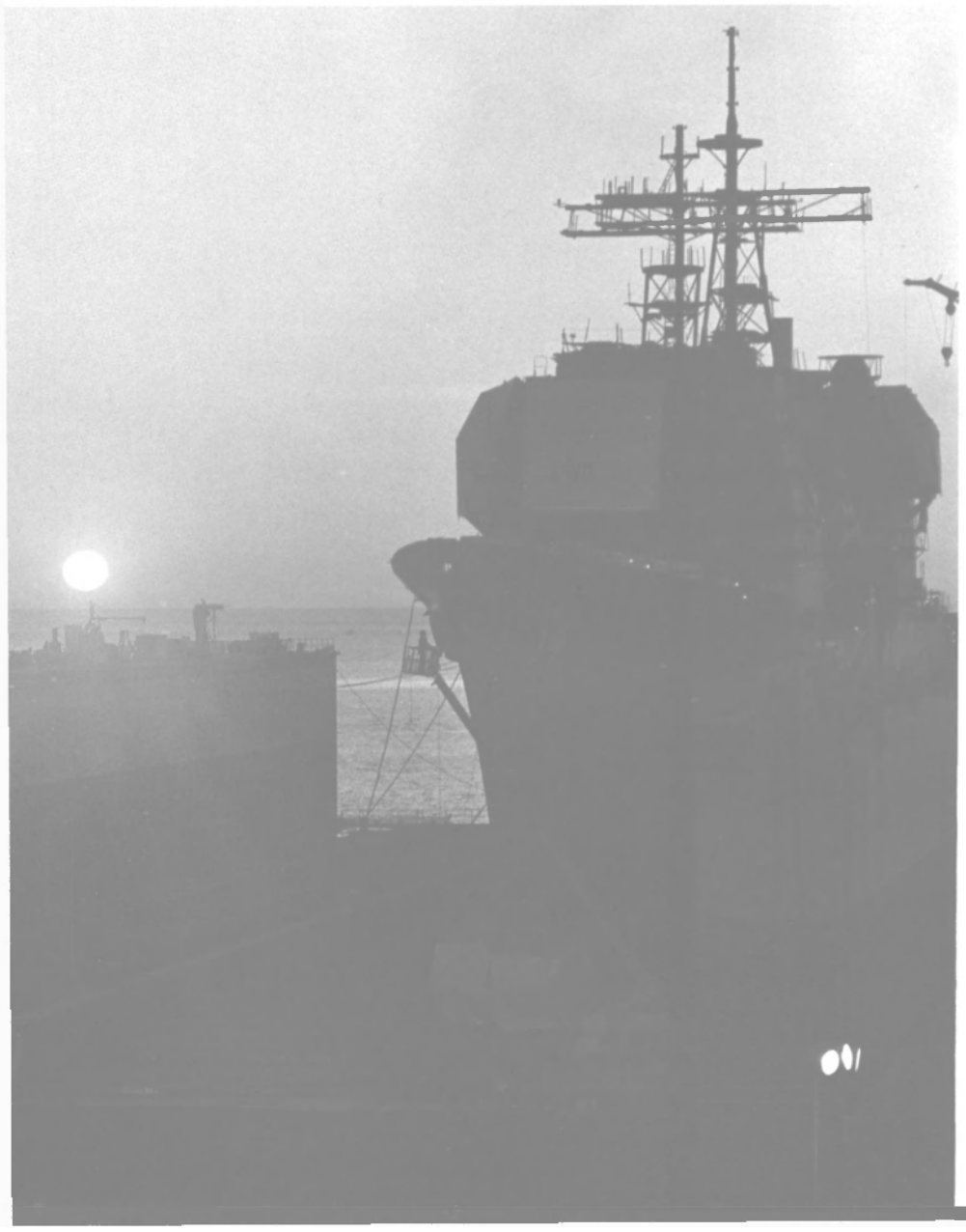
Tracor Applied Sciences, Rockville, Md., is being awarded a **$6,365,796** cost-plus-fixed-fee contract for engineering support for submarine programs. Work will be performed in Rockville, and is expected to be completed November 30, 1986. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-86-C-2053).

April 16

General Electric Company, West Lynn, Mass., is being issued a **$4,310,000** delivery order under a basic ordering agreement for 12 line items in support of the numeric stock objective for main reduction gears used in ships. Work will be performed in Lynn, Mass., and is expected to be completed June 7, 1987. The Navy Ships Parts Control Center, Mechanicsburg, Pa., is the contracting activity (N00104-85-G-0334).

April 18

Harris Corporation, Syosset, N.Y., is being awarded a **$14,300,000** modification exercising an option provision in the third program year of a three-year multi-year basic contract for an additional four AN/USM-407(V) avionic test sets in support of the F/A-18 aircraft. This modification increases the value of Lot I under the basic contract



to a new total of **$129,896,000.** Work will be performed in Syosset, and is expected to be completed February 29, 1988. The Naval Regional Contracting Center, Philadelphia, Pa., is the contracting activity (N00140-84-C-4843).

Magnavox Government and Industrial Electronics Company, Fort Wayne, Ind., is being awarded a **$5,498,106** firm-fixed-price modification to design, qualify and furnish 2,100 AN/SSQ-53D sonobuoys with LAU-126/A launcher containers and associated data. Work will be performed in Garrett, Ind., and is expected to be completed in July 1988. Three bids were solicited and three offers were received. The Naval Avionics Center, Indianapolis, Ind., is the contracting activity (N00163-86-0006).

Braswell Shipyards Incorporated, Mt. Pleasant, S.C., is being awarded a **$3,075,912** firm-fixed-price contract for the restricted availability of USS Los Alamos (AFDB-7). Work will be performed in Holy Loch, Scotland, and is expected to be completed August 12, 1986. Four bids were solicited and three offers were received. The Supervisor of Shipbuilding, Conversion and Repair, Charleston, S.C., is the contracting activity (N00024-85-H-8139).

April 21

General Electric Company, Ordnance Systems Division, Pittsfield, Mass., is being awarded a **$17,167,500** firm-fixed-price contract for Aegis MK-82 fire control system gun and guided missile directors and MK-200 director controllers for the guided missile cruisers CG-63, CG-64 and CG-65. Work will be performed in Pittsfield, and is expected to be completed June 30, 1988. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-86-C-5101).

April 22

Sperry Corporation, Great Neck, N.Y., is being issued a **$3,500,000** modification to a previously awarded cost-plus-incentive-fee contract for navigation system components for the Trident missile program. Work will be performed in Great Neck, and is expected to be completed September 30, 1988. This modification provides a portion of the FY-86 funds for this incrementally funded contract. The Navy's Strategic Systems Program Office is the contracting activity (N00024-84-C-4003).

Martin Marietta, Baltimore Aerospace Division, Baltimore, Md., is being awarded a **$14,500,000** cost-plus-fixed-fee contract for services for the MK-41 Vertical Launching System (VLS). Work will be performed in Baltimore, and is expected to be completed in April 1987. The Naval Sea Systems Command, Washington, D.C. is the contracting activity (N00024-86-C-5417).

Hughes Aircraft Company, Ground Systems Group, Fullerton, Calif., is being awarded a **$4,788,308** cost-plus-fixed-fee contract for engineering services for Submarine combat systems equipment. Work will be performed in Fullerton, and is expected to be completed in December 1988. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-86-C-6222).

April 23

Honeywell Incorporated, Underseas Systems Division, Hopkins, Minn., is being awarded a **$3,257,030** order under a basic ordering agreement to furnish 119 receiver assemblies in support of the MK-46 torpedo system. Work will be performed in Hopkins, and is expected to be completed in 1987. The Navy Ship Parts Control Center, Mechanicsburg, Pa., is the contracting activity (N00104-85-G-0430).

April 25

Vitro Corporation, Silver Spring, Md., is being awarded a **$6,002,000** cost-plus-fixed-fee contract for engineering services for the British Naval Ballistic Missile System. This contract will be funded by the United Kingdom. Work will be performed in Silver Spring, and is expected to be completed in March 31, 1987. The Navy's Strategic Systems Program Office is the contracting activity (N00030-86-C-0089).

Lockheed Missiles and Space Company Incorporated, Sunnyvale, Calif., is being awarded a **$3,276,013** cost-plus-fixed-fee contract for repair of Polaris (A-3) missile hardware for the British naval ballistic missile system. This contract will be funded by the United Kingdom. Work will be performed in Sunnyvale, and is expected to be completed in March 31, 1987. The Navy's Strategic Systems Program Office is the contracting activity (N00030-86-D-0114).

Diagnostic/Retrieval Systems Incorporated, Oakland, N.J., is being awarded an **$18,107,785** modification to a previously awarded firm-fixed-price contract for materials for AN/SQR-17 Directional Frequency and Ranging (DIFAR)/Directional Command Activated Sonobuoy System (DICASS) sonar equipment. Work will be performed in Oakland, and is expected to be completed November 1988. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-85-C-6145).

April 29

Atlantic Marine Incorporated, Fort George Island, Fla., is being awarded a **$3,498,000** firm-fixed-price contract for repairs to USS Saratoga (CV-60). Work will be performed in Mayport Naval Station, Jacksonville, Fla., and is expected to be completed September 9, 1986. Two bids were solicited and two offers were received. The Supervisor of Shipbuilding, Conversion and Repair, Jacksonville, Fla., is the contracting activity (N00024-85-H-8112).

Alabama Dry Dock and Shipbuilding Corporation, Mobile, Ala., is being awarded a **$10,131,446** cost-plus-award-fee contract for the phased maintenance program of USS Lexington (AVT-16). Work will be performed in Mobile, and is expected to be

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Major Navy Contracts

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completed August 31, 1990. Three bids were solicited and two offers were received. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-86-C-8504).

General Dynamics Corporation, Electric Boat Division, Groton, Conn., is being awarded a **$29,000,000** modification to a previously awarded cost-plus-fixed-fee contract for design agent support for the Trident submarine SSBN-736, with options for design agent support for SSN-737 and SSBN-738. Work will be performed in Groton, and is expected to be completed in October 1990. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-80-C-2075).

April 30

Magnavox Government and Industrial Electronics Company, Fort Wayne, Ind., is being awarded a **$3,013,000** firm-fixed-price modification for the development of a design change to the current AN/SSQ-53B sonobuoy to meet the AN/SSQ-53X sonobuoy performance requirements. Work will be performed in Garrett, Ind., and is expected to be completed in August 1988. Two bids were solicited and two offers were received. The Naval Avionics Center, Indianapolis, Ind., is the contracting activity (N00163-86-C-0006).

Life Cycle Engineering Incorporated, Charleston, S.C., is being awarded a **$5,192,908** cost-plus-fixed-fee contract for technical engineering support for SSN/SSBN submarines and submarine performance monitoring programs. Work will be performed in Charleston, S.C. (55 percent); Washington, D.C. (33 percent), and Portsmouth, N.H. (10 percent), and is expected to be completed November 30, 1986. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-86-C-2052).

May 1

General Dynamics Corporation, Electric Boat Division, Groton, Conn., is being awarded a **$3,952,012** cost-plus-fixed-fee contract for architectural and engineering services for Los Angeles (SSN-688) class submarines. Work will be performed in Groton, and is expected to be completed October 1, 1986. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-86-C-2059).

Southwest Marine Company, San Diego, Calif., is being awarded a **$3,187,000** firm-fixed-price contract for the selected restricted availability of the amphibious cargo ship USS Durham (LKA-114). Work will be performed in San Diego, and is expected to be completed in July 1986. Ten bids were solicited and three offers were received. The Supervisor of Shipbuilding, Conversion and Repair, San Diego, Calif., is the contracting activity (N62791-86-B-0082).

General Motors Corporation, Allison Gas Turbine Division, Indianapolis, Ind., is being awarded a **$39,983,895** fixed-price contract to design, develop, fabricate, test and qualify the 501-M80C turboshaft engine for the V-22 tiltrotor aircraft for FY-86. Work will be performed in Indianapolis, and is expected to be completed in September 1990. Four bids were received. The Naval Air Systems Command, Washington, D.C., is the contracting activity (N00019-85-C-0034).

May 5

Raytheon Company, Submarine Signal Division, Portsmouth, R.I., is being awarded a **$17,717,536** modification to a previously awarded firm-fixed-price contract for TR-317B/BQ transducers for various submarines. Work will be performed in Portsmouth, and is expected to be completed in February 1989. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-85-C-6064).

Lockheed Missiles and Space Company, Incorporated, Sunnyvale, Calif., is being awarded a **$14,303,638** cost-plus-fixed-fee contract for engineering services for the British naval ballistic missile system. Work will be performed in Sunnyvale, and is expected to be completed March 1987. This contract will be funded by the United Kingdom. The Navy's Strategic Systems Program Office is the contracting activity (N00030-86-C-0121).

May 7

University of Southern California, Los Angeles, Calif., is being awarded a **$5,309,000** cost-reimbursement contract for research in battle management communications. Work will be performed in Los Angeles, and is expected to be completed March 31, 1989. This contract was competitively procured under a broad agency announcement issued by the Office of Naval Research. The Office of Naval Research, Arlington, Va., is the contracting activity (N00014-86-K-0311).

May 15

Rockwell International Corporation, Collins Defense Communications, Cedar Rapids, Iowa, is being awarded a **$5,528,742** modification to a previously awarded firm-fixed-price contract for commercial off-the-shelf high frequency shore transmitters and remote control units for worldwide naval communications stations. Work will be performed in Toronto, Ontario, Canada (80 percent), and Cedar Rapids, Iowa (20 percent), and is expected to be completed June 30, 1987. Forty bids were solicited and four offers were received. The Space and Naval Warfare Systems Command, Washington, D.C., is the contracting activity (N00039-86-C-0218).

Hughes Aircraft Company, Irvine, Calif., is being awarded a **$4,265,001** modification to a previously awarded firm-fixed-price contract for the purchase of 11 secure-voice switches with ancillary equipment for secure external ships' communications. Work will be performed in Irvine, and is expected to be completed December 31, 1987. The Space and Naval Warfare Systems Command, Washington, D.C., is the contracting activity (N00039-84-C-0145).

May 16

Honeywell Incorporated, Marine Systems Division, Everett, Wash., is being awarded a **$4,873,518** modification to a previously awarded firm-fixed-price contract for design services and production support for AN/SLQ-48 handling systems for the mine neutralization system. Work will be performed in Everett, and is expected to be completed in December 1987.The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-84-C-6044).

May 21

Advanced Technology Incorporated, McLean, Va., is being awarded a **$6,647,617** modification to a previously awarded cost-plus-fixed-fee contract for engineering services for Aegis CG-47 class guided missile cruisers. Work will be performed in Reston, Va., and is expected to be completed in January 1987. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-83-C-2081).

Raytheon Services Company, Burlington, Mass., is being awarded a **$3,070,435** cost-plus-fixed-fee contract for a Naval Tactical Data System/Anti-Submarine Warfare Module (NTDS/ASWM) upgrade installation kit for USS America (CV-66). Work will be performed in Ventura, Calif., and is expected to be completed in November 1986. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-86-C-2057).

OMI Bulk Transport Incorporated, New York, N.Y., is being awarded a **$32,196,623** fixed-price contract with cost-reimburseables for the time charter of the U.S. flag tanker M/V Ranger. The ship will be used to transport bulk petroleum products for the Department of Defense. Four-hundred-fifty bids were solicited and ten offers were received. The Military Sealift Command, Washington, D.C., is the contracting activity (N00033-86-C-1701).

OMI Bulk Transport Incorporated, New York, N.Y., is being awarded a **$32,196,623** fixed-price contract with cost-reimburseables for the time charter of the U.S. flag tanker M/V Patriot. The ship will be used to transport bulk petroleum products for the Deparmtent of Defense. Four-hundred-fifty bids were solicited and ten offers were received. The Military Sealift Command, Washington, D.C., is the contracting activity (N00033-86-C-1702).

OMI Bulk Transport Incorporated, New York, N.Y. is being awarded a **$32,196,623** fixed-price contract with cost-reimburseables for the time charter of the U.S. flag tanker M/V Courier with an option for M/V Rover. The ship will be used to transport bulk petroleum products for the Department of Defense. Four-hundred-fifty bids were solicited and ten offers were received. The Military Sealift Command, Washington, D.C., is the contracting activity (N00033-86-C-1703).

May 23

Metro Machine Corporation, Norfolk, Va, is being awarded an **$8,096,132** cost-plus-award-fee contract for the phased maintenance program for LPH class amphibious assault ships. Work will be performed in Norfolk, and is expected to be completed November 30, 1990. Five bids were solicited and two offers were received. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-86-R-8501).

May 27

General Electric Company, Machinery Apparatus Operation, Schenectady, N.Y., is being awarded a **$4,000,000** modification to a previously awarded cost-plus-fixed-fee contract for naval nuclear propulsion components. Work will be performed in Schenectady, and is expected to be completed in September 1990. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-85-C-4012).

Westinghouse Electric Corporation, Plant Apparatus Division, Wilkins Township, Pa., is being awarded an **$18,486,000** cost-plus-fixed-fee modification contract for naval nuclear propulsion components. Work will be performed in Wilkins Township, Pa., and is expected to be completed in September 1990. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-85-C-4016).

General Dynamics Corporation, Pomona Division, Pomona, Calif., is being awarded a **$12,894,791** cost-plus-fixed-fee contract for design improvements for the Standard Missile (SM). Work will be performed in Pomona. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-86-C-5335).

General Dynamics Corporation, Convair Division, San Diego, Calif., is being awarded a **$3,545,903** firm-fixed-price indefinite delivery, indefinite quantity contract for Tomahawk sea-launched cruise missile operational test launch support. Work will be performed in San Diego, and is expected to be completed in September 1986. The Joint Cruise Missiles Project Office, Washington, D.C., is the contracting activity (N00032-85-C-5651).

RCA Corporation, Missile and Surface Radar Division, Moorestown, N.J., is being awarded a **$16,554,000** fixed-price-incentive contract for long lead material for the MK-7 Aegis weapon system for the destroyer DDG-52. Work will be performed in Moorestown, and is expected to be completed in October 1986. The Naval Sea Systems Command, Washington D.C., is the contracting activity (N00024-84-C-5107).

Newport News Shipbuilding and Dry Dock Company, Newport News, Va., is being awarded a **$33,342,000** modification to two previously awarded cost-plus-fixed-fee contracts for inactivation of the Poseidon submarines Nathan Hale (SSBN-623) and Nathanael Greene (SSBN-636). Work will be performed in Newport News, and is expected to be completed in December 1986. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-85-C-2220).

May 30

Scientific-Atlanta Incorporated, San Diego, Calif., is being issued a **$6,417,288** modification definitizing a previously awarded firm-fixed-price letter contract for AN/BQR-23A(V)3 sonar receiving sets for SSN-637/688 class submarines. Work will be performed in San Diego, and is expected to be completed August 30, 1987. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-85-C-6315).

Litton Systems Incorporated, Ingalls Shipbuilding Division, Pascagoula, Miss., is being awarded a **$25,000,000** modification to a previously awarded cost-plus-fixed-fee contract for lead yard services for the CG-47 Aegis shipbuilding program. Work will be performed in Pascagoula, and is expected to be completed in May 1987. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-85-C-2060).

June 3

McLaughlin Research Corporation, San Diego, Calif., is being awarded a **$3,581,092** cost-plus-fixed-fee contract to provide configuration management services for the MK-46 torpedo, MK-50 torpedo Mine Neutralization System (MNS), Anti-Submarine Rocket (ASROC), Vertical Launch ASROC (VLA) and Mobile Submarine Simulator (MOSS) programs. Work will be performed in San Diego, and is expected to be completed September 30, 1988. Eighty-five bids were solicited and four offers were received. This contract combines purchases for the U.S. Navy (83.7 percent); Japan (10.5 percent); United Kingdom (2.2 percent); Canada (1 percent); Australia (1 percent); France (0.8 percent); the Netherlands (0.4 percent); and Turkey (0.4 percent). The Naval Ocean Systems Center, San Diego, Calif., is the contracting activity (N66001-86-C-0071.).

Raytheon Company, Submarine Signal Division, Portsmouth, R.I., is being issued a not-to-exceed **$6,261,515** modification to a previously awarded contract for spares for the Submarine Active Detection Sonar Transit Group (SADS-TG). Work will be performed in Portsmouth, and is expected to be completed March 15, 1988. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-85-C-6143).

General Dynamics Corporation, Electric Boat Division, Groton, Conn., is being awarded a **$42,646,780** cost-plus-fixed-fee contract for planning yard services for SSN/SBN/NR-1 submarines. Work will be performed in Groton, and is expected to be completed September 30, 1987. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-86-C-2003).

June 4

Rayovac Corporation, Madison, Wisc., is being awarded a **$3,659,250** firm-fixed-price three-year multiyear contract to provide 10,500 MK-117 Mod 0 batteries to be used in support of underwater mines. Work will be performed in Madison, and is expected to be completed in November 1990. Thirteen bids were solicited and one offer was received. The Naval Ordnance Station, Louisville, Ky., is the contracting activity (N00197-86-C-0082).

Control Data Corporation, St. Paul, Minn., is being awarded a **$3,362,826** firm-fixed-price contract to extend a previously awarded contract which is for the lease and maintenance of a Cyber 176 computer system and its peripherals as well as any additional on-site, on-call analyst support for a period of eighteen months. Work will be performed in Bethesda, and is expected to be completed December 1, 1987. The David Taylor Naval Ship Research and Development Center, Bethesda, Md., is the contracting activity (N66032-83-C-0002).

RCA Corporation, Moorestown, N.J., is being issued a **$17,603,945** modification to a previously awarded cost-plus-fixed-fee contract for engineering and technical support services for CG-47 class cruisers. Work will be performed in Moorestown, N.J. (75 percent); Bath, Maine (12.5 percent); and Pascagoula, Mississippi (12.5 percent); and is expected to be completed in September 1987. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-79-5151).

Metro Machine Corporation, Norfolk, Va., is being awarded a **$3,721,616** firm-fixed-price contract for a docking selected restricted availability for USS Stump (DD-978). Work will be performed in Norfolk, and is expected to be completed in November 1986. Six bids were solicited and two offers were received. The Supervisor of Shipbuilding, Conversion and Repair, Portsmouth, Va., is the contracting activity (N00024-85-H-8187).

June 6

Technology Applications Incorporated, Falls Church, Va., is being issued a **$3,019,060** modification to a previously awarded cost-plus-fixed-fee contract for installation services for shipboard non-tactical ADP program systems aboard U.S. Navy vessels. Work will be performed in Norfolk (80 percent), and other naval bases nationally (20 percent and is expected to be completed in January 1987. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-84-C-6407).

The Johns Hopkins University, Applied Physics Laboratory, Laurel, Md., is being issued a **$12,751,600** modification to a previously awarded cost-plus-fixed-fee contract for research on tactical/strategic systems, space science, geophysics, biophysics, energy conversion, microelectronics, and robotics. Work will be performed in Laurel, and is expected to be completed December 31, 1986. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-85-C-5301).

SofTech Incorporated, Waltham, Mass., is being issued a **$3,314,366** modification exercising an option under an existing cost-plus-fixed-fee contract for software engineering for Navy standard computers. Work will be performed in Waltham, and is expected to be completed in February 1987. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-85-C-7037).

Sperry Corporation, Computer Systems Division, St. Paul, Minn., is being awarded a **$91,502,421** letter contract for AN/UYK-7 computer sets (Navy Standard). Work will be performed in St. Paul, Minn. (65 percent); Pueblo, Colo. (25 percent); Clearwater, Fla. (10 percent), and is expected to be completed in February 1988. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-86-D-5280).

Singer Company, Librascope Division, Glendale, Calif., is being awarded a **$3,409,419** modification to definitize a previously awarded firm-fixed-price letter contract for MK-117 fire control system components: eight MK-92 Mod 4 attack control consoles; MK-19 Mod 3 weapon monitor panels; 22 MK-93 Mod 0 emergency preset consoles; associated pre-cable kits, ordnance alteration data and installation and checkout spares. Work will be performed in Glendale, and is expected to be completed in December 1988. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-85-C-6271).

June 12

Argo Systems, Calif., is being issued a **$12,733,884** contract modification to furnish 10 line items used in the SLQ-10 Band 1 improvement program. Work will be performed in Sunnyvale, Calif. Two bids were solicited and two offers were received. The Navy Ships Parts Control Center, Mechanicsburg, Pa., is the contracting activity (N00039-84-C-0311).

Vitro Corporation, Silver Spring, Md., is being issued a **$5,131,469** modification to a previously awarded cost-plus-fixed-fee contract for Aegis shipbuilding project production engineering services. Work will be performed in Silver Spring, and is expected to be completed in October 1986. The Naval Sea Systems Command, Washington, D.C., is the contracting activity (N00024-84-C-5128).

General Electric Company, Pittsfield, Mass., is being awarded a **$13,063,896** fixed-price-incentive contract for guidance system components for the Trident missile program. Work will be performed in Pittsfield. The Navy's Strategic Systems Program Office, Washington, D.C., is the contracting activity (N00030-86-C-0140).

John Deere Technologies International Incorporated, Rotary Engine Division, Wood-Ridge, N.J., is being issued a **$33,500,000** modification to a previously awarded cost-plus-fixed-fee contract for the design and development of the SCRE-2 stratified charge rotary engine. Work will be performed in Wood-Ridge, and is expected to be completed September 30, 1988. The Naval Systems Command, Washington, D.C., is the contracting activity (N00024-85-C-5150).

June 17

Austin Company, Austin Electronics Division, Fair Lawn, N.J., is being issued a **$3,770,941** modification to a previously awarded contract to exercise options for a 19F-3A firefighting shipboard trainer, related technical data, conferences, training program and logistics support program. Work will be performed in Fair Lawn, N.J., (85 percent), and Newport, R.I. (15 percent), and is expected to be completed in June 1989. Eight bids were solicited and three offers were received. The Naval Training System Center, Orlando, Fla., is the contracting activity (N61339-85-C-0053).

Sperry Corporation, Reston, Va., is being awarded a **$17,500,392** cost-plus-incentive-fee contract to furnish one 20G-6 Landing Craft Air Cushion (LCAC) full mission trainer with associated technical data and information integrated logistics support items and engineering support items. Work will be performed in Reston, and is expected to be completed in August 1990. Thirty-two bids were solicited and two offers were received. The Naval Training Systems Center, Orlando, Fla, is the contracting activity (N61339-86-C-0087).

DIESEL POWER REVIEW

Whether or not the current decline in oil prices is a temporary condition, most manufacturers of marine diesel engines are still concentrating on further improvements in specific fuel consumption, as well as on the ability to burn heavier grades of fuel. Regardless of availability, quality or price, fuel costs are and always will be a big ticket item for vessel owners. Diesel manufacturers know this and are continually improving designs.

Perhaps in the belief that the current decline in oil prices is a temporary condition, most manufacturers of marine diesel engines are still concentrating on further improvements in specific fuel consumption, as well as on the ability to burn heavier grades of fuel. These enhanced capabilities are being accomplished by the redesign of critical engine components, including more efficient turbochargers, which is also increasing the power outputs for many engine models.

MR/EN asked the diesel manufacturers to provide information on their latest developments, accomplishments, and plans for the future in fuel-efficient engines. The following review is based on the replies that we had received at press time.

Product literature and technical reports are available free of charge from the manufacturers included in this review. Just circle the appropriate Reader Service number(s) on the postpaid card in the back of this issue.

ALSTHOM

Circle 10 on Reader Service Card

The Alsthom Diesel Group of France manufactures a complete range of medium- and high-speed Pielstick diesel engines. The worldwide success of Pielstick engines is such that they now represent 35,000,000 bhp installed or on order.

The new PC 20, PC 30, and PC 40 series, introduced in 1985, are compact and powerful engines with low fuel consumption and the capability to burn heavy fuels of up to 6,000 Sec. Redwood. They provide easy access for maintenance and long service intervals between major overhauls.

The PC 20 type was successfully tested at Alsthom's plant in St. Nazaire at the end of 1985. Four of these engines, with a total output of 29,700 bhp, will power the cruise ship Sovereign of the Seas that is under construction for Royal Caribbean Cruise Line at Chantiers de l'Atlantique, Alsthom's shipbuilding division. These engines will be installed on a resilient suspension system to reduce noise and vibration in the 70,000-grt ship.

The Diesel Group has just announced the first order for PC 40 engines. Pielstick licensee Ishikawajima-Harima will manufacture four of the PC 40s, each with an output of 14,850 bhp, for installation in two car ferries that IHI will build for Shin Nihonkai Ferry.

The PC 40 is a very economical engine fitted with a power recovery turbine. The units aboard the Shin Nihonkai vessels will have a specific fuel consumption of 122 grams per bhp-hour. Delivery of the ferries is scheduled for the first half of 1987.

BERGEN DIESEL

Circle 11 on Reader Service Card

The latest Bergen Diesel engine, Type B, has now completed the most extensive tests ever carried out before market introduction of a Bergen design. With no significant alterations and few adjustments resulting from these tests, it has been established that this design, with an output of 550 bhp per cylinder (with its basis the smaller K Type of 250 bhp/cyl), is a complete success and will be a market leader with regard to overall economy in modern diesel power.

At the same time, Bergen Diesel, working with the Technical University of Norway in Trandhjem, carried out research on alternative fuels. The specially adapted combustion chamber, together with the introduction of other relevant components, while burning a lean-gas mixture satisfied the most stringent demands set by the State of California for exhaust emissions.

At the other end of the scale, the K-type engine is operating on all commercially available fuel oils of up to 700 cSt, and has behind it successful operating tests on untreated California crude oil as well as on oil distillate residues particularly rich in undesirable components and with specific gravities of about 1.007.

Bergen standards for time between overhauls for operation on these alternative fuels are set to be comparable with those for operation on marine diesel oil—10,000-12,000 hours for exhaust valves and 15,000-20,000 hours for piston ring packs.

With fuel oils consumption generally well below 145 grams per bhp-hour and lube oil consumption of 1 g/bhp-h (figures valid for both engine designs), and with both the K and B types having considerable development potential for higher loading, Bergen Diesel feels well equipped with products to face a marine market that is perhaps more demanding than ever before.

In addition to these latest engine designs, Bergen Diesel can offer highly qualified and advanced installation services, and has recently handled the increasing interest for resiliently mounted propulsion engines. The company has also supplied two-speed gearboxes for shaft-driven alternators, as well as hydraulic power transmission from auxiliary engines to propeller for emergency "take-home" propulsion.

BOMBARDIER/ALCO

Circle 12 on Reader Service Card

Alco Power of Auburn, N.Y., now a subsidiary of Bombardier of Canada, manufactures the Model 251 diesel engine. Latest improvements to the series are said to reduce fuel consumption, lower maintenance costs, and enhance engine/component reliability. Major components involved are pistons, cylinder heads, and camshafts.

In order to establish viability of production tooling, Alco has been offering preproduction sets of deep-bowl pistons in limited quantities, as well as cylinder heads and camshafts. Full production of these components is expected during 1986.

With a 12.5:1 compression ratio, the pistons can be used in all Model 251 engines that are equipped with 123-degree or 140-degree overlap camshafts. In laboratory tests, up to six percent fuel savings were realized under controlled conditions. While actual savings will vary according to engine ratings, average service throughout a typical duty cycle are predicted at about 2- to 2½-percent reduction in fuel consumption.

B&W ALPHA

Circle 14 on Reader Service Card

B&W Alpha Diesel A/S in Frederikshavn, Denmark, a company of the M.A.N.-B&W Group, designs, manufactures, markets, and services complete vessel propulsion systems. The company has completed the integration of the in-line and V versions of the 20/27 M.A.N.-B&W engine, and the in-line 32/36 M.A.N.-B&W engine with existing Alpha controllable-pitch propellers and gearboxes. This has resulted in four-cycle diesel propulsion systems developing as little as 680 bhp at 1,000 rpm, which can burn heavy fuel of up to 2,100 sec. Redwood 1 at 100 F.

Another series being offered is the 20/27-VO propulsion system. While the engine itself is not new, this system incorporates the new Alphatronic I and Alphatronic II, the Danish company's latest electronic remote control systems.

CATERPILLAR

Circle 15 on Reader Service Card

Cat's 11 by 11.8-inch bore and stroke, 1,700-6,000 bhp, 4-stroke cycle, turbocharged-aftercooled 3600 family of in-line 6 and 8, Vee 12- and 16-cylinder models are establishing a track record for performance and fuel economy.

By mid-1986 there were 13 operating multi-cylinder 3600 engines with 31,500 operating hours. In addition, single-cylinder test engines have operated more than 35,000 hours, including development work on residual fuel configurations. Both 3500 and 3600 engines have been qualified on 1,500 sec Redwood 1 fuel for 1986, with 3.5 percent maximum sulfur content by weight for the 3600s and 2.5 percent for the 3500s.

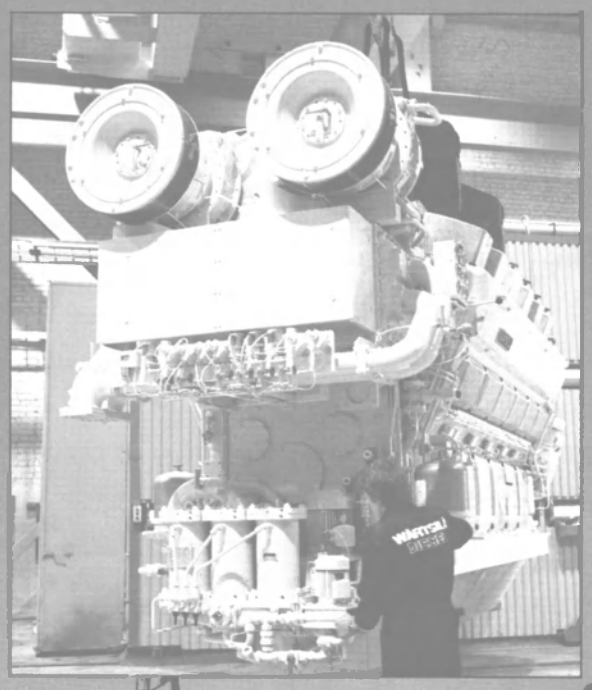
A 3612 repower of the Great Lakes freighter George A. Sloan has operated 3,500 hours at 4,500 bhp. Just beginning its second season, the owner has been pleased with the engine's performance and reliability. Replacing the original steam engine with the 3612 has transformed the Sloan from the least economical in the fleet to the most fuel-efficient, with fuel savings up to one-third. A conversion package is now being designed for operation on blended fuel up to IF 320.

The 3600 family production began with four 3606 generator sets shipped during the latter part of 1985. Two of these have operated 1,200 hours providing power for a refinery and nearby towns. Another is operating 19 percent more efficient than the Caterpillar D398/D399 it replaces, and has operated 3,800 hours. Another 3606 has operated for Brinco Mining in British Columbia for 2,900 hours, and is 14 percent more fuel-efficient than competitive units at the site.

A production 3606 rated 2,150 bhp at 900 rpm was installed in mid-May this year on a clamshell dredge to work initially at Government Island in the Oakland-Alameda estuary in California for Smith Rice. This 3606 barge-mounted electric shovel is the first dredge installation worldwide. Since beginning operation in March 1986, the engine has operated 1,100 hours. It will soon be joined by a pair of 3606s powering a new Belgian hopper dredge for Dredging International, operating on heavy fuel in Belgium.

Cat's 3500 family, with a bore of 6.7 inches and stroke of 7.5 inches, Vee 8, 12, and 16 cylinder models, continue successful operation in main propulsion and auxiliary applications due to their large displacement, conservative ratings, fast response, excellent fuel economy, and simple repair and maintenance. Whether for repower or new application, the 700-2,000 bhp 3500 marine engines are being selected for pure economic reasons—lowest cost of operation.

Caterpillar marine propulsion (continued)



Long-term service experience confirms that Wartsila Diesel engines are capable of burning the low fuel qualities of the future. For example, the recommended time between overhauls for the Vasa 32 engine on heavy fuel is today 12 000 hours.

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Tel. (212) 599-1360
Telex 971358 wpi ny

(continued)

systems are supported by a worldwide network of more than 200 Cat dealers, with parts and service locations in more than 140 countries.

To further support user financial needs, Cat Financial Services Corporation currently offers both tax and non-tax affected lease plans as well as installment sales contracts. Many operators are evaluating the cost of repowering old, inefficient vessels rather than proceeding with new ship construction. With Caterpillar financial services rates for repower as low as 6.9 percent, the cost savings and increased productivity from a new engine can many times offset monthly payments for the new engine.

