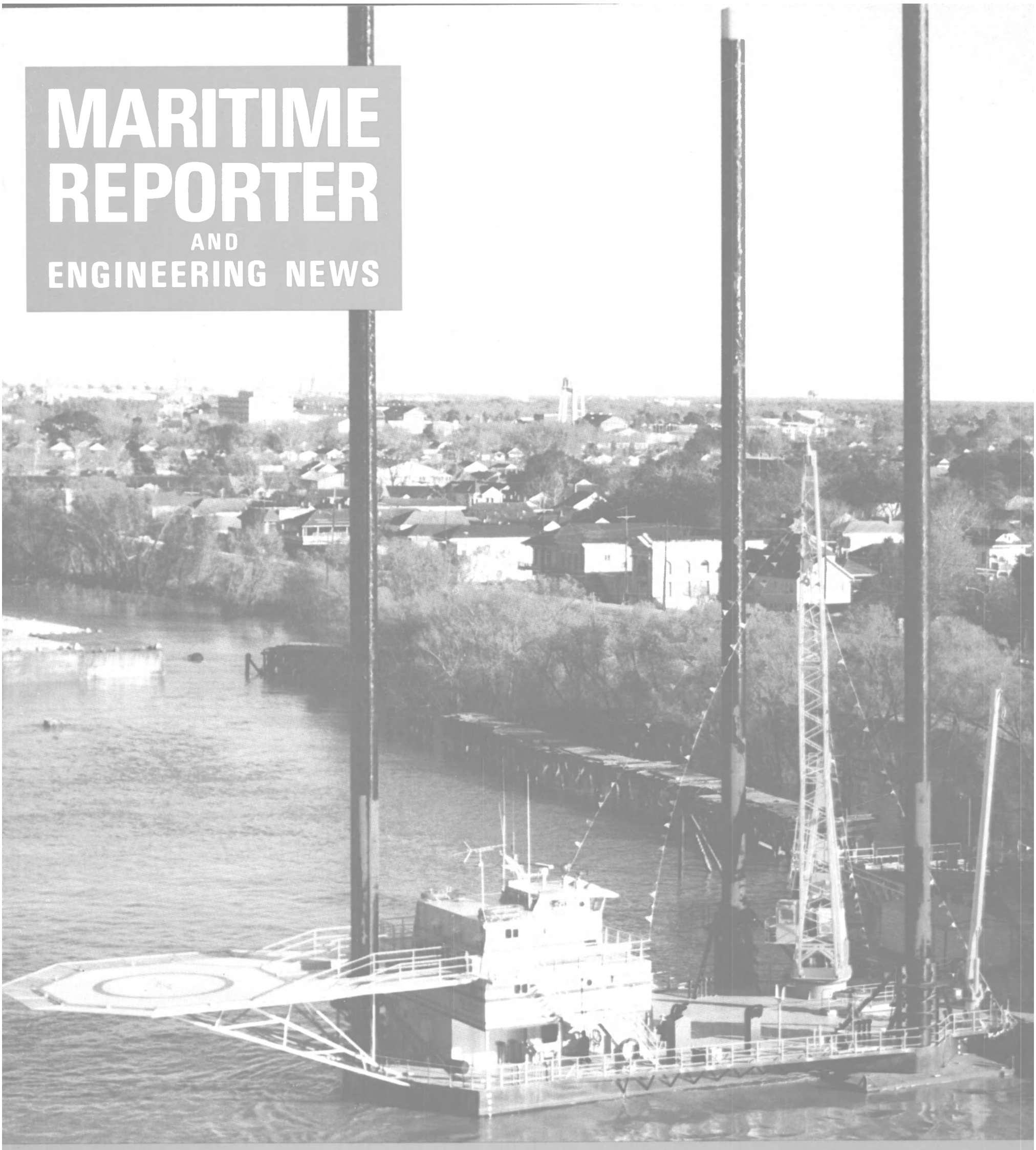
MARITIME REPORTER
AND
ENGINEERING NEWS



Blue Streak-Gulf Island Operations "Gulf Island V"

Diesel Propulsion Systems Equipment

•

FY 86 Navy Programs

(SEE PAGE 4)

MARCH 15, 1985

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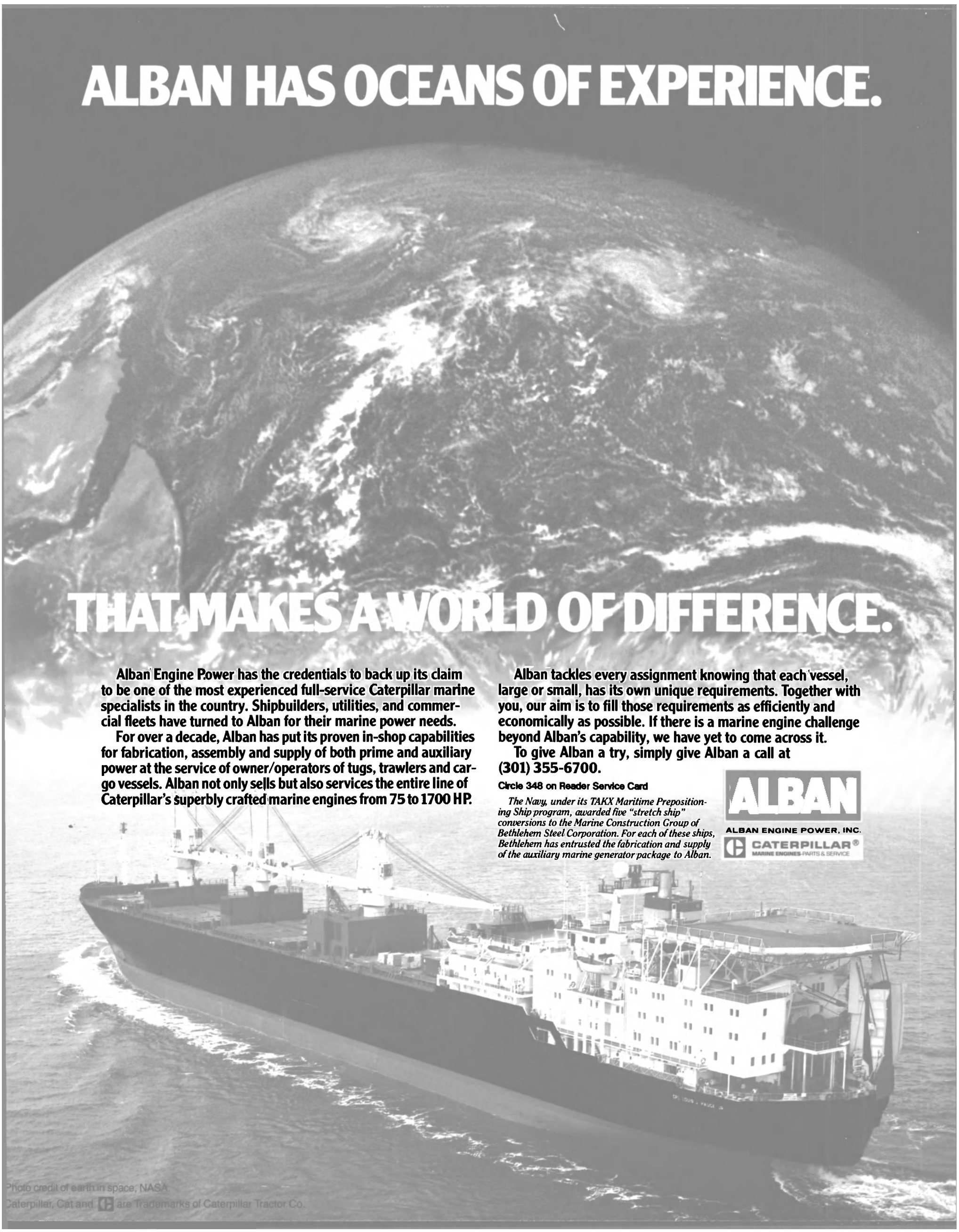

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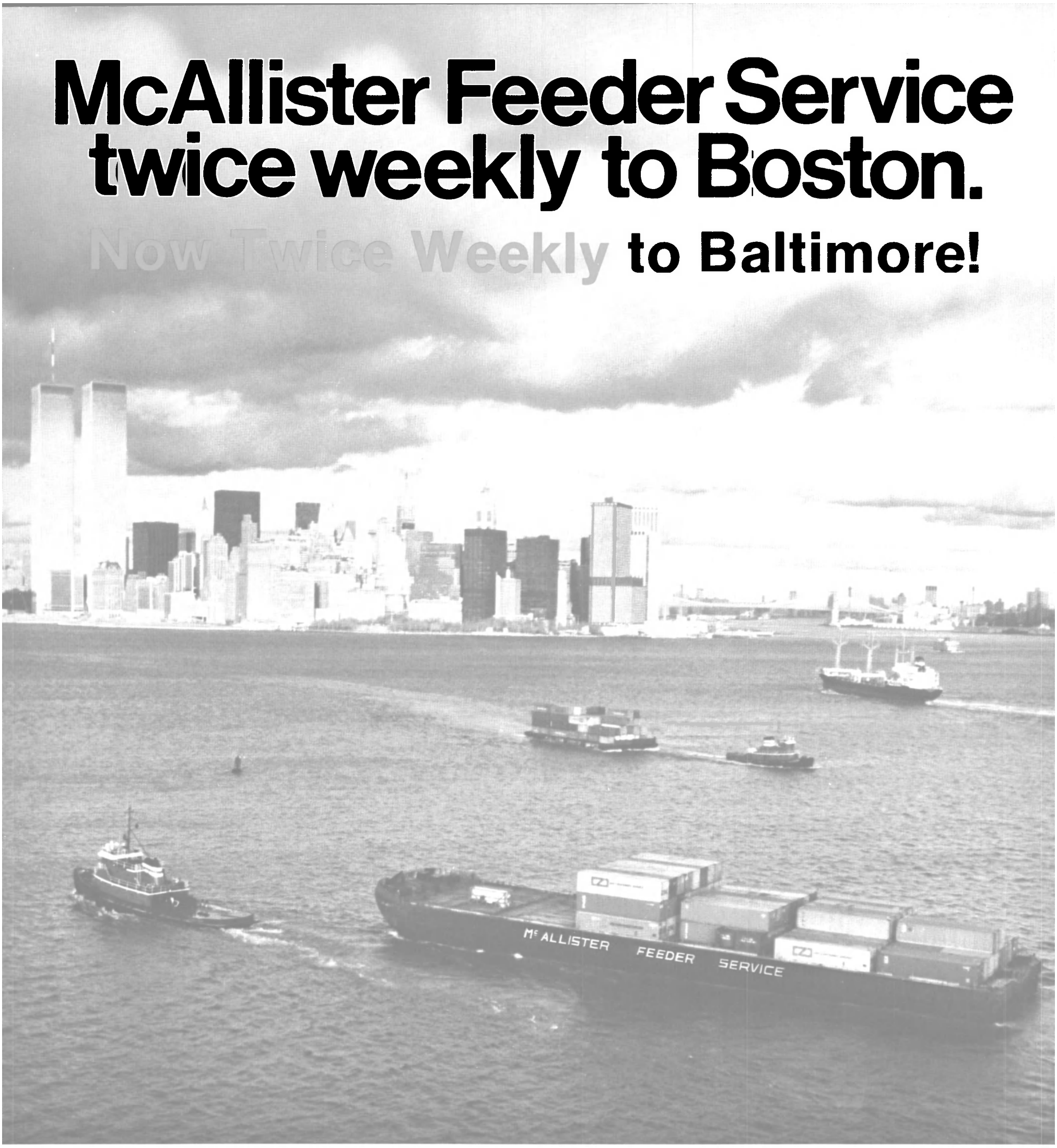

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ON THE COVER

New Partnership Formed To Operate Large Versatile Lift-Boat Fleet

A new partnership, Blue Streak-Gulf Island Operations, has been formed to operate a fleet of self-propelled, self elevating offshore workboats. The partnership was formed by Blue Streak Marine, Inc., a self-elevating vessel operating company, Belle Chasse, La., and Gulf Island Marine, Inc., a Baton Rouge, La., company engaged in the financing and management of offshore marine vessels.

Offices for the new venture are located at 2306 Engineers Rd., Belle Chasse, LA 70037. **Dennis L. Good,** president of Blue Streak Marine is president of the combined venture and **Avis J. Bourg, Jr.,** is vice-president and general manager. Participating Gulf Island Marine executives are **Ronald E. Sanders,** chairman of the board, **John S. Hadaway,** executive vice-president, and **Jeffrey R. Nicholson,** vice-president of finance.

Mr. **Good** said the joining of Blue Streak's 11 lift boats and Gulf Island's five vessels combines to produce a fleet of some of the largest and most versatile lift boats in the world.

"Our customers can draw from a fleet that operates vessels with legs from 75 feet to 200 feet with crane capacities of 10 tons to 75 tons," said Mr. Good. "Also," he added, "we can provide quarters and galley facilities for 14 to 42 people and electrical generation capacities from 40 KW to 300 KW." Additional office space, galleys, or quarters for up to 65 people can be provided through the use of portable buildings secured to the decks of the Blue Streak-Gulf Island Operations boats.

For free literature and additional information on their services,

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REPRESENTATIVES

U.S.A.
Houston, Texas — ROBERT HAWLEY, GARY LINDENBERGER, MIKE SULLIVAN, 11777 Kay Freeway, Suite 155, Houston, TX 77079, Telephone (713) 870-0470

Italy — MR. VITTORIO F. NEGRONE, Ediconsult Internazionale, Piazza Fontane Marose, 3-16123 Genova, Italy, Telex: 211197 EDINT I, Telephone: (010) 543-659-268.334-268.513

Scandinavia — MR. STEPHAN R G ORN, AB STEPHN R G ORN, Box 184, S-271 00 Ystad, Sweden, Telex: 33335 Orn S, Telephone 0411-184 00

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Bergen Diesel's Machinery Division Renamed BMV Maskin A.S

The Machinery Division of A.S Bergens Mekaniske Verksteder in Norway has been established as a separate company and commercial entity under the name BMV Maskin A.S, with **Jan Woldsdal** as managing director.

The new company will continue to advance the activities of the former Machinery Division, in particular as producer of Bergen Diesel propulsion and generator engines, and Norwinch hydraulic deck machinery. Relations with customers, suppliers, and general business connections will be developed as previously.

The new address of BMV Maskin A.S is P.O. Box 924, N5001 Bergen, Norway; telephone 475-190000, telex 42735 BMVH N.

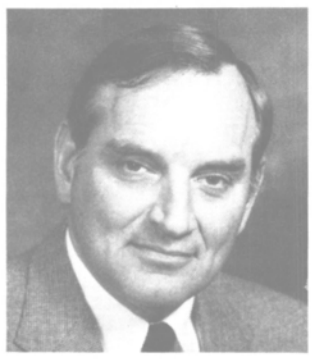
Far East Levingston Yard To Build Big Jackup Of Friede & Goldman Design

Foramer S/A of France, a leading international drilling contractor; Friede & Goldman, Inc. of New Orleans, the leading offshore mobile rig designer; and Far East Levingston Shipbuilding Ltd., the pioneer offshore rig builder in Singapore, announced recently that they have agreed to jointly develop and construct a harsh environment jackup rig of the L780 MOD V type. Scheduled for completion by mid-1986, the rig will be constructed to satisfy the rules and regulations of the American Bureau of Shipping, the U.S. Coast Guard, IMO, and the U.K. Department of Energy. The rig will be available to the offshore industry for sale or for contract drilling.

Brazilian Yards Awarded Orders For Five Tankers For Total Of $162.8 Million

Petrobras, the state oil company of Brazil, has placed contracts for construction of five 30,000-dwt tankers at a total cost of $162.8 million. Two will be built by Industrias Reunidas Caneco A/S for $31 million each, and three will be constructed by Verolme Estaleiros Reunidos for $33.6 million per ship.

Wittmeyer Succeeds Serrie As Operations Vice President At Penn Ship



James R. Wittmeyer

James R. Wittmeyer has been appointed vice president-operations at Pennsylvania Shipbuilding, Chester, Pa. He succeeds **John A. Serrie,** who has retired after more than 40 years in the shipbuilding industry.

Mr. **Wittmeyer** has 30 years of experience in shipbuilding. He started in the engineering department of the John H. Mathis Company, and subsequently spent 12 years with New York Shipbuilding in Camden, N. J., rising to the position of chief designer. He joined Sun Shipbuilding as a senior project engineer in 1971, and was director of engineering in 1982 when the Chester shipyard was acquired by Pennsylvania Shipbuilding Company. He continued as director of engineering for two years before becoming director of new construction and conversion. In his new position he will be responsible for all production operations, including new construction, conversion, ship repair, and industrial products.

He holds a BS degree in mechanical engineering from Drexel University, and is active in the maritime technical community, being a member of both the Committee on Engineering of the American Bureau of Shipping, and of the Executive Committee of the Philadelphia Section of SNAME.

ON THE COVER

Blue Streak-Gulf Island Operations Christens Giant Lift Boat

16th Vessel Joins The Fleet

Dennis Good (above) addresses guests at the christening ceremonies for the Gulf Island V.

Below. **John Hadaway** looks on as **Patsy Hadaway** christens the vessel.

The Gulf Island V, a giant self-elevating, self-propelled lift boat capable of servicing rigs in deep water, was christened recently in New Orleans by its operator, Blue Streak-Gulf Island Operations of Belle Chasse, La.

The vessel was christened by **Patsy Hadaway**, wife of **John Hadaway**, executive vice-president of Gulf Island Marine of Baton Rouge, La.

The new 96-foot by 48-foot boat is equipped with three 175-foot legs enabling the jackup vessel to work in water up to 125 feet.

Dennis Good, president of Blue Streak-Gulf Island Operations, said the Gulf Island V is one of the largest and most versatile vessels of its type in the world. It includes air-conditioned quarters and galley facilities for 42 persons, a large heliport, a 75-ton-capacity crane, two 75-kw generators, 3,200 square feet of open deck space for up to 250,000 pounds of deck cargo and more.

Lift boats move to and from offshore installations under their own power. Once alongside a rig or platform, the boat lowers its elevated legs to the ocean floor and becomes a stable platform from which a variety of work is performed. Some of the more than 20 functions are: sandblasting and painting; wireline work; pile and conductor driving; salvage work; work platform for fabrication crews; quarters for work crews; diving support; and coring.

Blue Streak-Gulf Island Operations operates a fleet of 16 self-propelled lift boats with leg lengths from 75 feet to 200 feet. Mr. **Good** noted that all 16 vessels in the Blue Streak-Gulf Island Operations fleet are currently under work contracts.

The new boat was built by Blue Streak Industries, Inc. of Pearlington, Miss. Blue Streak is currently one of the world's largest builders of lift boats, having built and delivered 30 such vessels since 1979.

For additional information and free literature on Blue Streak-Gulf Island Operations vessels, capabilities and services

Circle 27 on Reader Service Card

GULF ISLAND V
Equipment List

Main Propulsion Engines (2) . . Detroit 16V92N engines w/ Twin Disc MG527 reverse reduction gears w/383:1 reduction & front PTO w/MARCO E1400 adapter

Propellers (2) . . . . . Michigan 58″ dia. x 38″ pitch, 4-blade bronze

Generators (2) . . 75-kw International Electric generators driven by Detroit Diesel 6-71N engines turning 1,200 rpm

Bow Thruster/Auxiliary Crane Engine (1) . . Detroit Diesel 6-71N engine w/front PTO

Mod 75 Crane Engine (1) . . . Detroit Diesel 8V71N

Jacking Pump Drives (2) . . Funk Mod 593c triple pump drives

Jacking Pumps & Motors (6) . Rexroth AA4V 90EL variable displacement motors

Jacking Planetaries (24) . . . . . Tulsa P25 boxes w/101.7:1 reduction & rated 25,000 Ft. Lnbs. output torque

Jacking Controls (3) . . . . . OEM Ms4 12-volt controllers

Engine Controls . . Kobelt Air Controls

Steering System . . . . . Orbitrol w/2-7½ hp electric motors

Model 15 crane RECO Mod. RC 15DT50 hydraulic crane w/50-ft double taper box 7300M

Model 75 Crane Blue Streak Industries Model M-75 closed loop hydraulic crane rated 150,000# at 30 Ft radius w/110 ft lattice boom, Rexroth AA4V125 125EL pumps, Hagglunds 43 series k/inch motors, OEM controls, Markload weight/angle indicator and Rotec 10,000 series roller bearing

Bow Thruster . Blue Streak Industries Model BT125, closed loop hydraulic pump and Texroth AA2F180 motors and Michigan 28″ dia. x 18″ pitch 3-blade bronze propellers

Bilge/Ballast/Fire Pumps (2) Peabody Barnes Mod 15CCE 3″ x 3″, driven by Marathon Electric 7½-hp motors

Fuel Oil Transfer Pump (1) . . . Goulds 7 HR

Portable Water System (2) . . Peabody Barnes, ¾-hp pressure sets w/prefilter and Aquapure secondary filter

Air Compressors (2) . . . . . Kellogg 5-hp Compressors w/120 gal receivers

Switch Gear . . . Continental Electric Split Buss w/shore power connection

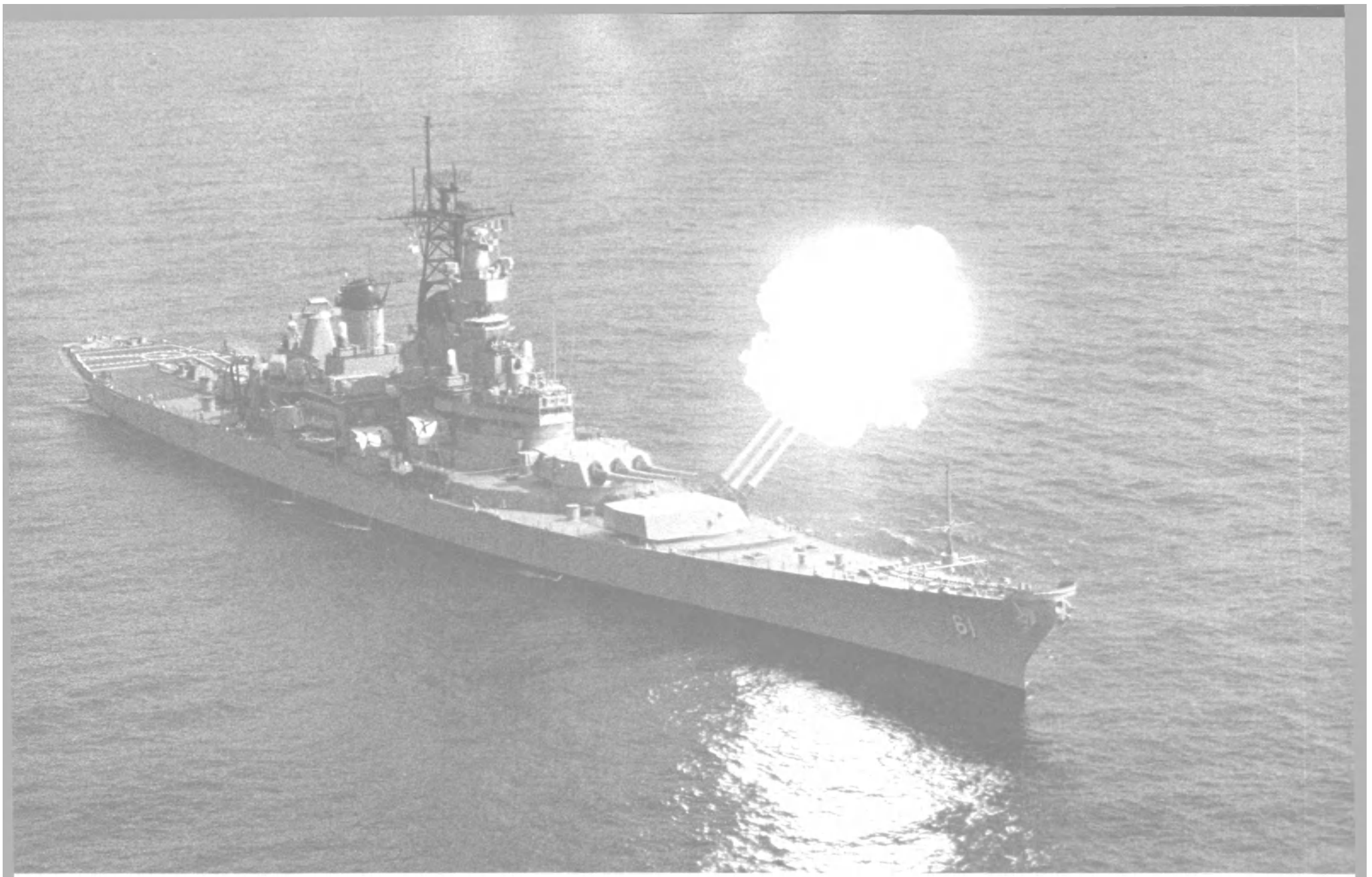
Navigational Equipt:
- Richie Compass (2)
- Carlisle Finch 15″ searchlights
- Perkco Navigational Lights
- Kahlenberg horn
- Sailer VHF radio
- Standard VHF radio
- IDM-RD 370 radar
- Harris SSB radio
- Standard L.B. FM radio
- Loran SIT 760C
- Rathon Loudhailer
- Datamarine DAT 3000 depth recorder

Water Maker . . . . . Sea Recovery 1,200 gal/day reverse osmosis unit

Overboard Pumps (2) . . . . . Goulds Mod 25EL10422

Water Heaters (2) . . . . . State 82-gal capacity

Air Conditioning . . . . Trane Central units w/six compressor units & three condensing units



The battleship, USS Iowa (BB 61) on sea trials. Ingalls Shipbuilding photo

THE FY 86 NAVY PROGRAMS

By David H. Carroll

For the U.S. maritime industry, and for the U.S. Coast Guard, the fiscal year 1986 budget sent to Congress by President **Reagan** was little short of disastrous. For the U.S. shipbuilding industry and its various suppliers and subcontractors, though, there was much good news mixed in with the bad.

