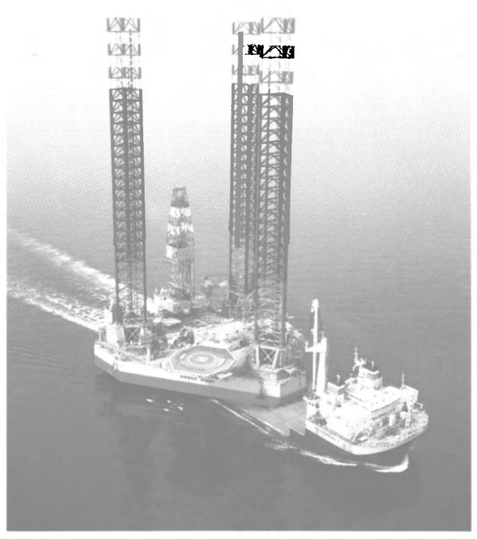
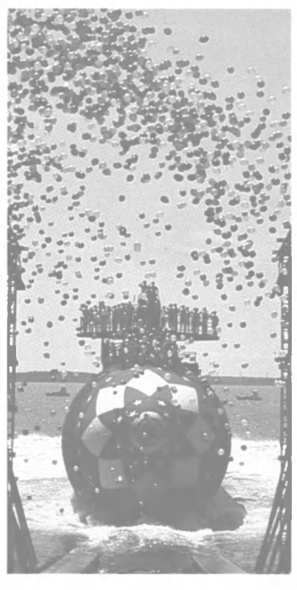
MARITIME REPORTER
AND
ENGINEERING NEWS





ASNE CENTENNIAL - OTC '88

APRIL 1988

GIVING NATIONAL DEFENSE A BIG LIFT.

Theodore Roosevelt (CVN71), the first aircraft carrier built making extensive use of modular construction, was commissioned 16 months before contract delivery date, saving the U.S. Navy and American taxpayers over $80 million.

Abraham Lincoln (CVN72) and George Washington (CVN73) are the next two aircraft carriers being built through modular construction. At Newport News Shipbuilding, we're proud our 900 ton lifts give a big lift to our nation's ability to meet its global commitments.

Newport News Shipbuilding (TENNECO)
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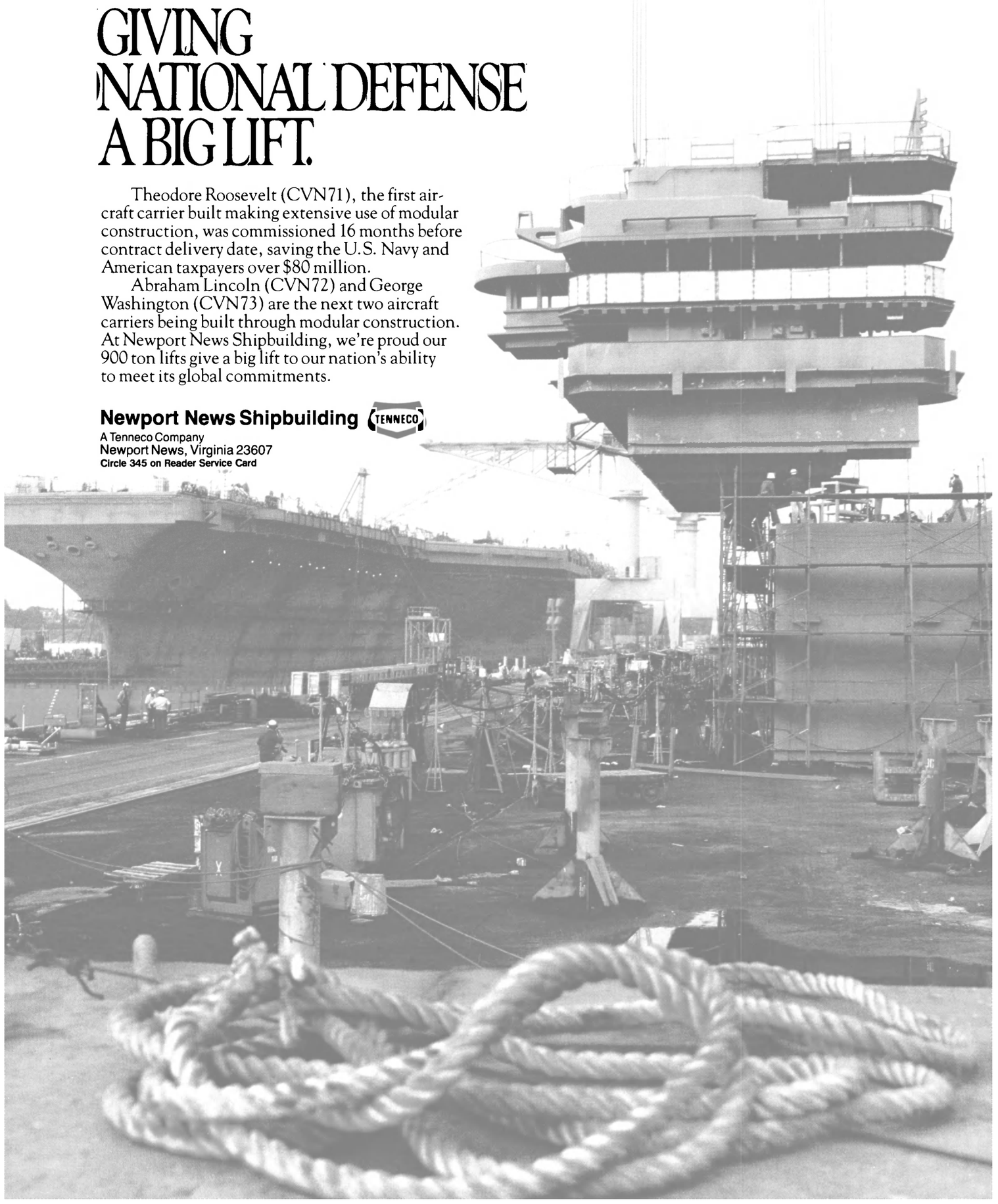
Newport News, Virginia 23607
Circle 345 on Reader Service Card