COLT INDUSTRIES

Circle 16 on Reader Service Card

The construction, testing, and shipping by the Fairbanks Morse Engine Division of Colt Industries of the first two 10-cylinder Colt/Pielstick PC4.2 engines rated at 16,500 bhp each marks a milestone in U.S. diesel engine manufacturing. The largest diesel in horsepower ever manufactured in the U.S. is now being assembled in the U.S. Navy's new T-AO-187 Class of fleet oilers, whose mission is refueling of ships at sea. Each of the vessels of this class will be powered by two PC4.2 engines.

Due to the engine's large size and weight, a special railcar had to be built, and special routing was required to reach its destination at Avondale Shipyards near New Orleans. Several miles of local rail line had to be rebuilt or reinforced to handle the load.

The Fleet Renovation and Modernization (FRAM) program for the Hamilton Class Coast Guard high-endurance cutters will require the remanufacture of Fairbanks Morse original parts to "as new" condition for the two engines in each of 12 vessels. The engines in each cutter operate in a Combined Diesel or Gas Turbine (CODOG) arrangement. Each engine will be dismantled and rebuilt to the current production engine configuration, using as many original parts as meet or fall within dimensional limitations.

Other ongoing contracts include the continued support for the Los Angeles and Ohio Class submarines, and continuing contracts that supply both the ship's service generators and main propulsion engines for the LSD-41 Class ships.

Further developments underway or completed at Fairbanks Morse include: completion of the new Diesel Training Center at the Beloit, Wisc., factory; the new Regional Parts Distribution Centers at Indianapolis, Ind., and Sparks, Nev.; and additions to existing Service Centers in Norfolk, Seattle, San Diego, and Gretna, La. All parts and service centers are available to support marine diesels entering ports anywhere in the U.S., and are computer-linked to speed delivery of parts and assist in service to Colt's marine customers.

CUMMINS

Circle 17 on Reader Service Card

Cummins Engine Company of Columbus, Ind., recently announced the availability of its new VTA28-M diesel engine, said to be suitable for a wide variety of continuous-duty marine applications, from tugs and towboats to trawlers and draggers. Rated 675 bhp at 1,800 rpm, the VTA28-M (28 liters) produces 55 more bhp than the former 1710 CID V-12 engine, a tried and proven marine industry standard.

By applying the latest technology in advanced turbocharging and design, Cummins developed the higher output while actually improving specific fuel consumption. In increasing the bhp from 620 to 175, the increase in total fuel consumption was held to less than one gallon

(continued)

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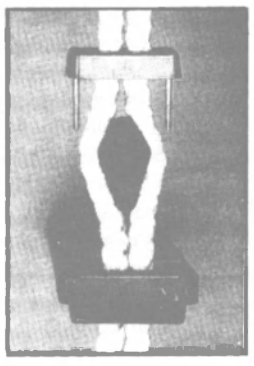
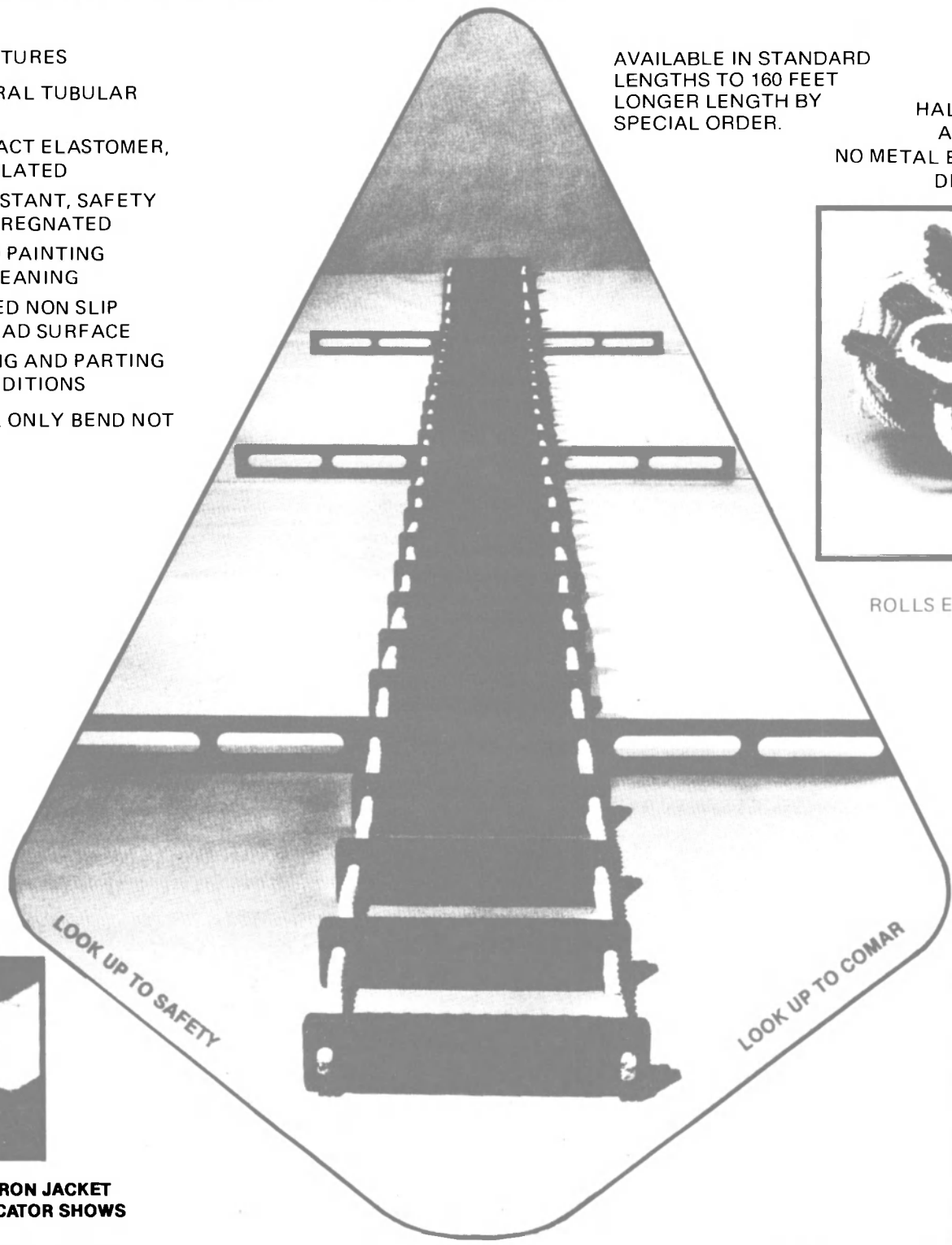


ACTUAL SHAPE OF WEDGE



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HALF THE WEIGHT OF A CHAIN LADDER
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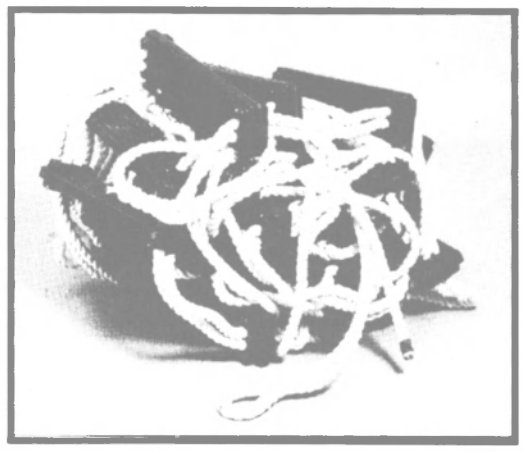
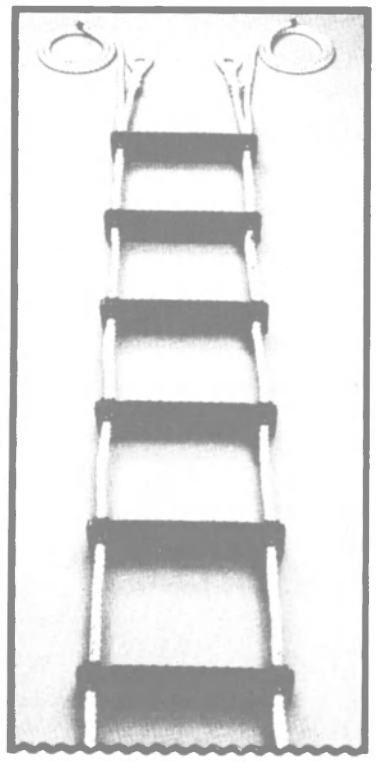
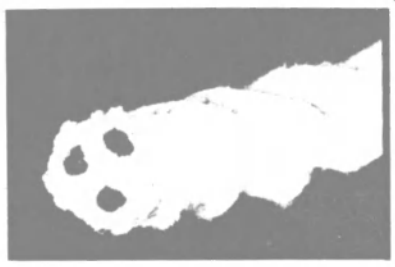


ROLLS EASY FOR STOWAGE





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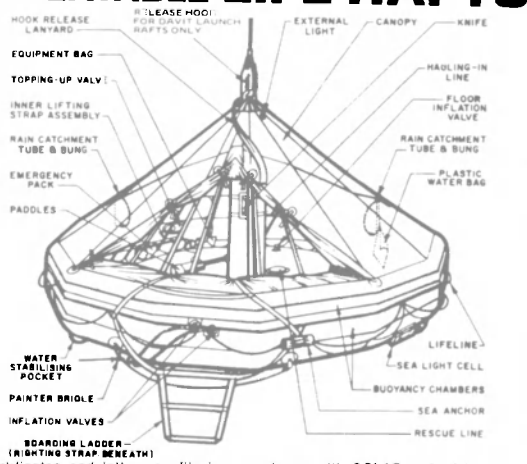

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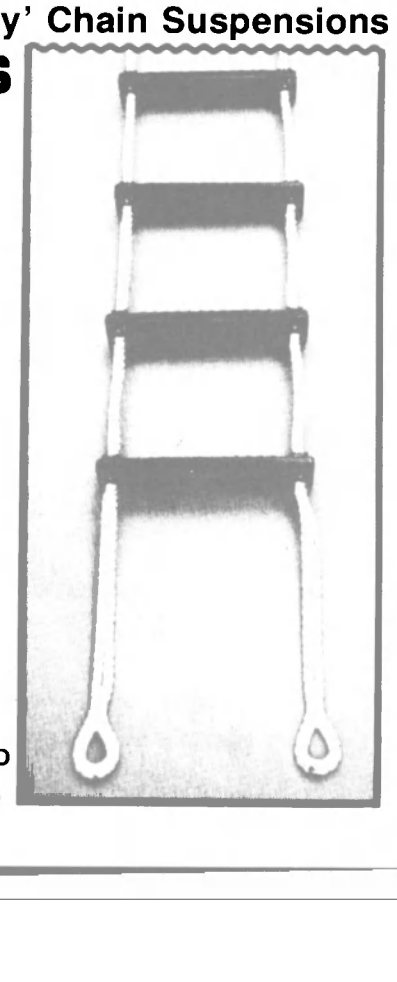

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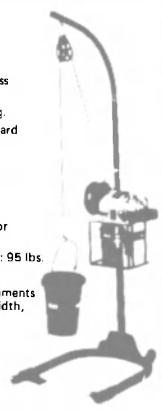
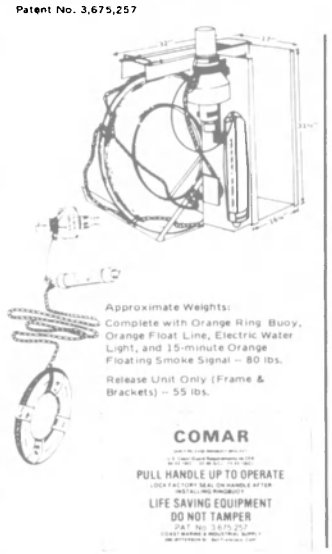
9. Shipping weight: 144 lbs.
10. Packed for Air Freight shipments approx. 24" length, 24" width, 48" height.





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(continued)

per hour, and the bsfc was reduced by 10 points.

At this power rating, the VTA28-M is said to be lighter in weight and more compact than comparable marine diesels. In addition to the lighter weight-to-power ratio, this also means there is more walk-around room in the engine compartment for service and ease of maintenance.

The first marine models of its new B and C Series of lower-horsepower diesels, introduced in 1985, expands the Cummins marine product line to 61 bhp at the lower end.

The B Series consists of 4- and 6-cylinder models with displacements of 3.9 and 5.9 liters, ranging from 75 to 152 bhp at 2,500 rpm, rated 2,500 for intermittent duty and 2,800 for maximum duty. The B Series is capable of providing main propulsion in a wide variety of marine applications.

The C Series propulsion engines, which will be available in the second half of this year, comprise six-cylinder units with a displacement of 3.8 liters, ranging from 158 to 204 bhp.

Cummins has also increased engine horsepower ratings for its NT855-M and KT855-M marine models. The NT855-M is now available rated 360 bhp at 2,100 rpm, up from the former rating of 295 bhp at 1,950 rpm. Its continuous-duty rating has been increased from 270 bhp to 300 bhp at 1,800 rpm.

The KT19-M's intermittent rating of 510 bhp at 2,100 rpm has been available since 1984. Its continuous-duty rating has now been increased from 365 bhp to 425 bhp at 1,800 rpm.

DAIHATSU

Circle 18 on Reader Service Card

A new type of engine, the DL Series, which features low fuel consumption, low quality fuel burning capability, and low load operability, has been developed by Daihatsu Diesel Manufacturing Company Ltd. of Japan, represented in North America by Daihatsu Diesel (U.S.A.) Inc.

The DL Series engines—DL-20, DL-26, DL-28, and DL-32—are a medium-speed type of 600 to 1,000 rpm, with outputs covering the range from 750 to 3,000 bhp. They are suitable for both main propulsion and auxiliary generating applications.

Extensive testing under various conditions on all parts of these engines was carried out at the Daihatsu laboratory and factory in Osaka before they were placed on the market. The company's traditional design concepts—simple and sturdy construction, easy maintenance, and lower maintenance costs—are fully incorporated in the DL Series. The company reports an increasing number of orders for the DL engines from shipowners overseas.

Product literature and technical reports are available free of charge from the manufacturers included in this review. Just circle the appropriate Reader Service number(s) on the postpaid card in the back of this issue.

DETROIT DIESEL

Circle 19 on Reader Service Card

Detroit Diesel Allison (DDA) recently introduced the 12V-92TA marine model, a turbocharged, aftercooled engine that incorporates "Forward Plan" components and features an increased horsepower rating of 545 bhp for workboat applications.

Forward Plan components feature a water-cooled turbocharger and exhaust system current with application regulations, two-pass aftercooler, and advanced air induction system combined to offer improved fuel economy at increased horsepower. Similar components will be incorporated into the Series 92 six-, eight-, and 16-cylinder models in 1987. The 8V92TA version will be rated at 365 bhp for workboat applications and will replace the currently offered 12V-71N model. In addition, the Forward Plan components will be featured on the 1987 version of DDA's 12V71TA model, with improved fuel economy and an increase in horsepower to 400 bhp.

A current R&D project being conducted by DDA in conjunction with the Maritime Administration, U.S. Department of Transportation, involves studying the benefits of Detroit Diesel Electronic Control as applied to the 149 Series for towboat applications. This system employs two Electronic Control Modules connected via a high-speed communication link to control injection and governing on the 16V-149TIB engine. This, combined with turbocharger developments providing excess air flow for burst power and transient conditions with reduced parasitic losses, will allow DDA to offer smaller engines to replace larger engines in marine applications.

As with the Series 71 and Series 92, the naturally aspirated 149 Series engines will be replaced with Forward Plan models for the eight-, 12-, and 16-cylinder T and TI models.

DEUTZ/MWM

Circle 20 on Reader Service Card

Two major West German diesel engine manufacturers, Klockner-Humboldt-Deutz AG of Cologne, and Motoren-Werke Mannheim AG of Mannheim, have merged to form Deutz/MWM, and now offer one of the broadest power ranges of diesel engines in the world.

This merger brings together two engine builders with a total of more than 230 years of experience, as well as a combined reputation for quality, reliability, and service excellence.

The KHD Group's Engine Division will be restructured with all activities involving the water-cooled engine business being combined at Mannheim. KHD will relocate its medium and big engine activities in development, sales, and parts manufacturing to Mannheim in combination with the engine program of MWM. The medium-sized and big engine built in Mannheim and Cologne will be manufactured and marketed under the trade name Deutz/MWM.

The formation of Deutz/MWM will offer an expanded range of marine and stationary prime movers, for propulsion and electric power generation, to world markets including North America.

The North American headquarters of the new company is located in Montreal, with a division based in Atlanta.

ELECTRO-MOTIVE

Circle 21 on Reader Service Card

The latest diesel engine design from the Electro-Motive Division (EMD) of General Motors is the 710G Series, offering increased reliability, better fuel economy, and the potential for significantly higher horsepower in the future. The new design is an evolutionary development of EMD's turbocharged, uniflow-scavenged, two-stroke cycle engines. The simplicity of design, maintainability, and high reliability of those engines have been retained in the new design.

The 16-cylinder 710G is rated 3,600 bhp at 900 rpm for marine applications. It has a bore of 9.06 inches, stroke of 11 inches, and displacement of 710 cubic inches per cylinder.

The design of the 710G is a logical outgrowth of EMD's current production series, the 645F engines. The most recent version of that series, the 645FB, is the result of a succession of incremental improvements. From 1980 to 1983, for example, the fuel efficiency of the 645F was increased by six percent and the compression ratio was raised from 14.5:1 to 16:1.

The 710G can also be viewed as a new dimension in engine design in terms of its potential for future development. Greater displacement and an advanced-design turbocharger give the 710G the capacity for significant increases in horsepower. Thus, the 710G combines innovation with the proven technology of its predecessor, but its potential makes it more than just this year's model.

The 710G is EMD's most fuel-efficient engine to date; full-load consumption has been improved by nine percent over the 1980 645F3 engine.

The longer stroke and added displacement of the 710G led to structural improvements in the engine, including: new Model G crankcase; larger-diameter plunger injectors; larger-diameter crankshaft; longer cylinder liner; and longer piston and rod assembly. Overall dimensions also increased; the 710G is 4⅝ inches longer and 1⅝ inches higher.

The added engine length is the result of a larger, extremely efficient turbocharger. Entry to the turbine was streamlined to improve gas flow, and an improved exhaust diffuser also reduces flow restriction. The turbocharger is deeper to accommodate a larger annulus for a smoother and less restrictive discharge of exhaust gases. Overall, the turbocharger is said to be the most efficient ever produced by EMD.

The state-of-the-art G turbocharger provides a 15-percent increase in air flow for reduced thermal loading of critical engine components. This higher air flow, combined with an increased injection rate from the new 0.56-inch plunger injector, accounts for the increase in fuel economy at rated output, with no increase in engine thermal loading.

A key concern in the development of a large-displacement diesel is reliability. Throughout the development of the 710G, EMD used advanced laboratory techniques to analyze stress and predict performance. Finite element analysis and comprehensive strain-guage testing were used extensively to take full advantage of EMD's broad experience with the 645 engines. Total development cost of the 710G was $60 million, and the tooling cost alone was $78 million.

GARDNER

Circle 22 on Reader Service Card

The first-ever intercooled Gardner diesel engine was introduced to the marine market early this year in London. The manufacturer, L. Gardner & Sons Limited, is a Hawker Siddeley company.

Designated the 6LYTi, the new engine is available in power ratings of 335 bhp at 1,700 rpm or 310 bhp at 1,600 rpm for propulsion duties, and 230 to 280 kva at 50 cycles for auxiliary duties. A logical development from the turbocharged 6LYT, the 15.5-liter intercooled engine has the highest power-to-weight ratio and fuel efficiency of any Gardner engine, yet the new model remains lightly stressed and has capacity for future development.

The 6LYTi engine shares the main features of the 6LYT, including cross-flow cylinder head, oil jet piston cooling, single-piece camshaft, externally mounted viscous damper, and a rear-mounted gear train.

Intercooling is provided by an air-to-water tubular design intercooler that is included in the closed-circuit freshwater cooling system of the engine. This system is suitable for combining with an externally mounted heat exchanger or keel cooling. Complete with a shallow case marine gearbox, the new 6LYTi weighs only 3,510 pounds.

The first production units of the 6LYTi intercooled marine engines will be fitted with Twin Disc reverse/reduction gears, although gears from other manufacturers will be available as options. As with all Gardner engines, the new unit is approved by the American Bureau of Shipping, Det norske Veritas, and Lloyd's Register of Shipping.

The entire range of Gardner engines and spare parts is now available in the U.S. from Gardner Diesels (USA) in Houston. The range of the 6- and 8-cylinder covers power ratings from 62 to 335 bhp for propulsion applications, and from 48 to 252 kva at 50 cycles or 53 to 280 kva at 60 cycles for auxiliary service.

Supporting Gardner engines is a network of 18 distributors in the U.K., as well as overseas sales, service, and parts facilities. The British-built engine will eventually be marketed through several geographically spaced distributors in the U.S., in addition to the Houston operation.

GENERAL ELECTRIC

Circle 23 on Reader Service Card

The fuel-efficient, four-stroke 7FDM marine diesel engines manufactured by General Electric's Diesel Power Products Division in Erie, Pa., now offer ratings from 1,525 to 4,000 bhp. Its 8-cylinder model has an output of 1,525 bhp at 90 rpm, and a rating of 1,800 bhp at 1,050 rpm. The 7FDM 12-cylinder engines are rated 2,550 bhp at 900 rpm and 3,000 bhp at 1,050 rpm. The 16-cylinder models carry ratings of 3,400 bhp at 900 rpm and 4,000 bhp at 1,050 rpm.

GE's three-ring piston design is said to reduce lube oil consumption significantly. This design, using two compression rings and one oil control ring, also reduces ring wear for longer periods between overhauls.

The development of turbochargers that operate more effectively in marine service is said to improve acceleration characteristics and further improve fuel efficiency. The life expectancy of connection rod bearings and their crankshaft journals has been increased with the development of a grooveless upper rod bearing half, while welded-in, stainless steel, 30-degree-value seats improve cylinder head life.

GEORGE ENGINE

Circle 24 on Reader Service Card

George Engine Company's "bypass operation"—the upgrading of a Detroit Diesel 149 Series engine from its normally aspirated operation to a turbocharged, intercooled, blower-bypass configuration using the latest Detroit Diesel components—is said to provide a reduction in fuel consumption of as much as 11.5 percent. From its facilities in Baton Rouge, Morgan City, Lafayette, and Harvey, La., the company also provides custom power packages and a broad range of services for marine and offshore applications.

The blower-bypass is a simple butterfly valve arrangement that automatically diverts the incoming air around the Roots blower when turbocharger boost has reached a sufficient level. With the blower bypassed, it no longer imposes an accessory load on the engine; the horsepower that was previously required is now available at the flywheel to do useful work.

The TIB configuration, with a smaller fuel injector, produces the same horsepower at the same rpm as the NA arrangement, but does it with significantly less fuel. Alternatively, the owner may elect to use larger injectors to achieve greater horsepower output, and still at a competitively low specific fuel consumption.

GRANDI MOTORI

Circle 25 on Reader Service Card

Grandi Motori Trieste, the diesel engine division of Fincantieri Cantieri Navali Italiani, will introduce a number of new engine designs this year and in 1987. Most of them will be for marine applications or stationary power plants.

One series is the GMT A320 medium-speed, four-stroke engine with outputs of 3,000 to 8,000 bhp at 720-750 rpm, but with special features to insure improved performance at part loads. This range will use the latest bore-cooling technique for combustion chamber components, and utilize to best advantage the greater efficiency of the latest Brown Boveri exhaust gas turbo-

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chargers. This engine series, and the other commercial (non-naval) GMT diesels, are designed for operation on heavy fuel oil.

On extensive testbed trials is a longer-stroke version of the well-established B550 engine, with a bore of 550 mm the largest of the GMT medium-speed engine range. This higher-powered, more economical BL550 series covers a power range from 9,900 to 33,000 bhp for ship propulsion or electric power generation.

By increasing the piston stroke from 590 to 630 mm, the per-cylinder output of the BL550 has been increased to 1,650 bhp at 450 rpm with only a modest rise in mean effective pressure from 20.6 to 21.6 bar, and of the mean piston speed from 8.85 to 9.45 meters per second.

Following testbed results on a new 12-cylinder 420H engine, production has begun on this higher-rated version of the GMT A420H with a bore of 420 mm. Output per cylinder has been increased from 700 bhp at 500 rpm to 800 bhp at 600 rpm. This series now covers an output range from 4,800 to 12,800 bhp, from in-lines with 6, 8, or 9 cylinders and V-form with 10, 12, 14, or 16 cylinders. Fitted with the Brown Boveri VTR ME4 turbochargers of the latest design and higher efficiency, this engine series has a lower specific fuel consumption of about 128 grams per bhp-hour compared with the original A420 engine.

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Another major step for Grandi Motori will be taken this year when production of the supercharged A210SM naval engine begins. This engine is a further development of the naturally aspirated A210M engines installed in the Italian Navy's Sauro Class submarines. Redesign and other development work has resulted in an even more compact engine with 8, 12, or 16 cylinders in V-form, of low specific weight, and covering outputs of 2,575, 3,870, and 5,150 bhp at 1,500 rpm.

ISOTTA FRASCHINI

Circle 26 on Reader Service Card

Isotta Fraschini SpA, a company of the VM Group in Italy, designs and manufactures a broad range of diesel engines for various applications. The ID 32 Series for marine propulsion offers a power range from 180 to 400 bhp at 2,700 to 3,000 rpm.

The ID 38 Series is rated from 180 to 400 bhp at 2,700-2,900 rpm for workboat propulsion, and 500 bhp at 3,000 rpm in military applications. The ID 36 Series has a power range of from 300 to 1,320 bhp at 1,650-1,800 rpm for workboats, and up to 1,600 bhp at 1,900 rpm for military vessels.

The ID 36 engines are available in V configuration with 6, 8, 12, and 16 cylinders; a 10-cylinder version is under development. All production engines in this series are available in amagnetic versions.

Isotta also manufactures, under license, the Paxman Diesel model PV2000 engine, which has a power range from 1,000 to 4,500 bhp at 1,600 rpm.

KRUPP MaK

Circle 27 on Reader Service Card

The latest marine diesel offered by Krupp MaK Maschinenbau GmbH of Kiel, West Germany, is the M 453 C series, a product of continuous development dating back to 1962. Each succeeding generation has been improved in technical design and fuel economy, with the M 453 C having a specific fuel consumption of 133 grams per bhp-hour under typical marine operating conditions.

The medium-speed, in-line M 453 C is available with 6, 8, 9, 12, or 16 cylinders. Bore is 320 mm and stroke is 420 mm. Output per cylinder is 442.5/402 bhp at 600 rpm. The M 453 C is capable of burning heavy fuel oil, and is suitable as a main propulsion engine in a single and multi-engine installations, with fixed or controllable-pitch propellers, and as an auxiliary engine.

The long stroke of the M 453 C means lower engine speed, reducing mechanical friction. It also permits favorable design of the combustion chamber despite a high combustion ratio. Thus there is ample height in the combustion chamber for the jet to diffuse unimpeded.

Special attention has been paid to the development of the cylinder head. This robust component of spheroidal graphite cast iron now incorporates an intermediate deck to make it highly rigid. The cylinder head can be removed with a pneumatic impact tool within 20 minutes.

Cylinder liners are supported in the engine housing immediately below the collar. The housing has been strengthened to insure that the increased forces can be absorbed safely. Liners are hardened and precision-honed to provide low levels of oil consumption.

MaK medium-speed engines have been using heavy fuel oils with viscosities of up to 700 cSt for more than 20 years, with all of this experience embodied in the M 453 C. MaK has delivered some 2,200 diesel engines of the M 451, M 452, and M 453 series with a total output of about 4.7 million bhp. This includes some 1,000 engines of the M 453 range since 1972, and this series continues to figure prominently in MaK's annual production.

M.A.N.-B&W DIESEL

Circle 28 on Reader Service Card

M.A.N.-B&W Diesel, as the world's largest designer of marine diesel engines, has successfully developed engines with the highest thermal efficiency available, while at the same time maintaining a very high level of service reliability.

With the introduction of the MC low-speed series, M.A.N.-B&W has brought the fuel consumption down to 118 grams per brake horsepower-hour, which, compared with the 156 g/bhph 10 years ago, means a reduction of about 25 percent. At the same time the corresponding revolutions of the direct-coupled propeller have been reduced from 114 rpm to 60 rpm, which has led to an increase in the propeller efficiency of 12-15 percent. These factors combined mean a total saving in the fuel oil consumption on propulsion engines alone of up to 40 percent.

The new four-stroke, heavy-fuel L58/64 engine will be produced as in-line units with six, seven, eight, and nine cylinders, providing a power range (mcr) from 9,900 to 14,850 bhp.

The L58/64 is a logical upgrading of M.A.N. medium-speed engines that have rendered excellent service in operation on heavy fuel for almost 20 years. This early understanding of heavy fuel-burning characteristics was further extended by the 40/45 engine type, which in the 1970s introduced a modern concept with high firing pressure, the basis for low fuel consumption.

During the development of the L58/64 engine, particular emphasis was placed on the following: low fuel consumption; high reliability in unrestricted operation; simple and easy maintenance; and adaptability to varying operating and environmental conditions as well as fuel ignition qualities.

M.A.N.-B&W HOLEBY

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The 4-stroke diesel engines of B&W design manufactured in Holeby, Denmark, are used entirely for generator sets. The annual capacity of the factory is 170,000-200,000 bhp, of which the large majority is produced for marine installations. The Holeby Diesel production is

worldwide, and engines are manufactured under license in Sweden, Spain, Yugoslavia, Brazil, Japan, and Korea.

Engines are based on two designs: the 23/30 and the 28/32, designating the bore/stroke in centimeters, both running at 720/750 rpm. The capacity ranges from 500 to 2,000 kw for in-line engines, thus covering all market requirements for electric power generation in ships.

Exceptional cases, such as large passenger vessels, are covered by V-type engines with a maximum of 18 cylinders per unit.

Based on operating experience with heavy fuel oil installations in service since the early 1960s, all engines are designed for burning of all commercially available fuel oils with viscosity up to 700 cSt at 50 C.

The Unifuel concept, in which auxiliary engines are operated continuously without any restrictions on the same heavy fuel as the main diesel engine, was introduced in 1980, and now constitutes the vast majority of gensets supplied to the newbuilding market. Integrated fuel treatment plants are developed and produced by Holeby, and are usually specified as part of the gensets.

Continuous development of both engine types is performed with a view to match in advance future market requirements, and have lately been concentrated on specific fuel consumption and environmental considerations with regard to emissions and noise control.

MIRRLEES BLACKSTONE

Circle 30 on Reader Service Card

Mirrlees Blackstone, the British diesel engine manufacturer, has its U.S. headquarters in Houston, where it warehouses spare parts and has service personnel as well as new engine marketing for the marine and industrial sectors.

The Mirrlees Blackstone line of diesels is manufactured at two plants in the U.K.—at Stockport, where the first British diesel engine was built by Mirrlees in 1897, and at Stamford, where the original Blackstone company was established in 1837.

The range of advanced-technology engines produced in these factories covers horsepowers from 330 to 17,624 bhp. The E and the ESL MK2 series cover outputs from 330 to 4,000 bhp at crankshaft speeds of up to 1,000 rpm. During the past year, an addition to the line of a 12- and a 16-cylinder V-form version has been made. The turbocharged and intercooled ESL MK2 can burn residual fuels of up to 3,500 sec Redwood 1. The MB 190 model is a heavy-duty high-reliability design built in 6- to 16-cylinder forms, with power outputs of 860 to 2,864 bhp at 1,500 rpm.

The medium-horsepower range offered by Mirrlees is covered by the MB 275, a heavy-fuel diesel built in 6- to 16-cylinder configurations with power outputs of 1,600 to 6,166 bhp at speeds up to 1,000 rpm. This engine is designed for heavy fuel burning capability with low specific fuel consumption and ease of maintenance.

The medium-speed Mirrlees K Major covers the horsepower range up to 13,000 bhp. This model is offered in a range from 6 to 18 cylinders and is designed to burn heavy fuel at speeds up to 600 rpm. The new MB 430 has recently been announced, with outputs up to 17,624 bhp. This range covers 6- to 18-cylinder versions at 500 to 600 rpm.

Mirrlees's research and development is continually upgrading existing engine designs and producing new models. Mirrlees Blackstone is a wholly owned subsidiary of the Hawker Siddeley Group.

MITSUBISHI

Circle 31 on Reader Service Card

Mitsubishi Heavy Industries Ltd. of Japan last year introduced its newly developed UE-LA Series of extra-long-stroke diesel engines to the marine market. With a specific fuel consumption in the economy rating of 119 grams per bhp-hour (116.5 for a derated engine) for the largest model in the series, Mitsubishi claims that the new UE-LA offers the lowest SFC for engines of their type.

In addition to the low fuel rate,

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other principal features of the new series include high propeller efficiency, high reliability, low-quality fuel compatability, easy maintenance, and compact design. The UE engine is the only low-speed diesel developed entirely in Japan.

The four models in the LA Series are each available in versions from four to eight cylinders. The largest engine in the series, the UEC60LA, has a bore of 600 mm and a stroke of 1,900 mm, and has a maximum continuous output of 2,100 bhp per cylinder at 110 rpm. The UEC52LA has a 520-mm bore and 1,600-mm stroke, with an output of 1,600 bhp per cylinder at 133 rpm. The UEC45LA model has a bore of 450 mm and stroke of 1,350 mm; output is 1,200 bhp per cylinder at 158 rpm. The fuel consumption of these three models has been cut 5 g/bhph compared with the former L series.

The UEC37LA is the smallest engine in the series, with a bore of 370 mm and a stroke of 880 mm. Its output is 700 bhp per cylinder at 210 rpm. Fuel consumption for this model has been cut to 129 g/bhph at maximum rating and only 126 g/bhph at economy rating.

For all of the LA Series engines Mitsubishi quotes what it calls "capable minimum fuel consumption rates." These range from the 116.5 g/bhph for the 60LA model to 123.5 g/bhph for the 37LA.

The Mitsubishi UEC-LA diesels appear to have excellent performance capabilities, high reliability, and economy, and should see widespread use as the main propulsion engines for bulk carriers, tankers, OBO carriers, containerships, multipurpose ships, and many other types of vessels.

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MTU

Circle 32 on Reader Service Card

MTU of North America, Inc. is the U.S. subsidiary of MTU-Motoren and Turbinen-Union of Friedrichshafen, West Germany. The German parent company is jointly owned by Daimler-Benz AG and M.A.N. AG.

The MTU diesel line covers a power output range of 440 to 10,000 bhp at rated speed between 1,000 and 2,400 rpm. Basic design features common to the series are: V-configuration, water cooling, exhaust gas turbocharging, and charge air cooling. All engines are the result of the collective experience gained by Maybach, Mercedes-Benz, and M.A.N. in the development of cost-effective, high-performance diesels.

The model 20V 1163 TB 93 engine, introduced in 1983, is evidence of MTU's continued success in its engine development program, which focuses on increasing engine power and power concentration to open new powering possibilities, reducing fuel consumption throughout the entire speed range, extending operating range through higher mean effective pressures, and improving partial-load performance characteristics. MTU employs cylinder cutouts, cylinder charge transfer, and sequential turbocharging in some of its engines.

Power in the 1163 series has been increased from 349 to 496 bhp per cylinder, corresponding to an increase in mep from 305 to 426 psi. MTU's two-stage turbocharging is also employed in addition to the other systems mentioned. This allows overall engine dimensions to be kept almost constant, and results in a power-to-volume ratio of 11.7 bhp per cubic foot, and a weight-to-power ratio of 4.4 pounds per bhp with the 20V 1163 producing 9,920 bhp.

Output of the 396 series engines has also been increased. With a maximum rating of 2,570 bph and a weight of 10,475 pounds, the 16V 396 penetrates a power range that could previously be served only by larger and heavier engines.

PENSKE

Circle 33 on Reader Service Card

Since 1976, Penske GM Power, Inc. of Lodi, N.J., has expanded its facilities to include four sales and five service locations, including its newest on-water service operation in Monmouth Beach, N.J. Serving the requirements of both pleasure craft and commercial vessels, Penske's facilities are located throughout the metropolitan New York/New Jersey/Connecticut area. More on-water locations are planned for opening this year and in 1987. In addition to Detroit Diesel Allison, Penske's product line includes Alco, John Deere, and Volvo-Penta.