The reason is that, once again, the Administration is cutting back on Coast Guard programs, and has announced plans to further reduce federal assistance for the hard-pressed U.S.-flag merchant marine. But funding for naval shipbuilding will stay above the $10 billion level annually for at least the next five years, and will probably not be reduced much, if any, by a Congress seeking to reduce soaring budget deficits in any way possible.

The Maritime Administration (MarAd) budget story is short and bitter, and contains no real surprises. Not only is there no hint of reviving the CDS (construction differential subsidy) program, but the ODS (operating differential subsidy) program also is being cut back—from $329.5 million in FY 1985 to $299.5 million requested for FY 1986. Moreover, the FY 1986 ODS funding was requested only "to meet the federal government's obligations on existing contracts; no new contracts are anticipated" after current contracts expire.

Adding more salt to the wound, from the maritime industry's point of view, is the administration's decision to seek a limitation of $900 million "on loan guarantee commitments for Federal Ship Financing." Of that total, moreover, $300 million will be held in reserve, for use only if "needed in the interest of national security."

Members of Congress supportive of the U.S. maritime industry have promised to seek some legislative relief for the industry, but there seemed little hope, as the FY 1986 budget hearings began, that any additional funding for merchant marine programs will be approved during the current session of Congress.

The outlook was somewhat brighter for the U.S. Coast Guard, which also has not fared too well under Reagan Administration. Congress has in the past forced through higher funding for USCG programs than the administration had requested, and may well do so again. The Coast Guard, although smallest of the uniformed services, is also perhaps the most ubiquitous, with small units and detachments in virtually every state that has any sizable body of water. Its boating safety program, search and rescue operations, and similar activities make the Coast Guard part of the civilian community and account in large part for its strong support in Congress.

It will need all that support, and then some, to overcome the obstacles posed by an FY 1986 USCG budget request that, although conceding an increased workload for the Coast Guard in almost all mission areas, seeks both a funding reduction (particularly when inflation is factored in) and cuts in civilian as well as military manpower for the multi-mission service.

Following are the specifics: The overall Coast Guard budget in FY 1985, the current fiscal year (which started on 1 October 1984), will be an estimated $2,517.7 million when final receipts are in; only $2,509.4 million—about $8.3 million less, in other words—is requested for FY 1986. The biggest reduction is in the ACI (acquisition, construction, and improvements) account, slashed from $346.0 million allocated for FY 1985 to $303.1 million requested for FY 1986. Included in the new ACI request is funding for, among other things, construction of one river tender and the renovation/modernization of three 210-foot medium endurance cutters and the polar icebreaker USCGC Northwind (WAGEB-282).

Largely overshadowing the bleak shipbuilding outlook for the Coast Guard and U.S.-flag merchant fleet was the continued good news in nav-

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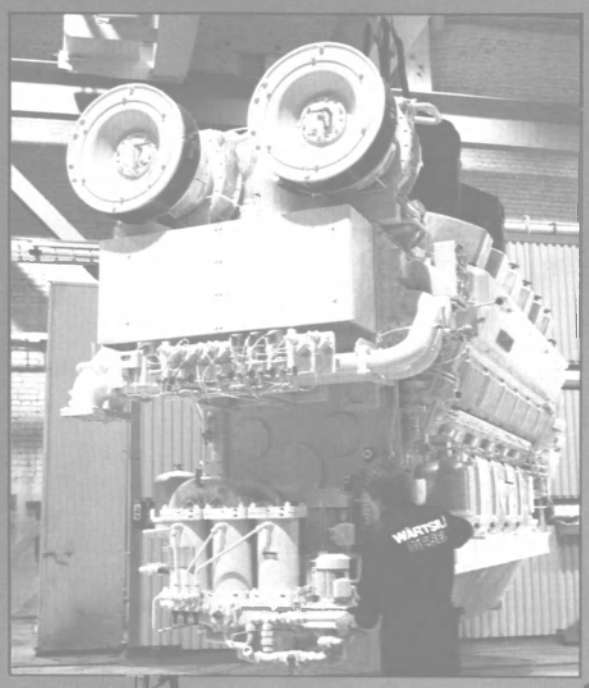

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Navy

(continued from page 8)

al shipbuilding. Included in the Administration's overall $313.7 billion FY 1986 Defense Department budget proposal is $104.8 billion for Navy programs—and, of that, some $11.4 billion is earmarked for the construction of 23 new ships, and the conversion of five others.

The FY 1986 program will be followed, moreover, by "outyear" programs of about the same magnitude for the next four years, according to FYDP (five-year defense plan) projections in the annual report to Congress by Defense Secretary **Caspar Weinberger.**

The Weinberger report, which kicked off the Pentagon's annual "posture" hearings before Congress, projects a five-year shipbuilding program (fiscal years 1986 through 1990, inclusive) of 107 new-construction ships and 24 conversions at a price tag of just over $75.0 billion.

A cautionary note, however: Outyear projections are just that—projections, and nothing more. Most such projections in the past have erred on the optimistic side. When the pressure is on, as it is now, to cut the overall federal budget the natural tendency in the White House as well as in Congress is to look at the biggest targets for immediate cuts. The inevitable result is that current-year shipbuilding programs almost always represent a reduction from the FYDP projections of the four previous years.

The FY 1986 shipbuilding program runs true to form. As the Shipbuilders Council of America points out in its own well-researched analysis of the FY budget, the $11.4 billion requested for SCN (shipbuilding and conversion, Navy) "represents a reduction from last year's estimate for FY 1986 of $14.1 billion, which would have constructed 27 new ships and converted two others. Thus, a reduction of 19 percent (in current dollars) led to delay or deletion of four new ships and the conversion of three more ships than was contemplated last year."

Even with that caveat, the industry has to be more than pleased with the administration's continuing commitment not only to rebuild the U.S. Navy's active ship inventory to the 600-ship level, but also to shore up such weak spots as amphibious shipping, mine warfare, and the sealift fleet—all of which had been neglected by the last several administrations (and by the Navy itself, as even its strongest supporters would grudingly concede).

The FY 1986 budget continues that broad-spectrum approach, funding not only such big-ticket items as Trident ballistic missile submarines and Aegis guided missile cruisers, but also such relatively unglamorous ships as TAO-187 oilers and modestly priced LCACs (landing craft, air cushion) for Navy/USMC amphibious forces.

Following—from the budget request and backup documents, the Weinberger report, and such standard sources as *Jane's Fighting*

Ships 1984-85 and the Navy League's annual *Almanac of Seapower*—are thumbnail descriptions of the major ships and craft for which funds are requested in the FY 1986 budget plan:

Acoustic Research Ship (AG): A twin-screw vessel capable of a 12-knot sustained speed, the AG will be converted from an existing catamaran hull (the USNS Hayes) for use in the transport, deployment, and retrieval of acoustic arrays used by the Navy for ASW (antisubmarine warfare), mine warfare, and other underwater research. The converted ship will be 246.4 feet in length and have a 75-foot beam and 21.3-foot draft. The AG will be manned by the Navy's Military Sealift Command (MSC). There are accommodations for a 36-man crew and 24 scientists. The FY 1986 budget requests funding for $86.9 million for the conversion, but does not name a prime contractor.

Battleship Reactivation: The four 58,000-ton Iowa-class battleships (BBs) are probably the most overt symbols of the Administration's program to restore U.S. naval superiority. The name ship of the class, USS Iowa (BB-61), and USS New Jersey (BB-62), already have rejoined the fleet. USS Missouri (BB-63)—on which the Japanese surrender documents were signed to end World War II—is now undergoing renovation and modernization at the Long Beach Naval Shipyard. The FY 1986 budget requests $76.2 million (including $1.0 million in research, development, test, and evaluation, or RDT&E, funding) for reactivation of the Wisconsin (BB-64), fourth and last ship of the class. "Armed with new Tomahawk and Harpoon missiles," Secretary **Weinberger** points out in his annual report, "these ship are capable of striking land or sea targets from points over the horizon. Their original 16-inch guns provide a much needed boost in naval gunfire support capability." An additional $435.6 million will be requested next year to complete Wisconsin's reactivation, if current estimates hold. No shipyard has been named to carry out the reactivation/modernization program, but if the earlier public yard/private yard rotation is followed it seems likely a joint contract would be signed with Avondale Shipyards (Westwego, La.) and Litton's Ingalls Shipbuilding Division (Pascagoula, Miss), which combined on Iowa's reactivation/modernization.

CG-47 Aegis Cruiser: Possibly the most technologically sophisticated surface ship in the world, the CG-47 Ticonderoga-class Aegis fleet air defense cruiser is designed to protect the Navy's carrier and battleship task groups by neutralizing or destroying incoming enemy aircraft and missiles. The name ship in the program, USS Ticonderoga (CG-47), performed outstandingly as part of the multinational peacekeeping force off Lebanon. Armed with SM-2 and Harpoon missiles, two 5-inch guns, and other systems, the CG-47s also will be able to meet most surface-ship and submarine threats mounted against the battle groups they protect. More than 25 Ticonderogas are planned; of that number, 16 have been previously funded. The new FYDP projects construction of 11 more through FY 1988, including three in FY 1986 (at a cost of $2,834.8 million) and three in FY 1987, ($2,988.9 million).

Other specifics: displacement, 9,200 tons full load; length, 567 feet; beam, 55 feet; speed, 30-plus knots; power plant, four General Electric LM2500 gas turbines, two shafts, 80,000 shaft horsepower; aircraft, two LAMPS (light airborne multi-purpose system ASW helicopters; complement, 375 (33 officers, 342 enlisted); builders, Ingalls Shipbuilding and Bath Iron Works.

Carrier Service Life Extension Program: The CV SLEP program, as it is inelegantly termed by the Navy, augments the Nimitz-class nuclear supercarrier new-construction program by prolonging the operating life of the Navy's older carriers. Three CV SLEPs were funded earlier; $156.8 million in advance funding is requested for the fourth, USS Kitty Hawk (CV-63). An additional $521.9 million will be requested next year. All of the CV SLEP modernizations are being assigned to the Philadelphia Naval Shipyard.

DDG-51 Aegis Guided Missile Destroyers: The Arleigh Burke-class DDG-51s, which are equipped with many of the same systems as the Ticonderogas, are designed for both offense and defense, and when deployed will be among the most

(continued on page 12)

(continued from page 11)

heavily armed ships the U.S. Navy has fielded since World War II. The contract could be awarded at any time for the lead and name ship of the class, funded in FY 1985 at $1,189.1 million (including $139.9 million in RDT&E money). Long-range Navy plans project construction of 60 ships in the class—about half of them "improved" Arleigh Burkes. The current FYDP calls for funding 17 DDG-51s over the next five years, including two in FY 1987 (at a combined price tag of $2,246.8 million), and five in each of the three years thereafter. The FY 1986 budget request seeks $118.8 million in RDT&E funds, plus $164.3 million for advance procurement money.

Some of the more important ship specifics: displacement, 8,500 tons full load; length, 512 feet; beam, 60 feet; power plant, four General Electric LM 2500 gas turbines, two shafts, 50,000 shaft horsepower; aircraft, two LAMPS helicopters; armament, Harpoon, Tomahawk, and Standard missiles, antisubmarine rockets, two 20 mm Phalanx close-in weapon systems (CIWS)—guns, two 5-inch 54-caliber guns, and two triple torpedo tubes.

LHD-1 Amphibious Assault Ship: The LHD-1 Wasp-class amphibious assault ship program is described by Secretary **Weinberger** as "the cornerstone of our plan to expand amphibious lift capacity." Similar in design to the already operational Tarawa-class multipurpose assault ships (LHAs), the 40,000-ton LHD-1 is designed for the transport of troops, vehicles, and cargo. Its key feature, though, is the capacity to carry three LCACs and a large number of helicopters, both of which platforms are considered essential for assault strikes launched from safe "over-the-horizon" distances. The Wasps also could serve as "convertible carriers" for V/STOL (vertical/short takeoff and landing) aircraft. The lead ship was authorized in FY 1984 and a contract awarded to Ingalls Shipbuilding. FY 1986 funding of $1,513.2 million (including $6.0 million RDT&E) is requested for the second of the twin-screw ships; $381.7 in long-lead funds will be requested in FY 1987. The Defense Department said the FY 1986, 1988, and 1989 ships "will be competed on a three-ship multiyear basis."

Some additional specifics: displacement, 39,500 tons full load; length, 817 feet; beam, 106 feet; speed, 20-plus knots; power plant, gas turbines, two shafts; aircraft, mix of 30 helicopters and 6-8 AV-8B Harrier V/STOL aircraft; armament, not yet decided—but probably will include three 20 mm Phalanx CIWS guns.

Landing Craft, Air Cushion: The smallest but in many respects most exciting of all the ship and craft in the current FYDP, the LCACs will be capable of speeds in excess of 40 knots, and will be able to operate (on a cushion of air) over land as well as on the water. Designed to carry the combat and logistical vehicles of a Marine landing force from ship to shore, the LCAC will give Navy and Marine Corps amphibious forces the ability to launch an assault, from over the horizon, in a matter of minutes. The Navy plans to buy at least 90 LCACs over the next decade or so. Of the 21 funded through FY 1985, one already has been delivered and is now undergoing a rigorous series of tests in the waters off Panama City, Fla. Fleet operations are scheduled to begin in the summer of 1986. Prime contractor for the first run of LCACs (a second source may later be named) is Bell Aerospace Textron of New Orleans.

Other LCAC specifics: weight, 149.5 tons gross, 87.2 empty; payload, 120,000 pounds; range, 200 nautical miles, length, 88 feet (on cushion); beam, 47 feet (on cushion); draft, 2.9 feet (off cushion); obstacle clearance capability, four feet; main engines, four Avco-Lycoming TF40B gas turbines; complement, five enlisted personnel.

LPD-4 Landing Platform Dock: The 1960s'-vintage Austin-class LPD-4s are being renovated in another SLEP program to give them another 10-15 years of useful service life and postpone their retirement until well beyond the turn of the century. "This will ease a major block retirement problem facing the amphibious fleet, "Secretary **Wein-**

berger points out, "while supporting our goal of increasing overall lift capacity." The first LPD-4 SLEP is planned for full funding in FY 1988. The FYDP projects funds for seven renovations, but requests only $5.1 million (RDT&E money) in FY 1986. An additional $80.5 million is projected for the FY 1987 budget request. The LPD-4 mission is to transport and land troops and their equipment and supplies; the SLEP will enhance that capability by expanding the LPD-4's LCAC-carrying capacity (two LCACs instead of one) and by permitting an approximate doubling of the current helicopter spots.

LSD-41 Landing Ship Dock: The Whidbey Island-class LSD-41s give the Navy an amphibious versatility it has been lacking for the last three decades. Able to carry four LCACs as well as helicopters and V/STOLs, it will be succeeded by a "follow-on LSD-41" previously called the LPDX. The latter will carry only two LCACs but will have considerably more cargo space. LSD-41s funded earlier are under construction at Lockhead Shipbuilding and Construction, Seattle, and Avondale Shipyards, New Orleans. A total of eight Whidbey Islands are projected—the six funded earlier, and two requested in the FY 1986 budget $426.5 million for the two, with additional costs of $23.5 million estimated for FY 1987). Six LSD-41 follow-ons are projected in the FYDP: two per year, FY 1988 through FY 1990, inclusive. "We anticipate construction of additional [follow-on] units in future years," Secretary **Weinberger** says, "to replace amphibious ships scheduled for retirement in the latter half of the 1990s."

Some of the more important LSD-41 specifications: displacement, 15,726 tons full load; length, 609 feet; beam, 84 feet; speed, 20 knots; power plant, four medium-speed diesels, two shafts, 34,000 brake-horsepower; aircraft, unspecified, but considered "helicopter and V/STOL-capable"; complement, 356 (19 officers, 337 enlisted), plus 338 troops.

Mine Countermeasures Ship (MCM): The Avenger-class MCM-ls shore up another of the Navy's weak points, giving it the ability to hunt and neutralize advanced mines that cannot be countered by current sweeping techniques or platforms. Nine MCM-ls have been authorized through FY 1985; the four requested in FY 1986 (at a combined $371.1 million price tag) and one in FY 1987 ($132.8 million) will complete the planned 14-ship program. Peterson Builders, Sturgeon Bay, Wisc., and Marinette Marine, Marinette, Wisc., are building MCM-ls previously funded.

MCM-1 specifications: displacement, 1,040 tons full load; length, 224 feet; beam, 39 feet; draft, 11.4 feet; main engines, four Waukesha L-1616 diesels (four Isotta-Fraschini diesels will be fitted in MCMs-3 on two shafts, 2,400 brake horsepower; speed, 14 knots; complement, 72 (five officers, 67 enlisted).

MSH-1 Minesweeper Hunter: A complement and follow-up to the MCM-1, then MSH-1 will be approximately 150 feet in length, displace 470 tons, and carry a crew of about 50. Capable of coastal mine-clearance operations for up to five days duration without replacement, its principal mission will be according to Navy position paper, to "hunt, sweep, and/or neutralize modern enemy moored and bottom mines in a coastal scenario, to allow breakout of U.S. combatant and resupply ships from CONUS (Continental United States) military and commercial ports." A contract was awarded late last year to Bell Aerospace Textron of New Orleans for the lead ship (of a planned 17-ship class). Bell Aerospace won the $27.3-million contract with an imaginative SES (surface effect ship) design which isolates the ship, riding a cushion of air while on mission, from the shock of an underwater explosion and also significantly reduces the ship's underwater acoustic, magnetic, and pressure signatures. The FYDP projects procurement of four MSH-1s annually from FY 1986 through FY 1989; the four in FY 1986 carry a combined price tag of $187.6 million; the four in FY 1987 are projected to cost $206.0 million

Nuclear Attack Submarine & (SSN-688): The Los Angeles-class SSN-688 nuclear attack submarine is 360 feet long and displaces 6,900 tons. It carries a crew of 102, is equipped with Mark 48 torpedoes as well as Harpoon and SubRoc missiles, and is considered the U.S. Navy's primary weapon system against the huge Soviet submarine

(continued on page 14)

(continued from page 13)

fleet. Of the 48 LA-class boats authorized through FY 1985, 29 already have been delivered and are now operating with the active fleet. The five-year program projects construction of another 18, including four in FY 1986 at a combined cost of $2,770.3 million, and another four in FY 1987 ($2,625.0 million). As is the case with all nuclear ships, the 688s have almost unlimited range, with crew endurance the only inhibiting factor. Speed is classified, but reported by Jane's to be "over 30 knots." The 127-man crew includes 12 officers, 115 enlisted. The only two yards building the 688s (or any other U.S. nuclear ships) are Newport News Shipbuilding, Newport News, Va., and the Electric Boat Division (in Groton, Conn.) of General Dynamics.

Both of those companies also are competing on the design for the Navy's new SSN-21 nuclear attack submarine, which will first complement and eventually replace the 688. The SSN-21 (so named because it is being designed "to meet the Soviet submarine threat of the 21st century") will be bigger, faster, quieter, deeper-diving, more versatile, and more sophisticated in general than the LA-class 688s. More important, it will be much more advanced in most areas of submarine warfare than anything now in the Soviet inventory or likely to be on the USSR's drawing boards for some time to come. The cost of the first ship, for which full funding will be requested in FY 1989, will be an estimated $1.6 billion. Cost will drop somewhat for later units, and level off at about the $1 billion per-ship level with the fifth or sixth ship. It seems most likely, therefore, that the still highly classified program will be the most expensive by any measurement, in U.S. Navy history.

TACS Auxiliary Crane Ship: Designed for the unloading of what the Navy terms "non-self-sustaining containerships," the auxiliary crane ships are among the more imaginative new ships and small craft which will convert the rapid deployment force concept into an operational reality. Containerships selected by the Navy and Maritime Administration for conversion into more "militarily useful" vessels, they will be assigned, after conversion, to the

FY 1986-90 Shipbuilding Program

	FY 1986	FY 1987	FY 1988	FY 1989	FY 1990	FY 1986-90 Five-Year Total
New Construction						
TRIDENT (Ballistic Missile Submarine)	1	1	1	1	1	5
SSN-688 (Attack Submarine)	4	4	4	2	4	18
SSN-21 (Attack Submarine)	–	–	–	1	–	1
CG-47 (Guided Missile Cruiser)	3	3	3	2	–	11
DDG-51 (Guided Missile Destroyer)	–	2	5	5	5	17
LHD-1 (Amphibious Assault Ship)	1	–	1	1	1	4
LSD-41 (Landing Dock Ship)	2	–	–	–	–	2
LSD-41 Follow-on (Landing Dock Ship)	–	–	2	2	2	6
MCM-1 (Mine Countermeasures Ship)	4	1	–	–	–	5
MSH-1 (Mine Hunter-Sweeper)	4	4	1	4	–	16
AOE-6 (Multipurpose Stores Ship)	–	1	1	1	1	4
AE-36 (Ammunition Ship)	–	–	1	1	1	3
AR (Repair Ship)	–	–	–	–	1	1
TAO-187 (Oiler)	2	2	2	2	2	10
TAGOS (Surveillance Ship)	2	2	–	–	–	4
Total	*23*	*20*	*24*	*22*	*18*	*107*
Conversions/SLEPs/Reactivations						
CV (Aircraft Carrier) SLEP	–	1	–	–	1	2
BB (Battleship) Reactivation	–	1	–	–	–	1
LPD-4 (Landing Platform Dock Ship) SLEP	–	–	1	3	3	7
AO ("Jumbo" Oiler) Conversion	–	–	1	2	2	5
AG (Acoustic Research Vessel) Conversion	1	–	–	–	–	1
TAVB (Aviation Support Ship) Conversion	1	–	–	–	–	1
TACS (Crane Ship) Conversion	3	2	2	–	–	7
Total	*5*	*4*	*4*	*5*	*6*	*24*

Ready Reserve Force (RRF), an important and growing component of the National Defense Reserve Fleet (NDRF). During National emergencies the RRF ships would be activated and assigned to the Military Sealift Command. The twin-boom pedestal cranes added during the conversion process (some ships may have two twin booms, others three) will give them a self-unloading capability, and also permit them to offload other ships "in the stream" or in other areas where port facilities are inadequate. Funding ($84.9 million) is requested in the FY 1986 budget for three conversions; another two conversions are projected for FY 1987, at a combined cost of $68.7 million. The final two crane ships, of a projected 11-ship force, are programmed for FY 1988 funding.

The first TACS, the ex-SS President Harrison, was converted by Bay Shipbuilding, Sturgeon Bay, Wis., and renamed USNS Keystone State. The second, ex-SS President Monroe, is undergoing conversion at Continental Maritime, San Francisco, and will be named Gem State. Contracts for the other conversions will be awarded "on a competitive basis." Ship specifications will differ within the class itself (because the hulls converted will not be identical to start with), but most will be close to the first two: 17,782 deadweight tons; 686.6-foot length; 76.1-foot beam; 33.5-foot draft; 20-knot speed.

SURTASS TAGOS: The civilian-manned Surveillance Towed-Array Sensor System (from which the unwieldly "SURTASS" is derived) ships are another of the key elements in the overall ASW mosaic designed to counter the unprecedented Soviet submarine threat. The systems they carry and the specific work they do is classified, like all else in the ASW field. But the Navy concedes that their principal mission will be "to support the towed arrays and data processing/transmitting equipments of the SURTASS system," and Secretary **Weinberger** told Congress in his annual report that the long-range surveillance capabilities of the TAGOS ships "will be useful both for extending coverage to ocean areas not presently monitored by fixed systems and for providing backup coverage in areas that are routinely monitored, should our fixed systems be incapacitated." The "fixed systems" the SecDef referred to probably are the seabed sensor systems, also highly classified, positioned in the GIUK (Greenland/Iceland/United Kingdom) Gap in the North Atlantic and presumably in such other oceanic chokepoints as the Bosporus and Dardanelles, Skagerrak and Kattegat, La Perouse Strait, the Strait of Gibraltar, etc. Congress has approved funding for 14 TAGOS ships through FY 1985. Two more are requested in FY 1986 ($121.0 million for the pair), and two more will be requested next year ($119.0 million). Contractor for the first 12 of the twin-screw, 11-knot, geared diesel ships is Tacoma Boatbuilding, Tacoma, Wash. Contract(s) for the final six conversions will be awarded on a competitive basis. The lead ship, USNS Stalwart (TAGOS-1—the "T" in MSC ship designations indicates the ship is civilian-manned), already has been delivered and is operating out of Key West, Fla.

Some of the more important unclassified specifications: displacement, 2,500 tons; length, 204 feet; beam, 42 feet, complement, 20 civilians 10 Navy personnel.

Fleet Oiler (TAO): The TAO-187 Henry J. Kaiser-class of fleet oilers is designed, Secretary **Weinberger** told Congress, "to relieve an existing shortage of oilers, while providing replacements for the 30-year-old vessels now operated by the Military Sealift Command." Seven TAO-187s previously have been authorized. The FYDP projects a two-per-year funding rate for the next five years. The two requested for FY 1986 will cost $330.5 million, the two in FY 1987 an estimated $374.9 million. A corollary program, to increase the fuel-carrying capacity of the Navy's five Cimarron-class (AO-177) fleet oilers, will begin in FY 1988. Avondale Shipyard is building the first four TAO-187s; contracts

(continued on page 16)

(continued from page 15)

for the other ships in the planned 18-ship force will be awarded on a competitive basis.