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Circle 159 on Reader Service Card

ON THE COVER

COVER (clockwise from logo): OTC Exhibition; Wijsmuller's Mighty Servant 3 carrying Maersk Guardian; Atlanta (SSN-712) is launched at Newport News (Navy photo); Drilling rig offshore Louisiana (API); Bethlehem Steel, Baltimore Marine Div. (Sparrows Point): A Portuguese bulk carrier in drydock. USNS Maury (upper right) oceanographic ship under construction for the Navy, and USNS Zeus, an MSC-operated cable-laying vessel; Jackup rig and production platforms, offshore Louisiana (API); Todd Seattle-built HMAS Sydney (FFG-03); (center and pages 10-11) Aircraft carrier Abraham Lincoln (CVN-72) at launching ceremonies Newport News (VA) Shipbuilding

Navy Awards $7.5-Million Contract To Atlantic Dry Dock

Atlantic Dry Dock Corporation, Ft. George Island, Fla., has been awarded a $7,466,000 firm-fixed-price contract for the Drydocking Selected Restricted Availability (DSRA) of the frigate USS Underwood (FFG-36). The work is expected to be completed August 18, 1988.

Great Point Towing Buys 1,400-Hp Tug

Great Point Towing of Nantucket, Mass., has purchased the 1,400-hp tug Bayou Babe, built in 1979 by Rayco Shipbuilding, from Misener Marine of Tampa, Fla. The vessel, to be renamed Wauwinet, will be stationed out of Nantucket. Brokerage was handled by Marcon International, Inc. of Coupeville, Wash.

USS Anchorage Undergoing $15-Million Overhaul At Southwest Marine

The San Pedro Division of Southwest Marine, Terminal Island, Calif., has been awarded a $15,048,870 firm-fixed-price contract for the Regular Overhaul (ROH) of the dock landing ship USS Anchorage (LSD-36). The work is being performed in Long Beach, Calif., and is expected to be completed November 3, 1988.

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Fred Olsen, Citicorp To Invest In Tankers

First Olsen Tankers Limited, a company sponsored by Citicorp, a subsidiary of Citibank N.A., and shipping firm Fred Olsen & Co., Oslo, has just been formed to invest primarily in medium- and large-sized crude oil tankers.

Citicorp and Fred Olsen & Co. believe that the tanker market is reaching a turning point. They expect a structural shortage of tonnage to develop in the next five years creating an opportunity for higher returns through profitable trading and capital appreciation. First Olsen Tankers Lmited plans to invest in secondhand tonnage rather than newbuildings.

In accordance with this policy, the board of directors has already approved the purchase of four Suezmax 140,000-dwt tankers. The ships will be managed and marketed by Fred Olsen & Co., in a pool with four similar tankers chartered by Fred Olsen & Co.