Penske is engaged in various applications of diesel power, with divisions specializing in high-performance pleasure craft and commercial marine power; mobile, prime, and standby electrical generators; and transportation, firefighting, and industrial applications. The company is able to service all aspects of diesel engine applications. Penske-engineered marine propulsion is currently in use in military, commercial, and high-performance pleasure-boat applications throughout the world.

The next 10 years promise increased visibility for the Penske-engineered product, with new emphasis on the "Penske Advantage" concept. The "advantage" is race-proven engineering and technology, state-of-the-art production and manufacture, and the "Hot-line" service and parts response that Penske customers have come to appreciate.

The Penske development of a complete GM engine room allows one service technician to service both Penske-engineered propulsion engines and Penske-built on-board electrical generating units. Penske offers diesel engines rated from 56 to 4,000 bhp and gensets 35-2,800 kw.

PERKINS

Circle 34 on Reader Service Card

Perkins Engines, Inc. of Wayne, Mich., is part of the worldwide Perkins Engines Group of Peterborough, U.K., which this year has added a powerful yet exceptionally compact diesel to its line of marine engines. A leading supplier of diesels in North America, Perkins offers marine engines ranging from 51 to 800 bhp, in four, six, eight, and 12-cylinder versions. These engines have a wide variety of applications, including main and auxiliary propulsion as well as generator sets.

The latest addition to the Perkins marine line, which was developed in conjunction with the British Royal Navy, is the 8-cylinder, V-form CV8 536(M) diesel that provides 536 bhp at 2,100 rpm. With low weight and low profile, this engine was designed for many commercial craft applications. The compact size of the CV8 allows for smaller engine rooms, thus offering increased payload.

The CV8's light weight insures a good power-to-weight ratio, and its outstanding fuel consumption is a plus factor in commercial and fishing applications. Options for this engine include a power takeoff unit, keel cooling, and change-over filters.

The Perkins marine line is headed by the 12-cylinder, 800-bhp CV12 diesel. This heavy-duty, Rolls-Royce-designed engine is a 60-degree V-form water-cooled diesel.

The new CV8 is next on the power chart, followed by the turbocharged, eight-cylinder TV8.540 diesel with a rating of 350 bhp at 2,800 rpm. This engine weighs less than 1,700 pounds, offering an outstanding power-to-weight ratio.

Foremost in the Perkins line is the Range 4 family of four high-power, six-cylinder engines. The turbocharged, six-cylinder T6.3544(M) is the leading member of this family, offering 240 bhp at 2,600 rpm. Two other versions of this engine provide 165 bhp and 135 bhp at 2,800 rpm.

Perkins also offers four-cylinder diesels led by the popular 4.236(M) that provides 85 bhp at 2,500 rpm. The 4.154 (M) has an output of 62 bhp at 3,000 rpm, while the 4.108(M) provides 51 bhp at 4,000 rpm.

STORK-WERKSPOOR

Circle 35 on Reader Service Card

Stork-Werkspoor Diesel BV (SWDiesel) headquartered in Amsterdam, is Holland's leading diesel engine manufacturer. Its production program covers an output range from 400 to 21,725 bhp, and consists of five models of four-stroke, medium-speed, heavy-duty engines, all capable of operating on heavy fuel.

The company's latest engine type, the SW280, is offered in an in-line configuration with six, eight, or nine cylinders, and in a 12-cylinder V-form version, with outputs ranging from 1,965 to 4,735 bhp.

Special attention in Stork's research and development program was given to the reduction in fuel consumption, resulting in lower figures for the SW280, F/SW240, and DR210 engines. R&D on the well-known TM410 and TM620 engine types, of which more than 650 have been delivered, has also been successful in meeting market demands for reduced fuel consumption; a reduction in fuel consumption of up to eight percent can be achieved. On a number of 18TM410 engines, a spe-

cific fuel consumption as low as 185 grams per kw hour has been recorded under full-load conditions.

These reductions in consumption have been achieved without increasing the combustion pressure. Further reductions are foreseen in the near future. This will be achieved by some increase in the maximum cylinder pressure. Major improvements on these engines include the application of new high-efficiency turboblowers, and valve timing in injection systems to give higher injection pressures.

Operation on heavy fuel is one of the strongest points of SWDiesel engines. The poorest quality fuels have been tested in TM and SW engines. When installed as auxiliary engines, the SW models can use the same heavy fuel as the main engine.

SULZER

Circle 36 on Reader Service Card

The well-established RTA low-speed diesel engine program of Sulzer Brothers Limited of Switzerland was further augmented recently with the introduction of an additional bore size, the RTA72 (720-mm bore). With four to eight cylinders, the RTA72 engines cover a power range from 7,680 to 28,000 bhp at speeds of 66 to 91 rpm.

The RTA72 follows the RTA52, RTA62, and RTA84 models introduced in late 1984, and has a longer stroke/bore ratio than previous RTA engines. Its lower rotational speeds widen the range available in the RTA series for optimal engine selection.

The RTA series is said to present the most cost-effective solution for ship propulsion. Its superior overall economy combines the benefits of low fuel consumption, low engine speeds, good waste heat recovery, high reliability, long times between overhauls, capability to burn low-quality residual fuels, and low maintenance costs, all supported by Sulzer's worldwide service network.

The integral power takeoff of RTA engines provides for both main engine driven generators and efficiency booster exhaust power turbines. With PTO and waste heat recovery, RTA engines are said to be ideal as integrated energy plants meeting all of the ship's requirements for propulsion, electrical power, and heating services in one simple prime mover.

Sulzer has also introduced a longer-stroke version of its 400-mm-bore, medium-speed four-stroke engine. The new ZA40S is a long-stroke version of the proven ZA40 engine. By increasing the stroke from 480 mm to 560 mm, a significant improvement in fuel economy was achieved (4 grams per bhp-hour), while increasing the maximum continuous rating from 870 to 900 bhp per cylinder and lowering the engine speed from 580 to 510 rpm.

The longer stroke and resulting lower engine speed of the ZA40S have the advantages of: better combustion as the time available for combustion is increased; better mechanical efficiency due to lower frictional losses in the engine bearings; and improved combustion chamber geometry. All of these features contribute to the improvement in specific fuel consumption without increasing the maximum firing pressure above 155 bar as in the ZA40.

The ZA40S engine is available as an in-line version with six, eight, or nine cylinders, and in a V configuration with 12, 14, 16, or 18 cylinders, and ranging in output from 5,400 to 16,200 bhp at 510 rpm. At an economy rating of 750 bhp per cylinder at 510 rpm, the V engines achieve a specific fuel consumption of 129 g/bhp-hr. By using an exhaust gas power turbine as an efficiency booster, the specific fuel rate can improved by three percent to 125 g/bhp-hr.

UNI DIESEL

Circle 37 on Reader Service Card

UNI Diesel is the new marketing name adopted by SACM (Societe Alsacienne de Constructions Mecaniques) of France for its entire range of medium- and high-speed, four-stroke, direction-injection diesel engines with power ratings of 200 to 10,000 bhp. UNI Diesel is represented in the U.S. by F.W. Donnelly Company of Houston.

UNI Diesel is a leader in the development of high-performance engines utilizing the RVR and Hy-

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perbar turbocharging techniques, and in nonmagnetic engine versions up to 2,880 bhp. The high-performance engines are used in such applications as the Bell Halter BH-110 SES oil field supply boats, SAR 33 patrol boats, Westamarine catamarine passenger ferries, Statfjord B/C production platforms, ODOCO's Ben Ocean Lancer drillship, and Circle Class minesweepers.

It is UNI Diesel's philosophy to further the development of the performance qualities of its engine range without sacrificing the essential operational qualities, including low specific fuel consumption, long time between overhaul, and ease of operation/maintenance. This development philosophy has resulted in UNI Diesel's now well known RVR turbocharging technique. RVR (reduced volumetric ratio) engines provide significantly more power than conventional high-performance engines while maintaining or slightly reducing the engine's thermal and mechanical stresses. Additional attractive features of these engines include the wide ambient temperature range in which the RVR engines may operate without power derating, the simple single-circuit cooling system that is employed, and the elimination of condensed water formation in the air intercoolers.

VOLVO PENTA

Circle 38 on Reader Service Card

Volvo Penta engineers have been working overtime to develop the most complete line of marine diesels ever offered. In the coming months, eight new marine diesels will be introduced, with more to come. These new diesels show technical innovation in the further development of combustion characteristics, higher torque at lower engine speeds, lower emission levels, and extended operating life, providing sensible power for today's hard-working vessels.

Advanced computer technology and heavy investments in technological research have been the cornerstones for Volvo Penta's new 61 and 71 series engines, meant for applications ranging from light duty to heavy duty. Turbocharged and aftercooled, these precisely designed and manufactured engines can increase performance and engine life, are more adaptable to commercial duty, and are easier to install than ever before. Service is simplified, while exhaust emissions and noise levels are greatly reduced.

The TAMD 61 generates from approximately 190 bhp at 2,200 for heavy load to about 306 bhp at 2,800 rpm under light load—up to a 20-percent increase in output without sacrificing engine lifetime or weight. The TAMD 71 produces from 218 bhp at 2,000 rpm under heavy load to 358 bhp at 2,500 rpm under light load, a 17-percent increase in output. These state-of-the-art engines are a preview of what the future looks like from Volvo's point of view.

For commercial workboat applications, the 238-bhp TMD 100C, the 300-bhp TMD 121C, and the 367-bhp TAMD 121C 6-cylinder, turbocharged, four-stroke engines are the mainstays of the Volvo Penta line. Their special alloy cast iron cylinder block and individual cylinder head, light alloy pistons with cast iron ring carriers, seven lead/bronze main bearings, and direct fuel injection continue to prove themselves in daily use.

The larger, heavier-displacement vessels should perform well with new Volvo 4-cylinder MD31 series, which includes the 62-bhp MD31A, the 100-bhp TMD31A, and the 130-bhp turbocharged and aftercooled TAMD31A. All are direct-injected for lower thermal stresses and lower fuel consumption across a wide range of speeds.

The excellent mid-range power of the 150-bhp TMD41A and the 200-bhp TAMD41A, combined with Volvo's unique MS4A reverse gear, offers the latest technology available with minimal drive train power losses. The two new 6-cylinder, 4-stroke diesels owe their significant increases in horsepower and lower fuel consumption, in part, to excellent volumetric efficiency.

Volvo's new AQAD31A is a compact, 2.4-liter turbocharged engine producing 130 bhp. When linked with a 290A outdrive, this 4-stroke, direct-injected and aftercooled 4-cylinder diesel can produce lower than ever fuel consumption throughout the entire range of operating speeds.

For larger high-performance applications, the 6-cylinder AQD41A also links with the 290A outdrive to deliver 150 bhp with the same benefit of fuel economy across a wide range of operating speeds. Additionally, there is an aftercooled version of this 6-cylinder engine designated the AQAD41A, producing 200 bhp. Efficient aftercooling lowers the temperature and increases the oxygen content of included air for more complete fuel combustion and lower consumption.

Product literature and technical reports are available free of charge from the manufacturers included in this review. Just circle the appropriate Reader Service number(s) on the postpaid card in the back of this issue.

WÄRTSILÄ DIESEL

Circle 39 on Reader Service Card

Wartsila Diesel, one of the world's leading manufacturers of medium-speed diesel engines, is a part of the Finnish Wartsila Group, with more than 16,000 employees and 35 production plants in seven different countries.

Wartsila specializes in purpose-designed, heavy-fuel diesels for propulsion and auxiliary installations on different types of vessels; for power generation on offshore rigs; and in land-based installations. The primary objective of the company's product development is to create diesel engines with good economy and safe operation even in the most demanding applications.

As a result of these efforts, Wartsila has become very strong in re-engining, where less fuel-efficient engines are replaced by total economy diesels. The company has created a whole re-engining concept for this kind of application, which takes care of the entire process from technical planning to financing.

Special modular re-engining methods have been developed. Thanks to this, the off-hire time for each ship is extremely short. The two main concepts are: "stop your ship for replacing the main engine" and "don't stop your ship for re-engining the auxiliaries." The first concept should be part of the normal docking program. The second concept implies that the auxiliary engines are taken aboard during normal harbor time and installed while at sea.

Wartsila Diesel's heavy-fuel engine types are the Vasa 32 and Vasa 22 HF, covering an output range of 760 to 9,180 bhp in a speed range of 720 to 1,200 rpm. The main features of these engines are: starting, stopping, and running on heavy fuel over the entire load range, with no limitations; heavy-fuel operation with the same safety and realiability as when operating on distillate fuel; good economy due to built-in serviceability; low fuel and lube oil costs; and low spare parts consumption.

The technical features of the Wartsila heavy-fuel diesels, such as pressure lubrication of the piston skirt, load-dependent temperature control system, and a turbocharging system developed for good low-load performance, combined with a long-time severe-environment service experience, give an extra guarantee of reliable and economical operation.

The latest Wartsila Diesel development providing increased service reliability and economy is the company's engine condition monitoring system. Compared with previous engine monitoring systems on the market, the Wartsila system has been developed with an emphasis on reliability, price efficiency, and easy operation. By means of automatic temperature of the main bearings, pistons and cylinder liners, load balance and exhaust valves, the system provides protection against total breakdown. At the same time it functions as a reliable monitoring system. In addition to these advantages, the system's exhaust temperature control offers a new means of decreasing the fuel consumption of the engine.

WAUKESHA ENGINE

Circle 40 on Reader Service Card

An ongoing product development program between Waukesha Engine Division of Dresser Industries in Waukesha, Wisc., and Sulzer Brothers Ltd., Winterthur, Switzerland, will result in substantially improved fuel rates for the AT25 Series diesel now being produced at Waukesha. The AT25 Series encompasses in-line 6- and 8-cylinder units and V-12 and V-16 models rated from 1,620 to 4,800 bhp. These engines are capable of operating on heavy fuels up to 500 cSt at 50 C.

Recent A Series orders placed at the Waukesha factory included 8-, 12-, and 16-cylinder models, both for distillate and heavy fuel applications. Other recent activity includes the addition of an 8.8-liter Scania 6-cylinder model, F517DS. The Scania product line now covers the range 167 to 450 bhp.

VHP Series diesel propulsion and auxiliary drive diesels offer a range of 404 to 1,636 bhp at speeds up to 1,215 rpm.

WICHMANN

Circle 41 on Reader Service Card

Wichmann of Norway, represented in the U.S. by Wichmann Diesel, Inc. of Kenner, La., designs and manufactures diesel engines providing fuel efficiency, reliability, and high performance. Its latest model, the WX28, is a compact two-stroke, medium-speed diesel designed for heavy fuel and simple maintenance. An integral block and crankcase with fully forged crankshaft are dimensioned for 50-percent future uprating from the initial output of 408 bhp per cylinder.

The WX28 is a trunk piston, 600-rpm diesel with a bore of 280 mm and stroke of 360 mm, supplied in versions from four to 16 cylinders to give outputs in the 1,600-6,435-bhp range. This spectrum offers great flexibility, and most components are interchangeable between the in-line and Vee versions. As with other Wichmann engines, a low rpm makes this series particularly suitable for operation on heavy fuels down to 3,500 sec Redwood 1 at 100 F.

Use of the latest design techniques during development has resulted in a very simple valveless configuration. All main components are computer-analyzed for stress and temperature distribution. Another feature that distinguishes this series is the large, high-efficiency turbocharger and scavenging air fan, giving excellent low-load running ability.

The WX28 has a low weight/power ratio, and the compact design provides vessels with higher cargo capacity. The new design also offers improved environmental conditions on board, and more space in the engine room.

Providing fuel efficiency, reliability, and high performance, the WX28 has been designed specifically to offer maximum power with the lowest possible fuel consumption.

Circle 221 on Reader Service Card ➔

"THE GREAT WHITE FLEET", 1907

A CENTURY of LEADERSHIP. A TRADITION of EXCELLENCE.

Newport News Shipbuilding
A Tenneco Company

"DOROTHY", LAUNCHED 1890

"MISSOURI", LAUNCHED 1901

"SEAL", LAUNCHED 1911

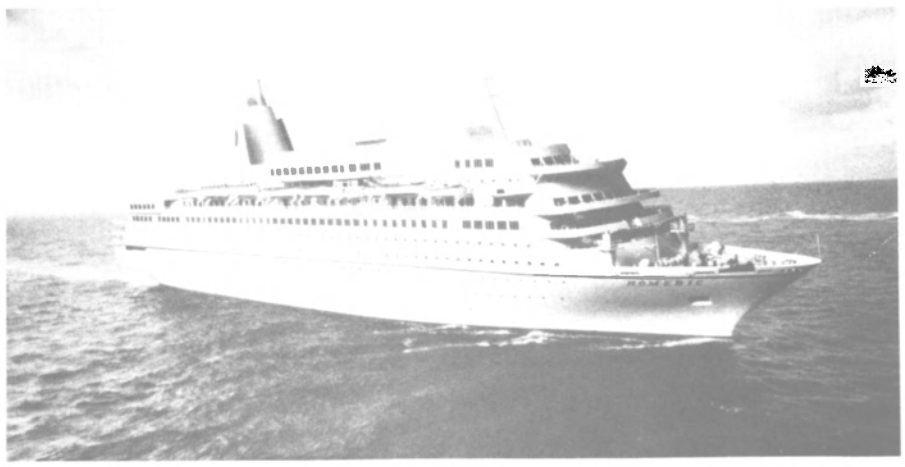
"ENTERPRISE", LAUNCHED 1936

"UNITED STATES", LAUNCHED 1951

"ENTERPRISE", LAUNCHED 1960

"NIMITZ", LAUNCHED 1972

"NEWPORT NEWS", LAUNCHED MARCH 15, 1986



M.A.N.-B&W-powered Homeric.

Meyer Werft Yard Delivers Luxury Cruise Ship 'Homeric' To Home Lines

The Jos. L. Meyer shipyard in Papenburg, West Germany, recently delivered the 42,092-grt passenger vessel Homeric to Home Lines Cruises, Inc. Built at a cost of $150 million, the 1,085-passenger cruise liner has an overall length of 670 feet, beam of 95 feet, and maximum draft of 23 feet. Eight of the ship's 12 decks are devoted to passenger accommodations, public rooms, and outdoor activities.

Meyer Werft won the contract to build the Homeric in 1984 against keen European competition. The order marked a new chapter in passenger ship construction at the yard. Subsequently, two additional cruise vessels were ordered at the Papenburg shipyard for delivery in 1988.

Main propulsion is provided by twin M.A.N.-B&W 10L55GB diesel engines, each with an output of 16,200 bhp at 155 rpm, driving two Lips controllable-pitch, highly skewed propellers. Service speed is 21 knots. The ship is fitted with Sperry Gyrofin stabilizers for passenger comfort and safety, and with two bow thrusters for enhanced maneuverability during docking and undocking.

Electrical power is provided by four MaK 8M453 medium-speed diesels, each driving a Brown Bovari generator. Navigation equipment includes two Krupp Atlas radars (one with ARPA), Magnavox satellite navigator, Simrad Loran C, Anschutz gyrocompass and autopilot, Anschutz course recorder, Plath radio direction finder, and JMC weather chart recorder. A satellite communications plant provides for telephone and telex service. A conventional communications system for radiotelephone and telex transmission via radio is also installed. Passengers can select the system they wish to use to communicate ship-to-shore from their cabins.

Classed by the American Bureau of Shipping and registered in Panama, the Homeric meets the applicable rules and regulations of the U.S. Coast Guard and the U.S. Public Health Service.

Initially, the Homeric will sail from New York to Bermuda, joining Home Lines' other cruise ship, the Atlantic, in offering regular seven-day cruises through October 18 this year. Following the Bermuda season, the new ship will continue to make seven-day cruises to the Caribbean from Fort Lauderdale, Fla., starting November 1.

$744,000 Contract Awarded Kollmorgen

The Electro-Optical Division of Kollmorgen Corporation, Northampton, Mass., has recently received a $744,000 competitive procurement for Trident submarine periscope spare parts. The contract includes a 100 percent option for follow-on spares.

Kollmorgen has been producing Trident periscopes for the U.S. Navy since 1977.

Coast Marine Celebrates 40-Year Anniversary With Successful Ladder Drop Test

To celebrate his 40 years in the industry, **Robert M. Salvarezza,** president of Coast Marine & Industrial Supply Inc., based in San Francisco, announced recently that his company has successfully completed what is believed to be the longest drop-test of a synthetic pilot ladder ever attempted by a manufacturer.

The ladder was a COMAR/MARK/I Pilot Ladder with an overall length of 160 feet. The test was accomplished with the use of a 180-foot crane. As prescribed by U.S. Coast Guard regulations and Underwriters Laboratories, the ladder was hoisted to the top of the crane in a rolled-up position, and with the use of a trip-line was released, allowing it to free-fall to its total length. After this was accomplished a 2,000-pound block of cement was attached to the lower step and was hoisted clear of the ground.

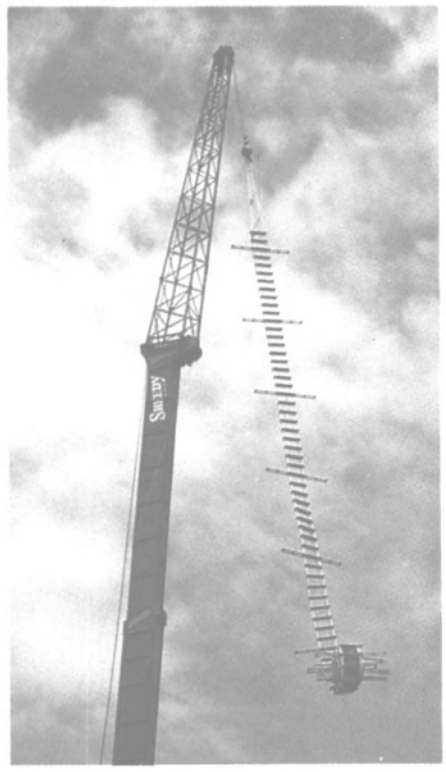
The complete drop-test was witnessed and approved by an inspector from Underwriters Laboratories, and U.L. has issued an approval.

Coast Marine has long been a pioneer providing major improvements in pilot ladders used on seagoing vessels throughout the world. Following recommendations of pilots all over the world and using their expertise in their field, Coast is producing a ladder which offers increased safety, longer service life, and the ladder can be rebuilt by reroping and re-griding the steps/spreaders.

The COMAR/MARK/I Pilot Ladder is USCG approved and accepted and indorsed throughout the world by such organizations as International Maritime Pilots Association (I.M.P.A.) and its 27 member countries; The Department of Trade England (D.O.T.); American Pilots' Association (A.P.A.); United Kingdom Pilots Association (U.K.P.A.); Panama Canal Pilots Association (P.C.C.); International Technical Committee (I.T.C.); and the European Pilots Association (E.M.P.A.), along with other countries such as Australia, Italy, New Zealand, Belgium, Canada, Germany, France, the Netherlands, and most recently, Japan. It has also received special mention in the latest edition of "Pilot Ladder Safety" by Capt. **Malcolm C. Armstrong.**

This industry-wide acceptance of the COMAR/MARK/I prompted the company to produce the COMAR/DEBARKATION Ladder which, the company reports, is manufactured with the same high quality materials and the same exacting standards as the COMAR/MARK/I, but does not use spreaders as do pilot ladders.

Utilizing rope specifically designed by an American manufacturer, this debarkation ladder is U.S. Coast Guard approved (approval #160.017/57/0) and is available in lengths up to 160 feet. Since the new SOLAS Regulation 48, Chapter III, which became effective July 1, 1986, made old style chain ladders obsolete, there should be great interest in this new COMAR ladder.



The COMAR/MARK/I Pilot Ladder is shown unrolling from atop the 160-foot crane just after being released by a trip line for the free-fall to its total length.

The ladder is shown above after completing the free-fall, when a 2,000-pound block of cement was attached to the lower step and hoisted clear of the ground.

There are to date over 1,000 COMAR ladders on ships throughout the world, including approximately 300 Navy ships.

The COMAR ladders are available worldwide with assembly stations in New York (COMAR NYC), Texas (COMAR HOU), California (COMAR SFC), and Japan (COMAR JPN).

For free literature containing full information,

Circle 56 on Reader Service Card

Vickers Yard Awarded $1-Billion RN Contract To Build Trident Sub

The British Governent has awarded a contract valued at some $1 billion to the recently privatized Vickers Shipbuilding & Engineering Ltd. (VSEL) of Barrow-in-Furness for construction of the first of four nuclear-powered Trident submarines. The contract includes about $308 million in first-of-class development costs that will not be included in contracts for the three follow-on boats.

Rolls Royce has been selected to develop the vessel's reactor and propulsion system (PWR 2), and General Dynamics will be responsible for the strategic weapons system spaces. To be named HMS Vanguard, the first Trident submarine is scheduled for delivery in the mid-1990s.

Bailey Announces Sales Management Appointments

Bailey Controls, Wickliffe, Ohio, has announced the following appointments in its domestic sales operation:

William T. Heist has been named manager of the newly formed Northeast Sales Region, which was created by the merger of the Eastern and Allegheny Sales Regions. Mr. **Heist** joined Bailey Controls in 1955 and has served in numerous sales capacities, most recently as the Eastern Regional manager.

John H. Sledge, Allegheny Region manager, has been named as the new sales manager for the Western Region and will be based in Los Angeles. Mr. **Sledge** joined Bailey in 1982.

Charles Kaliszewski has been promoted to manager of sales operations for Bailey Controls. He has been with the company since 1985 and headed its Market Research Group.

Bailey Controls, a division of Babcock & Wilcox, a McDermott company, is a major worldwide supplier of instrumentation, controls and computer systems.

Free Brochure Details Delaval's OEM Overhaul Of U.S. Navy Equipment

A free brochure entitled, "Service at the Source," published by Transamerica Delaval details the original equipment manufacturer (OEM) capabilities of the company's Turbine and Compressor Division for the overhaul of U.S. Navy pumps, gears and turbines.

With more than 80 years' experience designing, manufacturing, testing and repairing their equipment, Transamerica Delaval's Turbine and Compressor Division is a reliable source for overhauling Delaval pumps, gears and turbines used on U.S. Navy vessels.

The publication describes how Delaval personnel thoroughly inspect equipment and check individual parts against original or updated specifications. New components, made to original equipment specifications using state-of-the-art technology, can be manufactured and installed whenever necessary. Overhaul equipment can be tested prior to reinstallation, thereby minimizing the need for onboard testing. Testing procedures include: turbine rotor balancing at operating speed in a vacuum bunker, compilation of electronic strip chart showing governor performance, and where applicable, overspeed trip setting.

The brochure also describes how a complete Transamerica Delaval overhaul lowers operating costs and helps maintain fleet readiness. Transamerica Delaval guarantees support after the equipment is put back into operation, so the Navy and its contractors receive ongoing troubleshooting assistance if needed.

Transamerica Delaval's Turbine and Compressor Division, located in Trenton, N.J., manufactures high-speed rotating machinery for energy conversion markets. The company is headquartered in Lawrenceville, N.J., and is comprised of 15 worldwide divisions manufacturing a wide variety of engineered products.

For a free copy of this brochure from Transamerica Delaval,

Circle 72 on Reader Service Card

SNAME Lakes/Rivers Section Holds Spring Meeting In Louisville

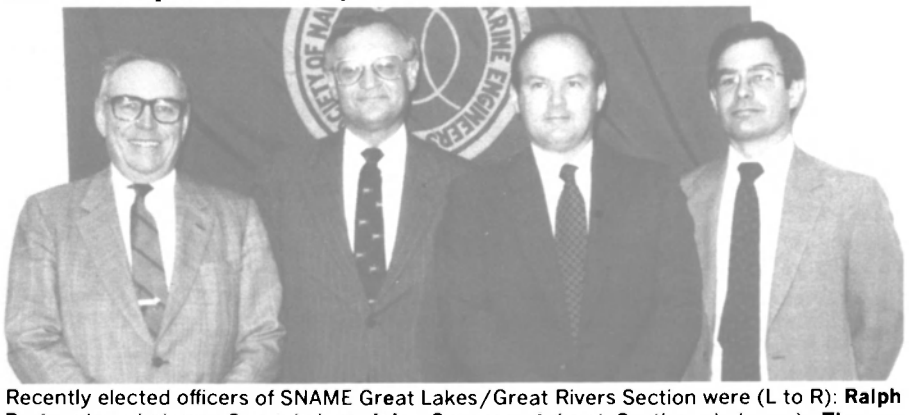
The Spring Meeting of the Great Lakes/Great Rivers Section of The Society of Naval Architects and Marine Engineers was held recently in Louisville, Ky. On the eve of the meeting an Early Bird reception was hosted by American Commercial Barge Lines, Cummins Engine, Falk, Western Diesel, and Whayne Supply.

The formal meeting opened with a brief business session at which new Section officers were elected for the 1986-87 season. They are: **Thomas Mackey,** chairman; **John Capin,** vice chairman-Great Rivers; **Ralph Bertz,** vice chairman-Great Lakes; and **Ian Sharp,** secretary-treasurer.

Attendees were then brought up to date on plans for the 1988 Spring Meeting-STAR Symposium that will be hosted by the Section in Pittsburgh in June 1988. This will be the first internationally sanctioned STAR Symposium; its theme will be to emphasize the truly world-wide nature of the marine industry in general and marine engineering in particular.

The technical portion of the meeting featured the following papers: "High-Performance Rudders—With Particular Reference to the Schilling Rudder," by **Peter Bingham** of Industramar (presented in his absence by **Thomas Mackey**); "Aeromarine System as Installed on M/V Hoosier State," by **Robert Hertzberg** of Cargo Carriers; "Waste Heat Recovery System," by Prof. **John Woodward** of the University of Michigan; and "Gensets for Uni-Fuel Operation and the Flexible Layout," by **Edward Waryas** of American M.A.N.

Following lunch the members and guests departed for a tour of the General Electric appliance assembly plant, where the state of the art in both the application of large-scale industrial robotics and employee relations were demonstrated.



Recently elected officers of SNAME Great Lakes/Great Rivers Section were (L to R): **Ralph Bertz,** vice chairman-Great Lakes; **John Greenwood** (past Section chairman); **Thomas Mackey,** chairman; and **John Capin,** vice chairman-Great Rivers.

ELECTRONICS UPDATE

Standard-C: Low-Cost Satellite Communications Terminal

The International Maritime Satellite Organization (INMARSAT) has developed specifications for a new lower-cost, very small satcom system that will, for the first time, bring the benefits of satellite communications within the reach of all sizes and types of vessels.

The Standard-C concept received an important boost in April, when the International Maritime Organization (IMO) agreed to accept Standard-C to satisfy the basic communications requirements of the Future Global Maritime Distress and Safety System (FGMDSS) for all ships of 300 grt and over operating within the coverage areas of INMARSAT satellites.

Unlike the normal Standard A terminal, which provides full duplex telephone and telex service, Standard C will be teletype only. So far, only prototypes have been shown, but INMARSAT expects manufacturers to be offering production models very quickly. The prototype was built at INMARSAT from readily available components. It measures 12 × 8.5 × 5 inches and weighs only 13 pounds, excluding the battery pack or main supply unit. It may be estimated that when produced in volume for the commercial market, Standard-C terminals will be significantly smaller, lighter and more power efficient than the prototype. To minimize final costs still further, Standard-C will be able to operate using a small, omnidirectional, non-stablilized antenna and may form part of a single unit containing all of the microwave and signal processing electronics. The unit could be mounted high on the vessel, giving it a clear, unobstructed view of the horizon, like a VHF antenna. It could be connected to the data terminal equipment below decks through a single cable providing the interface and power. The choice of data terminal equipment may range from a simple keyboard entry and display device to a microcomputer system capable of preparing and displaying received messages and monitoring and controlling the numerous other functions on the vessel. INMARSAT says that production models will probably cost no more than $5,000.

The Standard-C system provides data transmission between the ship and coast earth stations and vice versa, at an information rate of 600 bits per second. At the coast earth station, all messages received from the ship or terrestrial subscriber will be routed through a store-and-forward message switch. This may, in turn, provide access to and from a variety of telecommunications services, such as telex, teletex, voice-band data, packet switched data networks and elapsed lines. Standard-C will therefore be able to access virtually any telecommunications service with the exception of telephone, according to INMARSAT.

In addition to international telex, the potential to access such a wide variety of communication services will make possible all types of data services, such as electronic mail and public data banks, through voice-band data networks or packet switched data networks and exchange computer files between compatible systems on board and ashore. It may also be used for monitoring data collection and for control purposes where totally automatic operation may be desirable. Standard-C, says INMARSAT, may become the "workhorse of marine communications" in the 21st century, just as Morse key was in the past.

For further information,

Circle 49 on Reader Service Card

What's Wrong With Being Remanufactured?

Nothing at all! Just as Miss Liberty's grea looks have been completely restored, you ca obtain a Remanufactured Coffin® Turbo Pun designed to original engineering specification and tolerances.

With internal clearances restored to origin specifications, your remanufactured Coffin® pump will reduce operating and maintenance costs, and minimize downtime.

A Coffin® pump remanufactured by FM also gives you OEM quality, at competitive pri

Think about it — some things **are** worth restoring to their original qualities.

FMC Coffin® Turbo Pump

326 South Dean Street, Englewood, N.J. 07631

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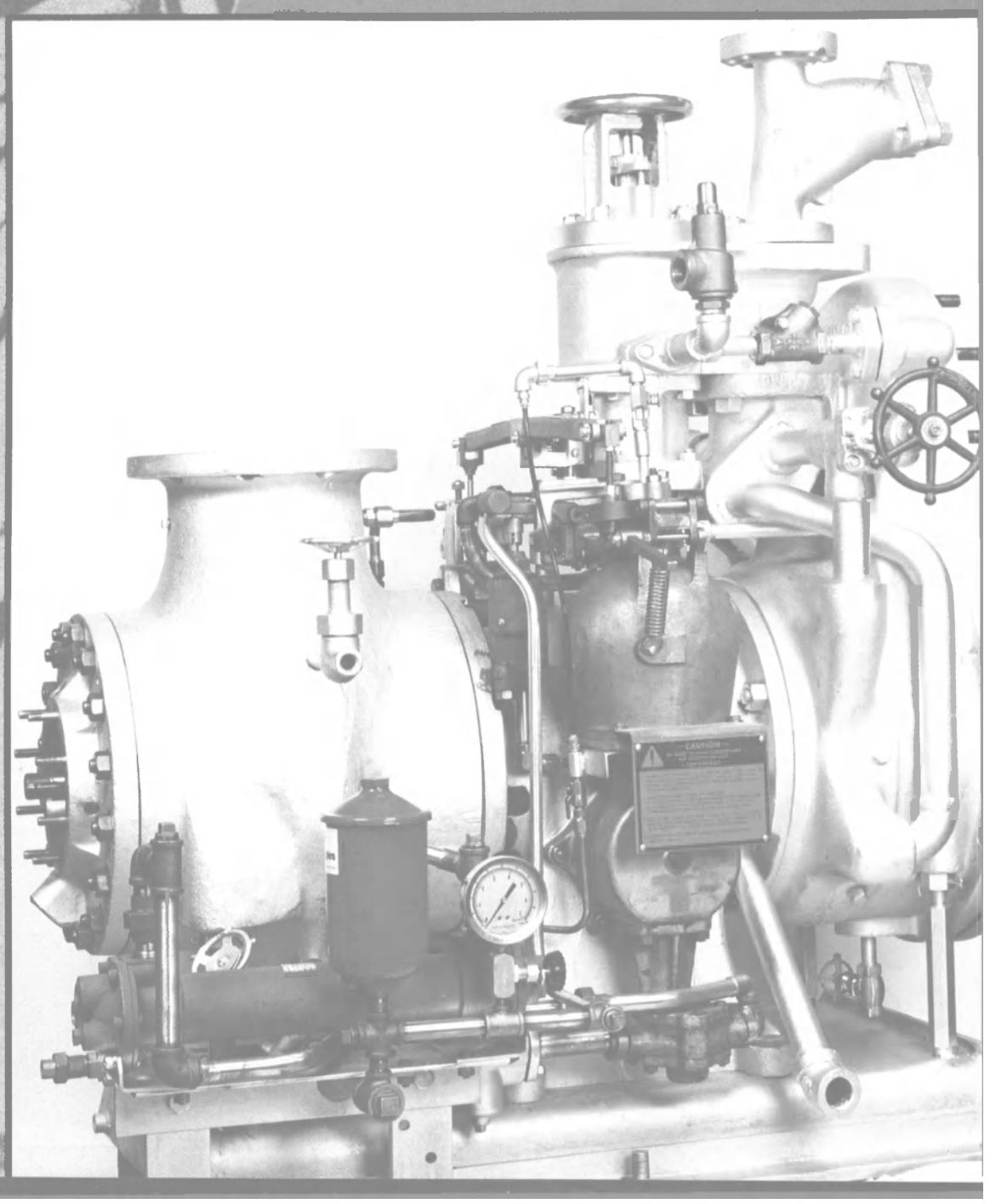


Port Of Portland Reports Soaring Imports Of Cars From Japan And Korea

Automobiles being imported from Japan and South Korea through the Port of Portland (Oregon) have grown to a record rate of 1,000 units a day during recent months, and are expected to soar even higher during the coming months. Executive director **Lloyd Anderson** reports that Toyota, one of three major car builders using Portland as a port of entry, expects to ship in a total of 100,000 vehicles during the four-month period beginning in June. The other car builders using the Port of Portland are Honda, and beginning this year Hyundai of South Korea.