Specifications: displacement, 40,000 tons full load; length, 677.5 feet; beam, 97.5 feet; speed, 20 knots; power plant, two fully automatic diesel engines, twin shafts, 32,000 shp; complement, 137 (106 MSC civilians and 21 Navy command, control, and communications personnel—10 "transient" spaces also are available); cargo capacity, 180,000 barrels of gas turbine and marine diesel fuel.

TAVB Aviation Logistics Support Ship: Another program developed with the rapid deployment force in mind, the TAVB conversions will modify two combined container/RO-RO (roll-on/roll-off) ships to give the Navy and Marine Corps two ships capable of lifting and supporting a Marine Intermediate Maintenance Activity (IMA). The IMA in turn is designed to maintain, repair, and otherwise support the USMC's fixed- and rotary-wing aircraft likely to be used on amphibious missions. The TAVBs will be assigned, following conversion, to the Military Sealift Command, which will keep them in a reduced operating status—but ready for activation on short notice. Todd Shipyards Galveston is converting the lead ship; the FY 1986 budget requests $31.4 million for the second conversion. The converted ships will be 603 feet long, have a 34-foot draft, and be capable of a sustained speed of 23.5 knots.

Trident Ballistic Missile Submarine: Equipped with 24 long-range ballistic missiles, the Trident SSBNs (nuclear-powered ballistic missile submarines) are probably the most important—because they are the most survivable—element in the U.S. strategic deterrent "triad" of manned bombers and land-based and sea-based strategic missiles. Bigger, more capable, more lethal, and considerably more expensive successors to the earlier Polaris and Poseidon SSBNs, the Ohio-class Tridents have been designed for a nine-year operating cycle between overhaul/refueling periods. Congress has authorized 12 Tridents through FY 1985, and the Defense Department plans to continue the current one-ship-per-year building program until the planned goal of two dozen ships or so (the plan changes, as administrations change) has been completed. The Electric Boat yard of General Dynamics has been prime contractor for all of the Tridents already delivered or now building. The FY 1986 budget seeks $1,764.0 million (including $56.6 million RDT&E and $161.0 in military construction money) for the Trident shipbuilding program (not to be confused with the Trident missile program, for which over $2 billion is requested) and projects a request for an additional $1,754.9 million in FY 1987.

The specifications for this mightiest and, except for the Navy's nuclear carriers, highest-cost ship in the U.S. fleet: displacement, 18,700 tons dived; length, 560 feet; beam, 42 feet; power plant, one nuclear reactor, geared turbines, one shaft, 60,000 shaft horsepower; complement, 133 (16 officers, 117 enlisted); armament, four torpedo tubes, in addition to the Trident missiles.

In addition to all of the preceding, the FYDP projects funding within the next five years for a number of other ship types, including multipurpose stores ships (AOE-6-class, one of which will be requested in FY 1987, at an estimated price of $756.6 million), ammunition ships (AE-36s), and repair ships (ARS).

Perhaps the "most interesting" aspect of the new SCN budget, though, according to the Shipbuilders Council, is that it also includes $203.4 million "for the acquisition of [12] commercially obsolete merchant ships for the Ready Reserve Force"—which Secretary **Weinberger** told Congress is projected "to grow to 116 ships (100 cargo ships and 16 tankers) by the early 1990s.

"This represents an increase of 39 ships over previously planned [RRF] levels," Secretary **Weinberger** also said—pointing out that the increase was "necessitated by a continuing decline in the breakbulk component of the civil fleet."

From the taxpayer's viewpoint it probably is "most interesting," as the Shipbuilders Council put it, that federal funding is being used to buy merchant ships for possible future Navy use, but cannot be used to keep other merchant ships operational for civilian purposes.

Cummins Introduces First Of Its B And C Series Marine Models

Cummins Engine Company recently introduced the first Marine models of its new B and C Series of lower horsepower diesels, which will expand Cummins Marine product line to 61 horsepower on the low end.

The B Series propulsion engines will consist of four and six-cylinder models with displacement of 3.9 and 5.9 liters, covering 76 to 152 horsepower, rated 2,500 rpm for intermittent duty and at 2,800 rpm for maximum duty. These engines are capable of providing main propulsion power in a wide variety of marine applications. Cummins has the 2,500-rpm B Series available now.

The C Series propulsion engines, available in the second half of 1986, consists of six-cylinder engines with a displacement of 3.8 liters, ranging from 158 to 204 horsepower.

Cummins is also introducing a completely new line of Marine auxiliary generator drive engines. Initially, B Series products rated at 61, 82 and 97 brake horsepower at 1,800 rpm will be available. Higher and lower horsepower ratings will be made available in the near future.

Design Objective

Cummins reports when they originally began the design of these engines, ambitious goals were set for durability, reliability and fuel efficiency. Furthermore, these engines had to be as compact and lightweight as possible so they could be easily adapted to a wide variety of applications and could be manufactured at lowest possible cost. This had to be achieved without sacrifice in strength and durability.

Since the market is so varied in this horsepower range, the engine design had to be flexible in order to meet the variety of requirements in the marketplace. The design also had to be easily serviceable since the engines would be used in diverse areas throughout the world.

Finally, the design had to meet the requirements of a high volume manufacturing facility with emphasis on keeping unit costs as low as possible.

The cast iron cylinder block has deep, ribbed skirts and main bearing supports between each cylinder for maximum strength and rigidity.

The single piece cylinder head is made of cast iron and is attached to the block with six capscrews surrounding each cylinder to provide maximum structural stiffness of the block/head assembly and to minimize bore distortion. The single piece design allows relatively close cylinder spacing to minimize the overall engine length. The head is a cross-flow design, exhaust and intake on opposite sides, with high swirl inlet ports to provide efficient air flow through the head, reduce pumping losses and provide thorough mixing of fuel and air for low fuel consumption.

The I-beam cross-section connecting rods are made from forged steel and are relatively short compared to the stroke of the engine to provide maximum structural strength while minimizing the overall height of the engine. The cap-to-rod interface is angle split with capscrew attachment for easy serviceability.

The crankshaft is a steel forging with integral counterweights. The crankshaft has large diameter main and rod journals (83-mm-diameter main and 60-mm-diameter rod) to maximize crankshaft stiffness and minimize bearing wear.

The bottom end of the engine was designed to withstand the high loads of turbocharging without sacrificing durability.

All B Series engines will use a direct injection fuel system with a distributor-type fuel pump.

One of the key design criteria for the B Series engines was simplicity so that the engines could be easily serviced with simple tools. One of the ways this was accomplished was by minimizing the total number of parts in the engine. Combining parts to minimize external plumbing and fasteners has greatly reduced the number of parts in the engines. For instance, the water pump inlet and volute, the lube pump housing, the lube oil cooler housing, and the water bypass line are part of the cylinder block casting. The thermostat housing, intake manifold, the fuel filter head are cast integral with the cylinder head. The Cummins water pump has up to 60 percent fewer parts than many other water pumps.

Cummins reports the unitized design concept means that the B Series engines have up to 40 percent fewer parts than other engines in the same power range.

"An engine that requires fewer parts offers several benefits to the user," said **Philip Jones**, Cummins Engine Company's vice president of engine projects. "For one, a reduced number of parts decreases the probability of component failure, thus increasing engine reliability. Fewer parts also mean lower service parts inventories to the dealer and the customer."

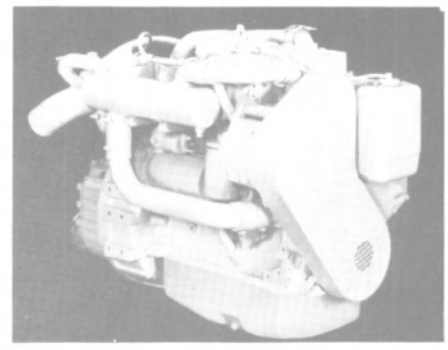
Great care was taken in the design to assure that the engine could be easily serviced and be completely disassembled and assembled using only simple hand tools. No special service tools are required. Mechanics will not require extensive training, and maintenance and repairs can be accomplished in less time at a lower cost.

Cummins has developed procedures for reconditioning the head, cylinder block and crankshaft in local machine shops. As an example, induction-hardened bearing surfaces and fillets allow the crankshaft to be reground up to .040 in. (1 mm) undersize and fitted with oversized bearings.

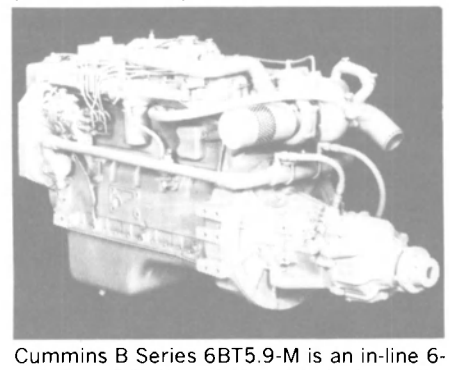
Cummins believes its B Series design combines simplicity, compactness and light weight without sacrificing strength. The company used three dimensional finite element stress analysis and other sophisticated techniques to design engines that would reliably withstand the added stress of turbocharging.

The Cummins worldwide parts and service network offers a wide range of repair options to keep equipment running and minimize repair cost. Genuine Cummins parts were available worldwide at the product's introduction. Cummins remanufacturing subsidiary, Diesel ReCon, will offer a full line of competitively priced B Series ReCon components and engines.

Complete detailed brochures and literature are available, at no cost, which provide full technical data as well as service and warantee information.



Cummins B Series, 4BT3.9-M is an inline, 4-cylinder, 3.9 litre (239 cubic inches), 4-cycle diesel engine which features turbocharging, water-cooled turbo and exhaust, and direct injection. Rated at 100 horsepower at 2,500 rpm.



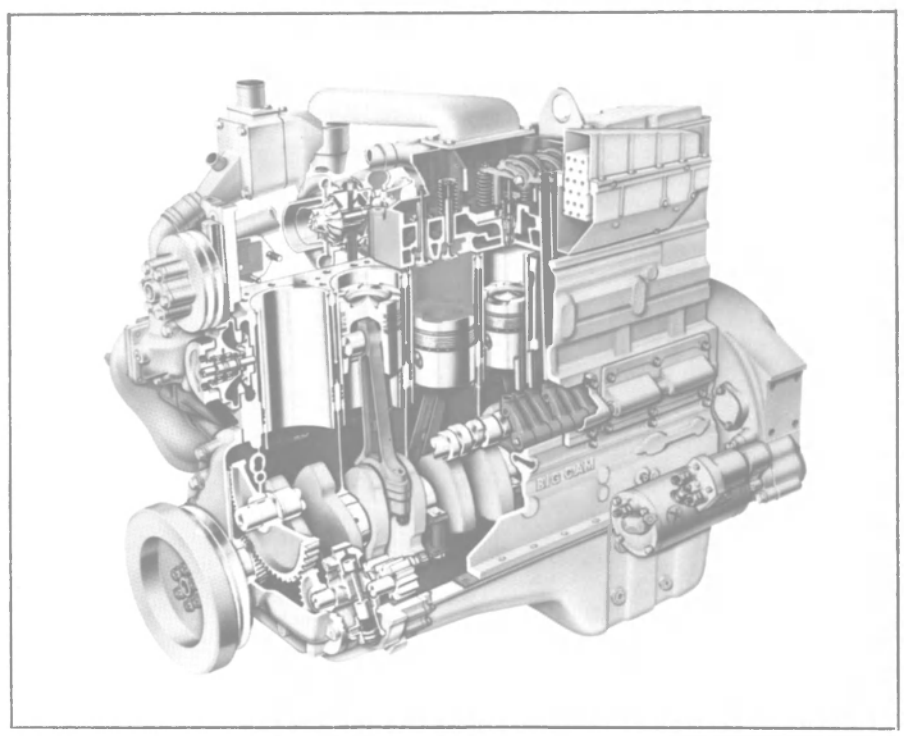
Cummins B Series 6BT5.9-M is an in-line 6-cylinder, 5.9 litre (359 cubic inches) displacement engine weighing 502 Kg (1,105 pounds) including a Borg Warner 72CR2 marine gear, Turbocharging, water-cooled turbo and exhaust, and direct injection. The 6BT5.9-M will be offered initially rated 152 horsepower at 2,500 rpm.

For free literature describing Cummins B engines,

Circle 47 on Reader Service Card

For a brochure describing the complete line of Cummins diesel engines,

Circle 49 on Reader Service Card



ELECTRONICS UPDATE

Radio Holland Introduces Expanded Marine Communications Line

Shown left to right, **Nick van Ginkel,** Volker-Stevin Dredging B.V., **Jack Frost, Sal Berte** and **Chris Wilberts** of Radio Holland and **Bruce Murray** of Station KLC.

Radio Holland USA, B.V., one of the nation's largest distributors of advanced communications and navigational equipment, recently had a "hands-on" private exhibition of their Total Shipboard Communications Center at the Houston headquarters complex. Attendees at the three day session included a wide range of technical and operational personnel from the shipping and marine electroncis industries. According to **Sal Berte**, general sales manager of Radio Holland, the program was planned to provide potential customers with an opportunity to see the most modern equipment live in a real-life environment.

Among the equipment on display was Radio Holland's new FCC type approved TR 4750 survival craft/lifeboat radio. This ultracompact system transmits on the 500, 2182 and 8364 kHz international distress frequencies, and meets all current applicable SOLAS, ITU and FCC requirements for two-way communications. For use on 500 and 8364 kHz, the TR 4750 incorporates an automatic switching and automatic keying device which transmits the radiotelegraph distress signal on both frequencies, as well as the DF dash on 8364 kHz. A built-in two-tone generator provides automatic transmission of the radiotelephone alarm signal on 2182 kHz. The unit will operate either from an external 24 VDC battery or from the built-in hand-cranked generator.

Circle 20 on Reader Service Card

As the exclusive distributor for Sailor radio equipment in the U.S., Radio Holland had virtually the entire product range available. Included was the new FCC type approved Program 1000/B 400W SSB radio system with fully automatic telex capability; the new FCC type approved 500 kHz main/reserve SOLAS radio station; the complete VHF radiotelephone line including the new ultracompact full duplex RT 2047 with scanning, dual watch and selective calling all in a package occupying less than one-half cubic foot, the well known multi-remote RT 146; plus Sailor's new CRY 2001 compact scrambler that permits up to 16.8 million possible code combinations for the ultimate in communications security.

This line of Sailor equipment is manufactured by S.P. Radio A/S of Aalborg, Denmark, in a modern factory capable of producing in excess of 20,000 sets annually. The company's product line has become known worldwide both for reliable operation and the distinctive green finish that provides a nylon finished, scratch-free surface that is highly resistant to salt water.

Circle 21 on Reader Service Card

The Program 1000/B short wave communications system is able to meet all maritime communications needs in the frequency range from 1.6 to 27.5 MHz due to the unusual design flexibility. A variety of receivers, transmitters, exciters and power supplies can easily be mounted in the Sailor 19″ rack to satisfy the communications requirements of every size vessel. In addition, the antenna coupler can be mounted directly at the foot of the antenna for maximum efficiency. The system can also operate under full remote control to meet the requirements of an automated radiotelex station. In the ARQ mode, the system works through a single antenna and has switching speed sufficient for telex operation over a single simplex frequency.

One configuration of the Sailor Program 1000/B is the Nordic Maritex Terminal. Maritex is an automated radiotelex system for the exchange of ship-to-ship or ship-to-land information. The central Maritex equipment is located at Gothenberg Radio and gives subscribers the ability to automatically transmit and receive telex messages 24 hours a day. The system is open to shipowners of all nations and complies with land mobile and diplomatic applications as well as marine.

Circle 22 on Reader Service Card

At the other end of the communications spectrum, Radio Holland also featured Comsat Telesystems' new MCS 9100 compact, lightweight satellite communications terminal, integrated with the new Philips PACT 250 teleprinter that offers a large CRT display. Another product shown was the Telesystems "in-a-suitcase" portable satellite communications terminal.

Circle 23 on Reader Service Card

In the VHF radiotelephone range, Radio Holland offered two Sailor products. The first was the familiar RT 146, which is a full duplex synthesized set for all international maritime VHF channels. An unlimited number of full function control units may be used with the system. The new RT 2047, as mentioned earlier, is a remarkably compact full duplex unit operating on all available VHF frequencies and including such standard features as dual watch, selective calling, scanning, and the ability to program as many as 60 private channels where permitted.

The new Sailor CRY 2001 compact scrambler was also available for demonstration. This unit provides up to 16.8 million possible code combinations via its use of both time and frequency division scrambling techniques. With the CRY 2001, full privacy is assured even with selective or group calling. It may be used with VHF, SSB, or ordinary telephones.

Circle 24 on Reader Service Card

In navigation equipment, Radio Holland provided one of the first public demonstrations of the new NCD-39 electronic charting system from Odin Electronics, Inc. This unit is capable of storing navigation charts in digital computer memory, then displaying them at a scale of your choice on a bright 12″ monochrome CRT display. It will interface with most popular loran or satnav receivers to provide position tracking information in real time. The user may overlay a wide range of information and even personalize charts with wrecks, drilling rigs, shoals, etc. A password security system protects private chart data and an automatic chart stringing function supports long voyages.

Circle 25 on Reader Service Card

The three day seminar was considered to be an outstanding success by all attendees.

For complete brochures and literature describing any of the above equipment, circle the appropriate numbers on the reader service card in the back of this issue.

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DIESEL POWER SYSTEMS EQUIPMENT

A Review

Over the years we have published many feature articles that reviewed the latest designs and developments of diesel engines per se. For the review that follows, we decided to report on the many kinds of ancillary equipment and services that transform the diesel prime movers into total marine propulsion systems.

We asked many manufacturers both in the U.S. and abroad to tell us about their latest diesel-related equipment. This roundup is based upon the replies that we had received by press time.

For additional information on the products of any of the companies included in this article, circle the appropriate number on the Reader Service Card in the back of this issue.

ALCO

Alco Power Inc. of Auburn, N.Y., is currently involved in a project that will add increased fuel efficiency to its model 251 diesel engine, as well as decrease the amount of time required to achieve rated horsepower and speed from engine idle speed. This is accomplished by the application of the model 131 turbocharger on the Alco 16-cylinder 251 CE diesel engine. This is now being tested in towboat service on the Lower Mississippi.

Alco is also involved with the development of a new piston design to further increase fuel efficiency over its current valve-pocketed design. Other developments on the horizon include continued experimentation with heavy fuels, camshaft design changes, and work with turbocharger application, all of which will add up to increased fuel efficiency.

Circle 61 on Reader Service Card

ALFA-LAVAL

Alfa-Laval, Inc. of Fort Lee, N.J., has available a new 16-page color brochure describing its activities and the kinds of technologies in which it is involved. These include centrifugal separation, energy management, process systems, and biotechnology.

The new brochure, "Serving America with Technology for a Changing World," gives a detailed description of products and systems manufactured by Alfa-Laval's two major units in the U.S., the Industrial Group based in Fort Lee and the Agri Group in Kansas City.

Alfa-Laval, Inc. is the U.S. subsidiary of the international Alfa-Laval Group headquartered in Sweden, a world leader in process systems and equipment for a broad range of marine, industrial, and other applications.

Circle 2 on Reader Service Card

ALPHA DIESEL

Within the M.A.N.-B&W organization, Alpha Diesel in Frederikshavn, Denmark, is the specialist in complete marine propulsion systems.

In one of the most modern factories of its kind, Alpha Diesel's more than 80 years of experience is coordinated and translated under one roof into high-quality diesel engines, gearboxes, propeller equipment, and remote controls. The complete propulsion system is covered by a single warranty and supported by a worldwide service organization, with spare parts stocked at all important locations.

The Alpha system primarily consists of a modern M.A.N.-B&W four-stroke, medium-speed diesel engine designed for efficient operation on heavy fuel; an Alpha gearbox designed for heavy-duty operation; an Alpha controllable-pitch propeller of rugged design; and an Alpha electronic remote control system to obtain the best possible fuel economy.

The power range of the Alpha diesel is 680-5,400 bhp per engine and multiples thereof.

Circle 62 on Reader Service Card

AMERICAN METAL BEARING

American Metal Bearing Company of Garden Grove, Calif., has just published a new full-color brochure, "Excellence in Bearing Design and Manufacture." The eight-page publication outlines the product lines, design and manufacturing methods, experience, and client list of the company.

AMB has been manufacturing and maintaining large bearings for ship propulsion systems since 1921. The company now offers a comprehensive service to shipbuilders, shipowners, and navies, designing, manufacturing, and maintaining complete, fully integrated propeller shaft bearing systems.

Circle 63 on Reader Service Card

AMERICAN-STANDARD

The Heat Transfer Divison of American-Standard Inc., Buffalo, N.Y., has published a new bulletin giving details of small, pre-engineered, fixed-tube-sheet heat exchangers used for heaters or oil coolers in a wide variety of industrial applications.

The brochure includes data on the 57 BCF® model heat exchangers, many of which are available from local American-Standard distributor stock. Also included is information about HCF® models, which can be quickly assembled using standard, pre-engineered components to accommodate special shell and tube materials, special tube sizes, nozzle configurations and orientations, special gaskets, and mountings.

Model HFF units, also included in the new bulletin, feature SAE-flanged, shell-side connections for quick bolt-in-place installation.

Circle 3 on Reader Service Card

ARMCO

"How Armco Now Provides You Bigger and Better Aquamet Boat Shafting" is the title of a new brochure published by Armco's Specialty Steels Division headquartered in Butler, Pa.

To make its Aquamet shafting even more appealing to naval architects and boatbuilders, Armco provides shafts with four different combinations of properties , each offering special advantages in either properties or price. Aquamet 17, 18, 19, and 22 shafting have varying degrees of strength, toughness, corrosion resistance, and cost to meet customers' specific requirements for a variety of applications, from use on tugs, patrol boats, commercial vessels, and pleasure craft.

Current mill modernization combined with free design assistance and ready product availability make Armco a leading choice for boat shafting, and new Armco facilities and equipment provide new sizes and better quality and precision.

Circle 64 on Reader Service Card

AMERICAN UNITED MARINE

American United Marine Corporation, headquartered in Saugus, Mass., is the exclusive U.S. representative for A/S Maritek of Bergen Norway, a consulting engineering firm that has developed performance monitoring systems for diesel engines. These include the Maritek torque thrust meter, waste heat program, combustion analyzer program, scavenging air program, and performance program.

The Maritek Combustion Analyzer (MCA) is a computer-based diesel engine analyses program using fuel injection, cylinder pressure, scavenging air pressure, and crank angle indicator. The MCA output provides: graphical and numerical presentation of cylinder pressure and fuel injection pressure; mean indicated pressure and indicated horsepower; ignition timing/ignition lag; and bar graph of MEP cylinder comparison. Additional data of compression pressure, maximum cylinder pressure, expansion pressure, ignition, and injection timing are compared with reference curves.

MCA programs are available for slow- and medium-speed diesel engines for both newbuilding and retrofit vessels. The additional Maritek programs of waste heat scavenging air deal with energy balance and recovery.

Circle 18 on Reader Service Card

BFGOODRICH/MOFFITT

The product of years of research and development by BFGoodrich and Lucian Q. Moffitt, Inc. of Akron, Ohio, Cutless® brand bearings have an outstanding reputation for high-quality and long-lasting performance. A tough, resilient rubber lining and exclusive water wedge design are the two distinguishing characteristics largely responsible for Cutless bearings' 60-year history of success in marine applications.

BFGoodrich's basis for using rubber as opposed to traditional hard-surfaced material is its low friction coefficient when wet. Resistant to oil, grease, and most chemical solutions, rubber bearings last many times longer than hard-surfaced bearings in the most severe abrasive conditions.

Adding to the Cutless bearing's long life is its exclusive water wedge design that incorporates rubber grooves that easily channel the flow of water. As the shaft rotates, dirt and grit roll into the grooves and flush away, maximizing lubrication and minimizing damage to the bearing and shaft.

Cutless bearings are designed with either metal or non-metallic shells. Those with metal backing come in either a full-molded style of solid or split design, as well as in a segmental style. The Cutless FE (fiberglass epoxy) bearing is also available.

Circle 65 on Reader Service Card

CATERPILLAR

Off-the-shelf availability and low exchange price are key benefits of Caterpillar Tractor Company's factory-remanufactured turbochargers. Now available for 3208, 3306, 3406, and 3408 engines, these turbochargers offer minimum downtime at prices as low as 25 percent of the new turbocharger price.

Cat's remanufactured turbochargers incorporate the latest design advances for longer life, better performance, and improved fuel economy. The company backs them with the same national warranty as new turbochargers—six months, unlimited mileage/hours—honored by more than 2,500 engine parts and service locations in North America (some 3,500 worldwide).

Circle 66 on Reader Service Card

CINCINNATI GEAR (CGCO)

The Cincinnati Gear Company in Ohio has recently made significant advancements in the design and manufacture of large carburized, hardened, and precision-ground (CHG) gears that will be of special interest to naval architects, marine engineers, and shipbuilders.

In a technically unprecedented move, CGCO has produced CHG gears with a diameter well over 100 inches (9 feet) for use in a new class of T-AO fleet oilers developed by the U.S. Navy and being constructed by Avondale Shipyards. The T-AO is powered by two 16,500-bhp diesel engines, each coupled to a CGCO gearbox. This machining milestone has established Cincinnati Gear as the primary source for all CHG gears over this diameter. These large gears can be produced to meet AGMA Class 15 level quality requirements, while some of the elements may exceed AGMA 15 levels.