Navy Awards $4.9-Million Contract To Continental Maritime

Continental Maritime, San Diego, Calif., has been awarded a $4,926,630 firm-fixed-price contract by the Supervisor of Shipbuilding, Conversion and Repair, San Diego, Calif., for the Selected Restricted Availability (SRA) for the aircraft carrier USS Ranger (CV-61). The work is expected to be completed June 24, 1988. The contract is (N00024-85-H-8212).

WhiteMetal Offers Free Color Brochure On New Blasting System

WhiteMetal Inc., Houston, Texas, is offering a free color brochure on its new JET STRIPPER™, a highly productive surface cleaning system which enhances the strong points of conventional dry blasting.

The JET STRIPPER uses lower volumes of water than other wet abrasive systems, and eliminates the dust with minimal water run-off problems.

According to the company, the JET STRIPPER system will produce a surface cleaner than a "white metal" surface with a deeper and cleaner anchor profile than any conventional dry, high pressure water, or wet abrasive blasting system because of the added force of the abrasive blast. The brochure explains that the JET STRIPPER's unique operating and performance characteristics substantially reduce total operating costs in applications where dry abrasives or high pressure water blasting are typically used.

For your free copy of the color brochure from WhiteMetal Inc. on its new JET STRIPPER system,

Circle 81 on Reader Service Card

MHI Delivers Newest Tanker For Chevron Fleet

Chevron Corporation's newest tanker, the 78,000-dwt R. Hal Dean, was recently christened and delivered at Mitsubishi Heavy Industries' (MHI) shipyard in Nagasaki, Japan.

Christened by Mrs. **Gale Dean,** wife of **R. Hal Dean,** a member of Chevron's board of directors, the tanker was specially designed to carry crude oil from the company's very large and ultra-large crude carriers (VLCCs and ULCCs) sailing off the U.S Gulf Coast to the company's refineries at Pascagoula, Miss., and Port Arthur, Texas.

The R. Hal Dean can carry 510,000 barrels of crude oil. She meets all international standards for promoting safety at sea and for preventing pollution. The 12,060-hp, diesel-powered ship has state-of-the-art navigation and communication equipment and is extensively automated. Her specially designed rudder, bowthruster and controllable-pitch propeller enhance her maneuverability.

For literature detailing the shipbuilding facilities of MHI,

Circle 24 on Reader Service Card

Wartsila Acquires Bolnes Motorenfabriek After-Sales Operations

Wartsila Diesel has expanded its after-sales operations in the Netherlands by acquiring the diesel engine after-sales operations of the Dutch company Bolnes Motorenfabriek B.V. The agreement includes the transfer of Bolnes' after-sales activities to Wartsila Diesel's Dutch subsidiary Wartsila Diesel B.V., which will continue to run these operations side by side with their previous sales and servicing of Wartsila Diesel engines. Wartsila Diesel B.V. will concentrate their activities in Krimpen a/d Lek, in Rotterdam.

Production of Bolnes engines will be phased down and Bolnes Motorenfabriek will continue as Bolnes Multitechnik, a multi-technology subcontracting company.

For more information and free literature from Wartsila Diesel,

Circle 40 on Reader Service Card

New Nirex Freshwater Distiller And Ice Machine From Alfa-Laval

—Literature Available—

Alfa-Laval, Inc. of Ft. Lee, N.J., recently announced the introduction of a new Nirex ice machine for trawlers and fishing vessels, and a new Nirex freshwater distiller designed to meet the needs of small vessels.

FWI 1250 Nirex freshwater ice machine.

Designated the FWI Series, the Nirex ice machines are ideally suited for preserving and transporting fish over long distances. The freshwater ice produced will not freeze the fish flesh, but instead will maintain the fish at the correct temperature to insure the best quality.

The machines are compact and come fully equipped with electric motors, control panel, instruments, safety devices and complete internal piping. They produce flake ice at an ideal temperature of 23° F. The ice fills all cavities and completely surrounds the fish, keeping it wet and cool, without freezing.

Several models are available covering capacities from 0.350 up to 10 tons/day.

JWP-16-C40 Nirex freshwater distiller.

The new Nirex freshwater distiller, designated the JWSP-16-C40, is ideally suited for use on fishing vessels, workboats, supply boats and offshore rigs with small engines. It is designed to be easily connected to the diesel engine jacket water system and utilize the BTU's available in the JW system as the heat source. Steam can also be used if available.

The JWSP-16-C40 has a capacity range of 100 to 1,850 gpd, depending on the heating medium and cooling water temperatures. Distillers can be dimensioned to suit any jacket water temperature from 131-194° F and any seawater temperature required. The quantity of fresh water produced can be altered within each size by varying the number of plates in the heat exchanger assemblies.