Auto imports at Portland totaled nearly 341,000 during 1985. For the first three months of this year the total was 91,252, an increase of 37.4 percent over the same period in 1985. Continued imports at this rate would enable the port to handle more than 460,000 cars this year. Port officials estimate that each vehicle moving through Portland adds $200 to the local economy.

For full information on facilities offered by the Port of Portland,

Circle 88 on Reader Service Card

Kline Appointed VP And Technical Director Of R.A. Stearn, Inc.

Roger Kline

The appointment of **Roger G. Kline** as vice president and technical director of R.A. Stearn, Inc., Naval Architects and Marine Engineers, was recently announced by the firm. In his new position, Mr. **Kline** will be charged with the day-to-day management of the firm's activities, in addition to his prior responsibilities as technical director.

Prior to association with R.A. Stearn, Inc., Mr. **Kline** was a vice president of David J. Seymour, Ltd., a naval architecture and marine engineering consulting firm located in San Francisco. Mr. **Kline** joined R.A. Stearn, Inc. in 1978. He is a Registered Professional Engineer in the State of Wisconsin.

Miller Electric Offers New Diesel Welding Generator —Literature Available

A compact, smooth and quiet diesel powered DC arc welding generator with solid-state current control, BIG 30 Diesel is a product of Miller Electric Mfg. Co., Appleton, Wis. The new solid-state design assures a stable, consistent output of welding power, even as the unit heats up and cools down. The noise level of this new 1,800-rpm model is a quiet 78 db(A) at 23 feet (7 meters).

Powered by a Perkins 4.108 smooth four-cylinder engine, the unit is small enough to fit across the box of a standard size pickup truck. BIG 30 Diesel supplies 3 KVA of 120/240 volt AC auxiliary power while welding.

For shielded metal arc (SMAW) welding, the unit is NEMA rated 200 amperes, 100 percent duty cycle, 28 volts DC, or 250 amperes, 60 percent duty cycle, 30 volts DC. There are five separate welding ranges with fine adjustment in each, ample open circuit voltage for easy arc starts, and automatic idle device for weld and auxiliary power modes. Auxiliary power is 3 KVA, 120/240 50/60 Hz while welding, with circuit breaker protection.

Other features include a quiet, built-in muffler; primary and secondary fuel filters with water trap and drain; key operated glow plugs for cold weather starting; "maintenance free" battery. Weld current can be adjusted and tuned on and off at the work site with optional remote controls.

For free literature,

Circle 75 on Reader Service Card

S.S. White Offers Free Brochure On Flexible Reach Rods

A free brochure is being offered by S.S. White Industrial Products on their line of havy-duty flexible reach rods, available to the marine industry for remote valve control up to 40 feet from the valve site.

S.S. White Industrial Products' pre-lubricated heavy-duty flexible reach rods have been designed to accommodate valves from 3/4 to 16 inches in diameter, and are available in three sizes. They are said to be ideal for controlling valves in difficult to reach, inaccessible, or hazardous areas, and eliminate a major problem with rigid rod systems.

S.S. White Industrial flexible reach rods provide a mechanical system which can be quickly and easily installed, and will manually operate a remote valve with efficient reliable safety. They provide smooth turning, low maintenance and long life. They resist corrosion and vibration.

For your free copy of the S.S. White Industrial brochure, which contains technical information on the three sizes of flexible reach rods,

Circle 82 on Reader Service Card

Lorenz, Trotter And Waldorf Named To Zapata Board Of Directors

George A. Lorenz, Jack T. Trotter and **Kenneth W. Waldorf** were elected to the board of directors of Zapata Corporation of Houston at the recent annual stockholders' meeting. All will serve three-year terms expiring in 1989.

Mr. **Lorenz** has been a member of the board since 1979. He retired in 1969 as general manager of research and development for the marketing, transportation and manufacturing departments of Shell Oil Company.

Mr. **Trotter,** a new member of the board, is an attorney and private investor.

Also a new member of the board, Mr. **Waldorf** is chairman and chief executive officer of Zapata Gulf Marine Corporation, a position he assumed when Zapata Gulf was formed in 1984. From 1983 to 1984 he was president of Zapata's offshore drilling subsidiary. He joined Zapata in 1973, and served as president of the company's marine service subsidiary from 1974 to 1983. From 1984 to 1985 he was also senior vice president-marine operations of Zapata Corporation.

NASSCO Appoints Janice S. Shanklin

Janice Shanklin

National Steel and Shipbuilding Company (NASSCO) has announced the appointment of **Janice S. Shanklin** to the position of director, Information Systems.

In this capacity, she reports directly to **R. H. Vortmann,** president, who said, "This will provide a single, company-wide focus for all data processing-related hardware and systems activities."

Ms. **Shanklin** received her B.S. degree in mathematics from the University of California at Irvine. In addition, she has completed postgraduate studies at UCLA.

Her NASSCO career began in 1974 when she joined the company as a cost analyst. Subsequent promotions included supervisor, Material Control, supervisor, Cost Analysis, chief, Material Control, manager, Material Planning and Control, manager, Manufacturing Systems, and manager, Systems and Programming.

Circle 306 on Reader Service Card ➔

Sea-Land Unit Restructured —Baker Appointed Vice Chairman And COO

Jackson A. Baker has been promoted to the new position of vice chairman for Sea-Land Service, the principal operating unit of Sea-Land Corporation. He was also named chief operating officer for Sea-Land Service and executive vice president-operations for the parent company.

R. Kenneth Johns will continue as president of Sea-Land Service, and **Joseph F. Abely Jr.** as chairman and chief executive officer.

Mr. **Baker,** who has been with Sea-Land for 23 years, was previously group vice president-Atlantic. He will be responsible for operations and marketing for the five major trades served by the containership operator, one of the world's largest.

Other major management changes include: **Jack A. Drobnick** has been appointed group vice president-North American operations; **John P. Clancey** has been named group vice president-Pacific; and **Wilford W. Middleton Jr.** becomes group vice president-Atlantic.

John R. Pyron will continue as executive vice president but will also be responsible for the company's Alaska division and its Americas division; the latter division services Central America and the Caribbean.

Goltens Uses Diversity To Seek New Markets

In accordance with its policy that diversity makes good business sense, Goltens, the 45-year-old worldwide marine diesel service organization, has undertaken a number of projects in fields beyond a strictly marine environment, but in areas in which Goltens is equally at home.

The firm's latest ventures include work on special elevator equipment for a New York City water tunnel project, a Rikers Island cogeneration installation designed to reduce power supply costs, and the company's new Hydraulic G-Pump, a tool originally developed for marine use that has won wide acceptance in general industry.

According to the company, none of Goltens's new ventures has been at the expense of the firm's original business: marine diesel engine service, with a specialty of in-place crankshaft repair. To the contrary, Goltens says marine business is expanding rapidly, with new assignments announced on a regular basis by the company's global network of offices.

Goltens's main American branches are located in Brooklyn, N.Y., Miami, Fla., Wilmington, Calif., and Fairhaven, Mass. In addition, there are facilities in Hong Kong, Singapore, Holland, and Norway.

For further literature containing full information on Goltens' services and capabilities,

Circle **85** on Reader Service Card

ACBL towboats Don Stephens (left) and Al Pannier were christened in Cairo, Ill.

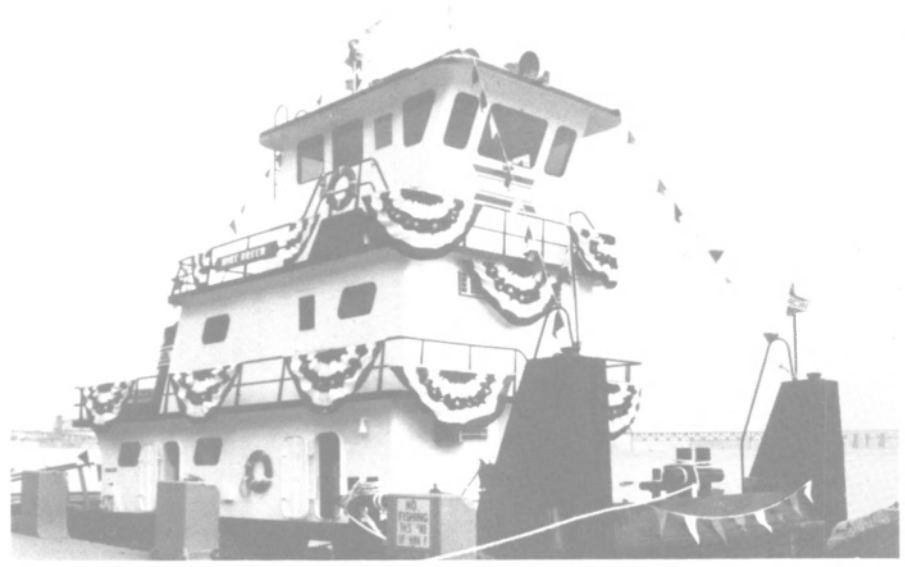
ACBL Rechristens Three Newly Acquired River Towboats

American Commercial Barge Lines (ACBL), headquartered in Jeffersonville, Ind., recently christened three towboats that it purchased from other companies. The renaming ceremonies for two of the vessels—the MV Don Stephens (ex-Miss Rosie) and the MV Al Pannier (ex-MV United States)—were held in Cairo, Ill. The third boat, the MV Mike Breen (ex-Miss Dee) was rechristened in Louisville, Ky.

The Breen, powered by two 16V 92 Detroit Diesel engines with a total output of 1,560 bhp, is named for **Mike Breen,** ACBL's superintendent of boat maintenance. The Stephens, as sister vessel of the Breen with the same power plant, is named for **Don Stephens,** currently master of the ACBL towboat W.T. Toutant, which operates mainly on the Mississippi River.

The Pannier, formerly the 180-foot towboat MV United States that was built for Federal Barge Lines by St. Louis Ship and delivered in 1958, is named for **Al Pannier,** general manager of Louisiana Dock Company, a marine supply, repair, and fleeting operation in Cairo. Both LDC and ACBL are subsidiaries of American Commercial Lines, Inc. of Jeffersonville.

The Breen and the Stephens will continue to serve as operating towboats. The Pannier, whose four diesels (10,500 total bhp) have been removed, will be used as a floating office quarters moored at Louisiana Dock's facility at mile 975 on the Ohio River near Cairo.



Towboat Mike Breen, sister vessel of the Stephens, was renamed in Louisville, Ky.

Marathon LeTourneau Awarded Contract For Platform Rig Project

Marathon LeTourneau Company's Brownsville, Texas, unit has been awarded a contract for the fabrication and modification of platform drilling rigs by Helmerich and Payne of Tulsa, Okla.

The contract calls for Marathon to fabricate a new platform drilling rig designated H&P Rig 106 (drilling depth capability 25,000 feet), along with a 56-person quarters. The rig will work on Green Canyon Block 18 in the Gulf of Mexico for Mobil Oil Exploration and Producing Southeast, Inc., and Mobil's partners, Monsanto, Diamond Shamrock and Kerr McGee.

Fabrication work is scheduled to be completed in October 1986. This project will be the second unit of this kind to be fabricated at Marathon LeTourneau's Brownsville, Texas facility for H&P IDC.

For more information, including complete color literature describing the yard's services and facilities,

Circle **95** on Reader Service Card

MTCR Introduces New Shipboard Engineering Training Systems

—Free Literature Available

Research and experience indicates . . . initially through Navy submarine fire control training and later through shiphandling training . . . that using sophisticated computer-generated models during classroom review of training conducted during computer-based simulation is valuable, particularly when the material is presented via a large screen display. Through instructor and student interactive use of computer-driven review equipment, key concepts are effectively illustrated, reducing training time by up to 50 percent and achieving better student understanding of the underlying concepts associated with the complex process being simulated. These impressive results cannot be matched by traditional simulation training methodology. Additionally, the graphic presentation of student performance data during simulator exercise critique sessions can provide important insights on student performance that traditional discussion cannot match.

Based on the success of these new computer-based capabilities in various training applications, it was suggested that they may also have substantial benefits for training marine engineering skills. In 1985, District 2, MEBA-AMO, Safety and Education Plan joined with the U.S. Maritime Administration in a Cooperative Research Program to develop a prototype system for marine engineering training applications. The Computer-Aided Marine Engineering Training System (CAMETS), developed by Ship Analytics during this program, consists of a micro computer, a graphics terminal employed as an instructor station, and a large screen display system driven by a Ship Analytics-developed software program. (See Figure 1).

CAMETS is presently being utilized to support ongoing training at the Maritime Training and Research Center (MTRC) simulation facility in Toledo, Ohio. Operating Systems include:

• A medium-speed diesel propulsion system comprised of twin diesel engines modeled on a Pielstick 2.2 "V" 16-cylinder turbocharged medium-speed reversable engine.

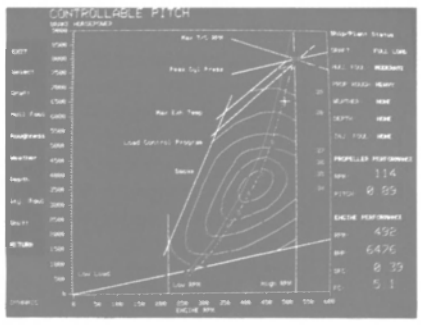


Figure 2: Controllable Pitch Visual.

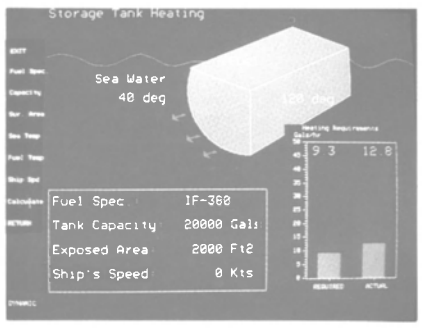


Figure 3: Storage Tank Heating Visual.

• An electrical generation system comprised of one turbo and two diesel alternators which can be configured to a variety of training requirements.

• Cargo/ballast system based on a Great Lakes self-unloading bulk carrier with five cargo holds and 13 ballast tanks.

CAMETS can be employed to provide a variety of interactive graphic displays—illustrated in Figures 2 and 3—which can be effectively utilized even if a training facility does not have an engine room simulator. These "stand-alone" displays allow the instructor to change a wide variety of settings (e.g., fuel temperature, injector fouling) on the simulated engine, and illustrate graphically their impact on engine performance.

The "linked" displays, which obtain their data from exercises conducted on the engine room simulator, graphically depict variations in key engine parameters and student control actions over the entire exercise period. Multiple parameters can be presented on one display, facilitating instructor/student discussion of key interactions (e.g., the impact of turbocharger fouling on fuel consumption). Key benefits of this technology are:

• Reduction of the time required to achieve specific learning objectives, resulting in course length reduced by 50 percent.

• Reduction of the need for an instructor through self-teaching modes thereby increasing instructor productivity and the required ration of instructors to trainees.

• Built-in measurement of trainee performance to assure learning is achieved.

• Overcomes language barriers and instructor-related variables which play a dominant role in effective training (e.g., the computer model, arranged graphically, is easily understood by the trainee as opposed to an instructor's attempt to explain a complex multi-variable process in his own words).

A one-week training program was designed specifically to implement CAMETS, primarily for chief engineers. However, the majority of the material covered is also appropriate for watch-standers, prospective watch-standers, and shore-side personnel. The program focuses on the effective operation of a medium-speed diesel plant with a controllable-pitch propeller. Other potential shipboard energy-saving areas, such as proper tank heating and vessel operational planning, are also addressed. The training program, using both the MTRC engine room simulator and the Computer-Aided Marine Engineering Training System, translate into effective dollars saved through energy movement.

Additional courses offered at the MTRC are: Casualty Control and Emergency Procedures; Effective Monitoring of Unattended Machinery Spaces; Diesel Plant Operation for Steam Engineers; and Operation of Automatic Load-Sharing Electrical Generator Systems.

For more information on available training programs and a free copy of the MTRC brochure,

Circle 54 on Reader Service Card

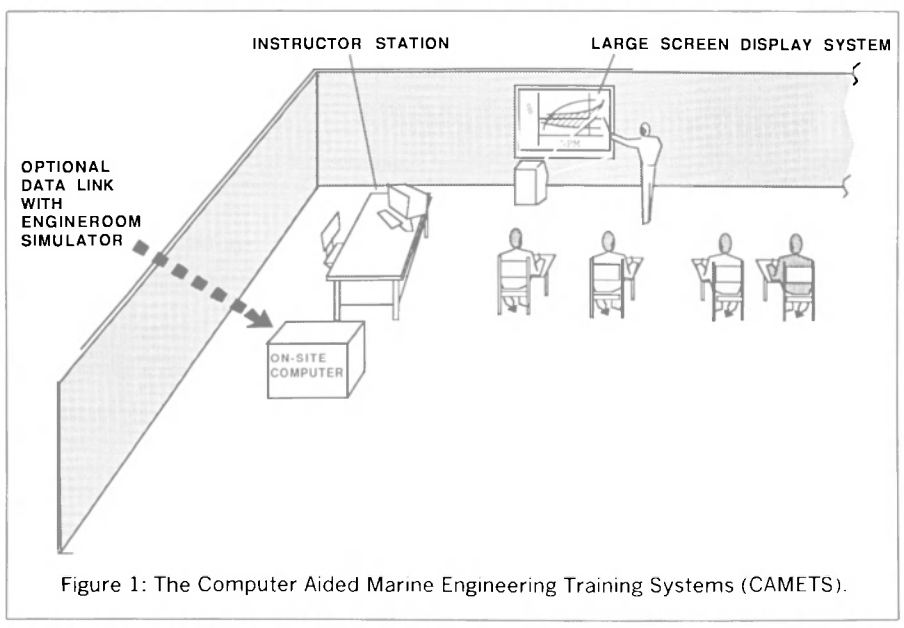
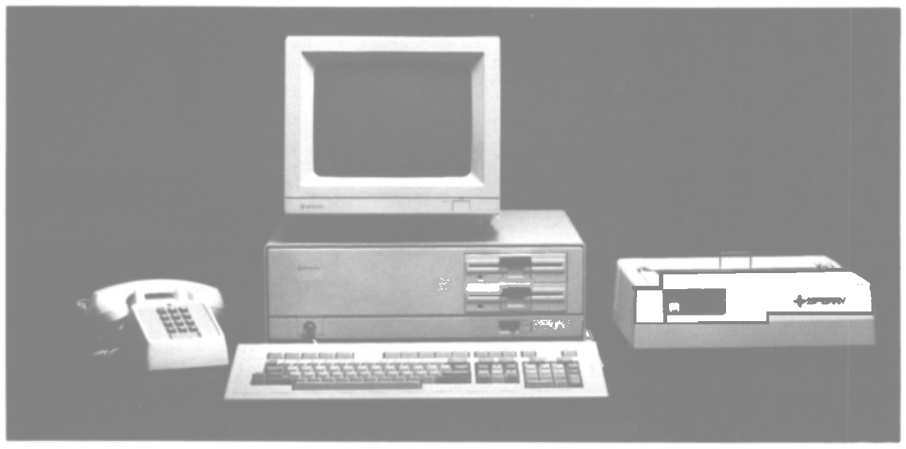


Figure 1: The Computer Aided Marine Engineering Training Systems (CAMETS).

ELECTRONICS UPDATE

Sperry Introduces Advanced Satellite Communicators

—Literature Available



Sperry MCS2B Satellite Communicator

The Sperry Corporation of Charlottesville, Va., has introduced the Sperry MCS2 Series satellite communicators for marine applications.

The MCS2 series comes in two models, the MCS2A and MCS2B. Both represent state-of-the-art technology applied to the marine environment. The MCS2 series provides, in a proven, effective, easy-to-use package, instant communications with access to telephone and telex networks throughout the world.

Simplicity of operation is stressed in the series. Step-by-step operator menus are displayed on the user-friendly visual display unit (VDU) and are executed using standard keyboard-driven software. These all-new below decks components are complemented with a modern lightweight antenna. This compact design and the use of standard cabling reduce installation and maintenance costs.

MCS2 Satcoms are Standard A, Class I Inmarsat Ship Earth Stations providing two-way telephone, telex, and data links between ship and shore at any time of the day or night, through the Inmarsat satellites and coast earth stations.

The speed, clarity and dependability of these next-generation Satcoms provide many opportunities for using modern information and automation technology in ship management.

The Sperry MCS2A offers all these features and can interface with facsimile machines, onboard computers, remote telephones, vessel PBXs, and the Sperry Integrated Data Communications System which includes the Starbaud module for high speed, 2400-baud transmission of reports, lisings or charts.

The MCS2B operates similarly, but features a full-color, ruggedized Sperry personal computer as the operator's control unit. The computer may be used for word processing and general shipboard management duties, using a large selection of commercially available software, simultaneously with operation of the Satcom. Telephone call initiation or reception is possible while the terminal is being used for word processing or other computer functions. With the addition of the Starbaud module, the MCS2B becomes a powerful compact Integrated Communications System.

For further information and free literature on the new Sperry MCS2 SatCom Series,

Circle 52 on Reader Service Card

Sanborn Named President Of Sonat Marine Inc.

James H. Sanborn has been elected president of Sonat Marine Inc. of Philadelphia. The announcement was made by **Ronald L. Kuehn Jr.,** chairman, president and chief executive officer of Sonat Inc., the parent company of Sonat Marine.

Mr. **Sanborn** succeeds **Stephen A. Van Dyke,** who recently became chairman of Sonat Marine and senior vice president of the parent company. He joined Sonat Marine in 1978 as a division vice president for the East Coast, and was named vice president-operations in 1982. Prior to joining Sonat, he held executive positions with other marine transportation companies.

He is a graduate of the U.S. Merchant Marine Academy. Following service in the Navy and merchant marine, he earned an MBA degree from the University of Pennsylvania's Wharton School of Business.

Sonat Marine is one of the largest independent marine carriers of petroleum products in the U.S. The company operates a fleet of 42 tank barges and 33 tugboats to transport crude oil and refined petroleum products along the Atlantic and Gulf Coasts.

PROPULSION UPDATE

Wärtsilä Diesel Introduces A New Compact V8 Engine

—Literature Available

The new compact high-performance Wartsila Vasa 8V22 is the latest development of Wartsila Diesel's Vasa 22HF engine series. This small, low-weight engine has an output of 1,160-1,400 kw (1,576-1,904 bhp) at 900-1,200 rpm. Although only recently introduced, the engine has already generated great interest, and the first Vasa 8V22 has already been sold for propulsion on a Dutch fishing vessel.

The low weight and small size of the Vasa 8V22 are the result of a design concept aiming at a powerful, compact V engine using high-quality materials in the main components. The cylinders are arranged at a 60-degree angle. The engine is fully balanced and suitable for resilient mounting. The nodular cast iron engine block is cast in one piece and combines thoroughly dimensioned channels and reinforcements to provide rigidity. The result is a frame that maintains its shape and provides a good basis for the efficient functioning of reciprocating and rotating parts.

The crankshaft, with hardened pins and journals, is forged in one piece. The shaft is highly rigid because it is short. These features result in longer service life and greater reliability for both bearings and crankshaft. Monoblock nodular cast iron pistons with hardened ring grooves and the Wartsila-patented pressure-lubricated skirt ensure safe operation.

A pulse charging system with a high-efficient turbocharger provides good load-taking capacity and high performance at all loads. The UIC test shows a low exhaust gas temperature level, 475° C after the cylinder, at an engine output of 1,650 kw and all deviations within +/− 15° C. Moreover, the emission values of the exhaust gases are low.

Cross section 8V22

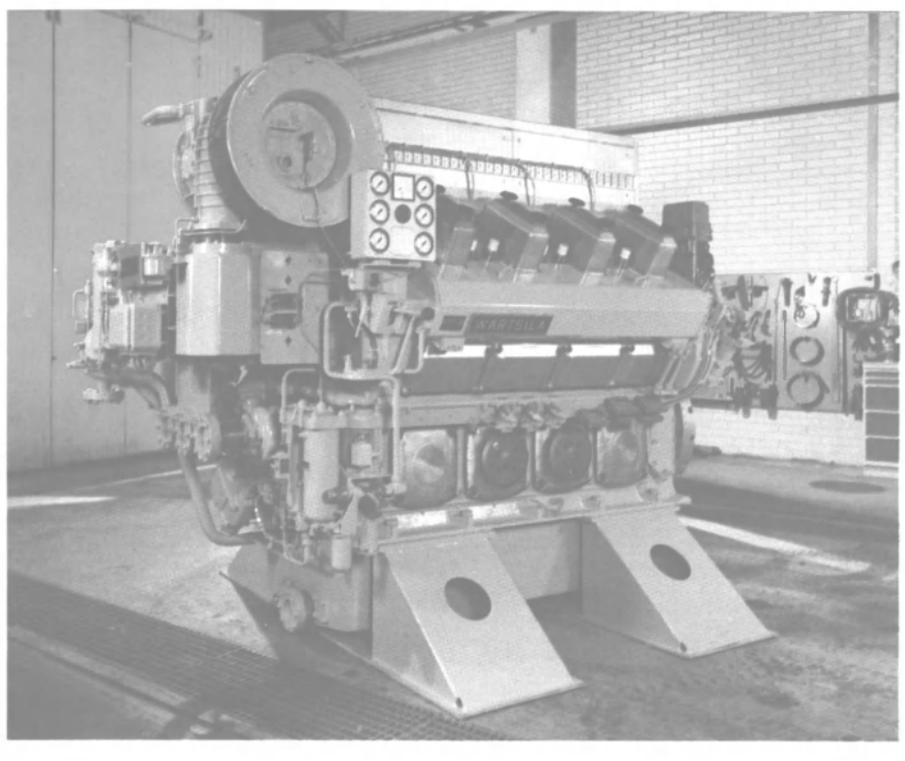
A new type of generating set has also been developed by Wartsila Diesel to match the compact engine design. This arrangement includes a flange-mounted alternator bolted to the engine front and to the welded oil sump. Mounting the alternator is easy because of a special coupling design that absorbs small shaft alignment divisions.

Wartsila Diesel, manufacturer of the Wartsila Vasa type engines, is a leading maker of medium-speed diesel engines. Wartsila Diesel comprises the Vasa and Turku diesel factories in Finland, the Trollhattan factory in Sweden, the La Ciotat factory in France, as well as a factory in Singapore.

With more than 4,500 diesel engines delivered to 45 countries, Wartsila Diesel has a great deal of experience in both marine and land-based installations of various types.

Detailed literature is available fully describing the new Wartsila Vasa 8V22 diesel engine and the new generating set. For free copies,

Circle 53 on Reader Service Card



Sembawang Diversifies Into Salvage And Towing

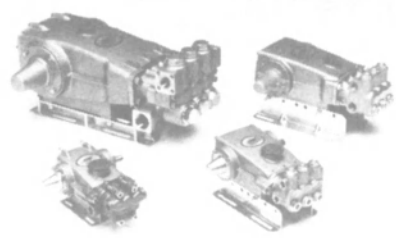
The Sembawang Group of Singapore has announced its entry into the international salvage and towing business with the launching of a new subsidiary, Sembawang Salvage Co. Pte. Ltd. (SEMCO). The initial investment is reported to be S$35 million (about $15.7 million). The new company was formed by acquiring the core salvage fleet and key personnel from Selco, the marine division of Pan-Electric Industries.

In announcing the acquisition, Sembawang Group chief executive **C.N. Watson** stated: "We have not bought the existing Selco salvage companies. We have acquired the core salvage fleet and the key personnel in order to retain Selco's leading salvage industry position East of Suez."

The acquisition includes nine salvage and towing tugs, 13 other support craft, and salvage equipment, as well as 60 staff members and 180 seagoing personnel.

SEMCO is a 50-50 joint venture between Sembawang Towing of the Sembawang Holdings Group and Temasek Holdings Pte. Ltd.

Cat Pumps Introduces Corrosion-Resistant Line —Literature Available



Cat corrosion-resistant plunger pumps.

Cat Pumps Corporation of Minneapolis recently unveiled a line of corrosion-resistant plunger pumps featuring aluminum bronze manifolds and 316 stainless steel or Nitronic 50 wet-end parts. Durable ceramic plungers, preset lubricated seals, and unique internal porting are said to make these pumps practically maintanance-free. The forged, nitrited chrome-moly crankshaft gives them unmatched strength and hardness.

Single or multiple-pump installations provide unlimited application versatility. These pumps provide the quality materials needed for such demanding applications as reverse osmosis and saltwater/wastewater injection, or the flexibility and mobility for in-plant jobs such as central cleaning systems, sanitizing, mold and conveyor cleaning, paint removal, or fleet washing. Seven models provide capacities ranging from 3.5 to 36 gpm, and pressures from 1,200 psi to 5,000 psi.

A complete line of pumps, parts, and complementary fluid controls is available through Cat Pumps' worldwide network of sales and service representatives.

For additional information on the Cat Pump product line,

Circle 80 on Reader Service Card

Fulkerson Named VP And General Manager, Chevron Shipping

Chevron Shipping Company recently announced that **John B. Arado,** vice president and general manager of the operations department, has elected to retire, effective August 1, after nearly 30 years of service. The company also announced that **Edward F. Fulkerson,** presently manager of the ports and navigation division in Chevron Shipping's operations department, has been named to succeed Mr. **Arado.**

Mr. **Arado** joined Chevron in 1957, with initial assignments in the manufacturing department. He subsequently served in a variety of analytical posts before joining Chevron Shipping in 1972. He held maintenance and engineering posts of increasing responsibility before being named to his present post in 1984.

ELECTRONICS UPDATE

A Report On The New Magnavox GPS Positioning & Navigation System

The new MX 4400 GPS Positioning and Navigation System from Magnavox is accurate, compact and housed in a sealed enclosure. The MX 4400 is designed to a wide variety of today's commercial GPS positioning and navigation requirements.

Magnavox reports the MX 4400 is a full-featured two-channel C/A code receiver.

Magnavox has designed the portable MX 4400 system both for use with the current interim GPS constellation and with increasing utility as more satellites are deployed. GPS is the extremely accurate satellite navigation system being developed by the U.S. Department of Defense. Once in full service, GPS will provide continuous position fixes anywhere in the world, 24 hours a day. Seven GPS satellites are currently in operation. There will be 18 active satellites once the system is fully operational.

The two-channel receiver provides continuous GPS navigation, without interruption, whenever sufficient satellites are available. The MX 4400 can navigate with as few as two visible satellites when an external atomic frequency standard is interfaced and altitude is known (sea level) or determined from the receiver's altimeter. This capability extends the number of hours per day that the MX 4400 receiver can be used. To provide navigation during GPS coverage gaps, the MX 4400 will automatically dead reckon using inputs from external speed and heading sensors.

Magnavox plans to introduce software in 1987 to permit the MX 4400 to accept GPS differential corrections in the standard RTCM SC-104 format. The differential inputs will result in enhanced dynamic accuracy in real time.

The MX 4400 is housed in a sealed, waterproof case assuring dependable operation, even in harsh environments. In order to provide continuous, optimum navigation and positioning information, the system employs an 8-state Kalman filter which evaluates and weighs satellite data. A 16-bit numerical coprocessor provides position, speed and heading updates every 1.2 seconds. The system has the capability of providing GPS data to integrated survey systems such as the Magnavox Series 5000 Geophysical Survey System.

Applications for this easy-to-use system include marine survey and navigation, rig positioning, land navigation and positioning, search and rescue operation, and GPS test and evaluation. The MX 4400 will be available for delivery in October of 1986.

For free color literature describing the new MX 4400 in detail,

Circle 51 on Reader Service Card

Tenn-Tom Development Conference Scheduled For October 22-24 In Knoxville

Governor **Bill Allain,** chairman of the Tennessee-Tombigbee Waterway Development Authority, has announced that the 1986 Tennessee-Tombigbee Waterway Development Opportunities Conference will be held in Knoxville October 22-24.

This prestigious conference will be jointly sponsored by the Authority, the Tenn-Tom Waterway Development Council, the Greater Knoxville Area Chamber of Commerce, the Tennessee Valley Authority, and the Tennessee Department of Transportation.

The Knoxville meeting will be the fourth annual development conference for the Tenn-Tom Waterway region.

For additional information about this year's conference in Knoxville, contact the Tennessee-Tombigbee Waterway Development Authority, P.O. Drawer 671, Columbus, MS 39703; telephone (601) 328-3286.

Pekka Laine Appointed Managing Director Of New Wartsila/Valmet Company

Pekka Laine, managing director of Tervakoski Oy, has been appointed managing director of the new shipbuilding company to be established by Wartsila and Valmet.

Mr. **Laine** has previously served as head of marketing for FINNPAP in Helsinki, in international duties in Warsaw and Frankfurt, and as mill manager for Paperituote and Tervasaari factory of United Paper Mills Ltd. In 1981-82 he was deputy managing director of Asko Oy, and took part in the foundation of Uponor as managing director in 1982-83. Since 1983 he has served in his present position as managing director of Tervakoski Oy. He will assume his new duties as managing director of the shipbuilding company on September 1, 1986.

Chairman of the board of directors of the new company will be **Tor Stolpe,** president of Oy Wartsila Ab.

Combustion Engineering Awarded $7 Million In Navy Boiler Contracts

Combustion Engineering, Inc. (C-E), Windsor, Conn., has been awarded three separate contracts for boilers and related equipment to be installed on U.S. Navy ships, the company recently announced.

Under the contracts, valued at approximately $7 million, C-E will supply nine waste heat boilers for three guided missile cruisers and two auxiliary boilers for a dock landing ship. Delivery is expected in 1987 and 1988.

Six of the waste heat boilers will be supplied to the Bath Iron Works Corporation of Bath, Maine. Bath will install three boilers on each of two U.S. guided missile cruisers (CG-63 and CG-64).

The second contract calls for one shipset of auxiliary boilers to be provided by C-E to the shipyard division of Avondale Industries, Inc. of New Orleans, La. Avondale will install the two boilers on a U.S. Navy dock landing ship (LSD 48).

The third contract has been awarded by Ingalls Shipbuilding of Pascagoula, Miss., a division of Litton Industries under which C-E will provide three waste heat boilers to be installed on a U.S. Navy guided missile cruiser (CG-65).

Combustion Engineering supplies equipment, systems and services to process, power and basic industries worldwide.

For free copies of C-E literature fully describing the firm's marine equipment, systems and services,

Circle 71 on Reader Service Card

Donahue Named VP Of Marketing At Robert E. Derecktor

Robert E. Derecktor of Rhode Island, Inc. has named **Mark S. Donahue** to the position of vice president, marketing.

As vice president, Mr. **Donahue** will serve as the shipyard spokesperson and assistant to **Robert E. Derecktor,** president. He will oversee all contract bidding procedures in both the U.S. and foreign markets, and will also serve as liaison between government agencies and commercial clients.

Mr. **Donahue** joined Robert E. Derecktor, Inc., in Mamaroneck, N.Y., in 1977 as chief mechanic. He came to the Middletown, R.I., shipyard in 1981 as assistant contract administrator.

Improved TV Antenna From Naval Electronics —Literature Available

The MK-20 omni-directional TV antenna offered by Naval Electronics Inc. of Tampa, Fla., distributors for Naval Electronics A.B. of Sweden, features three separate band elements with interference filters and an internal, changeable, low-noise amplifier utilizing state-of-the-art microwave devices.

The MK-20 feeds a special marine cassette amplifier system with "automatic gain control" to compensate for the changing reception conditions of a ship underway. The cassette amplifiers then feed a ship's distribution system that provides TV antenna outlets throughout the ship in lounges, cabins, and other areas.

Naval can arrange system engineering and installation in all U.S. ports as well as in more than 50 countries around the world through its marine service network.