Propulsion systems making use of the higher level AGMA quality gears operate with much lower noise and vibration levels than conventional gearboxes. Moreover, audible noise signatures sent out by noisy drive trains are greatly reduced, allowing warships to move closer to their targets without being detected. And because the gears have been made to a specified blueprint value, mating is not required when retrofitting; an individual gear can be replaced instead of the entire gearbox.

In drive systems using CHG gears, the gear tooth surfaces generally have a Rockwell C hardness value of 60. As a result, gears are designed with a high power density allowing the manufacture of large marine drives being at least 20 percent smaller and lighter than conventional through-hardened designs developed during World War II.

To accomplish the grinding of large precision gears, CGCO has installed the largest ultra-precision grinder in the U.S. It is equipped with in-cycle inspection equipment for measuring tooth spacing and for checking involute and lead. CGCO gears are designed with built-in performance modifications that insures full-face contact during full load. The inspection equipment computer prints out the exact AGMA quality level achieved and eliminates the need for operator interpretation of blips traced on a strip chart. By the time the gears are taken from the machine, their quality level has been checked, established, and recorded several times.

Cincinnati Gear Company has been a leader in CHG gearing since 1936, and this long learning curve is the key to making large CHG gears an affordable alternative for future marine drives. By applying CGCO's latest state-of-the-art technology and equipment, gears of lower than Class 15 quality can be produced with new-found economies.

Circle 67 on Reader Service Card

CUMMINS

Premium Blue, a new premium grade 15W-40 diesel engine lube oil from Cummins Engine Company of Columbus, Ind., is now available in the Southeastern states in a test marketing plant that will result in national distribution of the oil by mid-1985.

The test marketing is Cummins's first major step in a program to provide operators of diesel engines with a lube oil designed specifically to maximize performance of their engines. The project has resulted in the development of a combination of oil base stock, viscosity improvers, detergents, and stabilizing additives to create a premium multigrade oil.

Premium Blue is specially blended to provide cold start protection in temperatures as low as minus 13 F. Laboratory tests have shown less oil consumption until overhaul of an engine, and up to 30 percent more miles between overhauls as a result of improved lubrication and superior protection against oxidation and wear.

Circle 4 on Reader Service Card

(continued on page 22)

(continued from page 21)

DANA CORPORATION

A new four-page brochure describing the Wichita® mechanical power takeoff (PTO) that transmits and disconnects power from heavy-duty diesel engines is now available from the Power Transmission Division of Dana Corporation, Toledo, Ohio.

Highlighted in the brochure are the Wichita PTO's design advantages, including its incorporation of the heavy-duty Spicer® Angle-Spring® clutch for automatic self-adjustment and constant plate load throughout the wear life of the unit. The brochure also describes typical PTO applications, and gives detailed instructions for PTO selection. Included for quick reference are PTO selection charts for the major makes of diesel engines.

Complete engineering and dimensional information for the PTO are provided in line drawings accompanied by tables. Also included are toll-free numbers of regional sales offices where additional technical information may be obtained.

Circle 68 on Reader Service Card

ELECTRO-MOTIVE DIVISION

A General Motors Electro-Motive Division production marine drilling power unit, incorporating the EMD 20F9B 20-cylinder engine, has successfully completed the Det norske Veritas 15-degree permanent inclination test. The DnV approval applies to EMD's complete line of naturally aspirated and turbocharged engines, as applied to the drilling power unit configuration.

The test, which consisted of 12 hours of running time at full rated horsepower and speed, was witnessed by officials from DnV, the American Bureau of Shipping, and Lloyd's Register of Shipping. The test is mandatory for generating sets used on offshore rigs and platforms requiring DnV certification.

The means to achieve the 15-degree inclination requirement were based on a "total system" design approach. Engine, generator, modular accessory rack, and external lube oil tank were mounted on a common base and interfaced, as necessary, to provide a power unit capable of full rated output.

Lube oil and cooling water pressures and temperatures remained constant during the test. Normal engine start was achieved prior to initiation of each 6-hour test, and clear exhaust gases were observed throughout the entire load testing.

Circle 5 on Reader Service Card

ELLIOTT COMPANY

The Elliott White Gill Thruster and propulsion unit is a low-head, high-volume axial pump capable of delivering thrusts of up to 38,000 pounds in every direction—through a full 360 degrees.

It mounts flush with the hull, below the vessel's draft line, open to the water at both suction and discharge ports. Units are fitted in the bow section and/or the stern, depending on application. Thrust is produced by drawing water through the intake, and discharging it on an almost horizontal plane through a deflector that rotates a full 360 degrees. No part of the system protrudes below the vessel's keel line.

The Elliott White Gill unit, in horizontal, vertical, "T3", and cross shaft designs, gives ships of every class precision maneuverability in hundreds of applications offshore and on inland waterways around the world.

Drivers for thrusters can be diesel engines, ac or dc motors, or hydraulic motors. The diesel engine is an ideal driver because it is variable-speed, and requires no support system to furnish its power. As a result, diesel engines are the selected driver for a large percentage of Ellott's thruster applications.

When Elliott Company decided to package its cross shaft model with a driver, the diesel engine was the obvious choice. By mounting an engine bracket on the thruster, the engine could be mounted piggyback fashion, with its drive shaft parallel to the input shaft of the thruster. Selection of appropriate sheaves accomplishes the desired speed match, and varying the engine speed permits throttling of the thruster.

Because the White Gill performance follows a typical pump curve, the speed varies much less than the horsepower and thrust as the engine is throttled. For instance, if 50 percent of the thrust is required, the horsepower requirement is only 35 percent and the speed drops by only 29 percent. A variety of engines are used, depending on customer preference.

Circle 69 on Reader Service Card

FAIRBANKS MORSE

Colt Industries' Fairbanks Morse Engine Division in Beloit, Wisc., continues to be the leading manufacturer of medium-speed, high-horsepower diesel engines in the U.S. With a range of 640 to 29,286 bhp and the ability to burn a wide variety of fuels, these engines are widely accepted in both the marine propulsion and stationary power marketplaces.

Fairbanks Morse has strengthened its entire parts and service operation to improve all aspects of customer service worldwide. All Parts and Service Centers are computer-integrated with the main plant in Beloit to quickly process orders for stock items or special made-to-order parts.

Capabilities of these service centers include engine rebuilding and individual component repair. Complete fuel injection service available at the Reno, Nev., facility allows FM to stock rebuilt and exchange assemblies in all locations to complement its parts inventories.

With diesel engines available for instructional use, FM's Diesel Training Center provides customer personnel with hands-on service training on opposed-piston and Pielstick engines. Training specialists guide students to better understand and perform necessary steps for proper engine maintenance.

Fairbanks Morse's Electrical Engineering Department offers control and systems design capabilities for engine gauge and alarm panels, bearing temperature monitoring systems, and engine-generator control panels. Panels and systems assembled and tested by skilled craftsmen provide trouble-free control of engine operation.

Circle 70 on Reader Service Card

FALK

The Falk Corporation of Milwaukee, and Zahnraderfabrik Renk AG of Augsburg, West Germany, recently signed a license agreement under which Falk will have exclusive manufacturing, sales, and distribution rights in the U.S. for the Renk Series AWS reverse/reduction drives. In addition, the two companies have agreed to cooperate on custom design marine propulsion drives, primarily for Naval applications in the U.S.

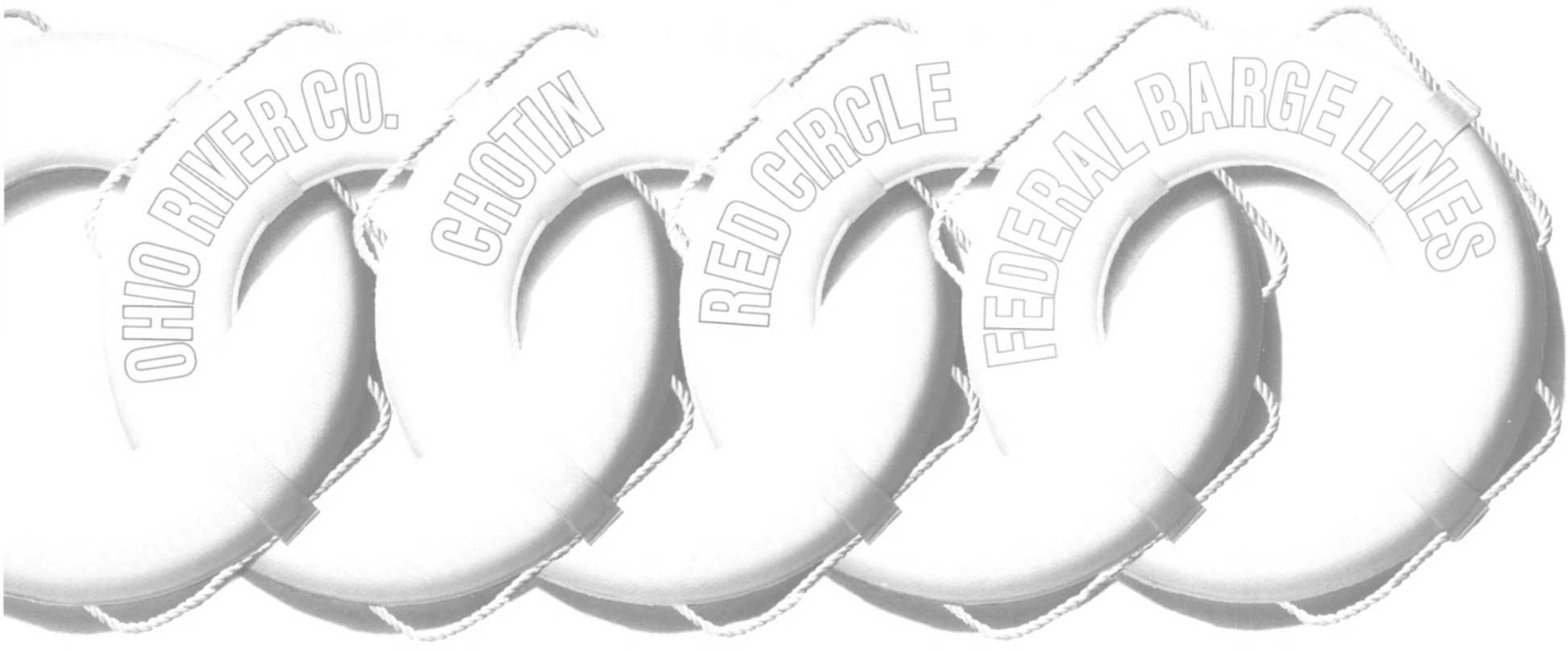
For many years, both Renk and Falk have demonstrated design, manufacturing, and application excellence in marine main propulsion gear drives. The combined strengths of the two companies will enhance the products offered to the marine industry, both in standard and custom design drives.

The Falk Corporation, a subsidiary of Sundstrand Corporation, is a leading producer of gear drives and flexible couplings. Renk is a subsidiary of GHH, one of the largest engineering groups in Europe, and is well known worldwide for the special-purpose marine propulsion gears.

Circle 71 on Reader Service Card

GENERAL THERMODYNAMICS

General Thermodynamics Corporation of Plymouth, Mass., has just published a technical bulletin on its



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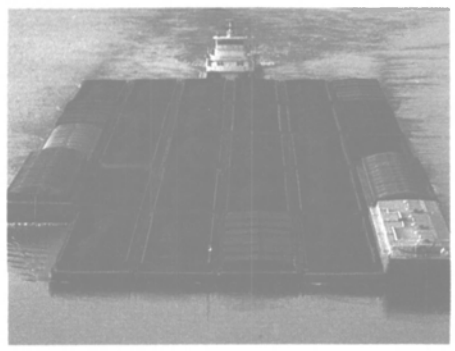

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Circle 111 on Reader Service Card

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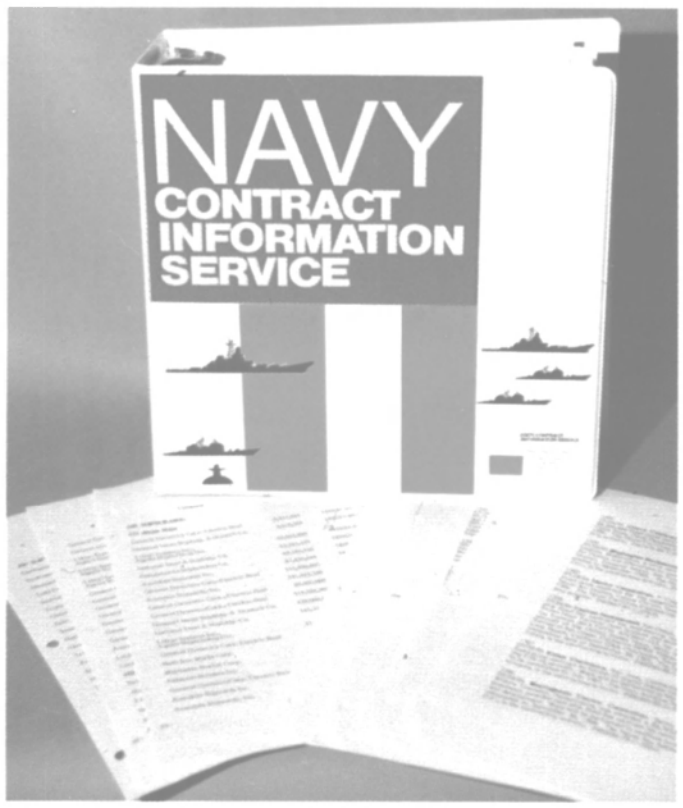

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Diesel Equipment
General Thermodynamics

(continued from page 22)

model 300-A BMEP balancer that is used to equalize the cylinder load of any multi-cylinder internal combustion engine equipped with individual fuel adjustments.

The balancer is described as being designed to fit the standard indicator valve. It is quickly connected and sealed with slightly more than hand-tight torque. When the indicator valve is opened, the pressure guage will come to a reading. The pointer is steady and will stay fixed as long as the cylinder load is not changed. Keeping the engine load constant, readings are taken for each cylinder, then fuel adjustments are made either up or down until all cylinders yield the same pressure reading. Each cylinder is then delivering equal power.

Along with the application, the construction and operation of the balancer are described, and some of its characteristics are listed, such as steady, accurate, repeatable, reliable, requires no maintenance, fits standard indicator valve, and easy to use.

Circle 72 on Reader Service Card

FERROUS

Ferrous Corporation of Bellevue, Wash., has developed a complete system for administering catalyst into the fuel oil of a diesel engine. The Ferrous Marine System (FMS) consists of a proportioning pump, depulsing unit, and 24-gallon day tank for injecting Ferrous FE-4 catalyst into the fuel oil at a ratio of one gallon per 3,000 gallons of fuel.

The FMS is said to mix the fuel and catalyst with a minimum of effort and maintenance, and a high degree of reliability. The standard package also includes a 90-gallon storage tank.

The proportioning pump allows accurate injection of the FE-4 catalyst from the day tank into the fuel line. It is powered by a variable-stroke, oil-driven diaphragm pump that operates on 115-volt ac. On special order it is available with dc and multiphase pump motors. The pump comes in various output capacities, measured in gallons per minute or hour, to meet virtually any fuel flow requirement.

Circle 6 on Reader Service Card

GEMS SENSORS

Gems Sensors Division of Plainville, Conn., has introduced a companion digital indicator for use with its Flow Ranger flowmeter. The indicator provides a readout of flow rates of 0-36 gallons per hour and 0-360 gph, as well as cumulative consumption rates.

The positive-displacement Gems flowmeter measures these flow rates, and the indicators provide an accuracy within two percent of actual flow rate. The indicator case is made of durable steel, and measures 3⅞ by 6$^{1}/_{16}$ inches. Used with Gems flowmeters they provide total system control and insure uninterrupted flow of liquid to its point of use.

Circle 7 on Reader Service Card

GEORGE ENGINE

As much as an 11.5-percent reduction in fuel consumption can be realized by George Engine Company's "bypass operation"—the upgrading of a Detroit Diesel 149 Series engine from its normally aspirated (NA) configuration to a turbocharged, intercooled, blower bypass (TIB) arrangment using the latest high-tech components from Detroit Diesel. Fuel savings provide a rapid payback of the cost of the conversion.

With a smaller fuel injector, the TIB configuration 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, but still at a competitively low specific fuel consumption figure.

Circle 73 on Reader Service Card

GOLTEN

Golten Marine Company of Brooklyn, N.Y., and Golten Service Company of Miami, Fla., recently announced a new agreement with Mitsubishi Heavy Industries of Japan. The Golten companies and MHI have signed a service and spare parts agreement covering the Mitsubishi type UE engine and MET turbochargers.

Golten's specially trained technicians will be on call, on short notice, to service these engines and turbochargers at any U.S. port. Under this agreement, Golten is also authorized to sell original MHI spare parts and perform "warranty" repairs and normal maintenance.

Circle 8 on Reader Service Card

GRANT MANUFACTURING

Grant Manufacturing & Alloying, Inc. of Souderton, Pa., produces a full range of babbitt alloys for marine applications. All material is refined in accordance with specifications QQT390A and ASTM B-23.

Grant's babbitt is currently used in marine bearing facilities throughout North America.

The various babbitt alloys are available for immediate delivery from the plant in Souderton, as well as from distribution warehouses in San Francisco, Houston, and Chicago.

Circle 74 on Reader Service Card

GULF OIL

Selection of appropriate lubricants for marine equipment is one of the most important steps toward insuring maximum protection of marine engines and efficient operation of vessels. To aid in the selection process, Gulf Oil Corporation has published a guide to its complete line of marine products.

Titled "Gulf Inland & Coastal Marine Lubricants," the brochure includes a quick reference guide to Gulf's marine lubricants as well as detailed data sheets on the properties of individual grades of lubricants.

Gulf marine products are available from many midstreamers and commercial marine outlets. A convenient pull-out folder included in the brochure identifies the ports where Gulf marine service and products are available.

Circle 9 on Reader Service Card

HAMWORTHY

With more than 60 years of experience, Hamworthy Engineering Ltd. of Poole, Dorset, England, is well known in both the U.K. and overseas. The company manufactures and supplies a comprehensive range of equipment allied to marine diesel engines. Each product is backed by an international spares and service network with a 24-hour turnaround.

Hamworthy recently introduced a new diesel-engine-driven, air-cooled air compressor for marine air starting duties. Designated the 35MM Distair, the unit is a two-stage machine having a capacity of 15 cubic meters per hour and a maximum discharge pressure of 30 bar. It has a horizontal configuration, with the single-cylinder diesel engine mounted above the compressor crankcase.

The combined compact unit has a simple three-point mounting, and requires no external services apart from sufficient ventilation. The set meets the requirements of the major classification societies, as do the remainder of the Hamworthy range of compressors. With complete accessibility for servicing, these compressors are designed for all marine duties including starting air, and have capacities ranging from 83 to 735 cubic meters per hour with pressures up to 40 bar.

The company's Sea Star diesel fuel blender has been in service for some time, with many well-known vessels showing substantial reductions in fuel costs. The compact unit blends relatively cheap oil used in the main engines with the more expensive generator diesel oil. The blended oil is then supplied to the generator without using additional pumps, heaters, or filters. With conventional blenders, there is a danger that the two fuels could stratify in the blended fuel service tank.

The Hamworthy Dolphin Series of diesel cooling, lubricating, and fuel centrifugal pumps are designed to meet the needs of most marine applications, from the smaller single-duty pump to the large double entry and two-stage versions. Capacities range from 60-1,800 gallons per minute, 700-32,000 gpm, and 150-1,000/150-700 gpm, respectively.

A range of horizontal triple-screw pumps also manufactured by Hamworthy are designed to handle light-viscosity oils, heavy fuel oils, and lubricating oils.

Circle 75 on Reader Service Card

HARBORMASTER

Literature on its fixed-pitch tunnel thrusters is available from Harbormaster of Quincy, Mass., a Division of Mathewson Corporation. The thruster is handsomely illustrated on the cover of the publication, which also gives important data in chart form on the various Harbormaster models, along with a diagram and informative text.

Circle 76 on Reader Service Card

JOHNSON RUBBER

The water-lubricated bearings manufactured by the Duramax Marine Division of The Johnson Rubber Company, Middlefield, Ohio, are furnished in sleeve and flanged types with naval brass shell in a full range of sizes. Sleeve bearings are also supplied with a non-metallic shell and are ideal where corrosion or electrolysis is a problem. Flanged bearings are available in solid or split style, and can be furnished for mate mounting with Duramax bronze stuffing boxes that are available in shaft diameters up to 15 inches, and in models for air/water/grease service, air/grease, air/water, water only, and grease service only. Split styles are also available to facilitate installation and servicing in close quarters.

Stuffing boxes employing air service feature the Duramax rubber "Air Seal" ring, which when inflated seals itself around the propeller shaft and seals out water while packing is being changed. Deflating allows the rubber ring to retract to its normal position from around the shaft.

Duramax keel coolers for engine or auxiliary equipment cooling feature spiral tubes of 90/10 cupronickel. Single—and double-bank models, which do not require through-the-hull fittings, range from four-tube to 24-tube.

Circle 77 on Reader Service Card

KAMEWA

In 1937, KaMeWa of Sweden delivered its first controllable-pitch propeller; since then, the company has been involved in marine propulsion and is today the world's leading CCP manufacturer. KaMeWa propellers are produced in the U.S. by Bird-Johnson Company of Walpole, Mass.

In the mid-60s, the first KaMeWa water jet unit was delivered to the Swedish Navy. This 250-hp unit was followed by a 480-hp installation in a private craft. Many potential water jet projects for all kinds of craft were investigated. It soon became clear that water jet propulsion provides some very positive characteristics, such as shallow draft and good maneuverability, but unfortunately combine with poor efficiency.

Thus water jet propulsion, with the then state of the art, could only be justified on some small, special-purpose craft, and the market was not very interesting for KaMeWa.

However, it was also realized that if the performance of water jet propulsion could be improved to about the same level as that of a fixed-pitch propeller, water jet units could be a very interesting product. Thus a development program with this aim was started by KaMeWa, mainly based on the model testing facilities already existing within the company.

The first of these high-performance, water jet units was delivered for a 98½-foot catamaran ferry in 1980. The high performance of the units was verified by comprehensive full-scale measurements. The tests showed that the water jet propulsion gave a fuel consumption equal to or lower than that expected for a fixed-pitch propeller installation.

Today KaMeWa water jet units have been ordered for commercial passenger ferries, passenger cruising craft, motor yachts, patrol boats, crewboats, workboats, and river towboats. Delivered units are in the power range of 161 to 13,410 bhp. The commercially operated passenger ferry with the first delivery has accumulated more than 9,000 running hours, during which a high degree of reliability of the 1,560-hp water jet units has been demonstrated. In total, all units in service have accumulated about 100,000 running hours.

Circle 78 on Reader Service Card

KHD

Klockner-Humboldt-Deutz AG (KHD) of Cologne, West Germany, recently introduced two centralized service systems for owners of Deutz marine diesel engines. Called Ship Information Service (SIS) and Ships' Information Processing System (SIPS), they are designed as a new method for lowering engine

(continued on page 28)

Diesel Equipment
KHD

(continued from page 27)

operating costs, increasing operating reliability, and reducing the workload for shipboard personnel.

With the SIS, the ship's engine is fitted with a number of sensors that record the characteristic engine operation data. These data are transmitted via satellite to the KHD computer center, where the computer compares the periodically transmitted operating data with the figures recorded in the test report made at the time of engine acceptance at the KHD factory, and the basic data entered during engine commissioning by the owner.

The results of the individual data comparison are evaluated by skilled KHD engineers, who prepare an engine status report with trend analysis, which is sent to the shipowner together with recommendations regarding necessary maintenance work. Based on the information received, the owner will decide on the measures to be taken. The SIS system further includes an individual maintenance schedule tailored to the actual operating conditions of a particular engine installation, providing a base for long-term planning.

SIS furnishes the shipowner not only with an efficient means for cost-saving planning of maintenance and service work, but also with engine records over long service periods.

Circle 79 on Reader Service Card

KORODY-COLYER

Korody-Colyer Corporation of Wilmington, Calif., one of the world's largest after-market component manufacturers, produces a complete line of replacement parts for the Detroit Diesel most popular Series 53, 71, and 92 engines. All K-C parts, new and rebuilt, are said to equal or exceed OEM in every way except price, which is generally 20 percent lower on components from individual replacement to complete engine overhaul.

K-C has made diesel engine injectors and other components a specialty for more than 20 years, and its entire line is backed by a comprehensive factory warranty. All new and remanufactured K-C parts, including the exclusive matched and balanced sets of injectors, are warranted equal to new.

Circle 80 on Reader Service Card

LIPS PROPELLERS

For more than 50 years, marine engineers, naval architects, and vessel owners and operators around the world have been familiar with the Lips name. Lips Propellers, Inc. is headquartered in Chesapeake, Va.

Since 1962, Lips has manufactured a family of controllable-pitch propellers to keep pace with the changing speed, power, and size requirements of modern vessels. Mechanically and hydrodynamically more sophisticated than the traditional monobloc propeller, today's CPP systems are the result of Lips' vast experience, research, and development. The company has made a thorough study of the effects of seawater, ice, sand, shock, vibration, and fatigue. Lips has designed CPP systems that provide high efficiency, low maintenance, easy assembly and disassembly, and maximum reliability. The product line consists of three models—the C-type for up to 50,000 shp, the LC-type for a range of 1,200 to 7,000 shp, and the L-tvpe for 200 to 2,400 shp.