Weighing no more than 400 pounds, the JWSP-16-C40 can easily be dismantled, allowing subassemblies to be hand-carried by two persons into the engine room without making alterations in the room. The unit can be quickly reassembled—just bolt it together, hook it up to water and electrical lines, and start it up with the push of a button. It can be either deck, bulkhead or overhead mounted.

The distiller is designed to operate automatically under varying operating and weather conditions without any effects on salinity of the fresh water produced.

Like all Alfa-Laval Nirex distillers, the JWSP-16-C series features titanium plate heat exchangers that eliminate corrosion problems and allow for increasing capacity simply by installing additional plates in both the condenser and evaporator. To further eliminate corrosion, the distiller cover is pressed from stainless steel. After cleaning, normally required only once per year, the Nirex distiller delivers 100 percent capacity. The "C" in the designation refers to the combined condenser cooling and ejector water system, a key feature of the JWSP-16-C40. This combined system lowers installation costs and increases reliability of the distiller.

For more information, free color literature, etc., on the new Nirex ice machine,

Circle 16 on Reader Service Card

For free color literature giving full details on the new JWSP-16-C series Nirex distiller,

Circle 17 on Reader Service Card

Crowley Subsidiary Expanding Barge Service

The barge service company Hawaiian Marine Lines, a subsidiary of Crowley Maritime Corporation, is expanding its present service, which had operated from Oakland and the Pacific Northwest to Hawaii, to include southern California.

The company plans to add Long Beach to its service, offering westbound barge transport for non-time-sensitive cargo such as building materials and construction equipment.

Repower With Cummins NTA-855-Ms Gives Pushboat A New Life

When J.F. Brennan Co., Inc., a marine contractor located in La Crosse, Wis., decided to repower their eight-year-old workboat Anne Marie, they selected two 350-hp Cummins NTA-855-M marine diesels.

The increased power and performance of the in-line, six-cylinder, turbocharged and aftercooled Cummins power plants was noticed immediately by the J.F. Brennan Co. crew. After only the first few weeks, they were reporting "lots of power," and "now we're getting some performance."

The Cummins NTA-855-Ms are expected to deliver improved performance all-around, including fuel economy, lower noise levels, durability and reliability . . . all from the more compact in-line six package that is easy to access for routine service and maintenance. The engines were furnished by Cummins Great Lakes, Inc. of Chippewa Falls, Wis., and J.F. Brennan Co. personnel performed the repower.

The 50-foot-long by 18-foot-wide Anne Marie, built by Louis G. Ortis Boat Co., is equipped with a Twin Disc MG515 marine gear, 4.5:1 ratio, 52-inch by 38-inch four-blade propellers, and Fernstrum keel coolers.

After the 50-foot-long workboat Anne Marie was repowered with Cummins marine diesels, improved performance was noticed all around, including fuel economy, noise, durability and reliability.

The workboat is currently used in moving and positioning the barge carrying a dragline when performing dredge work, or handling barges of rip-rap along the Mississippi River and connecting waterways.

For free literature giving full information on Cummins engines,

Circle 37 on Reader Service Card

System Expansion For WLO Radio

Mobile Marine Radio, Inc., owners and operators of coastal station WLO Radio, North America, one of the largest public coast stations in the U.S., and one of the world's largest coast stations offering fully automatic Radiotelex, has awarded to Radio-Holland USA, BV, an expansion contract of 12 automatic channels to their previously upgraded and operational 16-channel fully automatic RTX system.

WLO Radio not only pioneered Radiotelex services in the U.S. over 13 years ago and was the first station to offer this type of service, they are also the only USA coast station to offer completely automatic end-to-end telex-at-sea communications.

Through Radio-Holland in Houston, WLO's modernization program started in 1985 with the initial purchase of Thrane & Thrane's eight-channel semiautomatic direct ship-to-shore system, with free signalling generation.

The RTX system was upgraded in 1986 with eight more channels, the new CCIR Rec. 625 (as well as 476-3 for full backward compatibility) and the TT-1000 host computer to provide via a sophisticated data base, automatic store-and-forward, shore-to-ship and ship-to-shore traffic.

With the delivery of the 12-channel expansion, WLO's system configuration consists of: 28 TT-1585 Radiotelex modems, seven channel processors (the traffic cop allowing for simultaneous call capabilities to/from land-line subscribers), seven manual assist positions (MAPs), seven log printers (for automatic logging of traffic status and toll-ticketing), and the TT-1000 communications processor and associated peripherals.