For further information and free literature on the Naval antenna,

Circle 81 on Reader Service Card

Marathon LeTourneau Awarded Contract For Platform Rig Project

Marathon LeTourneau Company's Brownsville, Texas unit has been awarded a contract for the fabrication of a platform drilling rig by Helmerich & Payne International Drilling Co., a wholly owned subsidiary of Helmerich & Payne, Inc. of Tulsa, Okla.

The contract calls for Marathon to fabricate a new platform drilling rig designated H & P Rig 105, along with an 82-person quarters. H & P Rig 91, an existing unit, will be modified and repaired by Marathon. Both rigs will work on the same platform in the Gulf of Mexico for Standard Oil Production Company, Inc. Fabrication work is scheduled to be completed in September 1986.

These projects are the first of their kind to be fabricated at Marathon LeTourneau's Brownsville, Texas, facility. They are part of an effort by the company to expand into markets beyond the area of mobile offshore drilling rigs.

Marathon is a Penn Central company. Penn Central manufactures products and supplies services in the areas of electronics, telecommunications, defense and energy.

Holland America Views 1986 With Confidence

Holland America Line, the Seattle-based cruise ship operator that last year more than doubled its profits, expects another good performance in 1986. The company's 1985 annual report also indicates that HAL is looking for new tonnage. HAL's net profit for 1985 rose to $25 million from $11.6 million the previous year.

Holland America operates three cruise ships—the Nieuw Amsterdam and the Noordam, both of 33,930 grt, and the 37,783-grt Rotterdam. Each vessel has a 1,200-passenger capacity.

Honda Will Use U.S.-Flag Central Gulf Lines Ship To Transport Cars To U.S.

Under a three-year contract signed recently by Honda Motor Company and Central Gulf Lines of New Orleans, a U.S.-flag merchant ship will be used to carry passenger cars from Japan to the U.S. market. The agreement calls for Central Gulf to order a new carrier with a capacity of 4,000 cars. Expected to be in service by the fall of 1987, the new vessel will be chartered by Act Maritime Company, a car-carrying joint venture of Honda and Mitsui O.S.K. Lines.

Shortly before this contract was awarded, Central Gulf, a subsidiary of International Shipholding Group, announced another agreement with Toyota to transport 30,000 cars annually. Earlier this year, two other U.S. companies were awarded contracts to carry Japanese cars to the U.S. Maritime Transport Lines will carry cars for Nissan Ltd., and Overseas Shipholding Group will transport 30,000 cars per year for Toyota.

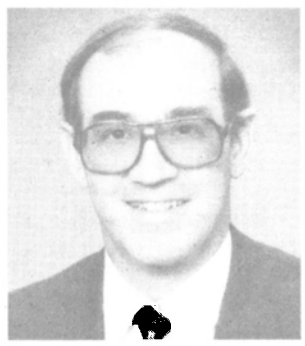
$9.7-Million Contract Awarded Bender For USS Pensacola Overhaul

Bender Shipbuilding & Repair Co., Inc., Mobile, Ala., recently announced that it has been awarded the regular overhaul of the USS Pensacola (LSD-38). The contract, valued at $9,670,000, was awarded by the Supervisor of Shipbuilding, Conversion and Repair, Portsmouth, Va. It will be administered by the Pascagoula, Miss., office of SUPSHIP.

Senator **Jeremiah Denton** and Congressman **Sonny Callahan** of Alabama were pleased to note that peak employment on the overhaul is expected to exceed 160 jobs, including three major subcontractors from the Mobile area.

The USS Pensacola, a "landing ship, dock," is 562 feet in length by 84 feet in width. It is used for amphibious landings. The vessel is expected to arrive in Mobile in late August and will be in port approximately nine months. The total contract duration will exceed 10 months.

Pickens Elected VP— Sales And Marketing At Washington Aluminum



Robert L. Pickens

Washington Aluminum Company has announced the election of **Robert L. Pickens** as vice president-sales and marketing. Mr. **Pickens,** a 1968 graduate of Davidson College, comes to the company from Kaiser Aluminum and Chemical Corporation, where he spent eighteen years working in various sales marketing and operations positions, most recently serving as the sales/marketing manager of the Halethorpe extrusion facility in Baltimore.

PROPULSION UPDATE

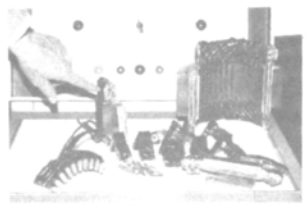
Motor Insulation System Meets Navy Specifications —Brochure Available

Louis Allis, Milwaukee, Wis., has announced the availability of induction motors with sealed insulation systems that meet U.S. Navy specifications.

The company now provides a full line of AC motors, from 1 through 500 hp, that meet the stringent specifications of MIL-M-17060E, Amendment 1. This includes high efficiency and sealed insulation requirements.

Typical shipboard applications include fans, pumps, winches, and compressors, among others.

Louis Allis sealed insulation system is also available for rewinding or reconditioning existing motors in the Navy's fleet, whether constructed by Louis Allis or another manufacturer.



Louis Allis-produced Navy Sealed Motor Stator (MIL-M-17060E, Appendix A) cut into numerous segments to show the complete sealing of motor coils.

For free literature containing complete information,

Circle 8 on Reader Service Card

Prior Named Director Marketing And Sales At Robert E. Derecktor

Robert E. Derecktor of Rhode Island, Inc. has appointed **Geoffrey A. Prior** to the position of director of marketing and sales.

Mr. **Prior's** responsibilities will include coordinating new construction, conversion and repair of both commercial and pleasure craft. He will serve as liaison between designers, clients and the Derecktor workforce.

Formerly with Hood Sailmakers, Inc. of Marblehead, Mass., Mr. **Prior** has an extensive background in marketing marine products and services.

MSC To Procure Additional Ships For Ready Reserve Force

The Military Sealift Command has announced that it intends to procure on the world market during FY 1987 various types of additional ships for the Ready Reserve Force (RRF), in order to meet its final force goal of 120 ships. On January 17, 1986, the Navy spent $206.7 million (U.S.) to purchase 13 merchant class ships to add to the RRF.

RFP N00033-86-R-4011 is scheduled for release on or about July 7, with an offerors' conference planned for July 23 and proposals due on August 15, 1986.

The Ready Reserve Force, a subset of the National Defense Reserve Fleet, currently consists of 73 ships. The Navy is committed to achieving a goal of 89 ships in the RRF by October 1986 and 120 ships by the end of FY 1992.

MSC will buy the most advantageous mix of militarily useful ships from among those offered under the RFP. The Navy will take delivery and become the owner of record of these ships not later than September 30, 1987. In an emergency, MSC would take control of the ships for military use.

MSC's first priority is for clean product tankers, 20,000 dwt-50,000 dwt. Tankers are required in the RRF to support surge and resupply requirements. MSC requirements for FY 92 include 20 tankers. There are eight tankers in the RRF at present.

The second priority is for fast breakbulk ships, which will be enhanced by later modification to provide underway replenishment of ammunition and cargo to Navy combatants.

The third priority is for semisubmersible, heavy lift ships capable of lifting and transporting individual items weighing in excess of 200 long tons. Satisfying this priority will enhance MSC's capability to provide equipment worldwide including over the shore areas where sufficiently sophisticated port facilities are not available. These semisubmersible, heavy lift ships should be capable of lifting landing craft, offshore petroleum discharge systems, floating waterfront facilities (e.g. DELONG piers) and other outsize equipment.

The fourth priority is for containerships to be converted to auxiliary crane ships (T-ACS). The T-ACS objective for the RRF remains at 12 ships. Two crane ships are in the RRF, one is under conversion, three are programmed for conversion in FY 87, and at least two more for FY 88.

The fifth and final priority for MSC procurement is for roll-on/roll-off (RO/RO) ships. These ships figure prominently in both surge and resupply roles because of their versatility. The priority of the RO/RO's has been reduced from earlier RFP's since 13 have been recently added to the RRF.

Tanker, heavy lift, and RO/RO ships can be foreign built, but must be reflagged with work done in U.S. shipyards. All other types of ships must be U.S. built and repair/layup work done in U.S. yards.

Detailed requirements for each ship type will define the minimal operational capabilities and characteristics acceptable to the Government. Requirements in RFP will address basic ship characteristics, e.g., age, carrying capacity, speed and range.

NAVY CIVILIAN EMPLOYMENT OPPORTUNITIES

The Military Sealift Command, Pacific, Oakland, CA a major component of the U.S. Navy is seeking an experienced senior Mechanical Engineer, GS-12. (Salary range $31,619-$41,105).

Duties will include research, development and implementation of an ongoing program of vessel performance and reliability testing. Duties also include the development of test procedures, supervising on board testing and analyzing results from a reliability engineering and energy conservation perspective. Extensive travel may be required.

Candidate must possess a B.S. degree in an applicable engineering discipline. Extensive engineering experience in the maritime environment with an in-depth knowledge of mechanical and electrical systems and test procedures is mandatory. A U.S. Coast Guard chief engineer license or professional engineer registration is highly desirable.

TO OBTAIN APPLICATION MATERIAL CONTACT:

Military Sealift Command
Code P-223
Oakland, CA 94625-5010
or telephone (415) 466-4690

ELECTRONICS UPDATE

Radio Holland USA Announces New Thrane & Thrane Radiotelex Unit

—Literature Available—

The Distributor Products Division of Radio-Holland USA of Houston, exclusive distributor in North America for Thrane & Thrane A/S of Denmark, has announced that as part of the Danish company's commitment to supply the latest in communications technology, and to serve both present and future radiotelex installations worldwide, it is the first radiotelex manufacturer to offer equipment with the newly passed CCIR Recommendation 625. All Thrane & Thrane standard and double-speed ATOR (Automatic Telex Over Radio) modems will henceforth be delivered with a new software package containing not only its high-performance, user-oriented feature package, but also the new CCIR Recommendation 625.

To fully utilize all the benefits that this new recommendation has to offer, automatic coast station systems delivered by Thrane & Thrane will also be upgraded to CCIR Recommendation 625, including Singapore Radio, Hong Kong Radio, Lyngby Radio, Scheveningen Radio, Bern Radio, and WLO Radio in Mobile, Ala.

Of equal importance, the new recommendation programs will be supplied as an upgrading kit for all earlier-delivered TT-1585 series of ATOR modems (more than 2,800 installed), including the very first

versions delivered some four years ago.

The new recommendation, approved by CCIR at its May 1986 meeting in Dubrovnik, Yugoslavia, not only replaces the well-known CCIR Rec. 476-3, but it is also fully backwards-compatible, enabling existing modems to communicate with modems and coast stations following the new improved recommendation.

CCIR Rec. 625 includes nine-digit call codes in accordance with the future requirements of a common call code for all maritime communications systems, and a completely new scheme for exchange of station identification during initial calls and during rephasing procedures, preventing the annoying problems of a third station rephasing into an existing communications connection and possible receiving the rest of the message.

The 256 kbyte memory ATOR modems will interface with virtually any teleprinter, or supplied free of charge is the copyrighted XCOM program enabling both full control and operations of the modem from DOS-compatible computers, as well as free file transfer between the modem memory and the computer disk system. And for the discriminating user, a high-security telex cipher feature, provides total security against those eavesdropping on the radio circuits.

Free literature is now available completely describing the new Thrane & Thrane radiotelex equipment. For your copy,

Circle 61 on Reader Service Card

Phillips Reassigns Three In Supply, Transportation

Phillips 66 Company has reassigned three employees in its supply and transportation division, a subsidiary of Phillips Petroleum Company.

Gary J. Heinz becomes northern region manager of Phillips Pipe Line Company. He directs the operations and maintenance of the northern region crude oil and products pipeline systems.

Richard D. Gooley has been promoted to manager of chartering and vessel utilization. In his new assignment, Mr. **Gooley** directs the chartering of tankers and barges and manages the utilization of Phillips marine fleet. He was formerly staff director of international crude oil trading in the supply and transportation division.

Vince Liberto is the new staff director in international crude oil trading for the supply and transportation division. He acquires, sells and trades crude oil in worldwide markets. Mr. **Liberto** was formerly stock transfer analyst in the office of the secretary.

Nicor Installs Advanced Management System Aboard Supply Boat

Walter Todd, president of American Information Management Corporation of Bay St. Louis, Miss., has announced that the Genesis Information Management System has been installed on the 192-foot offshore supply boat Long Island, owned and operated by Nicor Marine, Inc. of Morgan City, La. The vessel is under contract to Conoco Oil, Inc., and operates out of Frand Isle, La. With this installation, Conoco and Nicor join the ranks of industry leaders who are utilizing this innovative system on their vessels.

The Genesis System solves three major problems for Conoco: reducing fuel burn from the normal, everyday underway operation of the boat; inventory control of fuel loaded abroad the vessel and fuel transferred to the rigs; and with the electronic log, shoreside management has a simple, easy-to-use report to maximize vessel utilization. With this electronic log, Conoco's transportation manager takes an active role in managing the vessel utilization and maximizing productivity. In addition, the system gives a read-out on the inventory control for dry bulk drilling mud abroad the vessel.

In its everyday servicing of oil rigs the boat can, with information generated by the Genesis System, set its throttles to maintain the best fuel efficiency yet still meet the needs of the rigs and platforms it needs to service.

For further information on The Genesis System,

Circle 90 on Reader Service Card

PROPULSION UPDATE

Grandi Motori Already Has Orders For Its New Long-Stroke Medium-Speed Diesel

—Literature Available—

Now undergoing prolonged testing in the Trieste factory of the Grandi Motori division of Fincantieri Cantieri Navali Italiani is a new long-stroke, higher-powered, medium-speed 4-stroke engine covering a power range from 9,900 to 33,000 bhp. With a cylinder output of 1,650 bhp at up to 450 rpm, this BL550 diesel is one of the world's highest-powered, medium-speed engines for ship propulsion or land-based electric power generation.

Rigorous testbed trials are continuing, and GMT director **M. Carchidio** says that the results are more than confirming predictions. Orders have already been received for four of these newly developed BL550 engines—two 6-cylinder units for a ferry ordered in Italy by the Italian State Railways, and two dual-fuel (gas and diesel oil) Vee-type units for a total-energy plant for Turin. The engines for the ferry are scheduled for testbed trials in October this year.

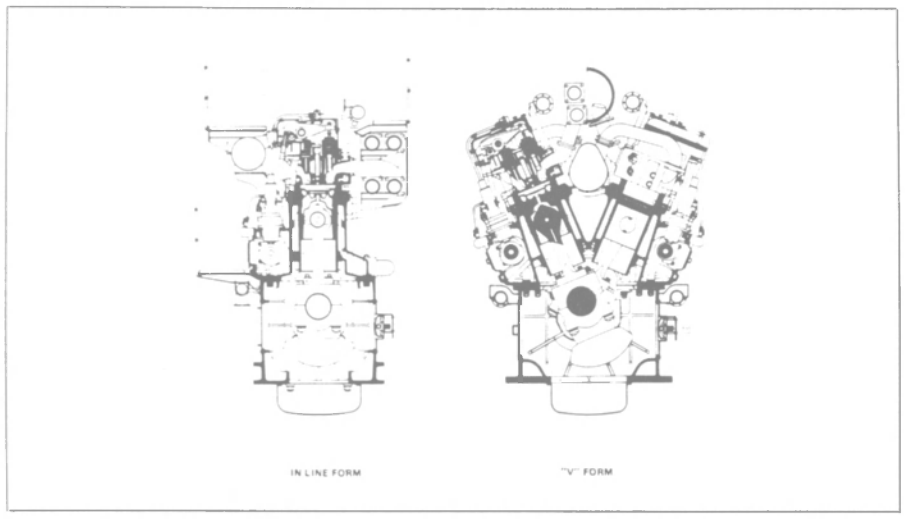
The BL550 is a further development of the GMT 550-mm bore, 4-stroke engines put on the marine and industrial markets in 1970. Compared with the original A550, the new BL550 has the piston stroke increased from 590 to 630 mm, rpm from 435 to 450, MEP from 17.6 to 21.6 bar, and output per cylinder from 1,200 to 1,650 bhp.

As with all Grandi Motori low- and medium-speed engines, the BL550 is designed and equipped to burn heavy fuel oil. Over the past 10 years research and development efforts have been concentrated on reducing further the specific fuel consumption and improving reliability, with extended operating periods between the need for maintenance or overhaul.

The new engine retains the proven characteristics of the B550 version. The increased stroke/bore ratio, from 1.07 to 1.15, has enabled the compression ratio to be raised without excess shallowing of the combustion chamber, which have otherwise reduced the volume for effective fuel atomization, but the present design has reduced fuel consumption to 130 grams per bhp hour. However, as a result of a higher maximum combustion pressure and increased compression ratio, GMT's design team confidently predicts a lower value of 124 g/bhp-hr.

Lower fuel consumption and exhaust valve temperatures are the result of an improved pulse-pressure-charging system using the latest turboblowers of greater efficiency, together with readjusted timing for the inlet and exhaust valves.

The frame and bedplate continue



to be separate units, and for the in-line engines are of nodular cast iron. Unlike the original designs, the 8- and 9-cylinder bedplates and frames are monobloc castings secured by tie-rods. On the other hand, the Vee-type engines have a welded steel bedplate and a special cast iron frame for which tie-rods are not necessary and are therefore replaced by stud bolts.

For further information and free literature on the new Grandi Motori BL550 engines,

Circle 9 on Reader Service Card

National AirOil Introduces Portable Burner Ignitor —Literature Available

National AirOil Burner Company, Inc. (NAO), a Philadelphia, Pa., process equipment manufacturer, has introduced the Portable Burner Ignitor (NPBI). The hand-held unit is used to ignite burners in boilers and process furnaces and is the newest development from NAO.

Safe, easy and inexpensive are features of the NPBI. The unit is safe to operate since direct contact with the flame is avoided. The ignitor is controlled by the operating push button. Another feature of the NPBI is that it is easy to work. A small disposable propane cylinder is attached to the ignitor handle, then the ignition switch is flipped "on" and pressed until the ignitor is lit. In addition to being safe and easy, the unit is also inexpensive. The total cost of the unit is less than $200, plus $2 to $3, the cost of a disposable propane cylinder.

Other advantages of the Portable Ignitor include durability, long life, lightness, and assorted ignitor lengths. Areas exposed to heat are made of stainless steel for extended life, without affecting the lightweight design. The ignitor weighs less than two pounds, and is available in three standard lengths—36, 48 and 60 inches.

NAO is an internationally known manufacturer of combustion and pollution control equipment since 1912, and maintains offices in Houston, Texas; Tokyo, Japan; Milan, Italy; London, England, and has agents around the world.

For free literature containing full information about the NAO Portable Burner Ignitor,

Circle 4 on Reader Service Card

Circle 230 on Reader Service Card →

Royal Caribbean Orders Three More Vessels

Royal Caribbean Cruise Line recently announced the signing of contracts for an additional three vessels. The three, plus another now under construction in France, will give Royal Caribbean an eight-vessel fleet.

The new vessels, to be named the Nina, the Pinta, and the Santa Maria, are two tenders and a utility boat for use at Labadee, the line's new port of call on the northwest coast of Haiti.

The two tenders, designed by the line's senior marine superintendent **Thorlief Berg,** will be 72 feet long, 25 feet wide, with a draft of 6 feet. They will each accommodate 250 passengers for the five-minute ride from the Song of Norway (another of the line's cruise vessels) to Labadee's passenger pier.

The Santa Maria is scheduled for delivery this month, with christening ceremonies to be held in Miami at Royal Caribbean's berthing facilities on the Port of Miami.

The Pinta is a utility vessel, fitted for cargo duty in support of the passenger activities at Labadee.

MARINE LUBRICANTS

MEETING THE DEMANDS OF NEW AND UPGRADED DIESELS

—Improved Cylinder And Crankcase Oils—

The trend toward upgrading output and efficiency of marine diesel engines, as well as improving their ability to burn heavy residual fuels with high sulfur content, has placed increasing demands on the petroleum industry to improve their products. The oil producers have responded by offering new and reformulated marine lubricants, including highly alkaline cylinder oils to protect against the acidity resulting from the burning of residual fuels, and improved system oils to meet the severe-service demands of the latest engines.

The following review is based on data supplied by the major U.S. producers of marine lubricants. Free brochures and data sheets giving full details on the formulations and capabilities of these oils are available from all of the producers included in this review. To obtain copies, just circle the appropriate Reader Service Number(s) on the postage-paid card in the back of this issue.

BP MARINE

Circle 42 on Reader Service Card

During the past 30 years, the low-speed crosshead diesel engine has established itself as the preeminent power plant for marine propulsion. Two major factors contributed to this success story. One was the engine's ability to run on low-cost, heavy residual fuels, and thus combine maximum economic benefits with the already low specific fuel consumption of this design. The other was the oil industry's development of highly alkaline cylinder oils.

BP's Energol CLO 50M marine cylinder oil was formulated specifically to neutralize the acidic products of combustion formed by these high-sulfur fuels—a lubricant that gives the shipowner an ideal balance between low running costs and low wear rates in all modern engines.

Energol CLO 50M is formulated from a blend of high-quality base oils and a balanced combination of alkaline, detergent, and dispersant additives. Together they provide an outstanding level of lubrication, despite the acidic conditions that arise where heavy residual fuels are burned.

The alkalinity of CLO 50M neutralizes acidic products of combustion that would otherwise attack liners, pistons, piston rings, and ring grooves. Its high level of detergency helps to keep grooves, lands, skirts, and ports clean and deposit-free. The high level of detergency helps to maintain a high state of internal cleanliness, and keeps cylinder drainings and scavenge space deposits in a fluid state, for ease of drainage.

BP's Energol OE-M 30 has long been associated with the successful lubrication of the crankcase systems of crosshead marine diesel engines. Increased automation, reduced shipboard manning levels, and, probably more significantly, changes in engine operational practices, have led to a reduction in the use of water-washing to maintain system oil condition. The availability of improved additive technology has enabled the development of Energol OE-M 30 (New Formula).

Energol OE-M 30 (New Formula) is recommended for the crankcase system of crosshead marine diesel engines, and is suitable for use in engines with either water- or oil-cooled pistons. It has been approved by all major engine manufacturers, but for some engine types with more severe system oil operating conditions, a higher total base number (TNB) alkaline oil such as BP Energol DL-MP 30 may be preferred. In addition to its application in crankcases, it is also recommended for camshaft systems, shaft bearings, stern tubes and seals, air compressors, small gearboxes, and for general lubrication.

Energol OE-M 30 (New Formula) is formulated using the latest additive technology. It has excellent water separation properties, has improved thermal/oxidiation stability properties, and also displays improved anti-rust performance characteristics. The new additive system also imparts a degree of acid neutralizing alkalinity and detergency/dispersancy properties.

Energol IC-HF high-quality, crankcase/cylinder oils for medium-speed diesels have an established reputation for the effective lubrication of engines burning heavy fuel. Recent trends indicate that higher levels of alkalinity will be needed if engine protection is to be maintained. BP has anticipated this requirement with a new, improved range of Energol IC-HF (Internal Combustion-Heavy Fuel) oils.

In the reformulation of Energol IC-HF, selected base oils give thermal stability and effective bearing lubrication, while the newly developed additive combination provides alkalinity, detergency, dispersancy, anti-oxidation, gear-lubrication performance, and rust prevention. IC-HF oils insure low rates of wear and high levels of engine cleanliness, thereby enabling engines to perform efficiently and economically.

With the new IC-HF oils there is a complete range from which the user can choose. They offer a choice of three TBNs, and are designed to meet all the demands imposed by residual fuels for engines currently in service and for those likely to be introduced in the near future. Moreover, the nomenclature of these grades enables the user to identify the characteristics at a glance, and thus select the grade that suits the particular requirements.

CHEVRON

Circle 43 on Reader Service Card

Fifty years of experience are behind Chevron International Oil Company's DELO (Diesel Engine Lube Oil) products, Now the company offers an improved line of marine trunk piston engine oils to lubricate the medium-speed diesels of today and the future. Medium-speed diesel engines of today operate at higher outputs and on a wide range of varying-quality fuels.

Chevron's improved line of truck piston engine oils exceed the challenging lubrication demands of today's engines. They provide: better thermal and oxidation stability; improved detergency and dispersancy (deposit control); excellent alkalinity and base retention; higher wear protection; and good water tolerence.

The excellent performance of these improved lube oils is backed by many hours of severe laboratory testing—engine and bench tests—as well as field testing in the latest design, highly rated trunk piston engines. The products are approved by the leading engine manufacturers. Further, DELO marine oils are compatible with all engine lubricants currently marketed.

Thermal and oxidation stability are prime requisites for trunk piston engine oils for today's engines. Higher specific output engines using heavier fuel produce higher liner surface and piston temperatures. The lube oil must possess a high thermal stability to withstand the high thermal stresses involved in removing combustion heat. The resistance to oxidation of the new DELO marine is said to be oustanding.

All the reformulated Chevron DELO marine oils meet the requirements of the API Service Classification CD and pass the MWM-B test.

Chevron DELO 1000 marine oil is recommended for all types of trunk piston diesel engines using relative high sulfur distillate fuel or black marine diesel oil.

DELO 2000 and 3000 marine oils are suitable for trunk piston engines burning residual fuels with a maximum sulfur level of 2.5 and 3.5 mass percent, respectively.

DELO 3400 marine oil will satisfy those applications where a lubricant with high alkalinity is desired or specifically recommended by the engine manufacturer.

Available in SAE Grades 30 and 40, the reformulated DELO marine oils are approved by all major engine builders for use in their medium-speed engines.

From the experience obtained with the reformulated Chevron DELO marine oils in extended laboratory and field testing, these oils are said to provide: long engine life; long oil life; low engine maintenance costs; trouble-free engine operation; and economic operation.

CUMMINS

Circle 44 on Reader Service Card

Cummins Engine Company recently announced availability of its Premium Blue engine oil for the marine market. Cummins reports this premium 15W-40 oil contains additives selected to maximize the performance of heavy-duty diesel engines.

Paul A. Bennett, director-fuel and lubricants, and the chief designer of the product, stated: "Owners and operators are increasingly coming to realize that not all oils are created equal. Cummins has decided that the company can provide valuable service by making an oil that represents the best available technology focused on improving engine durability. Premium Blue is that oil."

Cummins Premium Blue is the

culmination of more than six years of service experience with a variety of commercial oils, and more than four years of field testing. Some 30 Cummins oil evaluation tests were also run before the final oil formulation was established.

Modern, high-performance diesel engine oils are complex mixtures of base oils and additives. The base oils in Premium Blue are mineral oils refined from selected crudes. Base oil is the predominant component of the blend. The remainder of the formulation is a mixture of a number of chemical additives. It is the selection and balance of these additives that imparts unique performance characteristics to superior oils.

Mr. **Bennett** also stressed the fact that superior performance can only be achieved by the proper marriage of an application, an engine, the oil, and the oil change interval. All oils become contaminated and additives are neutralized or used up in use. As this occurs, oil performance may decrease rapidly and the oil should be changed before there is an adverse effect on the engine.

The additives in Premium Blue include materials that modify base stock characteristics with respect to such factors as viscosity, detergency, dispersancy, wear, oxidiation, corrosion, pour point, and foam.

In any multi-viscosity oil, a major additive is the viscosity index improver. This additive works to thicken the base oil more at high temperatures than at low temperatures so the resultant product can perform similarly to a low-viscosity oil (15W) at low temperatures and like a higher-viscosity oil (40) at high temperatures.

"Viscosity is an important oil property," Mr. **Bennett** said. "The viscosity should be low enough at low temperatures to flow to critical engine parts on cold starts, and sufficient to control wear, leakage, noise, and consumption at operating temperatures. Excessive oil viscosity can result in bearing damage on cold starts, hard starting, loss of power, cooling problems, and increased fuel consumption," he said.

Premium Blue contains high concentrations of detergents, dispersents, and oxidation inhibitors to reduce the rate of formation of deposit-forming materials. Those materials that do form are suspended in the oil so that they can be removed from the engine when the oil is drained.

Also included are anti-wear additives to reduce engine wear rates, corrosion inhibitors to control the tendency of critical parts to corrode, pour point depressants to reduce the tendency for the oil to solidify at low temperatures, and antifoam additives to reduce oil foaming on air-entrainment characteristics.

"The selection and blending of the additives used in Premium Blue are the result of the combined efforts of many engine, oil additives, and petroleum people," Mr. **Bennett** said. "Cummins Premium Blue represents today's best proven engine technology and is a positive step in the campaign to reduce end user operating costs."

Premium Blue was first launched more than 1½ years ago in the Southeastern U.S. Since then, availability has spread throughout the entire U.S. and Canada. In the U.S., Premium Blue is available in bulk, 55-gallon drums, gallons, and quart bottles. In Canada, it may be purchased in bulk, 205-liter drums, 20-liter pails, and 4-liter jugs.

EXXON

Circle 45 on Reader Service Card

Exxon's De-Mar XT crankcase lubricant is the latest advance in the long-established line of De-Mar lubes for diesel engines in river towboats, tugs, and other harbor craft. It is formulated to meet the severe-service demands imposed by the newer engines.

De-Mar XT was field-tested in diesel engines manufactured by General Electric Company and the Electro-Motive Division of General Motors. These field tests culminated in its approval by GE as a Superior Class II Lubricating Oil, and recognition of its quality by EMD. De-Mar XT is a LMOA Generation 4 lubricant. Caterpillar approves the use of De-Mar XT in its most advanced engine series, the 3600, as well as in its 3400 and 3500 engines.

The newest improvements in GE and EMD engines are modified piston rings and cylinder liners that have cut oil consumption in half. This places an extra burden on the

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oil because of the drastic reduction in the amount of fresh oil makeup. In addition, the operating practice of extending oil drain periods is becoming more prevalent, further increasing demands on the oil. De-Mar XT, with its good base number retention, provides excellent lubrication even under these conditions.

De-Mar XT performed outstandingly in Caterpillar's 3601 single-cylinder engine test, which was used to predict crankcase oil performance in Cat's high-output diesel engine in marine applications. At the conclusion of the 250-hour test, top land carbon levels (the most critical rating in this application) were very low, and there was no evidence of stuck rings.

De-Mar XT has been shown to reduce existing deposit levels in engines where oils with lower dispersant characteristics have been used, and it maintains lower deposit levels than are common with conventional oils. In EMD engines, De-Mar XT works to keep the intake ports clean, and ring and cylinder wear has been minimal in all tests. The product is non-corrosive to silver bearings and all other engine metals.

De-Mar XT incorporates proven proprietary friction-reducing technology for greater fuel efficiency. Tests of the product in EMD engines have demonstrated statistically significant fuel savings when the lube is used in place of a comparable non-friction-reducing oil. These savings will vary depending on engine operating conditions.

For use in auxiliary engines, Exxon's XD-3 Extra, XD-3, and Exxon Heavy Duty engine oils, all API Category CD/SF oils, are the primary recommendations for engines (such as Cat and Detroit) requiring API CD quality oils. However, De-Mar XT has been proven to provide satisfactory performance in these engines. Detroit Diesel now recognizes the increasing use of higher-sulfur-content fuels and allows the use of oils with ash content above 1.0 percent to cope with these fuels. Therefore, De-Mar XT can conveniently be used to lubricate both main and auxiliary engines.

MOBIL

Circle 46 on Reader Service Card

Mobilgard 570 is a superior quality marine diesel engine cylinder oil formulated to provide outstanding performance in high-output crosshead engines. These highly loaded crosshead diesels are operated on heavy fuel oil with high sulfur content in order to reduce operating costs. Concurrently, advances in engine thermodynamics have permitted decreases in specific fuel consumption from 155 to 125 grams per bhp-hour. These changes in engine design for greater fuel efficiency, the use of higher viscosity residual fuels, and the need for reduced maintenance have increased the requirements on crosshead cylinder oil.

Mobilgard 570 was developed to provide high load-carrying characteristics, improved spreadability, tenacious film retention, and to minimize port and piston deposits. Because of its high alkalinity (70 Total Base Number), it provides better protection against corrosive wear by neutralizing large amounts of strong acids. This oil is compatible with oils normally used in the crankcase of crosshead engines.

Mobilgard 300 was developed especially for use as a system oil in modern, high-output, crosshead type marine diesel engines. The system oil must provide adequate lubrication of the bearings and other moving parts, such as cams and gears, and proper cooling, particularly in the pistons in crosshead engines so designed. The recent design trend in these engines has been in the direction of greater specific outputs, which has led to much higher piston operating temperatures than were normal for the previous generation of engines.

Mobilgard 300 is formulated from highly treated paraffinic base oils that are selected for their thermal stability and oxidation resistance. The inherent base oil characteristics are augmented with a balanced additive package including high-temperature oxidation inhibitors, alkaline detergent-dispersant, and defoamant. The formulation has maximum antiwear properties, good rust protection in the presence of salt water, and excellent water separation characteristics.

The Mobilbard 42 Series of marine lubricating oils has been developed to supplement the Mobilgard 24 Series (30 TBN) oils for the lubrication of modern high-output, medium-speed trunk diesel engines used for the propulsion of ocean-going vessels and ferries.

Mobilgard 42 oils have an alkalinity level of 40 TBN and are therefore particularly suitable for engines that show indications of corrosive wear to cylinder liners and/or piston rings. Mobilgard 342 and 442 are diesel engine lubricating oils made from high-quality base stocks, combined with specially selected stable additives to provide excellent performance under varying loads and temperature conditions. Careful selection of base stocks and additives for the Mobilgard 42 Series has resulted in an engine oil with well-balanced properties.

The Mobilgard 24 Series oils were developed originally to meet the requirements of medium-speed, trunk piston diesel engines used for main propulsion and as auxiliary drives on deepsea ships, and a main propulsion engines on coastal and river vessels. The Series was reformulated recently to provide improved performance in the new, higher-output versions of these engines now coming into service.

The Mobilgard 24 Series oils are formulated to provide the higher load-carrying ability required to control ring and liner wear in these higher-output engines, and to maintain satisfactory engine cleanliness regardless of the quality of fuel used. In addition, they will provide improved performance in older design engines where the demands on the lubricating oil are not as severe.

Mobilgard SHC 120 is a 12 TBN synthetic, medium-speed diesel lubricant. It contains a balanced blend of synthesized hydrocarbons and ester-based fluids, combined with an additive system designed to provide optimum performance in diesel engines. Although its measured viscosity indicates that it is an SAE 40 grade, this oil's inherent high viscosity index enables it to perform similar to an SAE 15W-40 viscosity grade diesel engine lubricant. It exceeds the qualification standard for an API CD rated diesel engine lubricant.

SHELL OIL

Circle 47 on Reader Service Card

A wide range of Shell Oil Company's marine lubricants is available at main ports throughout the world. The more important grades, intended for the lubrication of diesel engines, are described below, together with an indication of their principal applications.

Shell Alexia oils are for lubrication of large marine crosshead-type diesel engines. They have exceptional acid-neutralizing powers and are specially designed to combat high cylinder wear in engines burning heavy fuel oil. They also have outstanding cleanliness properties that enable them to minimize deposit formation on pistons and in cylinders.

Shell Melina oils are highly versatile, multipurpose heavy-duty lubricants specifically designed to meet crankcase/system oil requirements of high-, medium-, and low-speed engines used both for main propulsion and auxiliary power generation. They are also suitable for many items of oil-lubricated, ancillary shipboard machinery. Melina S oil gives the same level of protection as Melina oil in low-speed engines, only without the additional performance for use in auxiliary engines, and is thus lower in cost.

Shell Bela oil is a system oil for low-speed crosshead engines. It contains additives that give protection against rust and oxidation. In addition, it has good compatibility with water so that, if necessary, it can be water-washed safely.

Shell Argina oils are combined cylinder and bearing system oils for highly rated, medium-speed trunk type engines burning heavy fuels. Argina T is the primary grade for most applications. Argina X oil is specially fortified for certain high basicity requirements. Argina S oil is designed for auxiliary engines burning lower-viscosity thin fuel oils, where sulfur levels are more moderate.

Shell Gadinia oils are combined cylinder and bearing system oils for highly rated medium-speed and high-speed engines. Shell's BHGJ8616401 is designed for engines burning distillate fuels only. They are also multi-functional suitable for many other shipboard machinery applications.

Rimula oils are fully detergent, special-duty oils having outstanding anti-wear and protective properties. They are highly resistant to oxidation, and are designed to retard the onset of ring sticking, and preserve engine cleanliness under severe conditions.