To date, Lips has supplied the marine industry worldwide with CPP installations for an aggregate of more than 8,840,000 horsepower. Since 1975, the company has supplied 40 dynamically positioned drillship installations.

Complementing the CPP thruster installations are Lips' ANCOS 2000 and ANCOS 4000 electronic analog control systems. The ANCOS 2000 is applied when there is one prime mover per shaft line; the 4000 system is involved with multiple prime movers per shaft line, or very high levels of vessel control automation.

Lips' transverse tunnel thrusters are available in fixed—or controllable-pitch configurations. The FT Model fixed-pitch thrusters range from 100 to 2,700 horsepower; the CT controllable-pitch models range from 200 to 3,650 horsepower.

The standard components of Lips thrusters, both FT and CT, include the propeller, pod with right-angle gearing, hydraulic control unit (for the CT series), the lubricating and hydralic system, remote control, and starting equipment. The tunnel is fitted with a stainless-steel liner welded in the way of the propeller to prevent local erosion of the tunnel. Tunnels are provided in standard lengths for each size thruster; other lengths can be supplied upon request.

Circle 81 on Reader Service Card

LUFKIN

Founded in 1902, Lufkin Industries Inc. of Lufkin, Texas, has an established reputation for building dependable heavy machinery. The company begin building marine gears during World War II, and started marketing units of its own design in 1956. Since then, Lufkin has built thousands of diesel-driven marine gears with outputs ranging from 450 to 20,000 bhp. Applications include oceangoing tugs, river towboats, tug/supply vessels, tankers, Great Lakes ore carriers, harbor tugs, fishing craft, and many other vessels.

While Lufkin looks on its past accomplishments with pride, it realizes that diesel power systems are changing and demands placed on the reduction gear are getting more complex. With this in mind, the Texas company is maintaining its

old reliable lines of marine gears while adding new models to meet the challenges to today's marine propulsion systems.

Lufkin marine gears are designed and constructed for many modes of operation. Typical propulsion systems include single engines driving either a fixed-pitch or controllable-pitch propeller. Multi-engine or compound gears are available in either reverse/reduction or straight reduction designs.

The company's newest designs, the H.G. Series, transmit from 700 to 1,700 bhp at speeds up to 1,900 rpm. These gears utilize case-carburized and ground gearing, plus oil-cooled, air-actuated clutches. These units are designed with the same reliability as the larger Lufkin gears.

Circle 82 on Reader Service Card

MARINE ELECTRIC RPD

Galbraith-Pilot Marine (GPM), a product line of Marine Electric RPD, Inc. of Brooklyn, N.Y., has been a leader in the field of monitoring and control systems for the marine industry for more than 20 years. Recent developments have been in the area of packaged monitoring and control systems for completely automating the engine rooms of diesel-powered vessels.

GPM ship automation systems conform to the latest IEEE #45 Marine Electrical Installation Standards, American Bureau of Shipping Rules, U.S. Coast Guard Regulations, and Maritime Administration requirements in conjunction with manned and unmanned engine room operation.

GPM ship automation systems are available in a variety of basic configurations that can be tailored to meet specific vessel requirements. One example of a basic configuration is a system for a vessel with two non-reversing, constant-speed engines driving two controllable-pitch propellers through separate reduction gears. Such a vessel would be certified for one-man engine room operation (ABS Notation ACC). As this system has already been designed, manufactured, and installed, the major engineering costs have been reduced, making it GPM's most cost-effective package. The major components of this system are the engineer's central control console, bridge control console, local control panels, and the engineer's accommodation alarm panel. The system can be converted to unmanned operation with a minimum of additional control instrumentation.

Circle 83 on Reader Service Card

MARINE MOISTURE CONTROL

The lube oil clarifer and coalescer manufactured by Marine Moisture Control Company (MMC) of Inwood, N.Y., is designed to remove water, sludge, and solids from diesel fuel and lube oil systems without removing any of the additives from the oils. Except for a small electric motor driving a gear pump, all moving parts are eliminated, thereby reducing costly mechanical maintenance. This unit has no open drains and it can be run continuosly on the main turbine sump without the danger of losing oil to the bilge.

A two-stage separating process is used. The contaminated emulsified oil and water mixture is pumped into the unit and through the coalescer elements, where all contamination larger than approximately three microns is removed and the emulsion is broken into droplets of water suspended in clear oil. The oil rises into the top shell where the water separator screens allow the oil to pass through while holding back the water droplets until they collect and fall to the bottom of the unit to await manual draining.

These MMC units have been very successful in installations in main lube oil sumps, #2 diesel fuel separation, auxiliary generator sumps, hydraulic oil sumps, and stern tube lube oil applications. Many options and variations are available including heaters, automatic water drains, and filter element dirt indicators.

Circle 84 on Reader Service Card

MEGASYSTEMS

The Direct Optical Tuning

(continued on page 30)

(continued from page 29)

(DOT) combustion analysis system designed and manufactured by Megasystems, Inc. of Boca Raton, Fla., is a diagnostic tool for use on diesel ships. This system provides the operator with a simple and straightforward method of accurately tuning diesel engines to their optimum performance. No operator set-ups or calibrations are required.

The DOT system measures more than one cylinder at a time, thereby cancelling out changes caused by increasing or decreasing engine rpms or the engine load. This allows the operator to accurately balance the power output of each cylinder.

Use of the DOT system provides two major benefits. First, it allows operators to observe the time of ignition, expansion time, peak pressures, etc., in direct relation to the crankshaft position, decreasing fuel costs significantly. (For each 1° the crankshaft angle is off, a 2-percent fuel loss occurs.) Second, it allows operators to balance cylinder power output, reducing heat imbalance, vibration of the engine, and increasing the engine's life.

The standard DOT system contains a small CRT, a processing unit, and two sensors that are attached to the engine. Information from the sensors is displayed as a waveform, which is analyzed by the operator.

Circle 85 on Reader Service Card

MITSUBISHI KK

Mitsubishi Kakoki Kaisha, Ltd. of Japan is offering literature on three new products that the company recently placed on the market as a solution to the fuel quality problem. The products are the Selfjector Excellent-Series (SJ-E), the e-HIDENS-System, and the Marine Decanter Centrifuge.

The attractive 16-page brochure on the SJ-E explains that the new unit is a remodel of the original Selfjector (disc type centrifugal separator) that incorporates many new features such as a pilot valve mechanism in a high-tensile stainless-steel bowl, and the introduction of a microprocessor into the automatic control system.

Seven models of total and partial discharge separators are available so that the most economical unit for any particular main engine can be selected. The brochure contains cutaway color views, text, and important data on the various models and the automatic control system, as well as dimensions and space for installation.

The six-page brochure on the e-HIDENS-System states that the deterioration of fuel oil for diesel engines prompted the development of this high density fuel oil treatment system. The pamphlet contains an outline of what the system is, and discusses its features, actions, main components, and throughput capacity. Several pages of drawings, charts, and diagrams complement the text.

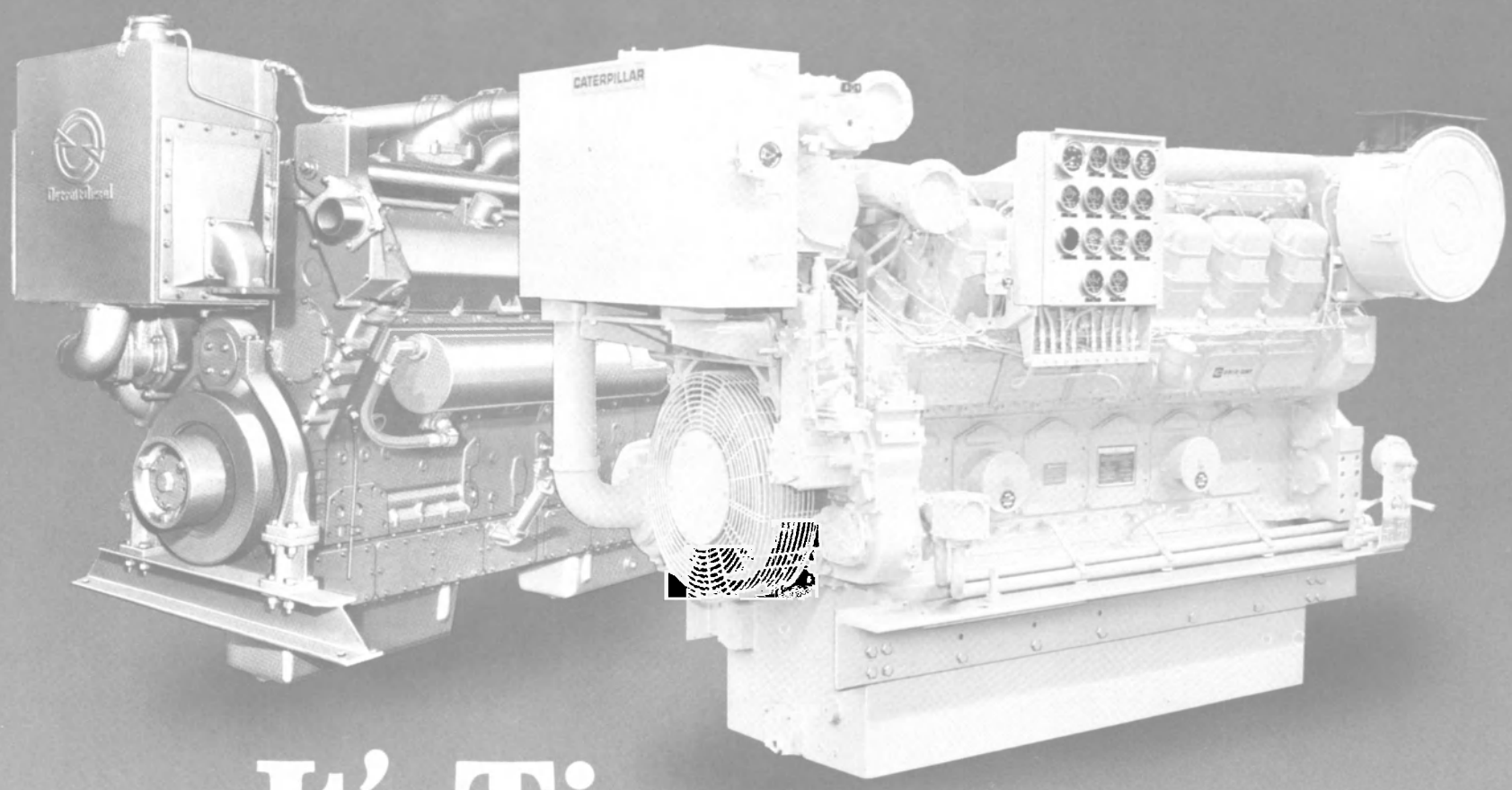
The Mitsubishi Marine Decanter Centrifuge is the subject of literature that points out it was also developed to cope with the deterioration of marine fuel oils, and that it fully meets the requirements for the clarification of low grade fuel oils with high viscosity, high specific gravity, and especially high content of sludges. The brochure covers the principles and and structure of the Decanter Centrifuge, its features, the effect of two-stage purification through the combination of Marine Decanter KVZ-M and Disc Type Oil Purifier (MHI Selfjector), and specifications for the various models.

Circle 10 on Reader Service Card

NORCONTROL

The DGS 8800 digital governing system from Norcontrol of Norway provides a complete package solution for all speed-governing tasks on low-speed, long-stroke engines. Using compressed air as a power medium, its main purpose is to regulate the position of the engine fuel servo in order to keep engine speed equal to a reference speed setting. The latter can be set from two selectable ship systems, usually the bridge or engine room, while slowdown or shutdown signals from external safety systems trigger an automatic response.

Two separate and self-contained computer processing sub-systems are combined in the package—handling speed regulation and fuel actuation functions, respectively. These sub-systems employ similar hardware modules, in line with Norcontrol's general commitment to highly standardized equipment and



It's Time to Think Repower.

Compare power alternatives for operating cost . . . performance. Not tradition . . . not old standards.

Cat 3500 Series offer unequalled efficiency with no sacrifice in performance. **Compare . . .**

Fuel efficiency. Fuel represents up to 90% of an engine's owning and operating cost. So it's easy to understand why the Cat fuel efficiency advantage can save you so much.

Model	Continuous shp	rpm	Gallons/ shp-h	Cat Fuel Efficiency Advantage Based on g/shp-h
3508	752	1600	.0522	**7.1%**
12V-149 NA	675	1800	.0562	
3512	1139	1600	.0505	**9.5%**
16V-149 T	1145	1800	.0558	
3516*	1504	1600	.0496	

*No comparable rated Detroit Diesel 149 Series engine. But compare the 3516 with an EMD engine.

Performance. Ask someone who has operated both makes. The Cat 3500s with higher cylinder displacement handle the load better and have added punch for superior response.

Maintenance Ease. Direct accessibility to critical engine components and maintenance points on Cat Engines makes inspection and adjustment easy. Fuel and oil filters and lube oil are changed at the same time. On the 3512 and 3516 this maintenance is required only once every 1,000 hours.

Price. It may be a surprise . . . the 3500s are very price competitive, even before you total up lifetime owning and operating savings.

Overhaul expense. Cat 3508 and 3512 Engines compete in the same performance class as Detroit Diesel models operating with four more cylinders each. So when you overhaul, you'll have fewer parts to replace, lower labor costs.

The way they're built. The 3500 Series are heavier than Detroit Diesel 149 Series engines . . . but the extra weight is in critical areas — between cylinders, in the crankshaft — where lighter construction can lead to shorter life and more parts replacement.

Have your Caterpillar Dealer help you make a comparison. He'll start by running a fuel analysis comparing Cat to Detroit Diesel or any other make engines. Then have him provide you an in-depth investment analysis so you know what it costs to own and operate a Caterpillar Engine over its long lifetime.

Consider your alternatives . . . your decision will be Cat 3500 Series.

Materials and specifications subject to change without notice.

CATERPILLAR

Circle 115 on Reader Service Card

circuit boards. All processes input and output signals are interfaced through separate plug-in adaptors, with options for all standard signal formats.

The DGS 8800 adapts to both fixed and controllable-pitch propellers, and other features include fuel-saving functions such as load-limiting. Computerized signal handling of all measurements and controls is performed by the system, which offers panel push-button flexibility for selecting, adjusting, and testing performance.

Circle 86 on Reader Service Card

NORTH AMERICAN MARINE JET

North American Marine Jet Inc. is a production manufacturer of commercial/military water jet propulsion systems located in Benton, Ark. The Nomera drives the company produces have been designed and developed especially for diesel engines of the 1980s and beyond.

Popular engines for the Nomera 14 are the Detroit Diesel 8.2-liter 53 Series, General Motors 6.2-liter, International 5.7-liter, Caterpillar 3208 Series, and Cummins' new 6-cylinder line, as well as Perkins, Mercedes, Ford, Volvo, and other diesels in the 200-300 bhp/2,600-3,500 rpm range.

After many years of successful application with the Detroit Diesel 71 Series engines, the new Nomera 20 drive has been redesigned for applications for engines such as the Detroit Diesel 92 Series, Mercedes, M.A.N., Cummins, Volvo, Deutz, and other diesels that produce from 300 to 700 bhp in the 1,800 to 2,400 rpm range.

Nomera propulsion systems and thrusters are viable alternatives to conventional propeller systems, with added benefits such as shallow water capability, lower operating costs, reduced downtime, simplicity, and comparable original costs.

Circle 87 on Reader Service Card

OMNITHRUSTER

When Imperial Oil Ltd. needed a rapidly responding bow thruster to work in ice and rough water they chose a model JT700, 400-hp Omnithruster with a 12V6M General Motors diesel coupled to it. The Omnithruster model W700 coupler provides a single lever for thrust direction and diesel speed.

This system operated for four years on the 380-foot ice class tanker Imperial Quebec without a single service call. Since that time, there has been only one call for service, which was to replace a loose key in the hydraulic pump. No further service has been required.

Western Geophysical Company of America selected a 350-hp model JT700-TD Omnithruster powered by a Caterpillar 3408 diesel for its 186-foot survey vessel Western Shore. This complex, highly instrumented ship was the second diesel-powered Omnithruster installation for Western Geophysical.

The diesel Omnithruster package not only provides side thrusting, but also slow-speed propulsion. As the Omnithruster has no hull protrusions and because its intake is guarded by a fine grid it cannot ingest lines or cables.

Gulfcoast Transit Company's 42,000-dwt, 655-foot bulk barge Marie Flood is maneuvered with a model PV, 800-hp Omnithruster powered by an MTU diesel.

Circle 11 on Reader Service Card

PHILADELPHIA GEAR

Philadelphia Gear Corporation, King of Prussia, Pa., has a license agreement with Ishikawajima Ship and Chemical Plant Company, Ltd. (ISC), a subsidiary of IHI, for the manufacture and sale of the IHI Duckpeller 36-degree steering/propulsion system in the U.S. and Canada. The system, consisting of twin drive units complete with propellers, is currently available in five sizes ranging from 2,000 to 5,000 bhp.

Features of the system may well revolutionize workboat propulsion in the U.S. Combining thrust steering in a single package, it will lower construction, fuel, and maintenance costs, as well as simplify vessel operation.

The Duckpeller, with its unitized design, transmits the power of the main engine to the propeller via two bevel gear sets. The twin propellers, which are fitted in energy-efficient Kort nozzles, can be rotated through 360 degrees, effecting thrust in any direction. This insures high maneuverability in all vessel movements, including on-the-spot turning, sideway movement, and rapid backing without the necessity of a rudder. The unit is furnished with a single-lever, remote-control console incorporating a micro-computer that automatically synchronizes the two propulsion units for movement in the desired direction.

The Duckpeller has been used successfully overseas aboard many vessels, including ferries, tugs, towboats, dredges, and floating cranes.

Circle 88 on Reader Service Card

RACOR

Racor Industries of Modesto, Calif., recently introduced a new line of improved filter elements for its fuel filter/water separators.

The new Aquabloc™ element gets its unprecedented filtration capability from a new filter medium, designed in a new configuration. The medium, manufactured to Racor's specifications, removes microscopic solids down to two micron. It also repels emulsified water, which coalesces on the surface of the impregnated element paper and runs off. In addition, the paper itself is corrugated, which exposes a larger surface area for filtration.

Racor's subtlest innovation comes in the special spacing of the pleats. To prevent the folds from collasping and clogging, the company has found a way of placing a widening spacing-bar at each pleat, thus keeping the folds rigid and holding them apart.

Racor products are marketed in 60 countries through a network of more than 2,000 distributors and dealers.

Circle 89 on Reader Service Card

Renk of Augsburg, West Germany, has available new literature on the Renk Constant Frequency (RCF) gear unit. The publication states that all shipowners ask for more cost-effective onboard power generation than was formerly possible, and one answer is the RCF system, which features a differential epicilic gear and a Renk controller. The epicilic gear unit with hydrostatic or electric superposition enables the generation of economic current by the large diesel engine of the main propulsion plant.

The RCF system is said to be a design solution that offers definite economical advantages, especially in plants incorporating low-speed diesel engines and fixed-pitch propellers. However, the RCF system is also used with controlled-pitch propellers and with medium-speed diesel propulsion systems.

Installation variants of the RCF system are described, with diagrams, such as parallel, vertical, rectangular, Z-arrangement a shaft-mounted generator, U-arrangement as shaft-mounted generator, and special solutions.

Circle 90 on Reader Service Card

RILEY-BEAIRD

Maxim® products manufactured by Riley-Beaird of Shreveport, La., can add to the efficiency of diesel engines by putting normally wasted heat to use. Heat recovery silencers by Maxim reclaim waste heat from the engine's exhaust gases, to generate steam and heat water or other fluids. Maxim silencers, with integral spark arresting, noise control, and energy efficiency, use proven U.S. technology, expertise, and materials.

Heat recovery evaporators by Maxim make use of the engine cooling water and/or recovered exhaust heat to provide fresh water from seawater. These evaporators are built to U.S. Coast Guard and American Bureau of Shipping requirements, and are available in a range of sizes to suit engines for main and auxiliary systems, and to satisfy varying shipboard demands for steam and water. They can be supplied as separate, independent, or packaged, integrated systems, for both shipboard and offshore applications.

Other Maxim specialty marine products include heat exchangers, seawater strainers, steam-fired boilers, and deaerators.

Circle 91 on Reader Service Card

SCHOTTEL-WERFT

Schottel-Werft—Joseph Becker GmbH & Company KG, has been well known for 35 years for its rudderpropellers, transverse power units, and for the past five years its Schottel-jets.

The rudderpropellers were the company's first product, and are supplied as transom and retractable units of up to 6,035 bhp. The next development was the single steerable and non-steerable rudderpropellers that were installed mostly in offshore type vessels.

Another development was the Schottel Navigator unit that incudes, mostly on a single frame, the engine with or without the rudderpropeller. It can also be supplied with an integrated steering stand. Next came the steerable and nonsteerable transverse tunnel thrusters and maneuvering units.

The latest development, the Schottel-jet unit, is supplied with a horizontal swinging propeller that, with the cone-jet type unit, is running under an angle of 25 degrees. The propeller is thereby accommodated within the bottom line of the vessel.

The new Schottel pump-jet does away with the propeller completely, using a rotary wheel instead. These are also 360-degree steerable. Up to 250 hp the units are often controlled by hand; above that power they are steered either hydraulically or electrically.

Circle 92 on Reader Service Card

SKF STEEL

The Coupling Division of SKF Steel, with U.S. headquarters in Avon, Conn., has developed the OKF coupling to fill the need for a simplified method of connecting a shaft to a flanged prime mover or gearbox output. This coupling connects a cylindrical shaft without taper or keyway to the output flange, reducing machining time and costs, and saving installation problems with tapered fits and fitted keyways.

The coupling is similar to the OK shaft coupling that uses no bolts, nuts, keys, or keyways. It employs a powerful interference fit to transmit high torque and shock loads—an interference fit that is created without using heat to expand the components.

Some of the needs and/or conditions under which the OK coupling is advantageous are: when high torque transmission is essential; high impact loads or reversing torque exist; reduced number of support bearings is desired; and couplings must be balanced exactly.

The OK coupling can be as easily removed as mounted; maintenance time for changing seals in bearings, for example, is considerably reduced.

Circle 93 on Reader Service Card

SULZER

The Sulzer Efficiency-Booster is an extremely cost-effective option for Sulzer RTA low-speed diesel engines. Applied as a compact, fully integrated part of the engine, it has demonstrated its ability to contribute further significant fuel savings to what are already highly efficient prime movers. It offers much more than straightforward savings in specific fuel consumption, and opens a whole new area for discussion about engine economy. Its overall benefits include:

Reduced fuel costs throughout the engine load range, with fuel savings of up to 4 grams per brake horsepower hour at engine contract maximum continuous rating—equivalent to about 3 percent less fuel consumption.

Reduced engine first cost. The added flexibility in engine selection offered by the Efficiency-Booster can allow the use of an RTA engine with fewer cylinders for the same ship requirements, hence a shorter engine room. Greater freedom in ship operation due to the fuel savings at engine part-load. It is thus particularly beneficial for "two-speed" ships—those vessels operating for long periods at reduced speed.

Circle 15 on Reader Service Card

TECH DEVELOPMENT

Tech Development Inc. of Dayton, Ohio, manufactures the TDI Turbostart™ air starter for diesel and gas engines. The company recently issued a new edition of its "Air Starter Selection Guide," a 70-page publication that is a cross reference of engine manufacturers and the appropriate Turbostart model.

Included in the guide are specifications for each starter model, and separate listings of diesel and gas engine models by manufacturer. All Turbostart market applications are covered in the new publication.

Circle 94 on Reader Service Card

THOMPSON-GORDON

Thompson-Gordon Limited of Burlington, Ontario, Canada, was founded in 1911, and began manufacturing Thordon® marine bearings in 1970.

The Thordon XL alloy represents a unique compromise between the outstanding wear-resisting capabilities of rubber bearings and the high load-support capability of lignum vitae and phenolic. Incorporated into the formulation are low-friction additives that reduce friction in boundary and start-up conditions. The relatively high compression modulus of Thordon permits L/D

ratios of 2:1, even for propeller shaft applications.

Thordon SXL and XL bearings are also suitable for rudder pintle, stock and carrier bearings, and have been fitted throughout a wide range of vessel types.

For exceptionally abrasive operation in rivers or shallow harbors, the company produces a special "Composite" bearing with the capability of offering wear performance considerably better than rubber/bronze bearings.

The low, dry, dynamic coefficient of friction of Thordon eliminates the squeal or chatter often associated with conventional rubber bearings, and the ease of installation based on the material's machinability and capacity for shrink fittings makes the material an interesting alternative.

Thordon bearings are available to suit any size of propeller shaft or rudder. They can be supplied fully finished or in rough form for final machining in the shipyard. There are Thordon stocking distributors in 50 countries; most have technical specialists available to provide field support.

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MariChem85

THE SIXTH INTERNATIONAL CONFERENCE AND EXHIBITION ON THE MARINE TRANSPORTATION, HANDLING AND STORAGE OF BULK CHEMICALS

LONDON, JUNE 25-27, 1985

Opening remarks from Conference Director with **Welcome Message** from **Mr. C.P. Srivastava, Secretary-General, International Maritime Organization, London**

Session 1
LEGISLATION AND REGULATION

Chairman: R.K. Roberts, Department of Transport, Marine Directorate, London

MARPOL Annex II: modifications and amendments agreed since acceptance
P. Bergmeijer, Head of Marine Environment Division, Directorate General of Shipping and Maritime Affairs, Rijswijk, The Netherlands, Chairman: IMO BCH Working Group on Implementation of Annex II to the MARPOL 73/78 Convention

Simplification of Procedures and Arrangements for Annex II
L.A. Sharp, Department of Transport, Marine Directorate, London

MARPOL Annex II — a shipping industry perspective
Speaker to be announced, International Chamber of Shipping, London

Do Governments fulfill their part of the International maritime anti-pollution regulations — shipowners do
J.P. Page, President-Directeur General, Societe Française de Transports Petroliers, Paris, Chairman, Intertanko Safety and Technical Committee

Anticipated operational problems associated with applying Annex II requirements
A.A. Damsteeg, Consultant, Voorschoten, Netherlands

An outline of the present situation on bulk chemicals transportation in domestic waters of Japan and implementation of MARPOL Annex II
Speaker to be announced, Shipbuilding Research Association of Japan, Tokyo

A comparative study of multi-national regulation of the maritime transport of bulk chemicals
R.L. Brown Jr., Riddell, Williams, Bullitt and Walkinshaw, Seattle, Wash., USA

Session 2
OPERATIONS AND SAFETY (1)

Chairman: R.J. Lakey, Robert J. Lakey & Associates, Inc., Houston, Texas, USA

The role of industry in developing operational and safety guidelines
Capt. A. Allievi, International Chamber of Shipping, London

The possible impact of IMO requirements and EEC environmental legislation upon terminal facilities
P.R. Cooke, Managing Director, Powell Duffryn Terminals Ltd., Fleet, Hants, UK

Experiments on efficient stripping systems for chemical carriers
H. Van't Sant, Directorate-General for Environmental Control & C. Van Dam, Directorate-General of Marine Affairs, Rijswijk, Netherlands

STWC (1978) Chemical Tanker Certificates. Onboard v. shore training
D.R. Owen, Safety Services Ltd. Sunbury on Thames, UK

The economics incentive for employing high-cost crews: chemical carriers and other high technology ships could benefit most
S.S. Phee, Phee & Phee, Inc., Island Heights, N.J., USA

The next generation of chemical tankers — are they becoming too sophisticated?
R.J. Lakey, Robert J. Lakey and Associates, Inc., and K.J. Szallai, President, Troll Tankers Inc., USA

Session 2
OPERATIONS AND SAFETY (2)

Chairman: E.M.J. Van de Laar, Netherlands Dock Labour Inspectorate, Rotterdam

Practical experience with applying inert gas and nitrogen inerting to chemical carriers
J.D. Mazzei and R.G. Terry, Sun Refining and Marketing Company, Aston, PA, USA

Operational experience with nitrogen generation through membrane separation on a chemical tanker
Th. Johannessen, Maritime Protection A/S, Kristiansand, Norway

Handling of vapours generated during transhipment of liquid bulk chemicals
J.W. Uijlenbrock, Badger B.V., The Hague

Legislation and regulation developments in the Netherlands: focus on air pollution
R.A. Hulscher, Ministry of Public Housing, Physical Planning and Environment, (VROM), The Hague

Developments in the movement of bulk liquid chemicals to and from New Zealand
P.G. Entwistle, Bulk Storage Terminals Ltd., Mount Maunganui, New Zealand

Cargo quality control — the role of the cargo surveyor
J. Vermeiren, SGS, Geneva

Quality and quantity inspection — a chief officers' guide
A.F. Percey, Caleb Brett (USA) Inc., Essington, PA, USA

The determination of supply and demand for chemical/parcel tanker carrying capacity in deepsea and/or European short sea trades
R.L. Tollenaar, Maritime Research Institute, Rotterdam, Netherlands

Session 3
TANK CONTAINERS IN THE BULK CHEMICALS TRADES (Workshop Session)

Chairman: D.C. Gasson, Technical Operations Manager, Unispeed Intermodal Ltd., Southampton, UK, Chairman: Association of Tank Container Operators, UK

A number of formal papers will be presented consecutively without discussion. Following the coffee break, the Chairman will initiate a discussion session in which the presenters of the formal papers will be joined on the platform by a number of other Tank Container specialists. The formal papers are listed below in order of presentation.

Tank containers operated by the shipper versus the tank container operator concept — which is the best way?
Mrs. E. Schlund-Tiedemann, Hoyers (UK) Ltd., Huddersfield, Yorks., UK

Multitanks — a new ISO-compatible generation of intermodal tank containers: 2000-10000 litres capacity
H. Gerhard, Westerwalder Eisenwerk Gerhard GmbH, Wetterfeld Steg, Germany FR

Some aspects concerning the maintenance of tank containers
D. Govder, Procor Tank Container Services, Birmingham, UK

Bulk liquids — the flexible alternative
D.C. Gasson, Unispeed Intermodal Ltd., Southampton, UK

Discussion led by Session Chairman
Panel will include speakers listed above together with Capt. H. Wardelmann, IMO, a panellist from Sea Containers Ltd., London and others to be announced

Session 4
TECHNICAL DEVELOPMENTS

Chairman: T.R. Farrell, Lloyd's Register of Shipping, London

Some considerations on the structure of chemical carriers
P.J. Latreille, Bureau Veritas, Paris

Reclamation of chemical solvents
M.N. Wells, London & Coastal Oil Wharves Ltd., Canvey Island, UK

A novel automatic level gauging system with very accurate measurements
A. Eam, Autronica A/S, Trondheim, Norway

Microcomputer technology for optimisation of chemical tanker management
E.R. Olschlager, LGA Gastechnik GmbH, Remagen-Rolandseck, Germany FR

Development studies on the design of a floating chemical cargo hose
C. Barber, TI Flexible Tubes Ltd., Delph, Oldham, UK

In-service maintenance and handling of tank coatings
P. Hartland, Sigma Coatings B.V., Uithoorn, Netherlands

The effects of low molecular weight cargoes upon tank coatings
D. Banks, Camrex Ltd., Sunderland, UK

The organisers reserve the right to amend this programme if circumstances so require

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We wish to make Conference Registration(s) for ..... delegate(s) and enclose our cheque for ..... made payable to MariChem. Conference fee of £277.75 per person before April 22, 1985 includes £27.75 UK VAT on taxable element. Fee covers registration, conference documentation, lunches, coffee breaks and an evening cocktail buffet party. After April 22, 1985 registration fee is £307.25.

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TWIN DISC

Twin Disc, Incorporated of Racine, Wisc., has been a leading manufacturer of heavy-duty power transmission systems for more than 60 years, and has long been recognized as a standard of comparison in the marine industry.

In addition to 22 models of Twin Disc-manufactured marine transmissions covering a broad power range from 70 to 1,600 bhp, the Wisconsin company offers many other marine products backed by Twin Disc. These include: Twin Disc/NICO marine transmissions with power ratings up to 5,000 bhp; Twin disc/Scanprop controllable-pitch propeller systems; a complete line of marine transmission accessories; and approved renewal parts and parts kits.

Several significant equipment options insure that a Twin Disc marine transmission can be tailored to a particular vessel's operation. These include front—and pump-mounted power takeoffs, top power takeoffs, live power takeoffs, trolling valves, output coupling flanges, heat exchangers, and indicating gauges.

Most Twin Disc marine transmissions have been approved by the American Bureau of Shipping, Lloyd's Register of Shipping, Det norske Veritas, and Bureau Veritas.

Circle 96 on Reader Service Card

UNIPAR

UNIPAR, Inc., a division of National Marine Service, Inc., has available literature that highlights the 40,000-square-foot facility the company has in St. Louis to provide diesel engine power packs, parts, and components.

Monorails and accumulating conveyors in the semi-automated facility play major roles in the company's commitment to quick service and quality products at competitive prices. The brochure contains photographs of the semi-automated line of work stations, and discusses each process along the way through the final work station.

Circle 12 on Reader Service Card

WABCO

WACO Fluid Power of Lexington, Ky., an American-Standard company, pioneered the concept of remote pneumatic maneuvering control of marine propulsion engines in the early 1940s, and today is a leading U.S. and international supplier of wheelhouse controls for a wide variety of diesel-powered ships. With control placed directly at the pilot's command, maneuverability is greatly increased and more efficient vessel operation is obtained. As the operator is now removed from direct contact with the propulsion machinery and cannot devote his complete attention to precise manipulation and timing of the control handle movement, the possibility exists for mishandling the propulsion machin-

ery unless a properly engineered control system is installed.

WABCO control systems are designed on the concept of single handle control of all maneuvering operations through a sequenced and interlocked control system, which insures that the proper operation of engines, clutches, reverse gears, and associated propulsion machinery is obtained without relying on operator judgment to time or anticipate propulsion machinery functions.

The flexibility and adaptability of pneumatic controls permits the installation of multiple operating stations with interlocked control transfer to insure that only one station can be in control at anytime. Rugged control components provide dependable operation under extreme operating conditions experienced in shipboard installations. The relatively uncomplicated component and control system construction facilitates maintenance and serviceability, contributing to extended system life and low maintenance costs.

Production control systems such as Gearmaster, Logicmaster Hydraulic Clutch, and Logicmaster Air Clutch are available for standard engine reverse gear applications. They combine proven, high-performance WABCO Pneumatic components in factory-assembled, tested, and pre-adjusted control units to simplify shipboard installation. All components are sub-base mounted, where possible, for easy and convenient servicing. These systems are generally applicable for installation up to 4,000 bhp per engine.

Recent control techniques combine the advantages of electronics and pneumatics to provide high-speed, electronic signal transmission from very distant remote stations, converted to pneumatic power at the engine location to perform the normal interlocking, sequencing, and positioning operations required.

WABCO's Helmmaster control systems combine the normally separate control levers for main engine/propellers, bow and stern thrusters, and rudders into a single joystick control lever that can precisely control vessel maneuvering.

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WARD LEONARD

Ward Leonard Electric Company of Mount Vernon, N.Y., offers a full complement of quality electric controls and other shipboard equipment for both defense- and maritime-oriented applications. Included are state-of-the-art solid-state motor starters, battery chargers, and uninterrupted power supplies, which may be used with equipment that turns a diesel engine into a complete marine propulsion system.

These modern designs offer high efficiency, smaller and lighter enclosures, and lower costs. Ward Leonard also is the prime designer of a new system for the remote control of motors using fiber optics. Over the years, the company has furnished much equipment for numerous naval and commercial vessels.

Ward Leonard's manufacturing facilities are extensive, utilizing the latest techniques and quality control procedures. Its design and production force is experienced and knowledgeable, permitting quick and efficient response to customer requirements.

Circle 98 on Reader Service Card

WESTERN GEAR

The Power Transmission Division of Western Gear Corporation recently entered into a license agreement with Rademakers Aandrijvingen of Rotterdam giving the Division the right to manufacture and sell the Dutch company's epicylic planetary transmissions in all of North America.

This particular Rademakers product line is based on the Stoeckicht design, which provides for a compact co-axial shaft transmission with low noise levels, high efficiencies, and high reliability. Applications for these transmissions include speed increases and decreasers for turbine generators, pumps, and compressors, and various marine propulsion reduction gears.

The Power Transmission Division manufactures an extensive line of power transmission equipment in-

cluding: marine propulsion gears for military and commercial vessels; industrial gear drives used in the production, transportation, and procession of petroleum, natural gas, and chemicals; drives used in the generation of electrical power; and gears used for refrigeration and air conditioning applications.

Circle 14 on Reader Service Card

WRIGHT-AUSTIN

Wright-Austin Company of Detroit, supplier to the Navy and merchant marine for more than 55 years, manufactures entrainment separators for removing condensate from any on-board air or steam systems.

All of the company's separators meet or exceed all requirements of the U.S. Navy, the U.S. Coast Guard, and the American Bureau of Shipping. Military ships currently using Wright-Austin separators include the Navy's nuclear aircraft carriers, guided-missile cruisers, destroyers, and rescue/salvage vessels, as well as the Coast Guard's medium-endurance cutters.

Circle 99 on Reader Service Card

ZURN

The Mechanical Drives Division of Zurn Industries, Inc., Erie, Pa., has just published a new eight-page catalog covering its seven product lines. The new brochure provides highlight information including features and application data, as well as size, torque, and misalignment ranges of the Zurn mechanical drives product lines.

The catalog is designed to make this basic information readily available to design, application, maintenance, and production engineers and other prospects for necessary product decisions. The customer is then directed to the appropriate in-depth catalog for complete detailed information.

Zurn has six detailed catalogs available totaling 146 pages of data. The separate catalogs are: Amerigear® and American® standard coupling designs; Amergear Class I high-performance gear couplings; Ameriflex® high-performance diaphragm couplings; Amerigear flexible spindles; Zurn/Voith universal joints; and Zurn TORC torque overload release clutches. All of these products are outlined in the new condensed bulletin, which includes a postcard order form to expedite delivery of the appropriate detailed catalog(s).

Circle 1 on Reader Service Card

Annual Net Income Of McLean Industries Rose 132 Percent For 1984

United States Lines' parent company, McLean Industries, has reported 1984 net income of $61,564,000 on revenues of $959 million, compared with the previous year's net of $26,552,000 on revenues of $784.5 million.

The parent firm's president, **Malcom P. McLean,** attributed the 132-percent rise in net income to "continuing improvements in the efficiency of our transportation system." The 22-percent growth in revenues, he said, was the result of new ships being placed in service and continuing growth in cargo volumes.

Report On Domestic Waterborne Commerce Available From MarAd

The Maritime Administration has recently released an updated report on "Domestic Waterborne Trade of the United States 1978-1982." Prepared by MarAd's Office of Domestic Shipping, the 225-page report provides a comprehensive analysis of cargo tonnages and commodities shipped in the domestic ocean, Great Lakes, and inland waterways trade. The last report in this series, published in 1983, covered the years 1976-80.

Copies of the new publication are available from the Office of Domestic Shipping, Maritime Administration, U.S. Department of Transportation, 400 7th Street, S.W., Room 7301, Washington, D.C. 20590; (202) 462-4373.

Bombardier/ALCO A New Force In Diesel Manufacturing

The recent acquisition of Alco Power Inc. of Auburn, N.Y., by Bombardier Inc., a diversified Canadian manufacturer of transportation, recreational and industrial products, will enhance ALCO's position as a well respected diesel engine manufacturer, according to **Gilles Courville**, responsible for ALCO operations.

This acquisition will allow rationalization of diesel engine production, through the combination of human and material resources of ALCO and Bombardier's Rail and Diesel Products Division (formerly MLW-Worthington). It will also open new market opportunities at both the domestic and international levels, Mr. **Courville** stated.

The Bombardier group originated in 1942 in Quebec's Eastern Townships region, when **J. Armand Bombardier** introduced a tracked vehicle designed to carry people and equipment over unplowed winter roads, fields and forests.

The company came into prominence in the '60s following the introduction in 1959 of the first recreational snowmobile, marketed under the SKI-DOO tradename. Bombardier soon became the world leader of the snowmobile industry and, as part of a vertical integration program, acquired in the early '70s the Austrian company which manufactured the ROTAX engine for its snowmobiles. The ROTAX company also manufactured tramways for the Austrian market. Its acquisition marked Bombardier's first step into the rail transit industry.

Bombardier entered the North American mass transit field in 1974, with a contract to supply the Montreal Urban Community with subway cars. The company has since become a leader in the transit industry, having obtained several major orders, the most important being valued at over one billion Canadian dollars for the supply of 825 subway cars to the New York Metropolitan Transportation Authority.

In order to consolidate its position in the rail transportation sector, in 1976 Bombardier acquired MLW-Worthington, a Montreal-based manufacturer of diesel-electric locomotives and of the world-renowned ALCO Model 251 Diesel Engine.

As may be recalled, in the '60s both ALCO and MLW were owned by Studebaker-Worthington, who sold ALCO to White Motors in 1970 but retained MLW.

"With the ownership of the two companies, Bombardier is now forging ahead to a position of recognized leadership in one of its fields of endeavor—that being rail transportation, diesel-electric locomotives and diesel engines," notes Mr. **Courville.**

The Model 251 Diesel Engine

The Model 251 Diesel Engine is well known in worldwide locations in a variety of applications which include ships service power, marine propulsion, offshore petroleum exploration, pumping and locomotive traction, "all of which require reliable diesel power," Mr. **Courville** points out.

For naval applications, the company reports the 251 engine design complies with the requirements of the marine certification authorities both in the United States, Canada and overseas. Therefore, this engine is well suited for installation in a wide range of vessels, from naval through tugs, workboats, dredges, ferries, fishing vessels, as well as other naval applications both ocean and inland.

Installation in the hull is simplified by the use of a four-point mounting method that also reduces vibration. The 1,200-rpm version that gives a lower weight/power ratio provides greater fuel storage or cargo capacity.

Simplicity of design of the 251 engine allows for improved ease of maintenance, an important cost factor. All 251 engines have the same bore and stroke. Components such as connecting rods, cylinder heads, liners and pistons, and fuel injection equipment are interchangeable, reducing inventory costs for the vessel owner.

The sound basic design of the 251 range of engines has remained the same, which permits easier upgrading of older 251 engines to today's applications and power requirements.

The Model 251 engine is a 9-inch bore by 10½-inch stroke, four-cycle turbocharged unit. The maximum power per cylinder is 225 bhp with a compression ratio of 11.5:1. The engine cylinder block and base is a weldment with the underslung crankshaft carried in forged steel saddles welded into the block. The engine base serves as an oil sump and is fitted with a four-point mounting arrangement.

Prior to the recent acquisition of ALCO by Bombardier, the long-standing relationship between ALCO and MLW had resulted in refinements being brought to the Model 251 engine through the R&D activities of each facility. Now, with both under the same ownership, the joint efforts of ALCO and the Rail and Diesel Products Division will enhance R&D activities and, according to company spokesmen, will result in further improvements.

Rationalization of manufacturing techniques is allowing the new organization to take advantage of new production techniques and materials to improve the quality and life of the product as well as reduce engine operating costs. "One instance of this," Mr. **Courville** stated, "is the fact that we can lengthen the life of the 251 Diesel in an electric application by conservatively rating the unit at 635 to 2,800 kw for continuous duty from 720 to 1,200 rpm."

Capital improvements have been made and more are planned for the two manufacturing facilities. In addition, the company reports a wide range of product support services, including feasibility studies, design, parts, technical assistance, maintenance facility and operations consulting.

A 30-page brochure describing these heavy-duty diesel engines is available at no cost. Profusely illustrated in four-color, the brochure lists specifications on the 251 series (6 to 18 cylinder) with general and specific engine characteristics and ratings. It includes specifications and performance tables, drawings, cutaway illustrations, and photos. For your copy,

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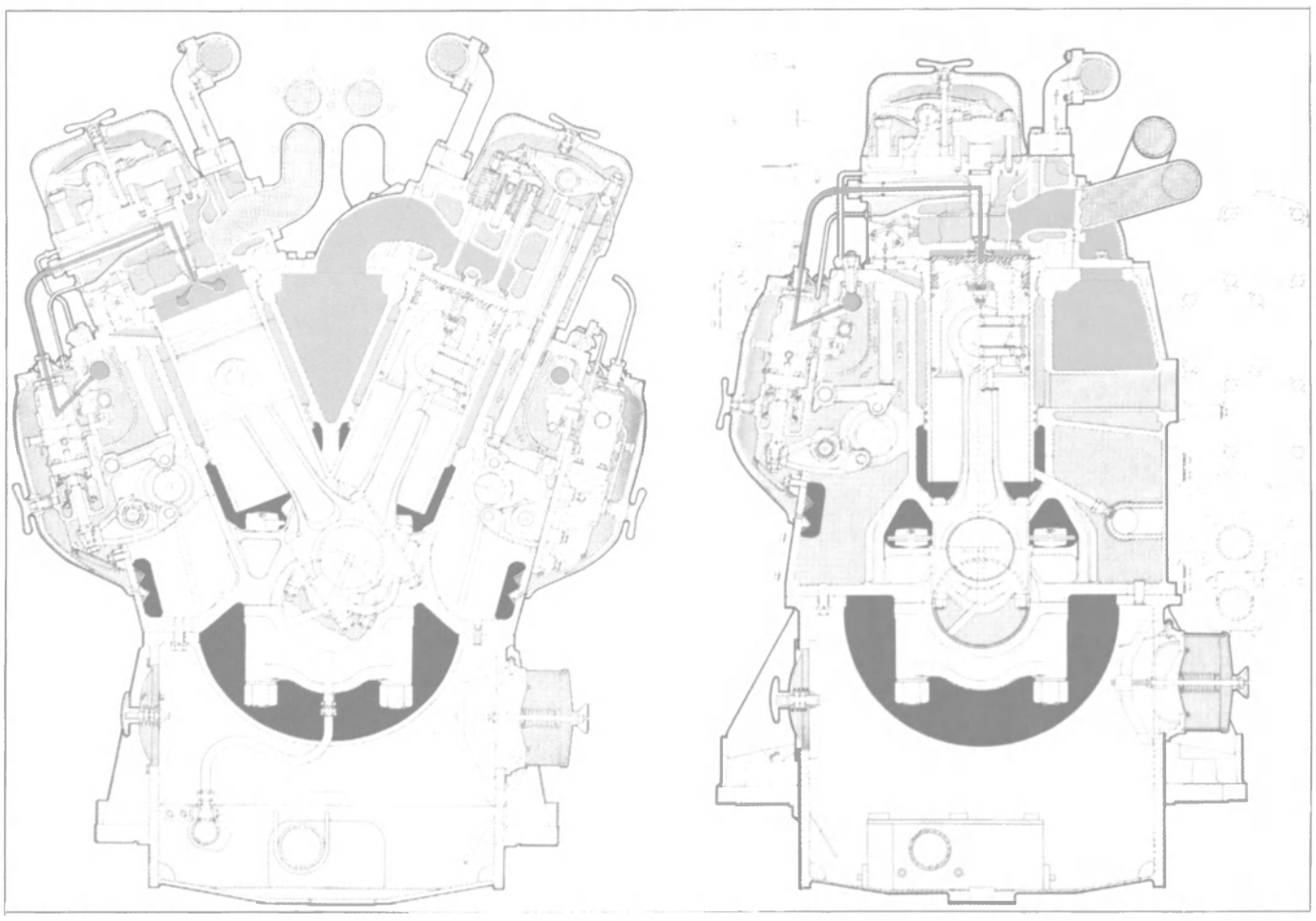

The Model 251 Diesel Engine shown left, the "V" type 4 cycle; shown right, the "in line" 4 cycle engine.

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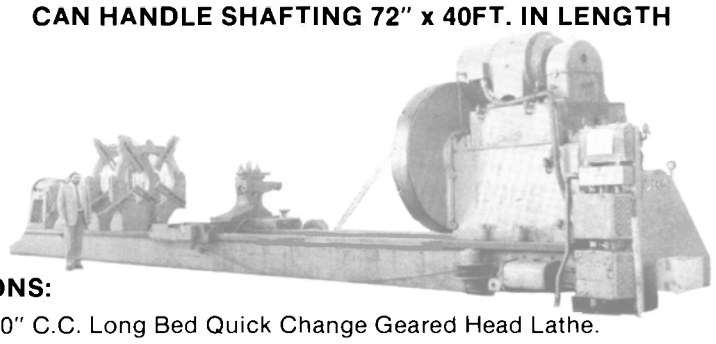

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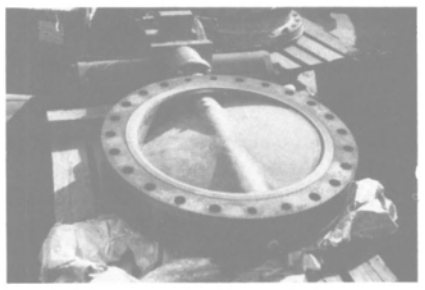

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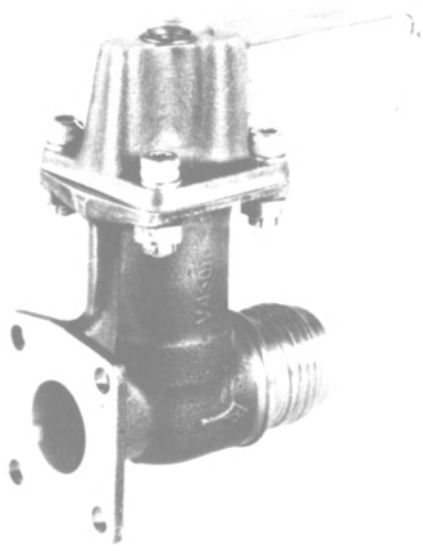
Pilot Operated, Hot Gas Solenoid Valve Introduced By Valcor Engineering —Literature Available



A two-way pilot operated, solenoid shutoff valve designed primarily for high temperature engine bleed air and liquid applications is now available from Valcor Engineering Corporation, Springfield, N.J.

Series 450 solenoid valves are extensively used to handle hot gasses and liquids in a variety of marine, aircraft and aerospace applications. They feature in-line flow, packless gate construction and a pilot solenoid that is positioned to allow good radiation to the ambient and isolation from the main valve body temperature.

Specifications include: temperature range of −65°F to +750°F operating pressure range of 20-250 psig; proof pressure of 570 psig; burst pressure of 950 psig; 0.03 lbs/minute external leakage over operating pressure range; voltage, 18-30 VDC; Cv of 5.2 to 10 (depending on model); available in ½ and 1-inch line sizes.

Options available include internal or external venting, latching coil and a variety of port fittings and electrical connections.