Shell Caprinus oils, although they contian additives to provide alkalinity, dispersance, and resistance to oxidation, contain no zinc additive and thus may be used in engines fitted with silver parts.

TEXACO

Circle 48 on Reader Service Card

Texaco's Marine Star Lubricants are offered in a variety of formulations that are available worldwide to meet the needs of all types of marine diesel engines.

TARO Special is a premium quality cylinder lubricant for large, low-speed crosshead diesels burning heavy residual fuels. It is blended from highly refined, mixed napthenic and paraffinic base oils and oil-soluble additives to produce a very high alkaline reserve product (70 TBN) with good lubricant film strength.

This product is approved by the major marine crosshead engine manufacturers. TARO Special has been extensively field tested and has given excellent performance when used under the most severe operating conditions. It is specially formulated to prevent corrosive wear that can result from the use of high-sulfur fuels. In addition, the high-quality base oils and high detergent level of TARO Special helps minimize ring belt deposits. Viscosity Grade is SAE 50.

DORO AR 30 is a premium crankcase lubricant for large low-speed crosshead engines. This product, blended from highly refined solvent neutral oils and carefully selected additives to produce a moderate alkaline reserve (6 TBN) oil, provides good water separability, anti-wear, and rust and oxidation inhibition. The specially selected high-temperature anti-oxidant makes DORO AR 30 particularly suited for those engines using oil-cooled pistons and for applications using the circulating oil for turbocharger lubrication.

The TARO XD oils are Texaco's medium-alkalinity (15 TBN) diesel engine crankcase lubricants for medium- and high-speed trunk type engines operating on fuels with sulfur contents up to 1.8 percent. Blended from carefully refined base oils in combination with a specially developed additive package, TARO XD is an API CD level product meeting all the major diesel engine manufacturers' requirements for this type of engine oil.

TARO XD has been extensively tested under both laboratory and field environments. It provides excellent engine cleanliness as a result of its carefully balanced detergent system, and prevents engine corrosion by neutralizing acidic combustion products. The excellent TBN retention characteristics of this product provide long in-life service.

The presence of a service-proven oxidation inhibiting additive system results in a high resistance to oxidative degradation of the oil. It is available in SAE viscosity grade 30 and 40.

The TARO DP Series are highly alkaline (30 TBN) oils specifically designed to lubricate medium-speed, trunk-type engines that utilize fuel with a sulfur content in excess of 1.8 percent. Blended from carefully refined base oils fortified with a specially developed additive package, TARO DP series has provided excellent laboratory and field test results. This API CD level product, although primarily recommended as a crankcase lubricant, is also perfectly satisfactory as a cylinder lubricant in medium-speed engines with separate cylinder lubrication. It is highly resistant to oxidation degradation, and affords excellent anti-wear activity. Its TBN retention properties give excellent anti-corrosion protection over long periods of operations. The TARO DP detergent and dispersant additives help protect against deposition of high-temperature carbon and low-temperature sludge, thus promoting good overhaul life. It is available in SAE 30 and 40 viscosity grades.

Texaco's Ursa Oil Extra Duty Series are premium API CC, MIL-L-2104B quality level lubricants. Blended from highly refined paraffinic solvent neutral oils and a selected additive package, this product series provides the required degree of anti-wear protection and helps minimize excessive deposit formation. The carefully balanced anti-oxidant additive system provides a product with a proven high degree of oxidation and corrosion resistance. It is available in SAE 30 and 40 viscosity grades. ■

American Commercial Barge Line Promotes Two

American Commercial Barge Line, Jeffersonville, Ind., recently announced two key promotions.

Michael Hagan was promoted to senior vice president of sales. Mr. **Hagan** joined American Commercial Barge Line in 1970 and has been vice president of sales since 1982. He is a graduate of Brescia College in Owensboro, Ky.

Promoted to general counsel for American Commercial Barge Line was **Michael J. Khouri.** In 1979, MR. **Khouri** joined the company as a part-time law clerk. He became a full-time attorney in 1981. Mr. **Khouri** is a graduate of the University of Louisville (Ky.).

Literature Offered On Metropolitan Strainers

Metropolitan Master Machinists, manufacturing division of Metropolitan Plumbing Supply Corporation, is offering literature on their extensive inventory of strainers.

Metropolitan is offering basket, "Y", tee, angle, duplex, swing and multiple strainers. The strainers are available from stock in cast iron, bronze, cast steel, stainless, ductile, monel and aluminum.

All end connections are on hand, including: screwed, flanged, butt-weld, socket-weld and brazed. Extra baskets, screens or cones are promptly made to order in stainless, bronze or monel.

For free literature and additional information on Metropolitan's full stock of strainers,

Circle 2 on Reader Service Card

ANADAC Awarded Navy Support Services Contracts Totaling $4 Million

ANADAC, Inc., a professional services firm in Arlington, Va., has been awarded a three-year, cost-plus-fixed-fee contract for $1 million by the U.S. Navy. The contract calls for ANADAC to provide systems engineering and technical support services to the Phalanx Close-In Weapons System Program Office of the Naval Sea Systems Command.

ANADAC has also received a three-year Navy contract for $1.5 million to provide assistance in systems design, planning, and functional management of the Ships' Maintenance Material Management System. The Naval Supply Center, Oakland, Calif., is the contracting activity.

The firm has also been awarded a three-year Navy time and materials contract for $1.5 million to provide systems engineering and technical support services to the Naval Supply Systems Command in connection with the Advanced Logistics Technology Division Program. The Naval Regional Contracting Center, Washington, D.C., is the contracting activity.

Call For Papers Issued For ASNE Day 1987— To Be Held April 30-May 1

The American Society of Naval Engineers has announced a call for papers to be presented at next year's ASNE Day Conference and Exhibition. Scheduled for April 30-May 1, the 1987 meeting at the Omni Shoreham Hotel in Washington, D.C., will have as its theme "Naval Engineering: 99 Years of Progress."

Prospective authors are asked to submit one-page abstracts; drafts are due prior to September 1, 1986. Send abstracts and direct questions to: ASNE Day 1987 Papers, Capt. **James E. Grabb,** USCG (Ret.)., Naval Engineers Journal, 1452 Duke Street, Alexandria, Va. 22314; phone (703) 836-6727.

New Rental Program For Magnavox Equipment Offers Wide Selection

The Magnavox Advanced Products & Systems Company recently announced the creation of a new program for worldwide rentals of its navigation, communication and survey products.

NAV-COM Incorporated—a Magnavox subsidiary—has been named rental agent for the program. NAV-COM is offering a wide selection of flexible, cost-effective rental and lease-buy agreements with many features not normally found in marine leasing plans, according to **Gerald A. Gutman,** company president.

"Our program offers customers a cost-effective way to take advantage of the latest developments in marine electronics technology," said Mr. **Gutman.** "In particular, this represents an attractive opportunity to evaluate the new line of Magnavox GPS products without tying up large sums in initial capital investment."

Rentals are available worldwide through Magnavox agents and dealers, on a daily, monthly or yearly basis. Products available include Transit satellite navigation receivers, GPS receivers, satellite communications systems, Busiship computer systems, GRiD portable computers and related items.

Full warranty service for rented equipment is provided through the extensive Magnavox network of agents and dealers worldwide.

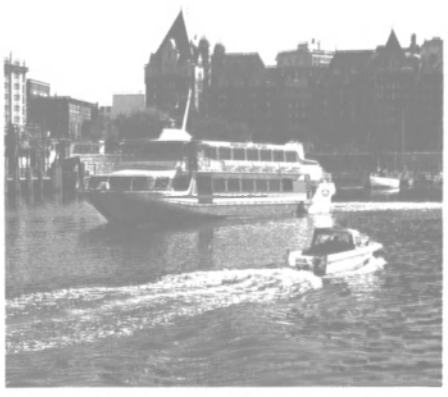
NAV-COM Incorporated is a leading U.S. marine electronics firm located in Deer Park, N.Y. The company has wide experience in integrating advanced shipboard and land-based communications and information systems. It is a wholly owned subsidiary of the Magnavox Government and Industrial Electronics Company.

For complete literature containing full information,

Circle 13 on Reader Service Card

PROPULSION UPDATE

Allison Implements Performance, Maintenance, Reliability Improvements In Marine Gas Turbines



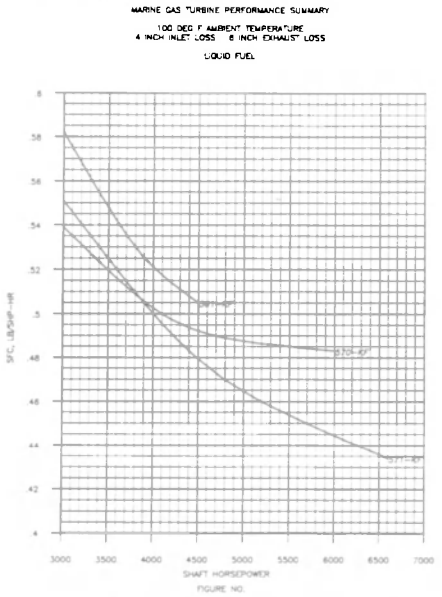
The Allison Gas Turbine Division of General Motors has extended its product improvement efforts to the 501-KF and 570-KF marine gas turbine engines for increased reliability and maintainability of these high-power density, simple-cycle units.

501-KF

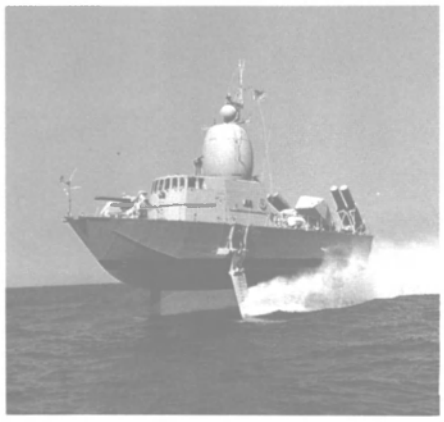
The 501-KF engine is successfully used in the Boeing "Jetboil" passenger ferry. The arrangement is a 501-KF engine on each side of the vessel driving a Rocketdyne PJ20 waterjet. The engines develop 4,330 continuous shaft horsepower each and are available with various improvements to enhance their capability. Recent options released to the 501-KF include:

- Split Outer Combustion Case—Allows access to combustion liners without engine removal.
- Low Emission Combustion Liners—Combines the need for low emissions with improved life through optimizing flame profile and thermal barrier coatings.
- Closed Loop Electronic Control—Improves fuel system performance by integrating speed and turbine gas temperature to provide stable efficient power.
- Turbine Gas Temperature measured at Interstage Point—Increases thermocouple life.

The engine is also employed as a single prime mover on the Grumman M161, 105-ton hydrofoils. This application uses bevel gearing for reduction and drives a single propeller for speeds up to 52 knots.

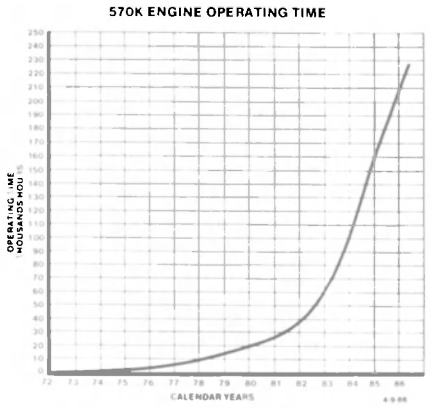


The 501 has exceeded 12-million hours of operating time in industrial and marine service. Mean Time Between Overhaul is, of course, dependent on duty cycle, and the 501-K engines have achieved intervals of 12,000 hours in certain applications. The fuel economy of the engine is shown in Figure 1 for Standard U.S. Navy conditions. The maximum operating point is shown at .505 lbs/hp-hr and 4,500 hp, under these conditions. Also, the engine is capable of operating on LPG or LNG for tanker applications although the typical marine application is with #2 diesel fuel.



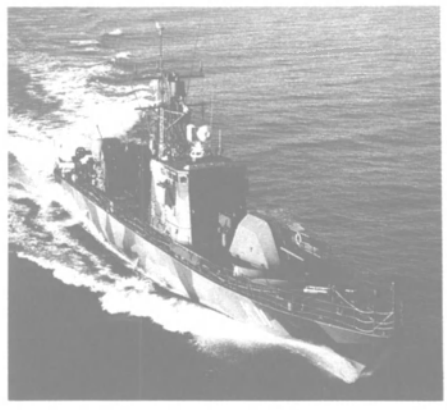
570-KF

The 570-KF is a 6,350 nominal horsepower marine gas turbine utilizing a variable geometry compressor and two-stage, gas-coupled power turbine.



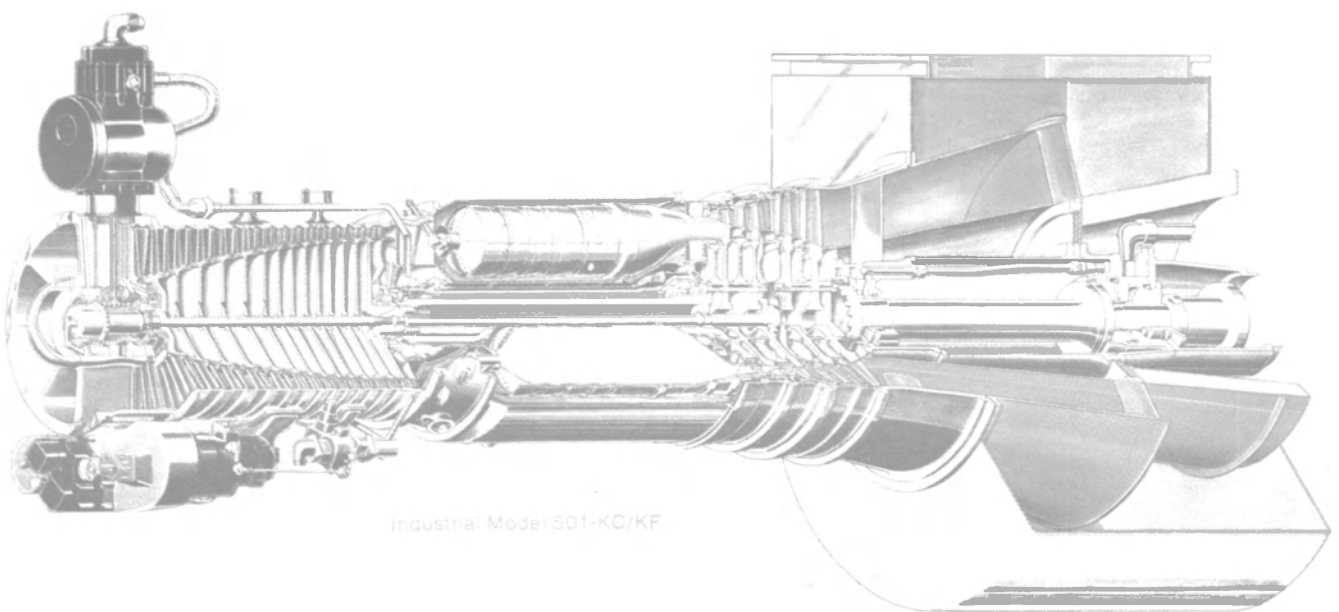
The 570-KF was first used for boost propulsion on the ocean yacht Shergar. In this application a pair of 6,500-shaft-horsepower 570-KFs drive through high-speed clutches into a combining gearbox. Finally, a 10,000-kw waterjet provides the propulsion. This 240-ton fast yacht has the capability of 50+ knots with the gas turbine/waterjet propulsion system.

The Swedish Navy has also selected the 570-KF for boost propulsion on their Spica III "Stockholm" class fast patrol boats. In this case the drive system uses a single stage epicyclic reduction gear and a 15-degree vee-drive to turn a controllable-pitch propeller. The 320-ton-ghp hull vessel has a boost speed of 38 knots.



Since introduction of the 570-K engine, Allison has continued its product improvement efforts to increase the service life of this single-spool, simple-cycle engine. Highlights of this program include:

- Compressor Blade Manufacturing Process—Application of electro-chemical machining techniques have eliminated subsurface defects caused by roll-forming blades. This change has eliminated early fatique failures in blades.



ALLISON GAS TURBINE COLOR BROCHURES AVAILABLE

Three full-color well-illustrated brochures completely describing the Allison gas turbine line are available at no cost. For copies, circle the appropriate number(s) on the reader service card in the back of this issue.

501-K—A Spectrum of Power—12 pages, full-color, describes all eight models in the 501-K series. Contains photographs, full-color cutaway illustrations, performance tables, specification tables and examples of applications.

Circle 57 on Reader Service Card

570-K and **571-K—Power for the Future**—12 well-illustrated full-color pages. Complete data on these dual-shaft engines include photos, illustrations, performance graphs and specification tables.

Circle 58 on Reader Service Card

501-K and **570-K**—16 full-color pages. Photos, cutaway color illustrations, mechanical drawings, performance graphs, specification tables and material specifications. Modular design is illustrated—details include reduced maintenance factors, distribution capibilities, field support, options, etc.

Circle 59 on Reader Service Card

• Combustor Development—The annular combustion liner was redesigned (for the Royal Canadian Defense Forces) to eliminate visible smoke. This improvement is now being used on all 570-K engines.

• Turbine Hot Section—Blade cooling has been improved with modified air passages. Vane life has been extended through material changes and cooling techniques.

• Thrust Balancing—570 engines now use a tilting pad thrust bearing system mounted aft of the power turbine that absorbs the 6,000-pounds of axial load in the power turbine. The effect of this change has more than doubled shaft bearing life.

The 570 has been selected by the Canadian Navy for cruise power on their 5,000-ton Tribal class destroyer. The vessels are scheduled for updating and modernization beginning in 1987 when a pair of 570-KF engines will be installed in each.

A major improvement was implemented this year when Allison introduced the Model 571-KF engine. This engine shares the gas generator design with the 570, but has a three-stage power turbine. It is 20 percent more powerful and 12 percent more fuel efficient. The engine has a continuous standard day, no-loss rating of 7,694 shaft horsepower and can operate in excess of 8,000 shp intermittently. The 571 was field-tested for over 900 hours prior to shipment of the first production unit in January 1986. Meanwhile 570-K engines have accumulated over 220,000 total hours of service time. The improvement mentioned above will allow that total to increase rapidly. ■

Free 12-Page Brochure On MARPAC Ball Valves From Mark Controls

A new 12-page color brochure published by Mark Controls Corporation of Skokie, Ill., describes the complete MARPAC ball valve product line, one of the broadest selections of automated and manual ball valves available. MARPAC ball valves are well-suited for applications requiring tight shutoff, but can be used in some modulating services. For heavy slurries requiring tight shutoff, MARPAC metal seated flanged valves have been field-proven to provide very effective performance and extended cycle life.

Augmenting Mark Controls' broad line of MARPAC ball valves is a complete line of actuators and automation accessories. These products include all types of actuator accessories capable of handling any control need. Mark Controls' standard line of actuators includes the Series 80 and 89 pneumatic and the Series 20/22 electric actuators.

Mark Controls Corporation manufactures and markets a broad line of automated and manual specialty valves and flow control products and services.

For your free Mark Controls brochure,

Circle 98 on Reader Service Card

ELECTRONICS UPDATE

Integrated Ship Electronic Systems

—Literature Available—

The bridge of most ships contains a varied assortment of individual instruments for navigation, monitoring and ship control which have been added, one or two at a time, over the years to meet carriage requirements and perceived needs. This multiplicity of equipment, with different layouts and procedures from ship to ship, can lead to confusion and occasional errors, as bridge watchstanders must rush back and forth from one station to another.

It has long been recognized that a movement toward standardization and integration would be desirable for bridge electronics. Integrated bridge systems, which bring together in one place the coordinated information and data from various sources, would greatly enhance the safe and efficient operation of the vessel, while reducing workloads and minimizing human error.

A leader in this area has been the Racal Marine Group, which has been developing and manufacturing commercial marine navigation and radar equipment since the mid-1940s and has been working on integration in these devices for many years. In 1971, Racal started a development program on an integrated bridge system, called MANAV, which received support from the U.K. government and culminated in sea trials on the ship Esso Mersey. These were in general successful, the system receiving the approval of ship's staff, who especially appreciated the ready interaction between an automatic chart table and the radar display. But the concept was judged to be ahead of its time, and production was not undertaken although a military version was developed for the British and other navies.

A decade later, Racal decided that the time was ripe for another look at the integrated bridge. A short feasibility study confirmed this and recommended that the project should be extended to cover three other principal operational areas of a ship.

Accordingly, in 1982, an R&D effort was set in motion, looking into the use of electronics in the four ship operating areas—bridge, machinery spaces, cargo and administration. This resulted in three-month sea trials aboard the ship British Trent. Concentrating on the two main areas of bridge and machinery, the trials aimed to foresee the principals and requirements of the 1990s.

The integrated bridge electronics developed out of this program included a workstation comprising a high-definition color graphic VDU acting as a command display and showing the master or watch officer a composite picture of the immediate information he needs: course, under-keel clearance, distance/course to next waypoint, speed, engine RPMs, etc. This involved two computers and associated VDU and keyboards, with inputs from a Racal-Decca ARPA, compass, log, Decca Navigator, satnav and engine room sensors, with outputs to the ARPA, autopilot and satellite communications terminal. Ship's position was displayed both in latitude/longitude and pictorially on the electronic chart, and the auto-route keeping was included, with alterations being made automatically between waypoints. An economics page could be called up on the computer, giving an assessment of performance and economics via bar graphs comparing the actual performance with results of the ship's original sea trials in terms of fuel consumption, propulsive power at a particular speed and fuel consumption vs. distance through the water. In turn, this information was converted into economic terms based on fuel costs. From this, it was possible to see such things as the degree of performance degradation due to hull fouling and the effect of speed and trim alterations. This was considered a useful tool for a master in costing the results of operational decisions. Data could be transmitted automatically at high speed to the company's head office via satellite.

On the British Trent, the ship's staff found the command display to be very useful and were of the opinion that the presentation generally gave all required information to the watch officer. Within certain limitations, the electronic chart worked well, and many of its facilities were also appreciated. There was general agreement, however, that this presentation could not currently supersede the standard paper chart. The presentation of passage economics aroused most interest, giving ship's staff an increased awareness of the importance of cost as a function of speed. This would help them make more economic speed decisions.

The valuable experience gained on these sea trials was embodied in the specification which laid the foundations of the full development of Racal's new integrated ship electronic system (ISES). This is a "family" of systems covering the bridge, engine room, cargo and ship administration, through standalone systems or as an interconnected network. An essential element in this family is the integrated bridge electronic system (IBES).

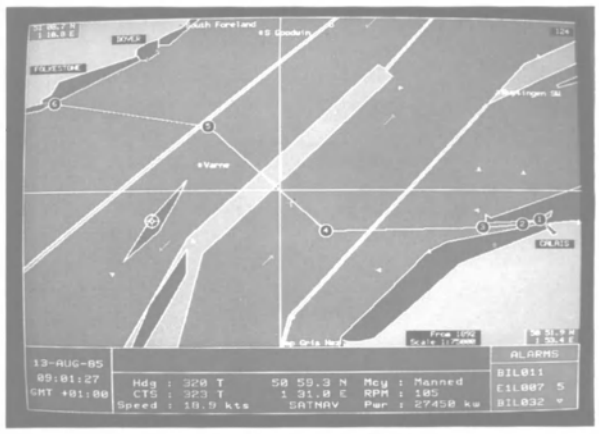
The IBES includes a navigational positioning system, an ARPA radar, an autopilot and an optional automatic chart table. It is available in two versions—the basic IBES 100 and the more extensive IBES 1000.

IBES 100 is centered on the Racal-Decca MNS 2000 marine navigation receiver, which integrates Decca, Loran-C, Transit, Omega and dead reckoning, depending on available input data and position on the earth's surface. This processor is connected to the ARPA, on which the operator can view, on demand, a video presentation of a cross-track error and intended track. It can also be connected to a Racal-Decca referenced adaptive autopilot to provide automatic track keeping. The automatic chart table, when fitted, shows the ship's position continuously as a spot of light projected below onto a standard hydrographic chart. Up to 100 waypoints can be stored, and the ship can steer automatically along prescribed routes. In addition, own-ship's position, GMT, course, speed and the next five waypoints are all continually available in digital form for use by other devices, such as an EPIRB and administrative area systems, if fitted.

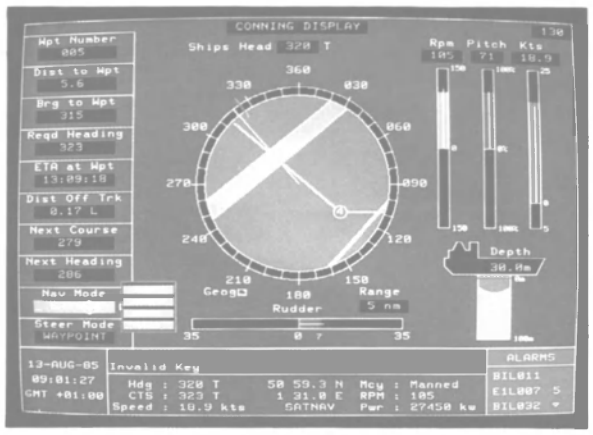
The IBES 1000 is centered on one or more workstations, each including a color graphic display and powerful data processing capabilities. These communicate with an ARPA, autopilot, automatic chart table and other navigational sensors. The small but powerful processor unit that drives the system is able to operate up to five workstations. Each workstation consists of a color monitor with an extremely flexible page accessing system, a specialized keyboard and cursor control device. They can be free-standing, tabletop or console mounted, with the processor fitted internally or as a separate unit.

Other hardware included in a typical IBES 1000 consists of two interswitched radars, one of which is normally an ARPA, one MNS 2000 navigation receiver, one automatic chart table, one adaptive autopilot and associated steering system, and two gyrocompasses. Optional equipment includes a printer for data logging and additional radar displays.

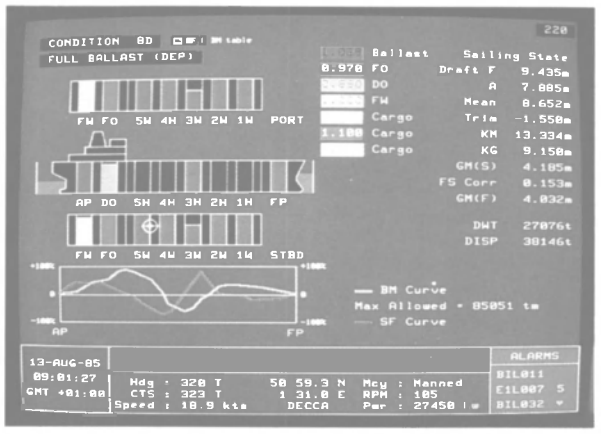
The integrated bridge electronic system can communicate with and show data from other ships' systems. The integrated cargo electronic system (ICES) provides centralized loading calculations, stress/stability monitoring, ballast control and monitoring, cargo loading control and cargo condition monitoring. The integrated management administrative system (IMAS) performs a wide range of shipboard administrative tasks, including personnel files, accounts, stock control, maintenance planning and word processing. The integrated ship instrumentation system (ISIS) can be used for monitoring and control of main and auxiliary machinery, cargo and ballast from one or more locations, trend analysis, condition



Geographic Display



Conning Display



Cargo Loading State Display

and performance monitoring of hull and machinery.

Racal emphasizes that these integrated electronic systems can be supplied individually for stand-alone use, or if two or more of them are fitted, they can be integrated to allow transfer and correlation of data between them. The result is an integrated ship electronic system providing economic, efficient and flexible operations.

FIVE FREE COLOR BROCHURES AVAILABLE FROM RACAL MARINE

Racal Marine Systems is offering a free literature package containing five brochures fully describing—the Integrated Bridge Electronic Systems, 100 Series and 1000 Series—Integrated Management Administration System—Integrated Cargo Electronic System—and, Integrated Ship Instrumentation System. All five booklets are fully illustrated, in color with photos and schematics and include complete detailed descriptions.

For your free copy of the Racal Marine literature package,

Circle 60 on Reader Service Card

COMAR Offers Free Catalog On New Marine Products

Coast Marine & Industrial Supply, Inc. (COMAR) of San Francisco, Calif., is offering a wide selection of color literature in a catalog on their new and reliable marine products.

COMAR's catalog contains color literature on their new doubling up rat guard, COMAR/MARK/I Pilot Ladder, mucking winch, quick-release ring buoy bracket and, as a special feature, a 68-page booklet entitled, "Pilot Ladder Safety," by **Malcolm C. Armstrong.**

As described in the color literature, the COMAR/MARK/I Pilot Ladder features internal peripheral tubular reinforcement, fracture-resistant steps, a non-slip abrasive grit tread surface and safety orange color. The COMAR product is U.S. Coast Guard-approved.

Other Coast Marine products mentioned in the free literature, the doubling up rat guard, mucking winch and quick-release ring buoy bracket, all have special features.

The new doubling up rat guard is self-adjusting and made of an aluminum alloy. COMAR also offers the quick-attach/detach rat guard made of 16 guage galvanized iron.

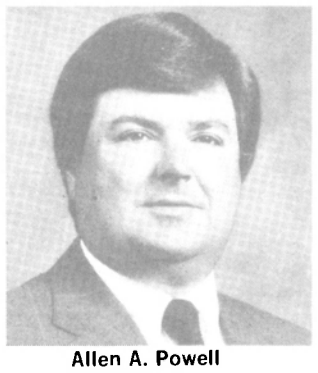
COMAR's mucking winch has a 1.7-hp air motor and variable speed control valve with a built-in snag control. An optional rubber bucket is available.

The quick-release ring buoy bracket comes complete with an orange ring buoy, float line, electric light and 15-minute orange floating smoke signal.

For your free COMAR catalog and 68-page booklet on pilot ladder safety,

Circle 93 on Reader Service Card

Powell Appointed Executive VP And General Manager, Bay Shipbuilding Corp.

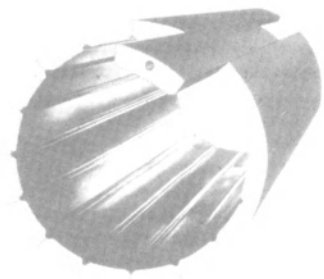


Allen A. Powell

Ralph Helm, president and chief operating officer of the Manitowoc Company, Inc., has promoted **Allen A. Powell** to executive vice-president and general manager of the company's shipbuilding subsidiary, Bay Shipbuilding Corp., Sturgeon Bay, Wis. In his new capacity, Mr. **Powell** will be responsible for all operations of that subsidiary.

Mr. **Powell** joined Bay Shipbuilding in 1979 as assistant manager of contract services, and served as manager of contracts, projects, and estimating since 1981. From 1967 to 1975, he served in engineering, cost engineering, and contract services departments of Newport News Shipbuilding. From 1975 to 1979, he served as design coordinator for naval architecture and marine engineering at Sea-Land Services Inc.

Unaflex Introduces New Molded Expansion Joints —Literature Available



Unaflex Rubber Corporation has announced the availability of their Unasphere precision molded expansion joints. Identified as Style 800, this line is available in sizes ranging from 2 inches to 12 inches in diameter.

Molded of neoprene and nylon, these units require less force for movement than conventional joints, allowing maximum deflection, elongation and compression. They are for use in a broad range of modern high-pressure and temperature piping systems to help eliminate noise and vibration and take up pipe expansion and contraction. Each Unasphere comes with alignable floating steel flanges. Spherical design provides an inherently stronger configuration that allows pressure to exert force evenly in all directions and reduce turbulence.

Literature is available on the Unasphere line. For free copies and further information,

Circle 74 on Reader Service Card

Caterpillar Tractor Co. Renamed Caterpillar Inc.

Caterpillar Tractor Company, headquartered in Peoria, Ill., recently became Caterpillar Inc. following approval of the name at the annual meeting. Also, the company's state of incorporation has been changed from California to Delaware as a result of the shareholders' action.

"Caterpillar Inc. better reflects the type of business we have become," said chairman of the board **George Schaefer.** "In the 1920s we were a tractor company. Today we offer far more. In addition to tractors, we provide engines, lift trucks, paving equipment, and many other products and service," he said. The corporate name change reflects the existing and growing diversity of the Caterpillar enterprise.

Caterpillar's Engine Division manufactures engines for earthmoving and construction machines; on-highway trucks; marine, petroleum, agricultural, industrial, and other applications; electric power generaton systems; and related parts. Cat diesel and spark-ignited engines meet power needs ranging from 85 to 6,000 bhp; and in generator set configurations, from 50 to 4,800 kw.

Caterpillar products are manfactured in 16 plants in the U.S. and 14 plants overseas. Four factories in the U.S. are involved primarily in the production of diesel and spark-ignited gas engines for incorporation into the company's machines and for sale to other equipment manufacturers and dealers.

Caterpillar engines are sold worldwide through independent dealers, and to other manufacturers for use in products produced by them. The Cat dealer network consists of almost 100 located in the U.S. and some 130 located abroad. Worldwide these dealers have more than 1,000 places of business.

For free color literature fully describing the complete line of Caterpillar marine diesel engines,

Circle 1 on Reader Service Card

Frazier Promoted To Director-Manufacturing At Cincinnati Gear

Charles T. Frazier

Charles T. Frazier Sr. has been promoted to director of manufacturing for The Cincinnati Gear Company. He is responsible for the organization, direction and coordination of all manufacturing and assembly activities, including industrial engineering, methods and testing.

In his previous position as methods manager, Mr. **Frazier** was instrumental in the development of special tooling and manufacturing procedures required to assure high quality, cost effective finished products.

Russellstoll Offers Plugs, Receptacles And Connectors For Cord Sets—Literature Offered

High amperage portable cord sets can handle up to 400 ampheres at 600 volts equipped with Max-Gard® pin and sleeve plugs, connectors and receptacles from the Russellstoll Division, Midland-Ross Corporation.

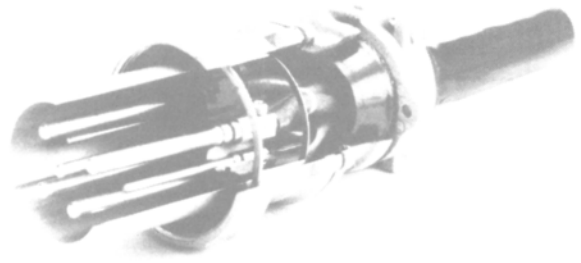
The 400-amp plugs and receptacles are offered in two to four wire, three- to five-pole contact configurations. The five-pole contact configuration provides three-phase conductors, a neutral and equipment ground conductor. Also, two additional control contacts can be provided for electrical interlock, metering or control circuits.

All Max-Gard receptacles and connectors feature gated dead-front construction to prevent insertion of foreign objects. Plugs, receptacles and connectors are supplied in single rated factory polarization to prevent insertion of devices polarized to a different amperage, voltage, frequency or phase.

Plugs, connectors and receptacles are constructed with copper-free cast aluminum housings for strength and corrosion resistance. All contacts are self-aligning and self-wiping with solderless pressure screw terminals.

Insulating interior parts are molded from high strength, glass-filled polyester. Interiors are polarized so they can only be assembled in the correct position. All hardware and assembly screws are 300 series stainless steel.

Receptacles and connectors can be specified with weathertight (flap cover) or watertight (screw cover) protection. Acme threads prevent "freezing" of screw collars and covers. "O" rings on pins, sleeves and interiors provide environmental separation and true waterproof integrity.



Cutaway view of the Russellstoll Max-Gard® pin and sleeve plug. They are designed to handle up to 400 amps at up to 600 volts.

Plugs and connectors can be specified equipped with adapters for rigid conduit, flexible conduit, armored cable or non-metallic cable.

Max-Gard receptacles, plugs and connectors comply with UL, CSA and IEC specifications.

For further information and free literature on the 400-amp 600-volt Max-Gard plugs,

Circle 70 on Reader Service Card

American Deck Machinery To Sell/Distribute McElroy Products In Louisiana

McElroy Machine and Manufacturing Co., Inc., Gulfport, Miss., announced its newly formed association with American Deck Machinery, Energy Maintenance Systems, Inc. of Houma, La.

According to the agreement, American Deck Machinery will become McElroy Machine's selling and stock distributor for its deck machinery and parts related to the commercial marine, inland, fishing and offshore markets in the state of Louisiana. American Deck Machinery will also provide McElroy with repair service and installation in Louisiana and the Gulf South.

For catalogs detailing all the equipment now available from McElroy Machine,

Circle 62 on Reader Service Card

Action Threaded Products Offers 20-Page Color Brochure On Non-Corrosive Fasteners

Action Threaded Products, Inc., is offering a free 20-page color brochure on their extensive line of non-corrosive fasteners, including: lock nuts, hex head cap screws, socket cap screws, wood screws, lag screws, studs, etc.