For literature or further information on the pilot operated, hot gas solenoid valve from Valcor,

Circle 17 on Reader Service Card

Monarch Introduces New Pistol Grip Portable Tachometer

Monarch Instrument of Amherst, N.H. has introduced a new convenient non-contact optical tachometer that is packaged in a pistol grip configuration. The new instrument, called PHASAR-TACH, measures rotational speed over the range of 50 to 20,000 rpm to an accuracy of +/ -1 rpm. Speeds are measured by aiming the instrument at a single reflective marker on the rotating object and reading the displayed speed directly in rpm. Speeds can be measured at distances up to three feet and angles up to 45 degrees from the reflective target.

Two models of PHASAR-TACH are available, the PHASAR-LCD featuring a liquid crystal display, both equipped with an on-target indicator. Both models are powered by four "AA" batteries accessible by lifting the hinged top cover of the instrument.

For those applications where the operator needs both hands free, PHASAR-TACH may be latched in the 'on' mode by means of a locking push button on the pistol grip trigger, and mounted on a standard ¼-20 threaded bushing at the base of the handle.

For more information on the new pistol grip tachometer from Monarch Instrument,

Circle 46 on Reader Service Card

Far East Levingston Yard Awarded Repair Contract On Four Jackup Barges

Far East Levingston Shipbuilding Ltd. has secured a contract with Verolme Estaleiros Reunidos do Brasil of Brazil to repair and upgrade four jackup barges. The units—three producing barges and one maintenance barge—are owned by Aramco Overseas Company. The barges, Arabiyah 1, 2, and 3, and the ARB-2, are scheduled to be in Singapore in March this year; the repair/upgrading work is expected to be completed in four months.

The work will include repairing of the legs, jacking frames, jack houses, main hull, and spud cans, and conversion/installation of some piping systems, draft indicator system, and jacking auto-greasing devices.

A Self-Programmable Monitor Alarm System Is Introduced By Engine Efficiency

Engine Efficiency Associates, Linden, N.J., has introduced a self-programmable 16 or-32 point monitor alarm system. A plain English 24 character message can be typed in via internal keypad for each point monitored. Fire, bilge and machinery pressure and temperatures are typical application, as well as intrusion. Sensors can be normally opened or normally closed contacts. Delays on each point can be from one second to one hour. The system runs on 12 V and draws less than 1 amp. When no alarms are present, the LCD display shows the correct time and date.

Engine Efficiency Associates offers a complete line of monitor and remote machinery control systems.

For further information on Engine Efficiency's self-programmable monitor alarm system,

Circle 57 on Reader Service Card

ASE Annual Symposium And Banquet Scheduled For March 29, 1985

The Association of Scientists and Engineers (ASE) of the Naval Sea Systems Command will hold its 22nd Annual Technical Symposium and Banquet on Friday, March 29, at the Sheraton Hotel in Crystal City, Va. Registration begins at 1:30 pm, and some 10 technical papers will be presented in parallel sessions.

The theme of this year's meeting is "Engineering for Results—A Timeless Goal." Featured speaker at the banquet will be Dr. **Judy Resnik**, NASA astronaut.

For additional information contact symposium registration chairman **Bob Bost** at (202) 692-1591, or publicity chairman **Susan King** at (202) 692-7217.

Coast Guard Approves Radar Training Courses At Marine Simulation

The U.S. Coast Guard has given its approval for courses in radar training at Marine Simulation, Inc., MSI, according to an announcement by **David L. Wood**, president. The approval of the radar programs at the new training center in Lower Manhattan covers initial, refresher, and re-certification courses. The certification process is accepted by the Coast Guard for initial or renewal of licenses that require the holder to have a Radar Endorsement on his license.

The three radar courses now join others, such as Crude Oil Washing (COW) and Inert Gas Systems (IGS), taught at the center in accordance with IMO and Liberian regulations.

Located at 17 Battery Place in New York City, MSI was established last November by Mr. **Wood**, a Maine Maritime Academy graduate and an ex-Navy flyer, to fill what he felt was a void in maritime instruction in Lower Manhattan.

MSI is said to be the only maritime training center in the New York City area that operates six days a week on a "walk-in" basis. No reservations are necessary, and the programs can even include meals and hotel accommodations at reasonable rates for students coming from outside the area.

Circle 19 on Reader Service Card

Crowley Offers Color Brochure On Barrier For Floating Pollutants

Crowley Environmental Services Corporation of Seattle recently announced the availability of a new four-page brochure describing and illustrating its 24- and 36-inch Petro Barrier for the containment or exclusion of oil, debris, or other floating pollutants. It contains a full-color picture of the Petro Barrier, and includes typical installation methods and specifications.

For further information and a free copy of the new brochure,

Circle 55 on Reader Service Card

FOR MORE INFORMATION
ON
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CIRCLE THE APPROPRIATE NUMBER ON READER SERVICE CARD OPPOSITE →

ADVERTISER	EQUIPMENT /SERVICE	CIRCLE NO.
ADAMS & PORTER	MARINE INSURANCE	163
ADVANCED STRUCTURES	DOORS	333
ALBAN ENGINE POWER, INC.	DIESEL ENGINES	348
ALFA-LAVAL, INC.	OIL/WATER SEPARATORS	103
ALLIED FIBERS	INDUSTRIAL NYLON	349
B.F. GOODRICH/L.Q. MOFFIT	SHAFT BEARINGS	265
BERGEN DIESEL	DIESEL ENGINES	350
BOSTON WHALER, INC.	WORKBOATS	101
CMC COMMUNICATIONS	T.V./ANTENNA SYSTEMS	214
CATERPILLAR ENGINE DIV.	DIESEL ENGINES	115
COOPER INDUSTRIES	LOAD DISTRIBUTION MONITOR	287
FRITZ CULVER INC.	DECK MACHINERY	215
CUMMINS ENGINE CO., INC.	DIESEL ENGINES	102
DAHL MANUFACTURING	FILTERS/WATER SEPARATORS	262
FRED DEVINE DIVING & SALVAGE	DIVING/SALVAGE	212
DURACOTE CORPORATION	NOISE ATTENUATION MATERIALS	271
ENGLEHARD	ANODE RECOATING	104
R.W. FERNSTRUM & CO.	GRIDCOOLERS	273
STACEY FETTEROLF CORP.	LINE BLINDS	185
GENERAL THERMALDYNAMICS		105
GOLTEN MARINE CO. INC.	DIESEL REPAIR EXPERTS	106
CMH HELESHAW HYDRAULICS	HUYDRAULIC EQUIP/SYSTEMS	302
HITACHI ZOSEN CORP.	SHIPBUILDING	107
IMEL	SHIPBUILDING/REPAIR	108

ADVERTISER	EQUIPMENT /SERVICE	CIRCLE NO.
JEFFBOAT	VESSEL CONSTRUCTION/REPAIR	297
JOHNSON RUBBER	BEARINGS	308
KSM FASTENING SYSTEMS, INC.	STUD WELDING SYSTEMS	225
McALLISTER BROS.	TOWING SERVICES	313
M.A.N. GHH STERKRADE	FLOATING DRYDOCKS	110
MARINE EQUIPMENT CATALOG	ANNUAL MARINE/NAVY CATALOG	157
MARDATA/MMS	COMPUTER INFORMATION SYSTEMS	307
MICROLOGIC	LORAN C TECHNOLOGY	259
MIDLAND AFFILIATED	WATER TRANSPORTATION SYSTEMS	111
NATIONAL MARINE SERVICE INC.	SHIPYARD SERVICES/TOWING SERVICES	222
OMNITHRUSTER INC.	SHIP CONTROL SYSTESM	112
PARKER HANNIFIN CORP.	HYDRAULIC VALVES	113
PECK PURIFIER SALES CO.	OIL PURIFIERS	256
SOUTHWEST MARINE, INC.	SHIPYARDS	117
SQUIRE-COGSWELL CO.	AIR COMPRESSORS	118
TECH DEVELOPMENT INC.	ENGINE AIR STARTERS	119
TELEDYNE HASTINGS-RAYDIST	PORTABLE RADIOLOCATION SYSTEMS	120
THOMSON-GORDON/WAUKESHA BEARINGS	BEARINGS	121
TRANSAMERICA DELAVAL/GEMS SENSORS	TANK LEVEL INDICATORS	122/125/126
ELLIOT CO./UNITED TECHNOLOGIES	WHITE GILL THRUSTERS	123
VERREAULT NAVIGATION INC.	SHIPBUILDING/REPAIR	207
VOLVO PENTA	DIESEL ENGINES	187
WARTSILA	DIESEL ENGINES	124

Blohm + Voss Awarded $3.4-Million Contract To Renovate Cruise Ship

The Hamburg yard of Blohm + Voss in West Germany has received an order from Sundance Cruises of Seattle valued at some $3.4 million for renovations to the 26,747-grt liner Scandinavia. Sundance, a consortium of the MacDonald Corporation of Seattle, Johnson Line of Stockholm, and Effoa Finland Steamship Company of Helsinki, bought the cruise vessel from DFDS Line of Denmark last November. To be renamed Stardancer, the Scandinavia was completed in 1982 by the Dubigeon Normandie yard in Nantes, France.

The liner is due to arrive at the Blohm + Voss yard on April 10 this year, with redelivery scheduled for the 28th of that month. B + V is understood to have been the low bidder for the conversion job, but the deciding factor may have been the fact that the Hamburg yard had the available berth to meet the very tight schedule.

Sigmaform Introduces GK-A60 Multi-Cable Transit System —Literature Available

Sigmaform Corporation of Santa Clara, Calif., is offering a free four-page color brochure on their new product line GK-A60 Multi-Cable Transit System that is designed to pass multiple cables from one compartment to another and maintain fire, gas and watertight integrity.

The system has been accepted for Navy shipboard installations in accordance with Naval Sea Systems (NAVSEA) publications, and also has been accepted by the U.S. Coast Guard for use on U.S.-flag vessels in Class A, B and C bulkhead and decks. It complies with the International Convention for the Safety of Life at Sea (SOLAS) A-60 fire tests and is approved for A-60 class bulkheads and decks. It has also been accepted by Lloyd's Register of Shipping and by the American Bureau of Shipping.

The brochure contains color photos that illustrate the simplicity of steps necessary to complete the GK-A60 Multi-Cable Transit System, beginning with installing the endfitting compression plate into the frame, then installing the first row of cables followed by the stay plate above, and then additional rows of cables and stay plates as required. The fill-in plate is then installed and the top bolt tightened until all air gaps are removed between packing modules. The system is then complete.

Specifics, along with line drawings, are given for various parts of the assembly for the system, such as the frame, endfitting compression plate, fill-in plate, stay plate, and packing modules.

For a free copy of the brochure and further information on Sigmaform Corporation's new product line GK-A60 Multi-Cable Transit System,

Circle 52 on Reader Service Card

Houston Ship Repairs Awarded $672,000 Contract For Work On Training Ship

The Maritime Administration has awarded a $672,000 contract to Houston Ship Repairs of Channelview, Texas, for repair work on the Texas Maritime Academy's training ship Texas Clipper.

Signet Forms New Ocean Transportation Services Division

Signet Marine Group, an operating entity of Signet Corporation of Houston, has formed an Ocean Transportation Services (OTS) Division, according to a recent announcement by **J. Barry Snyder**, president and chief executive officer of Signet, and **Thomas V. Van Dawark**, executive vice president of Dillingham Maritime. Under the terms of an agreement between Signet and Dillingham Maritime, Signet will charter Dillingham vessels to augment its existing fleet.

The OTS Division will specialize in marine towing and transportation of liquid, dry bulk, breakbulk, containerized, and project cargoes in the Atlantic, Gulf Coast, and Caribbean. Signet Marine's established operations include Bulkfleet Marine Corporation, a carrier of refined petroleum products and other bulk materials.

The management team chosen for the development of the expanded Signet Marine Group will include many of the former key Ocean Transportation Services, Inc. managers from Dillingham.

Circle 50 on Reader Service Card

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 24 issues, only to companies with continuing advertising programs in this publication, whether an advertisement appears in every issue or not. Because it is an editorial service, unpaid and not part of the advertisers contract, MR/EN assumes no responsibility for errors. **If you are interested in having your company listed in this Buyers Directory Section, contact John C. O'Malley at (212) 477-6700.**

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Hamworthy Engineering Ltd., 10555 Lake Forest Blvd., Suite 5F, New Orleans, LA 70127
Squire-Cogswell Company, 3411 Commercial Ave., Northbrook, IL 60062

AIR CONDITIONING AND REFRIGERATION—REPAIR & INSTALLATION
Bailey Refrigeration Co., Inc., 74 Sullivan St., Brooklyn, NY 11231
Flakt AB, Box 8862, S-40272, Gothenburg, Sweden
Marlo Coil/Nuclear Cooling, Inc., P.O. Box 171, High Ridge, MO 63049
Stal Refrigeration AB, Butangsgatan 16, S 601 87 Norrkoping, Sweden

ANCHORS AND CHAIN
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G.J. Wortelboer Jr. B.V., Eemhavenstraat 4, P.O. Box 5003, 3008 AA Rotterdam, Netherlands

ANODES—Cathodic Protection
American United Marine Corp., 5 Broadway, Rte. 1, Saugus, MA 01906
Engelhard Industries Division, 2655 U.S. Route 22, Union, NJ 07083
Federal Harco, P.O. Box 40310, Houston, TX 77240
The Platt Bros. & Co., Box 1030, Waterbury, CT 06721

BALLASTS
Genstar Stone Products Co., Executive Plaza IV Hunt Valley, MD 21031

BASKET STRAINERS
Riley-Beaird, P.O. Box 31115, Shreveport, LA 71130

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Grant Manufacturing & Alloying, Inc., 600 Schoolhouse Rd., Souderton, PA 18964
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

BLASTING—Cleaning—Equipment
Aqua-Dyne Inc., 2208 Karbach St., Houston, TX 77092
Aurand, 1270 Ellis St., Cincinnati, OH 45223
Butterworth Inc. (USA), 3721 Lapas Dr., P.O. Box 18312, Houston, TX 77223-9989
Butterworth Systems (UK), 123 Beddington Lane, Croydon CR9 4NX, England
CLEMCO, P.O. Box 7680, San Francisco, CA 94120
E.I. DuPont De Nemours & Co., Inc., Starblast Division, Room X39186, Wilmington, DE 19898
Key Houston Division of Jacksonville Shipyards, 13911 Atlantic Blvd., Jacksonville, FL 32225

BOILERS
Combustion Engineering, Inc., Windsor, CT 06095

BOILER CLEANING
Asea Stal, 50 Chestnut Ridge Rd., Montvail N.J. 07645

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Capt. Astad Company, Inc., P.O. Box 53434, New Orleans, LA 70153
ECO Inc., 1036 Cape St. Claire Center, Annapolis, MD 21401
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 525500, 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

CARGO HANDLING EQUIPMENT
MacGregor-Navire International, Box 8991, S-402 74 Goteborg, Sweden
MacGregor Navire U.S.A. Inc., 135 Dermody St., Cranford, NJ 07016

CASTINGS/FORGINGS
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CHOCKING SYSTEMS
Palmer Products Inc., P.O. Box 8, Worcester, PA 19490
Philadelphia Resins Corp., 20 Commerce Drive, Montgomeryville, PA 18936

CLOSURES—Marine
Cornell-Carr Co. Inc., 63 Main St., Monroe, CT 06468
Mock Manufacturing Inc., 777 Rutland Rd., Brooklyn, NY 11203

COMPUTERIZED INFORMATION SYSTEMS
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Maritime Data Network, Ltd., 102 Hamilton Ave., Stamford, CT 06902
Military Contract Information Service, Inc. Dist. by Maritime Reporter/Engineering News, 118 East 25 St. N.Y. N.Y. 10010
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ASEA, Inc., 4 New King St., White Plains, NY 10604
Autronica Marine USA, 280 Industrial Pkwy., Northvale, NJ 07647
Barringer Research, 304 Carlingview Dr., Rexdale, Ontario, Canada M9W 5G2
Biospherics Inc., 4928 Wyaconda Rd., Rockville, MD 20852
Bowmar/ALI, Inc., 531 Main St., Acton, MA 01720
Cooper Energy Services, Mount Vernon, OH 43050
Ergon, Inc., P.O. Drawer 1639, Jackson, MS 39205
Failsafe Motor/Generator Protector, Marine Safe Electronics Ltd., 101 Jardin Dr., Unit 24/25, Concord, Ontario, Canada L4K 1B6
Grumman Aerospace, 111 Stewart Ave., Bethpage, NY 11714.
Indikon Corp., 26 New St., Cambridge, MA 02138
Kongsberg North America Inc., 400 Oser Ave., Hauppauge, NY 11738
Leslie Co., 401 Jefferson Rd., Parsippany, NJ 07054
Marine Moisture Control Co., 60 Inip Dr., Inwood, NY 11696
Marine Safe Electronics, 37 Staffern Drive, Concord, Ontario, Canada, L4K 2X2

Maritime Protection A/S, Box 100, N-4620 Vagsbygd, Norway
Megasystems, Inc., 1075 N.W. 58th Street, Boca Raton, FL 33431
Nav-Vue, Inc., P.O. Box 1175, Huntsville, TX 77340
Offshore Technology Corp., 578 Enterprise St., Escondido, CA 92025
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
Transamerica Delaval, Inc., Gems Sensors Division, Cowles Road, Plainville, CT 06062
Valmet Automation A.S., P.O. Box 130, N-3430, Spikkestad, Norway

COUPLINGS
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SKF Steel, 201 Tower Lane, P.O. Box 745, Avon, CT 06001

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ASEA Hagglunds Inc., P.O. Box 7949, The Woodlands TX 77380
HIAB Cranes & Loaders Inc., 258 Quigley Boulevard, New Castle, DE 19720
Machinoexport, 35 Mosfilmovskaya Ul., 117330 Moscow, U.S.S.R.
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

DECK MACHINERY—Cargo Handling Equipment
Markey Machinery Co., Inc., 79 S. Horton St., Seattle, WA 98134
Murdock Engineering Company, P.O. Box 2278, Irving, TX 75061
Schoellhorn Albrecht, Div. of St. Louis Ship, 3460 So. Broadway, St. Louis, MO 63118

DECKING—GRATING
Selby, Battersby & Company, 5220 Whiby Ave., Philadelphia, PA 19143

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
Haynes Corporation, P.O. Box 179, Jackson, MI 49204
Illman Jones, 1111 Green Island Rd., American Canyon, CA 94589
Stewart & Stevenson Services, Inc.—MWM, P.O. Box 1637, Houston, TX 77251-1637

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Alco Power Inc., 100 Orchard St., Auburn, N.Y. 13021
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
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Sulzer Brothers Inc., 200 Park Ave., New York, N.Y. 10166

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Stewart & Stevenson Services, Inc.—MWM, P.O. Box 1637, Houston, TX 77251-1637
Valad Electric Heating Corporation, 162 Wildey St., Tarrytown, NY 10591
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Marine Electric RPD, Inc., 666 Pacific St., Brooklyn, NY 11217 TX: 125327

EMULSIFICATION SYSTEMS
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ASEA Hagglunds Inc., P.O. Box 7949, The Woodlands TX 77380
Band-It Division, Houdaille Industries, Inc., P.O. Box 16307, Denver, CO 80216
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Aqua-Chem Inc., P.O. Box 421, Milwaukee, WI 53201
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Gaylord Industries, Inc., P.O. Box 558, Wilsonville, OR 97070
Joy Manufacturing Company, 338 So. Broadway, New Philadelphia, OH 44663
Zidell Explorations, 3121 S.W. Moody St., Portland, OR 97201

FASTENERS
Sales Systems Limited,7006, 700 Florida Ave., Portsmouth, VA 23707

FENDERING SYSTEMS—Dock & Vessel
InterTrade Industries, 15301 Transistor Lane, Huntington Beach, CA 92649
Johnson Rubber Co., Duramax Marine Div., 16025 Johnson St., Middlefield, OH 44062
Samson Ocean Systems, Inc., 99 High St., Boston, MA 02110
Seaward International, Inc., 6269 Leesburg Ave., Falls Church, VA 22044

FILTERS
Dahl Manufacturing, Inc., 2521 Railroad Ave., Ceres, CA 95307

FINANCING—Leasing
Gulf Western Leasing Corp., 1500 City West Blvd., Suite 300, Houston, TX 77047

FIRE PROTECTION, DETECTION & ALARM SYSTEMS
Gulf Publishing Company Video (Firefighting Videotape), P.O. Box 2608, Houston, TX 77001
Walter Kidde, Walter Kidde Dr., Wake Forest, NC 27586

FUEL OIL/ADDITIVES—Analysis & Combustion Testing
Ferrous Corporation, 910 108th N.E., P.O. Box 1764, Bellevue, WA 98009
Hamworthy Engineering Ltd., 10555 Lake Forest Blvd., Suite 5F, New Orleans, LA 70127
McTigue Industries Inc., 1615 9th Ave., Bohemia, NY 11716
U.S. Borax, 3075 Wilshire Blvd., Los Angeles, CA 90010

FURNITURE
Bailey Carpenter & Insulation Co., 74 Sullivan Street, Brooklyn, NY 11231
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

HATCH & DECK COVERS—Chain Pipe
CamLock Flange Sales Corp./Marine Moisture Control Co., 60 Inip Dr., Inwood, NY 11696
Hayward Marine Products, 900 Fairmount Avenue, Elizabeth, NJ 07207
Marine Moisture Control Co., 60 Inip Dr., Inwood, NY 11696
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
Riley-Beaird, P.O. Box 31115, Shreveport, LA 71130

HOLD LINERS
Himont U.S.A., Inc., 1313 N. Market St., Wilmington, DE 19894

HULL CLEANING
Butterworth Inc. (USA), 3721 Lapas Dr., P.O. Box 18312, Houston, TX 77223-9989
Butterworth Systems (UK), 123 Beddington Lane, Croydon CR9 4NX, England
Gulf International Divers, P.O. Box 1342, Gretna (New Orleans), LA 70052
Pacific Maine Services, TLX: 664540 seaserv, Long Beach, CA 90802
Petroferm Marine, Route 2, Box 280, Amelia Island, FL 32034
Phosmarine Equipment, 21 Bd. de Paris, 13002, Marseille, France
Seaward Marine Services, Inc., 6269 Leesburg Pike, Falls Church, VA 22044
Seaward International, 5409 Beamon Rd., Norfolk, VA 23513 TX: 710-881-1182
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
Washington Chain & Supply, Inc., P.O. Box 3646, Seattle, WA 98124

INERT GAS—Generators—Systems
Maritime Protection A/S, N. American Agents, American United Marine Corp., 5 Broadway, Rte. 1, Saugus, MA 01906

INSULATION—Cloth, Fiberglass
Bailey, Carpenter & Insulation Co., Inc., 74 Sullivan St., Brooklyn, NY 11231
Duracote Corp., 350 North Diamond St., Ravenna, Ohio 44266
Superior Energies, Inc. P.O. Drawer 386, Groves, TX 72619

INSURANCE
Adams & Porter, 510 Bering Dr., Houston, TX 77057-1408
Adams & Porter, 1 World Trade Center, Suite 8433, New York, NY 10048
Wm. Keith Hargrove, Inc., 1300 Post Oak Blvd., Suite 2050, Houston, TX 77056
MGA International, 419 Park Avenue South, New York, NY 10016
United States P&I Agency, Inc., 80 Maiden Lane, New York, NY 10038

JOINER—Watertight Doors—Paneling
Advanced Structures Corp., 235 W. Industry Ct., Deer Park, NY 11729
Bailey Distributors, Inc., 74 Sullivan St., Brooklyn, NY 11231
Masonite Commercial Division, Dover, OH 44622
Megadoor Inc., 441 Lexington Ave., Suite 903, New York, NY 10017
Walz & Krenzer, Inc., 400 Trabold Road, Rochester, NY 14624

KEEL COOLERS
R.W. Fernstrum & Co., 1716 Eleventh Ave., Menominee, MI 49858
Johnson Rubber Co., Duramax Marine Div., 16025 Johnson St., Middlefield, OH 44062

LIGHTING EQUIPMENT—Lamps, Fixtures, Searchlights
ACR Electronics, Inc., P.O. Box 2148, Hollywood, FL 33022
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
Stacey/Fetterolf Corp., P.O. Box 103, Skippack, PA 19474

MACHINERY MAINTENANCE, REPAIR, OVERHAUL, AND TESTING
A-C Brake Co., 308 E. College St., Louisville, KY
CMH Heleshaw, Inc., 201 Harrison St. Hoboken N.J. 07030
Cunningham Marine Hydraulics Co. Inc., 2030 E. Adams St. Jacksonville, FL 32202
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
Rosan, Inc., 2901 West Coast Hwy., Newport Beach, CA 92663

METALS
Bayou Steel Corp., P.O. Box 5000, Laplace, LA 70068

MINING
Rocky Mountain Energy, 10 Longspeake Dr., Box 2000, Broomfield, CO 80020

MOORING SYSTEMS
Samson Ocean Systems, Inc., 99 High Street, Boston, MA 02110

NAME PLATES—BRONZE—ALUMINUM
Duramax Metals, Inc., 2401 Wesley Street, Portsmouth, VA 23707