The color publication, complete with a table of contents, is divided into 13 sections, with information on the more than 20,000 stainless steel, aluminum, brass, silicon bronze, monel™ and nylon fasteners in stock at Action Threaded Products. Each section contains a brief description on the advantages of certain fastener materials and drawings of the various fasteners offered in that material.

For example, in the section on stainless steel fasteners, the text explains the surface phenomenon known as passivity which gives stainless steel its corrosion-resistant property. In addition, more than 40 line drawings of fasteners are included in the section.

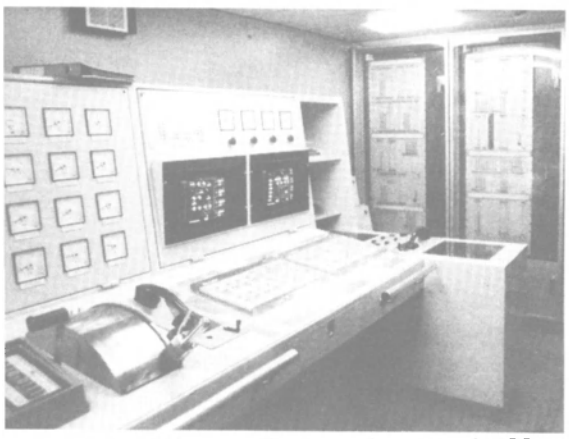
Included in the brochure are a corrosion guide (which will assist a user in selecting the most suitable metal to use in contact with chemicals, acids and other substances); chemical specifications charts; mechanical specifications table; torque guide; and thread guide.

Several fine color photographs showing Action Threaded Products fasteners, warehouse facilities and staff are included.

For your free copy of this handsome and informative brochure from Action Threaded Products,

Circle 66 on Reader Service Card

Valmet Automation Gets Order For Eight Damatic Systems From Yugoslavia



Valmet Automation a.s. in Norway recently received an order for eight Damatic marine automation systems to be delivered to the Yugoslav shipyards Split and Uljanic. These systems include monitoring as well as control functions of the propulsion machinery and electrical power station, and are based on the same technical concept as the several ships now in service with reduced crew complements.

During the past few months, Valmet Automation has received orders for 17 ships—the eight for Yugoslav yards, seven for South Korea, one for Finland, and one for Norway. Last year Valmet established a cooperation agreement with Hyundai Electrical Engineering Company (HEECO) in South Korea, a company manufacturing electrical rotating machinery, switchgear, and electronics. As a result of the contracts in Yugoslavia, a similar agreement has been signed with the Yugoslav company Rade Koncar.

Valmet came on the market in 1983 with a new concept for ship automation, replacing the six to eight traditionally separate systems with one multi-functional system, the Damatic Marine System, combining monitoring and control of the ship's propulsion and cargo gear into a microprocessor-based hardware concept with color video display units in the control room.

For free copies of brochures containing full information on the Damatic system,

Circle 92 on Reader Service Card

Bardex Offers New Brochure On Translift Load Walker

A new four-page brochure is available on Bardex Corporation's new generation of Translift Load Walkers. The new system is designed to move heavy loads over unprepared surfaces and has a extremely low profile. The brochure gives features and typical applications, explains the unit's operation, and presents outline drawings and specifications.

For a free copy of the new Bardex brochure,

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Coastal States Trading Announces Personnel Changes

Marianne C. Hughes, vice president of operations and administration for Coastal States Trading, Inc., the transportation and supply subsidiary of The Coastal Corporation, has assumed the additional responsibilities of marine operations following the retirement of **Albin Smith,** vice president of marine transportation.

Glen T. Maynard, has been promoted to director of marine services reporting to Ms. **Hughes.** In his new position, Mr. **Maynard** will supervise company and vessel operations, chartering, loss control, demurrage, marine operations and agency operations.

Mr. **Maynard** was most recently a senior marine analyst with Coscol Marine, also a subsidiary of The Coastal Corporation.

A Coastal employee since 1982, Ms. **Hughes** had been a crude oil representative at Coastal States Trading prior to her promotion in 1984 to vice president of domestic crude trading, responsible for domestic crude trading and domestic refinery supply activities. Ms. **Hughes** worked for a number of years in trading operations with Dane Energy Company and Phoenix Petroleum Company.

No Need To Remove Shaft For Bearing Change With Duramax Demountable Bearings

Easily replaceable, demountable rubber stave bearings are now available from the Duramax Marine Division of The Johnson Rubber Company.

The individual staves of Duramax demountable bearings can be assembled or replaced without shaft withdrawal. These keystone-sided, molded rubber staves slide into place without hindrance and can be removed as easily. Shipbuilders and owners will benefit from this time saving feature since Duramax demountable bearings can cut the cost of bearing inspection and replacement by about one-half.

Other bearings Duramax offers include metal backed stave bearings, with individually replaceable staves to support extreme shaft loads, and Duramax sleeve and flanged bearings, which feature specially formulated nitrile rubber securely bonded to metallic or nonmetallic shells.

For further information containing full information,

Circle 69 on Reader Service Card

Bailey Offers Custom Computer-Designed Refrigeration —Literature Available

The engineering department of Bailey Refrigeration has announced the addition of computer-automated drafting to its roster of services.

Using ATT computers and Autocad software, and the HP 6-pen Plotter, the firm can handle the large and small air conditioning and refrigeration needs of its customers more efficiently and many times faster.

The CAD system accommodates the need for the drawing of plans quickly and the CAD revision capability is up to 10 times faster than revisions made manually. A high quality output is assured. In addition, the Bailey hardware includes the ATT 6300 Computer, HP 7475 6-pen Plotter, Okidata 2400 printer, ATT 6300 mouse, 8087 math coprocessor and Seagate 20 Mbyte hard disk.

Together with the accompanying software, these computers can quickly effect piping, electrical drawings, installation drawings and details, equipment, dimensional and assembly drawings, schematics, and more, in two or three dimensional views.

Bailey Refrigeration can now computer-design to individual refrigeration needs and/or to the customer's unique own specification.

For free literature containing complete details on all Bailey's HVAC-R services,

Circle 67 on Reader Service Card

Gould Opens New Facilities For Circuit Breaker Repair, Overhaul —Literature Available

Gould Inc. Systems Protection Division has announced the opening of two new facilities to provide repair and overhaul services for circuit breakers.

The new facilities are located at Gould's headquarters plant in Philadelphia and in Virginia Beach, Va.

George Gordon, president of Gould Systems Protection Division, said the expanded facilities recognize a growing need for fast turnaround and expert workmanship in the repair and overhaul of circuit breakers.

He noted that Gould, which is the largest and only full line supplier of Mil spec circuit breakers and switchgear for the U.S. Navy, has previously provided overhaul services on a limited basis from its Philadelphia plant.

"Now, with dedicated facilities in two locations, we are able to serve this expanding market on a nationwide basis, assuring both speed and expertise from Gould specialists."

Gould Inc. designs, develops and manufactures computer and electronic products and systems used in defense, industrial and scientific applications.

For free literature containing full information,

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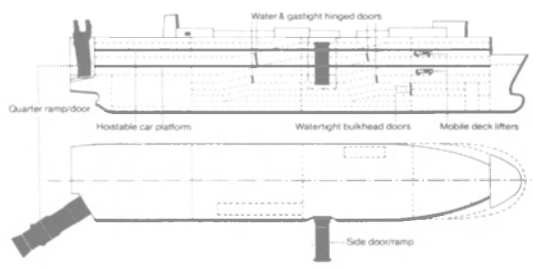
MacGregor-Navire Access Gear Ordered For Vehicle Carriers Building In People's Republic



The cargo access equipment for two car/truck carriers to be built at a major shipyard in the People's Republic of China for West German operator Christian F. Ahrenkiel will be MacGregor-Navire designed. Each 3,700-car capacity vessel will be fitted with an extensive access shipset that, in addition to the heavy-duty stern and side ramps, will include water/gastight doors, internal ramps, two complete liftable decks, and two mobile deck lifters.

The equipment order was placed with MGN's Hong Kong office by Jiangnan Shipyard, one of the PRC's larger yards located in the port of Shanghai. Considered to be well equipped, Jiangnan will have the distinction of supplying the first large car carriers of modern design to be built in China. Both vessels are included for delivery in the first half of 1988.

Designed by the Bremen office of the Swiss-based naval architect Maierform, each carrier will be able to load, besides cars, heavy vehicles over her 70-ton capacity MGN stern ramp, and up to 360 TEU in containers. To accommodate the 3,700 cars, there will be a total cargo area of 32,400 cubic meters distributed over nine decks. This includes the internal ramps and the 8,100-cubic-meter area provided by the two complete liftable decks that are being supplied in panel form by MGN.

For additional information on MGN cargo access equipment,

Circle 63 on Reader Service Card

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HOW TO PLACE CLASSIFIED ADVERTISING: Mail clearly written or typed copy to: MARITIME REPORTER, 118 East 25th Street, New York, NY 10010. Include any photos, drawings or logos if required. Specify size of ad and number of insertions . . . Classified Advertising — Per Issue Rate: Classified advertising is sold at a rate of $70 per column inch . . . MARITIME REPORTER'S classified section carries more advertising and sells more products than any other publication in the marine industry. Closing date for classified advertising is 20 days prior to the date of the issue. For further details contact John C. O'Malley at (212) 477-6700. Send all advertising material to MARITIME REPORTER And Engineering News, 118 East 25th Street, New York, NY 10010.

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Free 12-Page Color Guide On Rubber Bearing Applications Offered By BFGoodrich

BFGoodrich, Akron, Ohio, and its marketing subsidiary, Lucian Q. Moffitt, Inc., announced the recent publication of a free 12-page color brochure directed to the application engineer and other related bearing application job functions.

The color publication covers bearing design, operation, performance, installation and servicing. Several tables enumerate commercial marine, naval and industrial bearing clearance data. Also included is a section on recommended dimensions for full-molded bearings in marine service.

For a free copy or additional information,

Circle 65 on Reader Service Card

Marine Travelift Hoists Now Feature Four-Wheel Drive —Literature Available

Marine Travelift, Inc. recently announced that optional four-wheel drive mobility is now available on their 15-, 25- and 35-ton-capacity mobile boat hoists. The newly designed direct wheel drive eliminates drive chains and increases reliability and performance while reducing possible downtime.

The four-wheel drive feature adds extra gradeability and rough terrain mobility to the units for improved yard utilization and more versatility. Units can handle steeper yard grades than previous models which allows operators more opportunities for boat storage and repair.

Marine Travelift 15BFM, 25 BFM and 35 BFM mobile hoists also feature the "beam forward" design, forward sling adjustment behind the front beam allowing for more rigging and structure clearance. The units also have up to 9 feet of power adjustable sling placement at the closed end.

Operator convenience designs to permit handling a wide variety of pleasure and commercial sailing and power boats including fast hoisting, "plug in" gauge to permit instant inspection of each hydraulic pump function, two-speed drive and an easy access operator compartment.

The Marine Travelift hoists also have high strength box frame construction; pivot trunnion allowing side frames to pivot on uneven terrain; hydraulic motor with gear reducer; automatic brake and a mechanical, anti-two-block system built-in.

For complete details on the new Marine Travelift mobile hoist four-wheel drive system or for complete design details, prices, delivery and specifications on the complete line of mobile boat hoists,

Circle 54 on Reader Service Card

Circle 155 on Reader Service Card

Circle 246 on Reader Service Card

FOR MORE INFORMATION
ON
EQUIPMENT AND SERVICES ADVERTISED IN THIS ISSUE

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American Ship Building To Enter Hawaiian Cruise Ship Trade

The American Ship Building Company of Tampa, Fla., following the recent completion of a $300-million, five-ship T-5 tanker contract for Ocean Products Tankers of Houston and the Military Sealift Command, has announced its intention to embark on two new major programs.

A company spokesman disclosed that AmShip plans to enter the inter-island trade in Hawaii with American-built, American-flag passenger cruise ships that the company would build and in a joint venture, would own and operate.

The vessels would be constructed utilizing the most modern techniques of ship construction, and would be the first passenger ships built in a U.S. shipyard by American labor in more than 30 years. Commenting on AmShip's plans, a company spokesman stated: "We have been considering this possibility for some time. The Hawaiian Islands trade is a most attractive situation, and we feel that new ships constructed in American yards, manned by American crews, can operate successfully there. Our estimates show that the first ship could be ready to enter service within 24 months or less."

AmShip also announced that following a year-long preparatory research and development study, it intends to enter the business of producing "surumi," a paste made economically from minced fresh fish, high in protein and low in fat and cholesterol, which today is becoming one of the fastest-growing consumer industries in the world. Surumi is a product that is processed from pollack, a fish caught principally in Alaskan waters, which has vast potential due to the range of products in which it can be used, including "imitation" seafood.

The company spokesman stated: "The American Ship board has authorized proceeding with an advanced phase of involvement of our company in this industry, which should place us in the forefront of American companies involved in this fast-growing industry." Construction of the first of the large, oceangoing processing plants to produce the surumi could be completed and in operation within 12 months.

The American Ship Building Company is one of the largest ship repair and construction facilities in Florida, and is one of the major builders of barges on the inland waterways, at its Nashville Bridge Company yard in Nashville, Tenn.

For further information on AmShip's facilities and capabilities,

Circle 87 on Reader Service Card

Phillips To Elevate Six Norway Offshore Platforms

Phillips Petroleum Company said the Norwegian Petroleum Directorate has approved Phillips's proposal to elevate six offshore production platforms in Norway's Ekofisk oil and gas field in the North Sea.

The modification project, one of the biggest ever proposed for an offshore field, is necessary to compensate for an increase in water depth caused by a sinking seabed above the Ekofisk reservoirs.

Preliminary work on the $286-million project will begin this summer. The actual elevating operation will take place next summer in conjunction with a scheduled 12-day maintenance shutdown.

Rockwell-Collins Awarded Contract To Supply Data Links For Spanish Navy

A $700,000 contract to supply five Data Automatic Link 11 sets to the Spanish Navy has been awarded to Rockwell International Corporation's Collins Defense Communications (CDC). Under the 14-month agreement, five Spanish Navy Baleares Class frigates will be modernized with CDC's latest Technical Data System Link 11 equipment, including the TE-237P-1A programmable data terminal set that carries the U.S. nomenclature AN/USQ-92, and the 373E-2 Data Terminal Set Control (C-11494/U). Both units are state-of-the-art communications microprogrammable processor technology, and are NATO-compatible, having previously been deployed by five other NATO navies.

Link 11 is a long-range, digital data communications network connecting widely spaced elements of a task force. It provides technical data exchange among surface vessels, shore stations, and aircraft. This exchange of data provides a wider range of surveillance, and multiple reporting of radar tracks in fringe areas, for the command and control of weapons systems, air intercept, and air defense.

For free literature containing complete details on CDC's Link 11 equipment,

Circle 91 on Reader Service Card

Nicor To Sell Barging Operation Subsidiary

Nicor Inc. recently announced the signing of a letter of intent with a private investor group that plans to purchase the Houston-based inland barging operation of National Marine Service Incorporated, a wholly owned subsidiary of Nicor Inc. The purchase is subject to agreement on a definitive contract.

Included is a fleet of 143 barges and three towboats that transport petroleum and chemical products along the Gulf Intracoastal Waterway and Mississippi River System. The sale would carry out Nicor's previously announced plan to divest its barging operation in 1986.

BUYERS DIRECTORY

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

AIR COMPRESSORS
Hamworthy Engineering Ltd., Poole, Dorset BH17 7LA ENGLAND
Marketec, Inc., 27 Bowers Lane, Chatham, NJ 07928
Squire-Cogswell Company, 3411 Commercial Ave., Northbrook, IL 60062

AIR CONDITIONING AND REFRIGERATION—REPAIR & INSTALLATION
Bailey Refrigeration Co., Inc, 2323 Randolph Avenue, Avenel, NJ 07001
Borg-Warner Air Conditioning, P.O. Box 1592-361C, York, PA 17405
Flakt AB, Box 8862, S-40272, Gothenburg, Sweden
Mechanical Resources Inc., 210 West Side Ave., Jersey City NJ 07305
Stal Refrigeration AB, Butangsgatan 16, S 601 87 Norrkoping, Sweden
United Technologies, Carrier Transicold Division, P.O. Box 4805, Syracuse NY 13221

ANCHORS AND CHAIN
Baldt Incorporated, P.O. Box 350, Chester, PA 19016
G.J. Wortelboer Jr. B.V., Eemhavenstraat 4, P.O. Box 5003, 3008 AA Rotterdam, Netherlands

ANODES—Cathodic Protection
Engelhard Industries Division, 2655 U.S. Route 22, Union, NJ 07083
Federal Harco, P.O. Box 40310, Houston, TX 77240
Saphire Technology, Inc.; 9370 Sunset Dr., Suite A215, Miami FL 33173
Thermal Reduction Company, 1 Pavilion Avenue, Riverside, NJ 08075
Wilson, Walton International, Inc., 66 Hudson St., Hoboken, NJ 07030

BALLASTS
Genstar Stone Products Co., Executive Plaza IV Hunt Valley, MD 21031

BASKET STRAINERS
Riley-Beaird, P.O. Box 31115, Shreveport, LA 71130

BEARINGS—Rubber, Metallic, Non-Metallic
Golten Marine Co., Inc., 160 Van Brunt St., Brooklyn NY 11231
Johnson Rubber Co., Duramax Marine Div., 16025 Johnson St., Middlefield, OH 44062
Lucian Q. Moffitt, Inc., P.O. Box 1415, Akron, OH 44309
Norton Chemplast, 309-150 Dey Rd., Wayne, NJ 07470
Thomson-Gordon Limited, 3225 Mainway, Burlington, Ontario, Canada L7M 1A6
Waukesha Bearings Corp., P.O. Box 798, Waukesha, WI 53186

BOILERS
Aalborg Vaerft, P.O. Box 661, DK-9100 Aalborg DENMARK
Combustion Engineering, Inc., Windsor, CT 06095
Industrial Engineering & Equipment Co., 425 Hanley Industrial Ct., St. Louis, MO 63144
Marketec, Inc., 27 Bowers Lane, Chatham, NJ 07928

BOILER CLEANING
Asea Stal, 50 Chestnut Ridge Rd., Montvail N.J. 07645
Infrasonik AB (an ASEA Stal Co.). S-612 20 Finspong, SWEDEN

BROKERS
Capt. Astad Company, Inc., P.O. Box 53434, New Orleans, LA 70153
ECO Inc., 1036 Cape St. Claire Center, Annapolis, MD 21401
Jack Faulkner Inc., 2419 Caddy Lane, P.O. Box 371, Flossmoor IL 60422
Mowbray's Tug & Barge Sales Corp., 21 West St., New York, NY 10006
Western Maritime, 701 B Street, San Diego, CA 92101

BRONZES—COMMEMORATIVE
Duramax Metals, Inc., 2401 Wesley Street, Portsmouth, VA 23707

BUNKERING SERVICE
Belcher Company Inc., 8700 West Flagler, P.O. Box 025500, Miami FL 33152
Gulf Oil Trading Co., 535 Madison Ave., New York, NY 10022
National Marine Service Inc. (Transport Div.), 1750 Brentwood Blvd., St. Louis, MO 63144
Tramp Oil & Marine ltd., London ENGLAND. Telex: 8812194

CARGO HANDLING EQUIPMENT
Hiab Cranes & Loaders, Inc., 258 Quigley Blvd., New Castle, DE 19720
MacGregor-Navire International, Box 8991, S-402 74 Goteborg, Sweden
MacGregor Navire U.S.A. Inc., 135 Dermody St., Cranford, NJ 07016

CASTINGS/FORGINGS
NKS Industria Pesada, Grupo Industrial, Reforma 404, 140 Piso, Mexico, D.F. 06600 U.S. REP.—Lexington International Trading, Inc., 551 Fifth Ave., Room 910, New York N.Y. 10017

CHOCKING COMPOUND
InterProducts, Inc., 129 King Road E, Nobleton, Ontario LOG INO Canada
InterProducts, Inc., Avon Street Business Center, P.O. Box 1848, Charlottesville, VA 22903
Philadelphia Resins Corp., 20 Commerce St., Montgomeryville, PA 18936
Wirelock, 129 King Road E, Nobleton, Ontario LOG INO Canada

CLAMPS
Inter Product, Inc., Avon Street Business Center, P.O. Box 1848, Charlottesville, VA 22903

CLOSURES—Marine
Mock Manufacturing Inc., 777 Rutland Rd., Brooklyn, NY 11203

COMPUTERIZED INFORMATION SYSTEMS
TIMSCO, 622 Azalea Rd., Mobile, AL 36609
Veson Systems, 29 Broadway, Suite 1002, New York, NY 10006

CONDENSERS/SEPARATORS
Riley-Beaird, P.O. Box 31115, Shreveport, LA 71130
Wright Austin Co., 3245 Wight St., Detroit MI 48207

CONTROL SYSTEMS—Monitoring
American United Marine Corp., 5 Broadway, Rte. 1, Saugus, MA 01906
ASEA, Inc., 4 New King St., White Plains, NY 10604
Bailey Controls, 29801 Euclid Avenue, Wickliffe, OH 44092
Barringer Research, 304 Carlingview Dr., Rexdale, Ontario, Canada M9W 5G2
Cooper Energy Services, Mount Vernon, OH 43050
Ergon, Inc., P.O. Drawer 1639, Jackson, MS 39205
Indikon Corp., 26 New St., Cambridge, MA 02138
Instruments Computers & Controls Corp., 6942 Haven Creek Dr., Katy TX 77449
Leslie Co., 401 Jefferson Rd., Parsippany, NJ 07054
Pandel Instruments Inc., 2100 N. Hwy. 360, Grand Praire, TX 75050
Propulsion Systems, Inc., 21213 76 Ave., Kent, WA 98032
Teleflex Inc., 771 First Ave., King of Prussia, PA 19406
Thomas Products Ltd., Flow Switch Div., 987 West St., Southington, CT 06489-1023
Transamerica Delaval, Inc., Gems Sensors Division, Cowles Road, Plainville, CT 06062
Valmet Automation A.S., P.O. Box 130, N-3430, Spikkestad, Norway

CRANES—HOISTS—DERRICKS—WHIRLEYS
The Crosby Group, Inc., P.O. Box 3128, Tulsa OK 74101
Davit Sales, Inc., P.O. Box 232, Jefferson Valley, NY 10535
Hiab Cranes & Loaders, Inc., 258 Quigley Blvd., New Castle, DE 19720
Marine Travelift, Inc., 49 E. Yew St., Sturgeon Bay, WI 54235
J.D. Neuhaus, Hebezeuge, D5810, Witten Heven, West Germany
CMH Heleshaw, Inc., 201 Harrison St. Hoboken N.J. 07030
Cunningham Marine Hydraulics Co. Inc., 2030 E. Adams St. Jacksonville, FL 32202
Manitex, Inc., 2203 Timberlock Place, Suite 130, The Woodlands, TX 77380

DECK MACHINERY—Cargo Handling Equipment
Markey Machinery Co., Inc., 79 S. Horton St., Seattle, WA 98134
McElroy Machine & Mfg. Co., Inc., Lorraine Rd., Industrial Seaway, Gulfport, MS 39501

DECKING—GRATING
Alligned Fiber Composites, Highway 52, South Chatfield, MN 55923
International Grating, 7625 Parkhurst, Houston, TX 77028

DIESEL ACCESSORIES—CYLINDER LINERS
Colt Industries Inc. Fairbanks Morse Engine Div. 701 Lawton Ave., Beloit, WI 53511
General Thermodynamics Corporation, 210 South Meadow Road, P.O. Box 1105, Plymouth, MA 02360
Golten Marine Co., Inc., 160 Van Brunt St., Brooklyn NY 11231
Haynes Corporation, P.O. Box 179, Jackson, MI 49204
Illman Jones Inc., 5505 Broadway, American Canyon CA 94589
Stewart & Stevenson Services, Inc.—MWM, P.O. Box 1637, Houston, TX 77251-1637

DIESEL ENGINE—Spare Parts & Repair
Alban Engine Power, Inc., 6455 Washington Blvd., Baltimore, MD 21227
Alco Power Inc., 100 Orchard St., Auburn, N.Y. 13021
BMV Bergen Diesel A.S., P.O. Box 924, N-5001 Bergen NORWAY; 2110-10 Service Rd., Kenner LA 70062
Caterpillar, Inc., Engine Division, 100 NE Adams St., Peoria IL 61629
Colt Industries Inc. Fairbanks Morse Engine Div. 701 Lawton Ave., Beloit, WI 53511
Cummins Engine Co., Inc., Mail Code 40642, Box 3005 Columbus, IN 47202-3005
Goltens, 160 Van Brunt Street, Brooklyn, NY 11231
Granges Repair Service GMBH, Gutenbergring, 64 D-2000 Hamburg-Norderstedt TX:0215553
Markisches Werk GmbH, P.O. Box 1442, D-5884 Halver 1, Federal Republic of Germany
Schoonmaker Service Parts Co., Inc., P.O. Box 757, Foot of Spring St., Sausalito, CA 94966
Stewart & Stevenson Services, Inc.—MWM, P.O. Box 1637, Houston, TX 77251-1637
Sulzer Brothers Inc., 200 Park Ave., New York, N.Y. 10166
Volvo Penta of America, P.O. Box 927, Rockleigh, NJ 07647

ELECTRICAL EQUIPMENT
Midland-Ross Corp., Russellstoll Division, 530 W. Mt. Pleasant Ave., Livingston, NJ 07039
Newmar, P.O. Box 1306, Newport Beach, CA 92663
Sigmaform Corporation, P.O. Box 515, Richboro, PA 18954
Stewart & Stevenson Services, Inc.—MWM, P.O. Box 1637, Houston, TX 77251-1637
Zidell Explorations, Inc., 3121 S.W. Moody St., Portland, OR 97201

ELECTRONIC INFORMATION SYSTEMS
Inventory Locator Service Inc., 3820 Premier Ave., Memphis TN 38118

ELECTRONIC SYSTEMS
Marine Electric RPD, Inc., 666 Pacific St., Brooklyn, NY 11217 TX: 125327
Marine Safe Electronics Ltd., 37 Staffen Drive, Concord (Toronto), Ontario CANADA L4K 2X2

EMULSIFICATION SYSTEMS
Sunbelt Energy Systems, Inc., Park Square, 2105 Park Ave., Suite 14, Orange Park, FL 32073
S/S Research & Development Inc., 1050 State St., Perth Amboy, NJ 08862
Todd Marine Systems, 61 Taylor Reed Place, Stamford, CT 06906

ENGINE TEST EQUIPMENT
General Thermodynamics Corp., P.O. Box 1105, 210 S. Meadow Road, Plymouth, MA 02360

EQUIPMENT—Marine
American General/Levin Corp., 445 Littlefield Ave., So. San Francisco, CA 94083
Band-It Division, Houdaille Industries, Inc., P.O. Box 16307, Denver, CO 80216
Beaver Tool Co., 1525 SE 29th St., Box 94717, Oklahoma City, OK 73143
Boston Metals Company, 233 E. Redwood St., Baltimore, MD 21202
Thomas Coudon Associates, 6655 Amberton Dr., Baltimore, MD 21227
Daito Engineering Co., Ltd., 10-23 Kawaguchi, 3-chome, Nishi-ku, Osaka JAPAN
Genstar Stone Products Co., Executive Plaza IV, Hunt Valley, MD 21031
Hossfeld Manufacturing Co., P.O. Box 557, Winona MN 55987
Kearfott Marine Products, 550 South Fulton Ave., Mount Vernon, NY 10550
Maritime Power Corp., 200 Henderson Street, Jersey City, NJ 07302
Nicolai Joffe, P.O. Box 5362, 9171 Wilshire Blvd., Beverly Hills, CA 90210
Raytheon Service Company, 100 Roester Rd., Suite 103, Glen Burnie, MD 21061
Transamerica Delaval Inc., Corporate Marine Program, Cowles Rd., Plainville CT 06062
Waterman Supply Co., Inc., 2815 E. Anaheim Street, P.O. Box 596, Wilmington, CA 90748

EVAPORATORS
Alfa-Laval, Inc., Dept. MR-2, 2115 Linwood Ave., Fort Lee, NJ 07024
Atlas-Danmark Marine & Offshore, Baltorpvej 154, KD-2750 Bllerup, Copenhagen DENMARK
Meco (Mechanical Equipment Co., Inc.), 861 Carondelet Street, New Orleans, LA 70130
Riley-Beaird, P.O. Box 31115, Shreveport, LA 71130

FANS—VENTILATORS—BLOWERS
Joy Manufacturing Company, 338 So. Broadway, New Philadelphia, OH 44663
Jon M. Liss Associates, Inc., 411 Borel Ave., P. O. Box 5554, San Mateo, CA 94402
Robinson Industries, P.O. Box 100, Zelienople, PA 16063

FASTENERS
Action Threaded Products Inc., 7440 W. 100th Place, Bridgeview IL 60455
Erico Fastening Systems, Inc., 301 New Albany Rd, Moorestown, NJ 08057
Hardware Specialty Co., Ships Division, 48-75 36th St., Long Island City, NY 11101
Troy Company, 315 Fairfield Rd, Fairfield, NJ 07006

FENDERING SYSTEMS—Dock & Vessel
Johnson Rubber Co., Duramax Marine Div., 16025 Johnson St., Middlefield, OH 44062
Kahlenberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241
Seaward International, Inc., Clearbrook Industrial Park, P.O. Box 98, Clearbrook VA 22624

FILTERS
Dahl Manufacturing, Inc., 2521 Railroad Ave., Ceres, CA 95307
Marketec, Inc., 27 Bowers Lane, Chatham, NJ 07928
Parker Filter Division, 16810 Fulton County Rd., #2, Metamora, OH 43540

FINANCING—Leasing
JMJ Marine Investors Corp., 1525 River Oaks Rd East, Marahan LA 70123

FIRE PROTECTION, DETECTION & ALARM SYSTEMS
Formica Corp., One Cyanamid Plaza, Wayne NJ 07470
Walter Kidde, Walter Kidde Dr., Wake Forest, NC 27586

FUEL ADDITIVE
Drew Ameroid Marine, One Drew Chemical Plaza, Boonton NJ 07005

FUEL OIL/LUBE OIL—Analysis & Testing
Ferrous Corporation, 910 108th N.E., P.O. Box 1764, Bellevue, WA 98009
Ocean Fleet Services, 1301 Metropolitan Ave., Thorofare, NJ 08086

FURNITURE
Bailey, Carpenter & Insulation Co., 2323 Randolph Avenue, Avenel, NJ 07001
Comfort-Mate, Inc., 7988 NW 56th Street, Miami, FL 33166

GALLEY EQUIPMENT
Insinger Machine Co., 6245 State Rd., Philadelphia, PA 19135

GANGWAYS
Rampmaster Inc., 9825 Osceola Blvd., Vero Beach, FL 32960

GAUGES
Oil Recovery Systems, Inc., 1420 Providence Hwy., Norwood, MA 02062

HATCH & DECK COVERS—Chain Pipe
MacGregor-Navire Internatinal, Box 8991, S-402 74 Goteborg, Sweden
MacGregor Navire U.S.A. Inc., 135 Dermody St., Cranford, NJ 07016
Mock Manufacturing Inc., 777 Rutland Rd., Brooklyn, NY 11203

HEAT EXCHANGERS
Alfa-Laval, Inc., Dept. MR-2, 2115 Linwood Ave., Fort Lee, NJ 07024
Industrial Engineering & Equipment Co., 425 Hanley Industrial Ct., St. Louis, MO 63144
Meco (Mechanical Equipment Co., Inc.), 861 Carondelet Street, New Orleans, LA 70130
Riley-Beaird, P.O. Box 31115, Shreveport, LA 71130
Vapor Corp., 6420 West Howard St., Chicago IL 60648

HORNS/WHISTLES
Kohlenberg Bros Co., P.O. Box 358, Two Rivers, WI 54241

HULL CLEANING
Petroferm Marine, Route 2, Box 280, Amelia Island, FL 32034
Phosmarine Equipment, 21 Bd. de Paris, 13002, Marseille, France
Seaward Marine Service, Inc., 201 N. Union Street, Alexandria, VA 22314
Seaward Marine Service, Inc. 5409 Beamon Rd., Norfolk, VA 23513 TX: 710-881-1182
Seaward Marine Service, Inc. 424 West 8th Street, National City, CA 92050
Taylor Diving & Salvage Co. Inc., 701 Engineers Rd., Belle Chasse, LA 70037

HYDRAULICS
Aeroquip Corp., 1130 Maynard Road, Jackson, MI 49202
Bardex Hydranautics, 6338 Lindmar Dr., P.O. Box 1068, Goleta, CA. 93116
Cunningham Marine Hydraulics Co., Inc., 201 Harrison St., Hoboken, NJ 07030; 2030 E. Adams St., Jacksonville, FL 32204, TX: 710-730-5224
CMH Heleshaw, Inc., 201 Harrison St. Hoboken N.J. 07030
Del Gavio Marine Hydraulics Inc., 207 W. Central Ave., Maywood, NJ 07607
Hydra-Dynamics, Inc., 2141 Greenwood Ave., Wilmette, IL 60091
Parker Hannifin Corporation, 17325 Euclid Avenue, Cleveland, OH 44112
Titeflex Corporation, P.O. Box 54, Springfield, MA 01109
Washington Chain & Supply, Inc., P.O. Box 3646, Seattle, WA 98124

INERT GAS
Saab Tank Control, One Harmon Plaza, Secaucus NJ 07094

INSULATION—Cloth, Fiberglass
Bailey, Carpenter & Insulation Co., 2323 Randolph Avenue, Avenel, NJ 07001
Duracote Corp., 350 North Diamond St., Ravenna, Ohio 44266
Superior Energies, Inc. P.O. Drawer 386, Groves, TX 72619

JOINER—Watertight Doors—Paneling
Advanced Structures Corp., 235 W. Industry Ct., Deer Park, NY 11729
Astech, 3030 S. Red Hill Ave., Santa Ana, CA 92711
Bailey Distributors, Inc., 2323 Randolph Avenue, Avenel, NJ 07001
Masonite Commercial Division, Dover, OH 44622
Walz & Krenzer Inc., 725 Glen Cove Ave., P.O. Box 6, Glen Head NY 11545

KEEL COOLERS
R.W. Fernstrum & Co., 1716 Eleventh Ave., Menominee, MI 49858
Johnson Rubber Co., Duramax Marine Div., 16025 Johnson St., Middlefield, OH 44062
Kohlenberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241

LIGHTING EQUIPMENT—Lamps, Fixtures, Searchlights
Carlisle & Finch, 4562 W. Mitchell Avenue, Cincinnati, OH 45232
Midland-Ross Corp., Russellstoll Division, 530 W. Mt. Pleasant Ave., Livingston, NJ 07039
Perko Inc., P.O. Box 6400D, Miami, FL 33164
Phoenix Products Company, Inc., 4769 North 27th Street, Milwaukee, WI 53209

LINE BLINDS
American Piping Products Inc., Box 1056, New Hyde Park, NY 11040
Stacey/Fetterolf Corp., P.O. Box 103, Skippack, PA 19474

MACHINERY MAINTENANCE, REPAIR, OVERHAUL, AND TESTING
CMH Heleshaw, Inc., 201 Harrison St. Hoboken N.J. 07030
Cunningham Marine Hydraulics Co. Inc., 2030 E. Adams St. Jacksonville, FL 32202
Del Gavio, 207 W. Central Ave., Maywood, NJ 07607. Telex: 132610 DEL-MARINE
Jered Brown Brothers Inc., 1300 Coolidge, P.O. Box 2006, Troy, MI 48007
American General/Levin Corp., 445 Littlefield Ave., So. San Francisco, CA 94080
Goltens, 160 Van Brunt St., Brooklyn, NY 11231

METAL MARKER
J. P. Nissen Company, P.O. Box 188, Glenside PA 19038

MINING
Rocky Mountain Energy, 10 Longspeake Dr., Box 2000, Broomfield, CO 80020

NAME PLATES—BRONZE—ALUMINUM
Duramax Metals, Inc., 2401 Wesley Street, Portsmouth, VA 23707

NAVAL ARCHITECTS, MARINE ENGINEERS, SURVEYORS
Aero Nav Laboratories, Inc., 14-29 112 St., College Point, NY 11356
American Hydromath Inc., Box 2450, Danby-Pawlet Road, Pawlet, VT 05761
American Systems Engineering Corp., P.O. Box 8988, Virginia Beach, VA 23452
Ameritech Corporation, 7 Belver Avenue, Suite 215, N. Kingston, RI 02852
Amirikian Engineering Co., Chevy Chase Center Bldg., Suite 505, 35 Wisconsin Circle, Chevy Chase, MD 20015
Art Anderson Associates, 148 First St., Bremerton, WA 98310
B.C. Research, 3650 Wesbrook Mall, Vancouver, B.C. Canada V6S 2L2
Del Breit Inc., 326 Picayune Place (Suite 201), New Orleans, LA 70130
C.D.I. Marine Co., 5520 Los Santos Way, Suite 600, Jacksonville, FL 32211
C.T. Marine, 18 Church Street, Georgetown, CT 06829
Century Engineering, inc., 32 West Rd., Towson, MD 21204
Childs Engineering Corp., Box 333, Medfield, MA 02052
Crandall Dry Dock Engrs., Inc., 21 Pottery Lane, Dedham, MA 02026

C.R. Cushing, 18 Vesey St., New York, NY 10007
Design Associates Inc., 14360 Chef Menteur Highway, New Orleans, LA 70129
Designers & Planners, Inc., 1725 Jefferson Davis Highway, Suite 700, Arlington, VA 22202
ECO Inc., 1036 Cape St. Claire Center, Annapolis, MD 21401
Encon Management & Engineering Consultant Services, P.O. Box 7760, Beaumont, TX 77706
Engineering Visions, 1111 Bay Blvd., Chula Vista CA 92011
Capt. R.J. Fearson & Associates, P.O. Box 983, Tampa, FL 33601
Christopher J. Foster, Inc., 16 Sintsink Drive East, Port Washington, NY 11050
Gibbs & Cox, Inc., 119 West 31st Street, New York, NY 10001
John W. Gilbert Associates, Inc., 66 Long Wharf, Boston, MA 02110
The Glosten Associates, Inc., 610 Colman Bldg., 811 First Ave., Seattle, WA 98104
Phillip Gresser Associates, Ltd., 3250 South Ocean Blvd., Palm Beach, FL 33480
Morris Guralnick Associates, Inc., 620 Folsom Street, Suite 300, San Francisco, CA 94107
Hamilton Cornell Associates, Box 188, Snug Harbor Station, Duxbury, MA 02331
J.J. Henry Co., Inc., 40 Exchange Place, New York, NY 10005
Hi-Test Laboratories, Inc., P.O. Box 226, Buckingham C.H., VA 23921
HydroComp, Inc., 10 Cutts Road, P.O. Box 865, Durham, NH 03824
Intramarine, Inc., P.O. Box 53043, Jacksonville, FL 32201
JJH Inc. of Virginia, 330 County St, Portsmouth VA 23704
R.D. Jacobs & Associates, 11405 Main St., Roscoe, IL 61073
Jantzen Engineering Co., 6655-H Amberton Drive, Baltimore, MD 21227
James S. Krogen, 1515 NW 7th St., Suite 124, Miami FL 33125
Rodney E. Lay & Associates, 13891 Atlantic Blvd., Jacksonville, FL 32225
Alan C. McClure Associates, Inc., 2600 South Gessner, Houston, TX 77063
John J. McMullen Associates, Inc., 1 World Trade Center, New York, NY 10048
Fendall Marbury, 1933 Lincoln Drive, Annapolis, MD 21401
Marine Consultants & Designers, Inc., 308 Investment Insurance Bldg., Corner E. 6th St. & Rockwell Ave., Cleveland, OH 44114
Marine Design Inc., 401 Broad Hollow Road, Rte. 110, Melville, NY 11746
Marine Power Associates, 1010 Turquois St., Ste 217, San Diego, CA 92109
Maritime Design, Inc., 2955 Hartley Rd., Jacksonville, FL 32217
R. Carter Morrell, 715 S. Cherokee, Bartlesville, OK 74003
Nelson & Associates, Inc., 610 Northwest 183rd St., Miami, FL 33169
Nickum & Spaulding Associates, Inc., 2701 First Ave., Seattle, WA 98121
Northern Marine, P.O. Box 1169, Traverse City, MI 49685
Ocean-Oil Internatinal Engineering Corporation, 3019 Mercedes Blvd., New Orleans, LA 70114
Pearlson Engineering Co., Inc., 8970 S.W. 87th Ct., Miami, FL 33156
Q.E.D. Systems Inc., 4646 Witchduck Rd., Virginia Beach, VA 23455
M. Rosenblatt & Son, Inc., 350 Broadway, New York, NY 10013 and 667 Mission St., San Francisco, CA 94105
Sargent & Herkes Inc., 611 Gravier St., New Orleans, LA 70130
Schmahl and Schmahl, Inc., 1209 S.E. Third Ave., Fort Lauderdale, FL 33316
SEACOR Systems Engineering Corp., 520 Fellowship Rd., Ste C306, Mt. Laurel NJ 08054
STV/Sanders & Thomas, Inc., 1745 Jefferson Davis Hwy., Arlington, VA 22202
Seaworthy Systems Inc., 28 Main St., Essex CT 06426; 17 Battery Pl., New York, NY 10004; P.O. Box 205, Solomons MD 20688; 2 Skyline Pl, 5203 Leesburg Pike, Falls Church VA 22041
Seaworthy Electrical Systems, 17 Battery Pl. N.Y. N.Y. 10004
George G. Sharp, Inc., 100 Church St., New York, NY 10007
Simmons Associates, P.O. Box 760, Sarasota, FL 33578
R.A. Stearn, Inc., 253 N. 1st Ave., Sturgeon Bay, WI 54235
Thomas Coudon Associates, 6655 Amberton Drive, Baltimore, MD 21227
Timsco, 622 Azalea Road, Mobile, AL 36609
Tracor Hydronautics, Inc., 7210 Pindell School Rd., Laurel, MD 20707
Thomas B. Wilson, Associates, 1258 North Avalon Blvd., Wilmington, CA 90744

NAVIGATION & COMMUNICATIONS EQUIPMENT
AT&T Communications, 412 Mt Kemble Ave., Room N420, Morristown, NJ 07960
Atkinson Dynamics, Section 6, 10 West Orange Ave., South San Francisco, CA 94080
COMSAT World Systems, 950 L'Enfant Plaza, S.W., Suite 6151 Washington, DC 20024
A/S Elektrisk Bureau, P.O. Box 98, N-1360 Nesbru, Norway
Furuno U.S.A., 271 Harbor Way, S. San Francisco, CA 94080
General Electric Company, Mobile Communications Division, Lynchburg, VA 24502
Harris Communications (RF Communications), 1680 University Avenue, Rochester, NY 14610
Henschel, 9 Hoyt Drive, Newburyport, MA 01950
Hose McCann Telephone Company, Inc., 9 Smith Street, Englewood, NJ 07631
ITT Mackay, 441 U.S. Highway #1, Elizabeth, NJ 07202
Kongsberg Vopenfabrikk, Norcontrol Division, P.O. Box 145, Horten 3191, Norway
Micrologic, 20801 Dearborn, Chatsworth, CA 91311
Naval Electronics, 5479 Jetport Industrial Blvd., Tampa FL 33614
Nav-Com, Inc., 9 Brandywine Drive, Deer Park, NY 11729
Navigation Sciences Inc., 6900 Wisconsin Ave., Bethesda, MD 20815 TX: 705999
Perko Inc. (Lights), P.O. Box 6400D, Miami, FL 33164
Racal Marine Inc., 1 Commerce Blvd., Palm Coast, FL 32037-0029
Radio-Holland USA, Inc., 6033 South Loop East, Houston, TX 77033
Raytheon Marine Co., 676 Island Pond Road, Manchester, NH 03103
Raytheon Ocean Systems Company, Westminster Park, Risho Avenue, East Providence, RI 02914
Raytheon Service Co., 103 Roesler Rd., Glen Burnie, MD 21061
Robertson-Shipmate, 400 Oser Ave., Hauppauge NY 11788
S.P. Radio A/S, DK 9200 Aalborg, Denmark
SAIT Inc., 33 Rector St., New York, NY 10006
Simrad, 2208 NW Market St., Seattle WA 98107
Sperry Corporation, Rte 29 North, Charlottesville, VA 22906
Telesystems, 2700 Prosperity Ave., Fairfax, VA 22031 USA
Tracor Instruments Austin Inc., 6500 Tracor Lane, Austin, TX 78725

OILS—Marine—Additives
B P North America Petroleum, 555 US Route 1, So. Iselin, NJ 08830
Exxon Company, U.S.A., Room 2323 AH, P.O. Box 2180, Houston, TX 77701
Mobil Oil Corp., 150 East 42 Street, New York, NY 10017
Texaco, Inc. (International Marine), 135 East 42nd St., New York, NY 10017

OIL/WATER SEPARATORS
Alfa Laval, Inc., Dept. MR-2, 2115 Linwood Ave., Fort Lee, NJ 07024
Centrico, Inc. (Westfalia Separators), 100 Fairway Court, Northvale, NJ 07647
FAST Systems, Inc., 1717 Sublette, St. Louis, MO 63110
Hamworthy Engineering Ltd., Poole, Dorset BH17 7LA ENGLAND
Marketec, Inc., 27 Bowers Lane, Chatham, NJ 07928
Mitsubishi International Corp., Machinery Div., 520 Madison Ave., New York, NY 10022
NALCO Chemical, Co., 2901 Butterfield Road, Oak Brook, IL 60521
Oil Recovery Systems, Inc., 1420 Providence Hwy., Norwood, MA 02062
Peck Purifier Sales Co., 3724 Cook Blvd., Chesapeake, VA 23323
Sigma Treatment System, Merry Meadows RD 1 Box 70, Chester Springs, Pa 19425

PAINTS—COATINGS—CORROSION CONTROL
American Abrasive Metals Co., 460 Coit St., Irvington NJ 07111
Ameron, 4700 Ramona Blvd., Monterey Park, CA 91754
Devoe Marine Coatings Co., P.O. Box 7600, Louisville, KY 40207
Esgard, Box 2698, Lafayette, LA 70502
Farboil Company, 8200 Fischer Rd., Baltimore, MD 21222
Hempel Marine Paints, Inc., Foot of Currie Ave., Wallington, NJ 07057; 6868 NorthLoop East, Suite 304, Houston, TX 77028; P.O. Box 10265, New Orleans, LA 70181
International Paint Company, Inc., 2270 Morris Avenue, Union, NJ 07083
Jotun Marine Coatings Inc., 175 Penrod Court N&O, Glen Burnie, MD 21061
Magnus Maritec International Inc., 150 Roosevelt Pl., P.O. Box 150, Palisades Park, NJ 07650
Products Research & Chemical Corp., 5454 San Fernando Rd., Glendale, CA 91203

PIPE-HOSE—Cargo Transfer Clamps, Couplings, Coatings
Amermarine International, P.O. Box 9205, Dundalk, MD 21222
Ameron Fiberglass Pipe Division, P.O. Box 801148, Houston TX 77280
Deutsch Metal Components, 14800 S. Figueroa St., Gardena, CA 90248
Hydro-Craft Inc., 1821 Rochester Industrial Dr., Rochester, MI 48063
Knights Piping Inc., 5309 Industrial Road, Pascagoula, MS 39567
Murdock Engineering, P.O. Box 152278, Irving, TX 75015
Tioga Pipe Supply Co. Inc., 2450 Wheatsheaf La., P.O. Box 5997, Philadelphia, PA 19137
Willcox, P.O. Box 484, Garfield NJ 07026

PLASTICS—Marine Applications
Hubeva Marine Plastic, Inc., 390 Hamilton Ave., Brooklyn, NY 11231

PNEUMATICS
Limitorque Corporation, 5114 Woodall Rd., Lynchburg, VA 24506

PROPELLER POLISHING
Aquafacs Marine Technical Services, Pier One, Berth One, Boston MA 02128
Pacific Marine Services, P.O. Box 3400, Terminal Island, CA 90731

PROPULSION EQUIPMENT—Bowthrusters, Diesel Engines, Gears, Propellers, Shafts, Turbines
Allison Gas Turbine Division, General Motors Corp., P.O. Box 420 Speed code U6, Indianapolis, IN 46206
Amarillo Gear Co., P.O. Box 1789, Amarillo, Texas 79105
Armco Steel/Advanced Materials Div., 703 Curtis St., Middletown, OH 45043
Avondale Shipyards, Inc., P.O. Box 52080, New Orleans, LA 70150
BMV Bergen Diesel A.S., P.O. Box 924, N-5001 Bergen NORWAY; 2110-10 Service Rd., Kenner LA 70062
Boston Metals Co., 313 E. Baltimore St., Baltimore, MD 21202
Burmeister & Wain Alpha Diesel AS, DK-1400 Copenhagen K, Denmark
Caterpillar, Inc., Engine Division, 100 NE Adams St., Peoria IL 61629
Colt Industries Inc. (Fairbanks Morse Engine Div.), 701 Lawton Avenue, Beloit, WI 53511
Columbian Bronze Corporation, 216 No. Main Street, Freeport, NY 11520
Combustion Engineering, Inc., Windsor, CT 06095
Coolidge Propeller, 1608 Fairview Ave. East, Seattle, WA 98102; 3717 Industrial Rd., Pascagoula, MS 39567
Coolidge-Stone Vickers, Inc., 56 Squirrel Rd., Auburn Hills, MI 48057
Deutz Corp., 7585 Ponce de Leon Circle, Atlanta, GA 30340
Elliott Company, 1809 Sheridan Ave., Springfield, OH 45505
General Motors, Electro-Motive Division, LaGrange, IL 60525
Golten Marine Co., Inc., 160 Van Brunt St., Brooklyn, NY 11231
KHD Canada Inc., 180 Rue de Normandie, Boucherville, Quebec J4B 5S7, Canada
Kahlenberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241
Lips Propellers, 3617 Koppens Way, Chesapeake, VA 23323
M.A.N.-B&W Diesel, 2 Ostervej, DK-4960 Holeby, Denmark
MTU of North America, 10450 Corporate Dr., Sugarland, TX 77478
MWM-Murphy Diesel, 12 Greenway Plaza, Suite 1100, Houston, TX 77046
Michigan Wheel, 1501 Buchanan Ave., S.W., Grand Rapids, MI 49507
Mitsubishi International Corporation, Mita Kokusai Bldg. 4-28 Mita 1-chome, Minato-ku Tokyo 108 Japan
National Marine Service Louisiana, Inc., 222 Bayou Rd., Belle Chasse, LA 70037
North American Marine Jet P.O Box 1232 Benton, AR 72015
Omnithruster Inc., 9515 Sorensen Ave., Santa Fe Springs, CA 90670
Penske GM Power, Inc., 600 Parsippany Road, Parsippany, NJ 07054
Inland Water Propulsion Systems, Inc., 580 Walnut St., Cincinnati, OH 45201
Propulsion Systems, Inc., 21213 76 Ave. So., Kent, WA 98032
SKF Steel, Couplings Div., 22 Waterville Rd., P.O. Box 745, Avon, CT 06001
Schottel of America, Inc., 8375 N.W. 56 St., Miami, FL 33166
Skinner Engine, Co., P.O. Box 1149, Erie PA 16512
Stewart & Stevenson Services, Inc., P.O. Box 1637, Houston, TX 77251-1637
Sulzer Brothers, Dept. Diesel Engines, CH-8401 Winterthur, Switzerland
Tech Development Inc., 6800 Poe Ave., P.O. Box 14557, Dayton, OH 45414
Tenfjord Inc., 200 Jackson Ave., Hoboken, NJ 07030
Ulstein Maritime Ltd., 6307 Laurel St., Burnaby, B.C. Canada V5B 3B3
Ulstein Trading Ltd. A/S, N-6-65, Ulsteinvik, Norway
J.M. Voith GmbH Dept. WErung, Postfach 1940 7920 Heidenheim/Brenz, West Germany
Voith Schneider America, 159 Great Neck Rd., Ste. 200, Great Neck, NY 11021
Volvo Penta of America, P.O. Box 927, Rockleigh, NJ 07647
Wartsila Power Inc., 5132 Taravella Rd., P.O. Box 868, Marrero, LA 70072

PUMPS—Repairs—Drives
Allweiler Pump Inc., 5410 Newport Dr., Rolling Meadows, IL 60008 TX: 270-0444
Cat Pumps Corp., 1681 94th Lane NE, Minneapolis MN 55434
CMH Heleshaw, Inc., 201 Harrison St. Hoboken N.J. 07030
Cunningham Marine Hydraulics Co., Inc., 201 Harrison St., Hoboken, NJ 07030; 2030 E. Adams St., Jacksonville, FL 32204, TX: 710-730-5224
Del Gavio, 207 W. Central Ave., Maywood, NJ 07607. Telex: 132610 DEL-MARINE
FMC Coffin Turbo Pump, 326 S Dean St., Englewood NJ 07631
Goltens, 160 Van Brunt St., Brooklyn, NY 11231
Hamworthy Engineering Ltd., Poole, Dorset BH17 7LA ENGLAND
Jim's Pump Repair, 48-55 36th St., Long Island City, NY 11101
Meco (Mechanical Equipment Co., Inc.), 861 Carondelet Street, New Orleans, LA 70130
Megator Corporation, 562 Alpha Drive, Pittsburgh, PA 15238
Transamerica Delaval, Pyramid Pump Div., P.O. Box 447, Monroe, NC 28110
Vita Motivator Company, 200 West 20th St., New York, NY 10011
Warren Pumps Division, Bridges Avenue, Warren, MA 01083
Wilden Pump & Engineering Co., 22060 Van Buren St., P.O. Box 845, Colton, CA 92324

REFRIGERATION—Refrigerant Valves
Bailey Refrigeration Co., Inc., 74 Sullivan St., Brooklyn, NY 11231
Grasso, Inc., 1101 N. Governor Street, P.O. Box 4799, Evansville, IN 47711-0799
United Technologies, Carrier Transicold Division, P.O. Box 4805, Syracuse, NY 13221

ROPE—Manila—Nylon—Hawsers—Fibers
A.L. Don Co., Foot of Dock St., Matawan, NJ 07747
Allied Fibers, 1411 Broadway, New York, NY 10018
Atlantic Cordage Corp., 60 Grant Avenue, Carteret, NJ 07008
Tubbs Cordage Company, P.O. Box 709, Orange, CA 92666
Tubbs Cordage Co., P.O. Box 7986, San Francisco, CA 94120-7986
Vermeire N.V. Industripark Zwaarveld, B-9160 Hamme, Belgium TX: 21687

SANITATION DEVICES—Pollution Control
Davit Sales Inc., P.O. Box 232, Jefferson Valley, NY 10535
Envirovac Inc., 1260 Turret Dr., Rockford, IL 61111
FAST Systems Inc., 1717 Sublette, St. Louis, MO 63110
Golar Metal A/S, P.O. Box 70, 4901 Tvedestrand, Norway
Hamworthy Engineering Ltd., Poole, Dorset BH17 7LA ENGLAND

SCAFFOLDING EQUIPMENT—Work Platforms
McCausey Lumber Co., 7751 Lyndon, Detroit, MI 48238

SCALE MODELS
Oriental Industry Co., 408-29 Sokyo-Dong, Mapo-ku Seoul KOREA

SCUTTLES/MANHOLES
Mock Manufacturing Inc., 777 Rutland Rd., Brooklyn, NY 11203

SHAFT SEALS, MECHANICAL PACKING
EG&G Sealol Engineered Prod. Div. Marine Products Group, Warwick, RI 02888
Garlock Inc., Mechanical Packing Div., 1666 Division St., Palmyra, NY 14522

SHIPBREAKING—Salvage
Fred Devine Diving & Salvage, Inc., 6211 N. Ensign, Swan Island, Portland, OR 97217
Zidell Explorations, Inc., 3121 S.W. Moody St., Portland, OR 97201

SHIPBUILDING EQUIPMENT
Bardex Hydronautics, 6338 Lindmar Dr., P.O. Box 1068, Goleta, CA. 93116
M.A.N.—GHH, Sterkrade Werfsrabe 112 D-4100 Duisburg 18, West Germany
MAN—GHH, P.O. Box 110240, D-4200 Oberhausen 11, West Germany
Pearlson Engineering Co., P.O. Box 8, Kendall Branch, Miami, FL 33156
Total Transportation System Inc., 813 Forest Dr., Newport News, VA 23606
Total Transportation Systems (International) A/S, Bjornegarden, P.O. Box 248, N 5201, Os, Norway

SHIPBUILDING STEEL
Armco Steel Corp., 703 Curtis St., Middletown, OH 45042
Bethlehem Steel Corp., Martin Tower, Bethlehem, PA 18018
Welded Beam Company, P.O. Box 280, Perry, OH 44081

SHIPBUILDING—Repairs, Maintenance, Drydocking
Arsenale Triestino-San Marco Shipyard, Trieste, Italy, U.S. Rep: Marine Technologies & Brokerage, 33 Rector St., New York, NY 10066
Avondale Shipyards, Inc., P.O. Box 52080, New Orleans, LA 70150
Bardex Hydronautics, 6338 Lindmar Dr., P.O. Box 1068, Goleta, CA 93116
Bay Shipbuilding Corp., 605 N. 3rd Ave., Sturgeon Bay, WI 54235
Bender Shipbuilding & Repair Co., Inc., P.O. Box 42, Mobile, AL 36601
Bethlehem Steel Corp., Martin Tower, Bethlehem, PA 18018
Blohm & Voss AG, P.O. Box 100720, D-2000 Hamburg 1 (In US)-Blohm & Voss CO, Springfield, N.J.
Blount Marine Corp., P.O. Box 368, Warren, RI 02885
Boston Whaler Commercial Div., 1149 Hingham St., Rockland MA 02370
Brodosplit, Put Udarniku 19, P.O. Box 107, 58000 Split YUGOSLAVIA
Burrard Yarrows Corporation, P.O. Box 86099, North Vancouver, B.C., Canada
Chesapeake Shipbuilding Inc., 710 Fitzwater St., Salisbury, MD 21801
Cityvarvet AB, Lindholmen, P.O. Box 2753, S-402 76 Goteborg SWEDEN
Conrad Industries, P.O. Box 790, Morgan City, LA 70380
Coast Iron & Machine Works, 5225-7th Street E., Tacoma, WA 98424
Curacao Drydock (U.S.A.) Inc., 26 Broadway, Suite 741, New York, NY 10004
Eastern Marine, Inc., P.O. Box 1009, Panama City, FL 32401
Fincantieri SpA Cantieri Navali Italiani, Via Cipro 11, 16129 Genoa ITALY
Gladding-Hearn Shipbuilding, Box D (1 Riverside Ave.), Somerset MA 02726
Good People Sea And Shore Services Inc., 255 Commercial St., North Sydney, Cape Breton Island, NS CANADA B2A 3M3
HBC Barge Co. Brownsville, PA 15417
Hitachi Zosen Corp., 1-1-1 Hitotsubashi, Chiyoda-ku, Tokyo 100, Japan
Hong Kong United Dockyards Ltd., P.O. Box 534, Kowloon Central Post Office, Kowloon, Hong Kong
Hyundai Mipo Dockyard Ltd., 456 Cheonha-Dong, Ulsan, KOREA
Industrial Marine Engineering Ltd., P.O. Box 172, Suva, Fiji
Jeffboat Inc., Jeffersonville, Ind. 47130
Jered Brown Brothers, Inc., 56 S. Squirrel Rd., Auburn Hills, MI 48057
Keppel Shipyard Limited, 325 Telok Blangah Road, P.O. Box 2169, Singapore 0409
Koch Ellis Barge & Ship Service, P.O. Box 9130, Westwego, LA 70094
Paul Lindenau GmbH, & Co., Schiffswerft u. Maschinenfabrik, D-2300 Kiel-Friedrichsort, West Germany
Lisnave, Apartado 2138, 1103 Lisbon, Codex PORTUGAL
Lockheed Shipbuilding and Construction Co., 2929 16th Avenue, S.W., Seattle, WA 98134
M.A.N. GHH Sterkrade, P.O.B. 110240, D-4200 Oberhausen 11, West Germany
Main Iron Works, Inc., P.O. box 1918, Houma, LA 70361
Marathon LeTourneau Offshore, P.O. Box 61865, Houston, TX 77208
Marco, Inc., 2300 W Commodore Way, Seattle, WA 98199
Marinette Maine Corporation, Marinette, WI 54143
Mitsubishi Heavy Industries, Ltd., 5-1, Marunochi 2-chome, Chiyoda-ku, Toyko, 100 Japan
MonArk Boat Co., P.O. Box 210, Monticello, AR 71655
Moran Shipping Agencies, 602 Sawyer, Suite 200, Houston, TX 77077
Moss Point Marine Inc., P.O. Box 1310, Escatawpa, MS 39552
National Marine Service (Shipyard Division), P.O. Box 38, Hartford, IL 62048
National Steel & Shipbuilding Corp., San Diego, CA 92112
Nautilus Surveys Inc., 10822 Sageleaf Lane, Houston, TX 77089
Newport News Shipbuilding, 4101 Washington Ave., Newport News, VA 23607
Nichols Brothers Boat Builders Inc., P.O. Box 580, 5400 S. Cameron Rd., Freeland, WA 98249
Northwest Marine Ironworks, P.O. Box 3109, Portland, OR 97208
Pennsylvania Shipbuilding, P.O. Box 442, Chester, PA 19016
Port Allen Marine, P.O. Box 108, Port Allen, LA 70767
Promet (PTE) Ltd., 27 Pandam Rd., Jurong Industrial Estate, Singapore 22
Promet Marine Services Corp., 242 Allens Ave., Providence, RI 02905
Samsung Shipbuilding & Heavy Industries Co., Ltd., Samsung Main Bldg. 250, 2Ka, Taepyong-ro, Chung-ku, Seoul, Korea
Southwest Marine, Inc., P.O. Box 13308, San Diego, CA 92113
Tampa Shipyards Inc., P.O. Box 1277, Tampa, FL 33601
3. MAJ Associated Shipbuilding Industry, P.O. Box 117, 51001 Rijeka YUGOSLAVIA
Todd Shipyards Corporation, One Evertrust Plaza, Jersey City, NJ 07302
Tracor Marine, P.O. Box 13107, Port Everglades, FL 33316
Verreault Navigation Inc., Les Mechins, Quebec, G0J 1T0
Walker Boat Yard, P.O. Box 729, Paducah, KY 42001
Waller Marine, Inc. 11777 Katy Freeway/Suite 395, Houston, TX
Westport Shipyard, Inc., P.O. Box 308, Westport, WA 98595
Zidell Explorations, Inc., 3121 S.W. Moody Street, Portland, OR 97201

SHIPPING—PACKING
Pilotage Consultants, Inc., P.O. Box 2046, New Hyde Park, NY 11040

First International Conference On Ice Technology Held At MIT

The First International Conference on Ice Technology (ITC 86) was held on the campus of Massachusetts Institute of Technology, June 10-12 this year. The conference was preceded and followed by Tutorials on June 9 and June 13. On the morning of June 9, the session was presented by Dr. **A.M. Vinogradov** of the University of Calgary on Computational Methods in Ice Mechanics, with two separate lectures on (1) Constitutive Modeling of Ice, and (2) Computational Methods in the Deformation Analysis of Floating Ice Sheets. During the afternoon session, **Peter G. Noble** of the Marine Technology Corporation, Houston, presented two lectures on Model Testing and Instrumentation Techniques.

The conference was opened by Rear Adm. **Robert L. Johanson,** commander of the First Coast Guard District, Boston, who was introduced by Prof. **Francis T. Ogilvie,** head of the Department of Ocean Enginneering at MIT.

This was followed by a Keynote Address by Dr. **George Ashton,** a scientist from the U.S. Army Cold Regions Research and Engineering Laboratories, on Perspectives in Ice Technology.

The plenary sessions then began, with opening remarks by Dr. **Carlos A. Brebbia,** chairman of the Computational Mechanics Institute, the sponsoring organization of ITC 86. He also took the opportunity to present a plaque to Prof. **J.J. Connor** of the Department of Civil Engineering at MIT in recognition of contributions to advances in engineering mechanics.

A total of 44 papers were presented during the three-day meeting by authors from 10 countries. The technical sessions were devoted to properties of ice, ice modeling, ice experiments and field tests, vessels in ice, structures in ice, navigation in ice, ice management, and transportation.

At a film evening on June 10, delegates were able to participate in a narrated video presentation by Prof. **Douglas Tolderlund** of the U.S. Coast Guard Academy, dealing with the operation of USCG Polar Class icebreakers in the Arctic and Antarctic regions. There was also a short movie presented by Prof. **Per Tryde** of the Technical University of Denmark on the NIMBUS 7 multi-channel microwave radiometer image of the formation of ice in the East Greenland current (1978-79).

The latter part of the final day was devoted to a Panel Session on Arctic LNG—Present Position and Future Prospects. **Arthur G. Berndt** of Energy Transportation Corporation, New York, acted as moderator. Short techno-economic presentations were given by **R.D. Goff** of Sohio Petroleum Company on Technical and Economic Trends in Offshore Oil and Gas Exploration in the Arctic; by **J.K.S. Loh** of Gulf Canada Resources, Calgary, on Arctic LNG Production; and by **R. Dick** of Melville Shipping Ltd. on Transportation of Arctic LNG. This session was followed by a lively question and answer period.

The conference was closed by Dr. **T.K.S. Murthy,** consultant to the Computational Mechanics Institute, who was responsible for the organization of the conference from the initiation of arrangements in March 1984 to its conclusion.

Guest speaker at the banquet held June 11 at the Hyatt Regency Hotel in Cambridge was Capt. **Joseph Wubbold,** chief of ice operations in the U.S. Coast Guard.

The post-conference tutorial on June 13 was devoted to Vessels and Structures in Ice, with lectures by **Arno Keinonen** of AKAC Inc. in Calgary, and Prof. **Ben C. Gerwick** of the University of California at Berkeley.

Proceedings of the Conference are available in hard-cover binding from Computational Mechanics Publications, Ashurst Lodge, Ashurst, Southampton, SO4 2AA, England; price is $150 per copy.

Chromalloy Appoints Flowers President, Inland Barge Group

Chromalloy American Corporation recently announced the appointment of **J. Russell Flowers** as president of the Inland Barge Group, following the resignation of **Thomas J. Barta.** Inland Barge Group, headquartered in St. Louis, Mo., is owned by Chromalloy.

Mr. **Flowers** founded Flowers Transportation, a barge operation that was acquired by Chromalloy in 1981.

Chromalloy is a multi-industry corporation that produces and sells a broad range of products and services in operating companies in five industry segments: transportation, metal fabrication, apparel, petroleum and financial services.

Verolme To Build Two Corvettes For $50 Million For Brazilian Navy

Contracts have been signed by Verolme do Brasil, Brazil's leading shipbuilder, for the construction of two corvettes of 2,000-ton displacement for the Brazilian Navy. Both vessels are scheduled for delivery in 1989 at a total price of $50 million, which does not include the cost of owner-supplied items such as main propulsion, weaponry, and electronic navigation and communications equipment. Construction will begin in January and February 1987.

These ships will be the first warships ever built in a privately owned Brazilian shipyard in modern times, and form part of a long-term plan aimed at modernizing the Navy of Brazil. Two other corvettes of the Almirante Inhauma Class are currently under construction at the Brazilian Navy's own shipyard in Rio de Janeiro, Arsenal da Marinha.

At present, Verolme do Brasil has an enviable orderbook totaling some $385 million, which includes 10 ships and one offshore drilling rig.

The Almirante Inhauma Class corvette was designed by the Brazilian Navy to provide short- and long-range coastal defense and escort protection for coastal and oceangoing convoys. Both of the Verolme-built corvettes, which will have a maximum sustained speed of 26 knots, will be fitted with helicopter decks and hangars. Overall length will be 314.2 feet and beam 37.4 feet. Main propulsion will be a CODOG system with a gas turbine and two 3,620-bhp diesel engines driving two controllable-pitch propellers.

The weapons system will include one 4.5-inch Vickers MK 8 gun, two 40/70 single automatic guns, four Exocet MM-38 or MM-40 missiles in two twin launchers, two triple MK 46 torpedo tube launchers, one Linx helicopter for anti-submarine and surface action, and two Chaff launchers.

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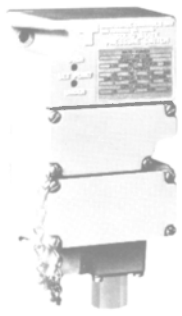

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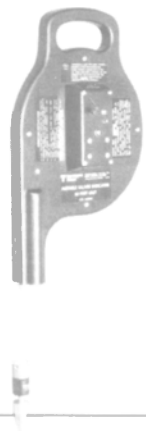

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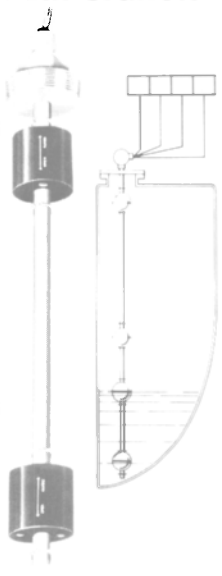

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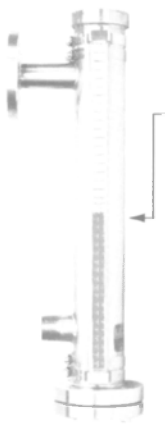

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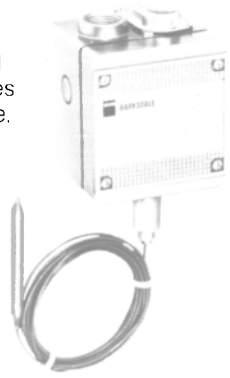

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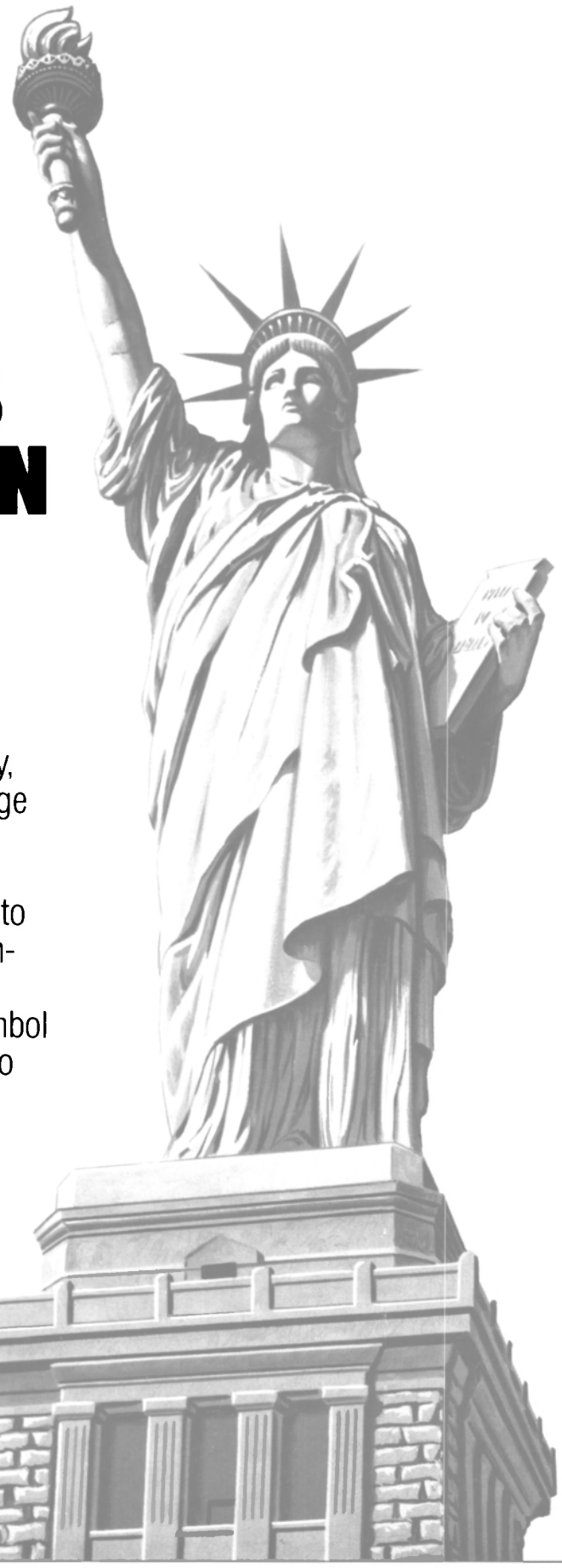

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