NAVAL ARCHITECTS, MARINE ENGINEERS, SURVEYORS
Advanced Marine Enterprises, Inc., 1725 Jefferson Davis Highway (Suite 1300), Arlington, VA 22202
Aero Nav Laboratories, Inc., 14-29 112 St., College Point, NY 11356
American Systems Engineering Corp., P.O. Box 4265, Virginia Beach, VA 23454
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.A.C.I., Inc., 1815 No. Fort Myer Dr., Arlington, VA 22209
C.D.I. Marine Co., 5520 Los Santos Way, Suite 600, Jacksonville, FL 32211
C.T. Marine, 18 Church Street, Georgetown, CT 06829
Phillips Cartner & Co., Inc., 203 So. Union St., Alexandria, VA 22314
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
Crane Consultants Inc., 15301 1st Ave., So. Seattle, WA 98148
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
Fleetweather Ocean Services, Inc., Rd. #2, Box 260, Hopewell Junction, NY 12533
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
R.D. Jacobs & Associates, 11405 Main St., Roscoe, IL 61073
Jantzen Engineering Co., 6655-H Amberton Drive, Baltimore, MD 21227
J.L. Konopasek & Associates, 3523 Scrimshaw Dr., Jacksonville, FL 32217
James S. Krogen & Co., Inc., 3333 Rice St., Miami, FL 33133
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
McLear & Harris, Inc., 28 West 44 Street, New York, NY 10036
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, 4475 Mission Blvd., Suite 235, San Diego, CA 92109
Marine Technical Associates, Inc., 95 River Rd., Hoboken, NJ 07030
George E. Meese, 194 Acton Rd., Annapolis, MD 21403
R. Carter Morrell, 715 S. Cherokee, Bartlesville, OK 74003
NKF Engineering Assoc., Inc., 8150 Leesburg Pile, Vienna, VA 22202
Nelson & Associates, Inc., 610 Northwest 183rd St., Miami, FL 33169
New England Engineering & Marine Services, Rt. 2, Box 50, York, ME 03909
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
PRC Guralnick, 5252 Balboa Ave., San Diego, CA 92117
Pearlson Engineering Co., Inc., 8970 S.W. 87th Ct., Miami, FL 33156
S.L. Petchul, Inc., 1380 S.W. 57th Avenue, Fort Lauderdale, FL 33317
M. Rosenblatt & Son, Inc., 350 Broadway, New York, NY 10013 and 667 Mission St., San Francisco, CA 94105
Schmahl and Schmahl, Inc., 1209 S.E. Third Ave., Fort Lauderdale, FL 33316
SEACOR Systems Engineering Associates Corp., 19 Perina Blvd., Cherry Hill, NJ 08003 (Publications Division at Cherry Hill location)
STV/Sanders & Thomas, Inc., 1745 Jefferson Davis Hwy., Arlington, VA 22202
Seaworthy Systems, Inc., 28 Main St., Essex Ct. 06426; 17 Battery Place, N.Y. N.Y. 10004, P.O. Box 205, Solomons, MD 20688
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
J.F. Stroschein Associates, 666 Old Country Rd., Garden City, NY 11530
Richard R. Taubler, Inc., 610 Carriage La., Dover, DE 19901
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
Atkinson Dynamics, Section 6, 10 West Orange Ave., South San Francisco, CA 94080
British Telecom International, The Holborn Centre, 120 Holborn, London EC1N 2TE
CMC Communications Inc., 5479 Jetport Industrial Blvd., Tampa, FL 33614
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 Corp., 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
Japan Radio Co., Ltd., Akasaka Twin Tower, 17-22, Akasaka 2-chome, Minato-ku, Tokyo 107, Japan U.S. Rep: 405 Park Ave., New York, NY 10022
Kongsberg North America Inc., 400 Oser Ave., Hauppauge, NY 11738
Kongsberg Vopenfabrikk, Norcontrol Division, P.O. Box 145, Horten 3191, Norway
Krupp Atlas-Elektronik, 1453 Pinewood St., Rahway, NJ 07065
Micrologic, 20801 Dearborn, Chatsworth, CA 91311
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 Autopilot, 400 Oser Ave., Happauge, NY 11738
Simrad, Inc., 2208 N.W. Market St., Suite 600, Seattle, WA 98107
Sperry Corporation, Great Neck, NY 11020
Standard Communications, P.O. Box 92151, Los Angeles, CA 90009
Texas Instruments, Inc., P.O. Box 405, 3438, Lewisville, TX 75067

OILS—Marine—Additives
Exxon Company, U.S.A., Room 2323 AH, P.O. Box 2180, Houston, TX 77701
Gulf Oil Company—U.S. (Domestic Oils), 909 Fannin Street, Houston, TX 77001
Gulf Oil, New York District Sales Office (Domestic), 433 Hackensack Avenue, Hackensack, NJ 07601
Gulf Oil Trading Co., 535 Madison Ave., New York, NY 10022
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
Biospherics Incorporated, 5001 Forbes Blvd., Lanham, MD 20801
Butterworth Inc. (USA), 3721 Lapas Dr., P.O. Box 18312, Houston, TX 77223-9989
Butterworth Systems (UK), 123 Beddington Lane, Croydon CR9 4NX, England
Centrico, Inc. (Westfalia Separators), 100 Fairway Court, Northvale, NJ 07647
Dahl Manufacturing, Inc., 2521 Railroad Ave., Ceres, CA 95307
Hamworthy Engineering Ltd., 10555 Lake Forest Blvd., Suite 5F, New Orleans, LA 70127
Hyde Products, Inc., 810 Sharon Dr., Westlake, OH 44148
Microphor, Inc., P.O. Box 490, Willits, CA 95490
Marine Moisture Control Co., 60 Inip Dr., Inwood, NY 11696
Peck Purifier Sales Co., 3724 Cook Blvd., Chesapeake, VA 23323

PAINTS—COATINGS—CORROSION CONTROL
American Abrasive Metals, 460 Coit Street, Irvington, NJ 07111
Ameron, 4700 Ramona Blvd., Monterey Park, CA 91754
A.W. Chesterton Co., Middlesex Industrial Park, Rt. 93, Stoneham, MA 02180
Chugoku Marine Paints (U.S.A.) Inc., 1290 Ave. of Americas, New York, NY 10104
CLEMCO, P.O. Box 7680, San Francisco, CA 94120
"CONSOL" manufactured by Contact Paint & Chemical Co. Inc., 200 S. Franklintown Rd., Baltimore, MD 21223
Dampney Company, Inc., 85 Paris St., Everett, MA 02149
Devoe Marine Coatings Co., P.O. Box 7600, Louisville, KY 40207
Drew Ameroid Marine, One Drew Chemical Plaza, Boonton, NJ 07005
E.I. DuPont De Nemours & Co., Inc. Nemours Bldg., Rm. N-2504-2, Wilmington, DE 19898
DuPont Co. MPS , Room X40750, Wilmington, DE 19898
Eureka Chemical Company, 234 Lawrence Avenue, So. San Francisco, CA 94080
Farboil Company, 8200 Fischer Rd., Baltimore, MD 21222
Glidden Coatings & Resins, Architectural & Maintenance, 925 Euclid Ave., Cleveland, OH 44115
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., 840 Key Hwy., Baltimore, MD 21230
Magnus Maritec International Inc., 150 Roosevelt Pl., P.O. Box 150, Palisades Park, NJ 07650
Norton Chemplast, 309-150 Dey Rd., Wayne, NJ 07470
Palmer Products Inc., P.O. Box 8, Worcester, PA 19490
Products Research & Chemical Corp., 5454 San Fernando Rd., Glendale, CA 91203
Selby, Battersby & Company, 5220 Whiby Avenue, Philadelphia, PA 19143
Sermatech International, 4401 SermeTel Dr., Moss Point, MS 39563

PIPE-HOSE—Cargo Transfer Clamps, Couplings, Coatings
Amermarine International, P.O. Box 9205, Dundalk, MD 21222
Deutsch Metal Components, 14800 S. Figueroa St., Gardena, CA 90248
Hydro-Craft Inc., 1821 Rochester Industrial Dr., Rochester, MI 48063
Selkirk Metalbestos, Box 19000, Greensboro, NC 27419
Tioga Pipe Supply Co. Inc., 2450 Wheatsheof La., P.O. Box 5997, Philadelphia, PA 19137

PLASTICS—Marine Applications
Hubeva Marine Plastic, Inc., 390 Hamilton Ave., Brooklyn, NY 11231
Norton Chemplast, 309-150 Dey Rd. Wayne NJ 07470

PLYWOOD
Simpson Timber Co., Third and Franklin, Sheton, WA 98584

PROPULSION EQUIPMENT—Bowthrusters, Diesel Engines, Gears, Propellers, Shafts, Turbines
Amarillo Gear Co., P.O. Box 1789, Amarillo, Texas 79105
Aquamaster Inc., 4125, 9th Avenue N.W. Seattle, WA 98107
Armco Steel/Advanced Materials Div., 703 Curtis St., Middletown, OH 45043
Avondale Shipyards, Inc., P.O. Box 52080, New Orleans, LA 70150
Bergen Diesel Inc., 2110-10 Service Rd., Kenner, LA 70062
Bird-Johnson Company, 110 Norfolk St., Walpole, MA 02081
Boston Metals Co., 313 E. Baltimore St., Baltimore, MD 21202
Burmeister & Wain Alpha Diesel AS, DK-1400 Copenhagen K, Denmark
Capitol Gears, 349 N. Hamline Ave., St. Paul, MN 55104
Caterpillar Engine Division, 100 N.E. Adams, Peoria, IL 61629
Cincinnati Gear Co., 5657 Wooster Pike, Cincinnati, OH 45227
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-Stone Vickers, Inc., 56 Squirrel Rd., Auburn Hills, MI 48057
Daihatsu Diesel (USA) Inc., 180 Adams Ave., Hauppauge, NY 11788
Deutz Corp., 7585 Ponce de Leon Circle, Atlanta, GA 30340
Elliott Company, 1809 Sheridan Ave., Springfield, OH 45505
George Engine Company, Inc., Lafayette, LA
General Motors, Electro-Motive Division, LaGrange, IL 60525
Golten Marine Co., Inc., 160 Van Brunt St., Brooklyn, NY 11231
Isotta Fraschini S.p.A., c/o Italian Aerospace Industries (U.S.A.), Inc., 1235 Jefferson Davis Hwy., Suite 500, Arlington, VA 22202
KHD Canada Inc., 180 Rue de Normandie, Boucherville, Quebec J4B 5S7, Canada
KaMeWa, P.O. Box 1010, S-68101, Kristinehamn, Sweden
KaMeWa, 1800 West Loop So., Suite 1620, Houston, TX 77027
Lips Propellers, 3617 Koppens Way, Chesapeake, VA 23323
M.A.N.-B&W Diesel, 2 Ostervej, DK-4960 Holeby, Denmark
MTU of North America, One E. Putnam Ave., Greenwich, CT 06830; 10450 Corporate Dr., Sugarland, TX 77478; 2945 Railroad Ave., Morgan City, LA 70203; 180 Nickerson St., Seattle, WA 98109; 1730 Lynn St., Arlington, VA 22209
MWM-Murphy Diesel, 12 Greenway Plaza, Suite 1100, Houston, TX 77046
Mapeco Products, Inc., 20 Vesey St., New York, NY 10007
Maritime Industries Ltd., 6307 Laurel St., Burnaby, B.C., Canada V5B 3B3
Michigan Wheel, 1501 Buchanan Ave., S.W., Grand Rapids, MI 49507
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
Penske GM Power, Lodi N.J., 180 Rt. 17 South, Lodi, NJ 07644
Inland Water Propulsion Systems, Inc., 580 Walnut St., Cincinnati, OH 45201
Propulsion Systems, Inc., 21213 76 Ave. So., Kent, WA 98032
SACM (Societe Alsacienne De Constructions Mechaniques De Mulhouse) 1, Rue De La Fonderie, Boite Postale 1210, 68054 Mulhouse Cedex, France
Schottel of America, Inc., 8375 N.W. 56 St., Miami, FL 33166
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
Transamerica DeLaval Inc., Engine & Compressor Div., 550 85th Ave., Oakland, CA 94621
Transamerica Delaval, Inc., Turbine & Compressor Div., P.O. Box 8788, Trenton, NJ 08650
Ulstein Trading Ltd. A/S, N-6-65, Ulsteinvik, Norway
Voith Schneider America, 159 Great Neck Rd., Ste. 200, Great Neck, NY 11021
Volvo Penta of America, P.O. Box 927, Rockleigh, NJ 07647
WABCO Fluid Power, an American-Standard Company, 1953 Mercer Rd., Lexington, KY 40505
Wartsila Power Inc., 5132 Taravella Rd., P.O. Box 868, Marrero, LA 70072
Waukesha Engine Division, Waukesha, WI 53187

PUMPS—Repairs—Drives
Allweiler Pump Inc., 5410 Newport Dr., Rolling Meadows, IL 60008 TX: 270-0444
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
Goltens, 160 Van Brunt St., Brooklyn, NY 11231
Hamworthy Engineering Ltd., 10555 Lake Forest Blvd., Suite 5F, New Orleans, LA 70127
Ingersoll—Rand Pump Group, Dept. B—346, Washington, N.J. 07882
Jim's Pump Repair, 48-55 36th St., Long Island City, NY 11101
Megator Corporation, 562 Alpha Drive, Pittsburgh, PA 15238
Sims Pump Valve Co., Inc., 1314 Park Ave., Hoboken, NJ 07030
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

ROPE—Manila—Nylon—Hawsers—Fibers
A.L. Don Co., Foot of Dock St., Matawan, NJ 07747
Allied Fibers, 1411 Broadway, New York, NY 10018
American Mfg. Co., Inc., Willow Avenue, Honesdale, PA 18431
Atlantic Cordage Corp., 60 Grant Avenue, Carteret, NJ 07008
DuPont Co., KEVLAR Aramid Fiber, Room G-15465, Wilmington, DE 19898
Samson Ocean Systems, Inc., 99 High Street, Boston, MA 02110
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
Wall Industries, Inc., P.O. Box 560, Elkin, NC 28621

SANITATION DEVICES—Pollution Control
Davit Sales Inc., P.O. Box 232, Jefferson Valley, NY 10535
Envirovac Inc., 1260 Turret Dr., Rockford, IL 61111
FAST Sewage Systems, Div. of St. Louis Ship, 611 East Morceau St., St. Louis, MO 63111
Golar Metal A/S, P.O. Box 70, 4901 Tvedestrand, Norway
Hamworthy Engineering Ltd., 10555 Lake Forest Blvd., Suite 5F, New Orleans, LA 70127
Marine Moisture Control Co., Inc., 60 Inip Dr., Inwood, L.I., NY 11696
Marland Environmental Systems, P.O. Box 501, Great Falls, VA 22066
National Sanitation Foundation, P.O. Box 1468, Ann Arbor, MI 48105

SCAFFOLDING EQUIPMENT—Work Platforms
McCausey Lumber Co., 7751 Lyndon, Detroit, MI 48238
Trus-Joist Corp., P.O. Box 60, Boise, ID 83704

SCUTTLES/MANHOLES
Mock Manufacturing Inc., 777 Rutland Rd., Brooklyn, NY 11203

SHAFT SEALS, REVOLUTION INDICATOR EQUIPMENT
Bird-Johnson Co., 100 Norfolk St., Walpole, MA 02081
Crane Packing Company, 435 Regina Dr., Clarksberg, MD 20734
Norton Chemplast, 309-150 Dey Rd., Wayne, NJ 07470

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 Hydranautics, 6338 Lindmar Dr., P.O. Box 1068, Goleta, CA. 93116
Cockatoo Dockyard Pty. Ltd., P.O. Box 1139, North Sydney, NSW 2060, Australia TX: 72086
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
United States Steel Corp., Christy Park Plant, 2214 Walnut St., McKeesport, PA 15132
Welded Beam Company, P.O. Box 280, Perry, OH 44081

SHIPBUILDING—Repairs, Maintenance, Drydocking
Amsterdam Drydock Company, Post Box 3006, 1003 AA, Amsterdam, Holland
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New Brochure Details Harris HF Marine Radio Products

Harris Corporation, RF Communications Group, Long Range Radio Division, Rochester, N.Y., has announced the availability of a new brochure on radio products for the marine industry. This six-page full color brochure describes Harris's full range of HF-SSB radio products and accessories.

The radio communications equipment and systems presented in the brochure are widely used for marine shipboard and limited coast shore applications—from oil exploration sites to refineries, from tanker fleets to delivery fleets, from harbor tug fleets to workboats and pleasure crafts.

The HF equipment featured includes the RF-230M 125-watt synthesized transceiver, the RF-230MS 125-watt Synthesized/Channelized Transceiver, the RF-104 lkw Linear Power Amplifier and the RF-798 Remote Control System.

The brochure also presents Harris's line of advanced HF communications systems providing customized HF computer control for onboard management, drill rig daily reporting and exploration data transfer. The equipment featured for these applications include the RF-2331 Series 125 watt Channelized ARQ System and the RF-7100 Series HF Adaptive Communications System.

The RF-2331 ARQ System is an advanced automatic-error-correcting HF teletypewriter system, designed for easy, channelized marine telex and data operation; available with an optional RF-536 Scan Control. This system is especially advantageous aboard ships as it allows a single operator to monitor a large number of shore station frequencies allowing fully automatic operation.

The RF-7100 HF Adaptive Communications System offers the ultimate solution to today's HF communications problems—providing automatic selection of the optimum channel in marginal signal conditions, and selectively calling a particular station on the network. The RF-7100 Series HF Adaptive System can be configured for a variety of applications, including point-to-point and computer-controlled frequency management systems.

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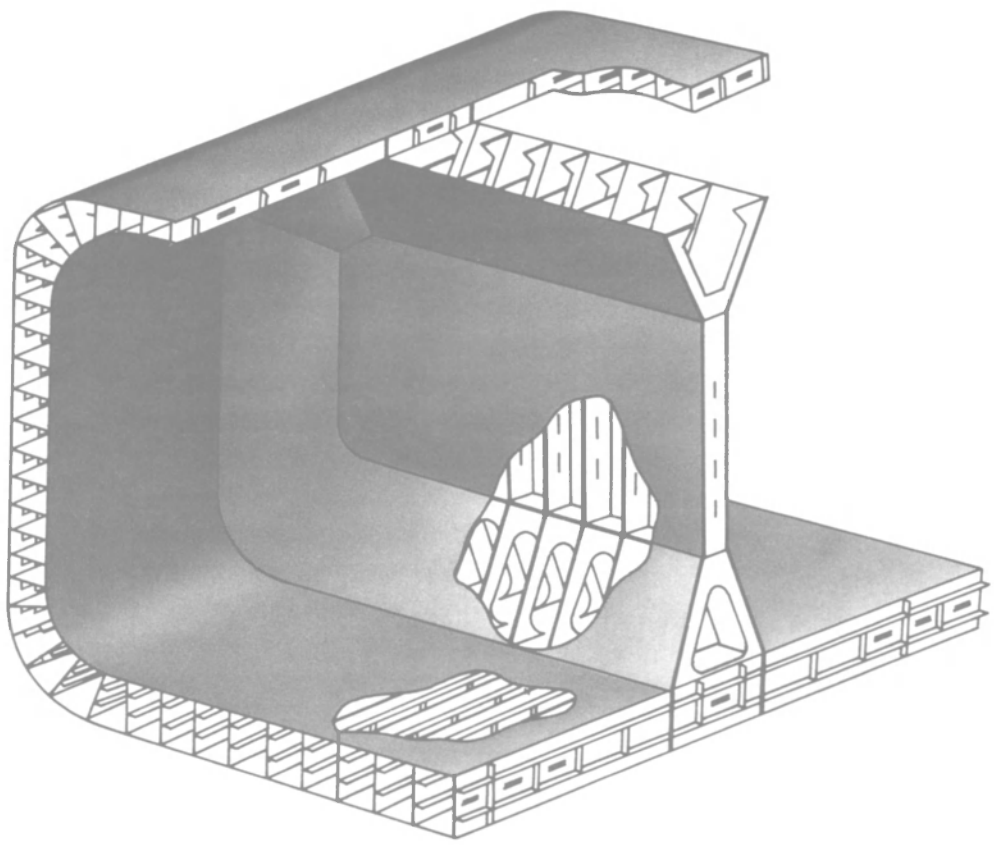

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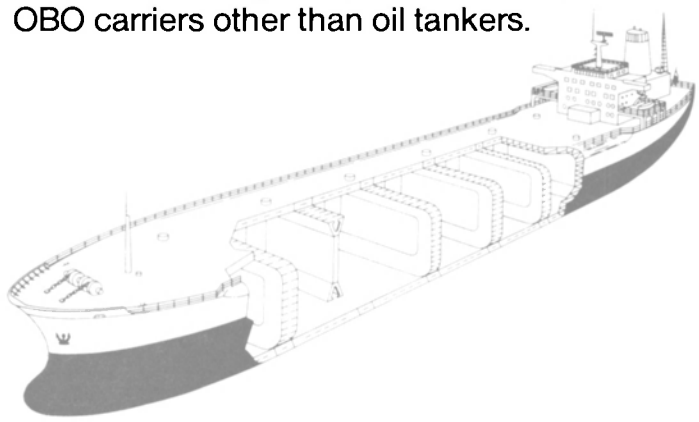

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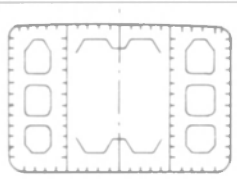
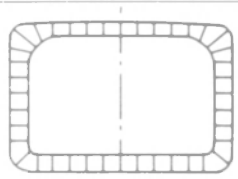
Tank configuration			
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Cargo tank heating		★	★★★
Cargo purity		★	★★★
Maintenance	cargo tank coating	★	★★★
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Safety	crack free	★★	★★★
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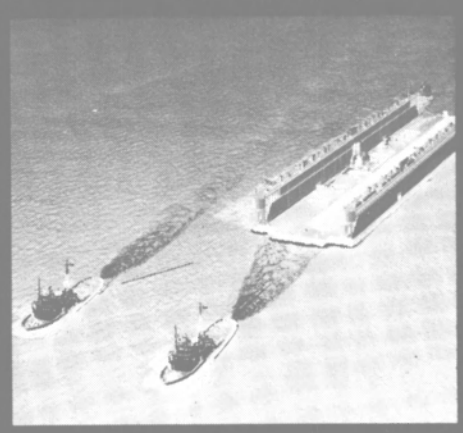

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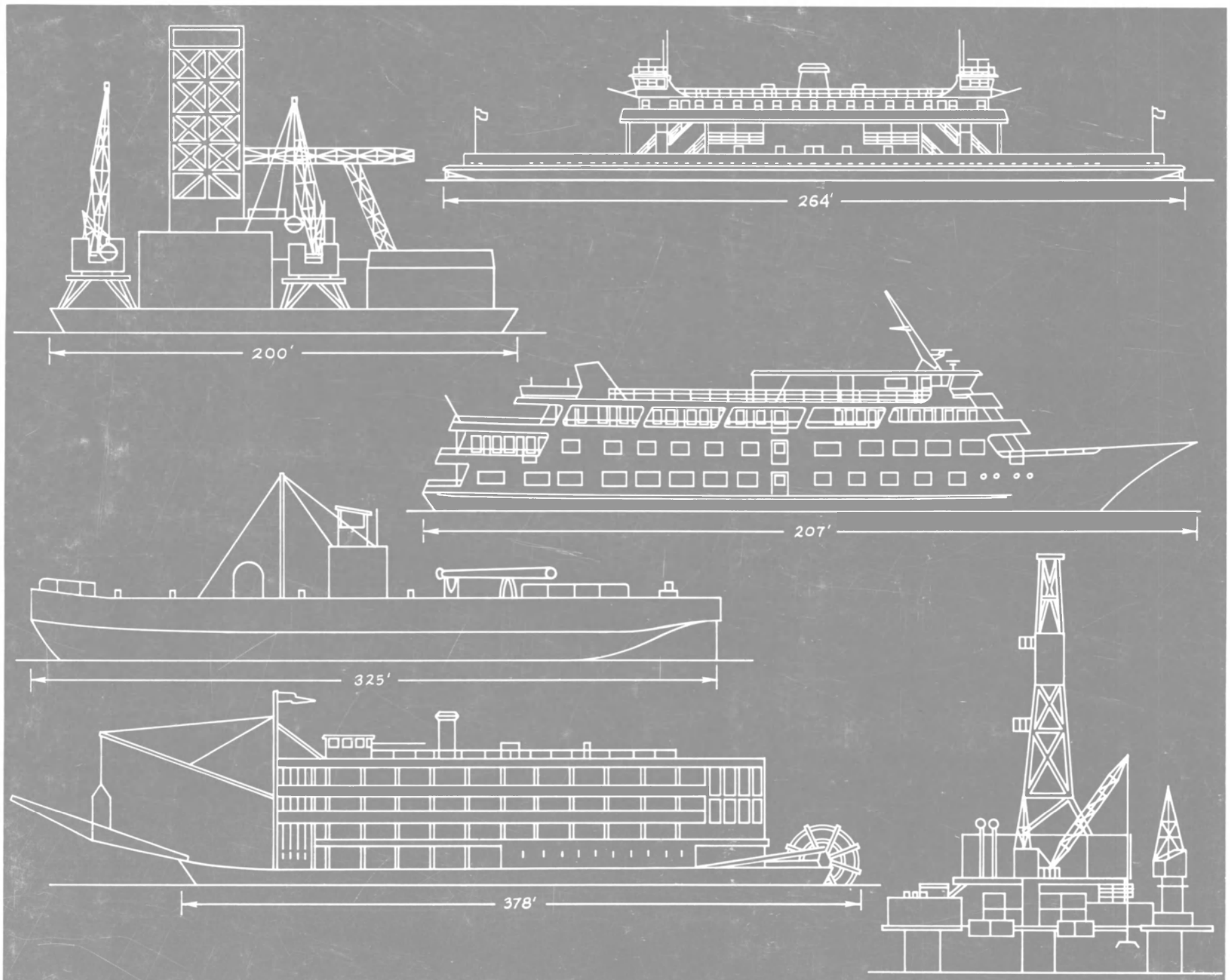

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