Thrane & Thrane automatic Telex-Over-Radio RTX equipment is now installed at six fully automatic and six semiautomatic Radiotelex stations.

For more information and free literature,

Circle 51 on Reader Service Card

Penn Ship Names Veteran Shipbuilder Grandin Vought Operations Vice President

Grandin S. Vought, an executive at Pennsylvania Shipbuilding Company in Chester, Pa., since 1983, has been named vice president for operations with responsibility for all phases of new ship construction, it was recently announced by **William T. Gallagher,** executive vice president.

In his new post, which is effective immediately, Mr. **Vought** will be responsible for managing the yard's largest division with over 1,600 employees in the construction of four fleet oilers for the U.S. Navy. The contracts are valued at $420 million.

Mr. **Vought** is a veteran with more than 30 years' experience in all phases of ship construction and repair. During his 21-year career at Newport News Shipbuilding in Virginia, he served in a variety of positions, beginning as an industrial engineer and departing as superintendent of steel fabrication for one of the largest private shipyards in the U.S.

Pennsylvania Shipbuilding Company is a 185-acre facility situated alone one-mile of Delaware River waterfront, nine miles south of the Philadelphia airport. As one of the largest private shipyards in the U.S., it can do new construction, conversions, overhauls and ship repair in addition to fabricating a wide range of large industrial products.

For free literature giving complete details on the facilities and capabilities of Pennsylvania Shipbuilding,

Circle 33 on Reader Service Card

Reagan Nominates William L. Ball For Navy Secretary

President **Reagan** has nominated **William L. Ball III,** Assistant to the President for Legislative Affairs, for the position of Secretary of the Navy. If confirmed, Mr. **Ball** would succeed **James H. Webb Jr.,** who recently resigned.

ELECTRONICS UPDATE

Krupp Atlas Elektronik Navaids

Advanced navaids from Krupp Atlas Electronik include the FCC type-approved 7600-8600 Series of 16-inch Rasterscan radars, more than 800 of which have been sold worldwide since their introduction four years ago. Also these radars hold Japanese type-approval certificates and they are characterized by a continuous television-type mode of presentation viewable under all conditions. Among latest U.S. customers to place orders are Pacific Gulf Lines of New Orleans, who are retrofitting interswitched X-band 7600 RM and ARPA units to two bulk carriers.

The 7600-8600 Series is complemented by the Atlas 5600 12-inch Rasterscan system and also by the recently introduced Atlas 5400, a relative motion system of similar size with a conventional radial display designed to meet IMO and other specifications.

Other products available include the Nacos 20 integrated bridge control system designed primarily for single manning and precision navigation at reduced cost. Typically comprising two rasterscan radars, doppler log, echo sounder and an adaptive radar-controlled autopilot, the central control console additional incorporates a full-color navigation information display unit together with interfaces for other sensors and bridge equipment.

Originally developed for the West German "Ship of the Future" project, some 40 Nacos configurations have already been sold worldwide.

The system will be the subject of a paper to be presented at the RTCM Annual Assembly Meeting at Fort Lauderdale, Fla., in this month.

For more information and free literature on products from Krupp Atlas Elecktronik,

Circle 18 on Reader Service Card

MarAd Awards Contract Worth $499,500 To Beth Steel-Beaumont

The Maritime Administration (MarAd) has awarded Bethlehem Steel Corp., Beaumont, Texas, a $499,500 contract for work related to the preparation of the 50,000-deadweight-ton tanker Chesapeake for retention in the National Defense Reserve Fleet. The work includes drydocking the vessel for inspection, hull blasting and coating, and cleaning and coating of tanks for preservation.

JJH Inc. Increases Computer Capabilities

JJH Inc., a leading naval engineering organization with offices located in Cherry Hill, N.J., Portsmouth, Va., Crystal City, Va., Bath, Maine, Long Beach, Calif., and Panama City, Fla., has announced the recent expansion of their organization's CAD/CAM/CAE capability.

JJH has upgraded their IBM mainframe computer and acquired two state-of-the-art computervision CADD server systems, all running the most current CAD/CAM/CAE software.

These systems support the company's approach of achieving a common database linked to powerful graphics software to achieve cost-effective, quality products.

The corporation's CAD/CAM/CAE facilities are operated by skilled, experienced JJH Inc. engineering and design personnel utilizing 16 interactive workstations supported by digitizing tables, high-speed printers, electrostatic and pen plotters and extensive on-link disk storge.

For additional information and free literature on JJH,

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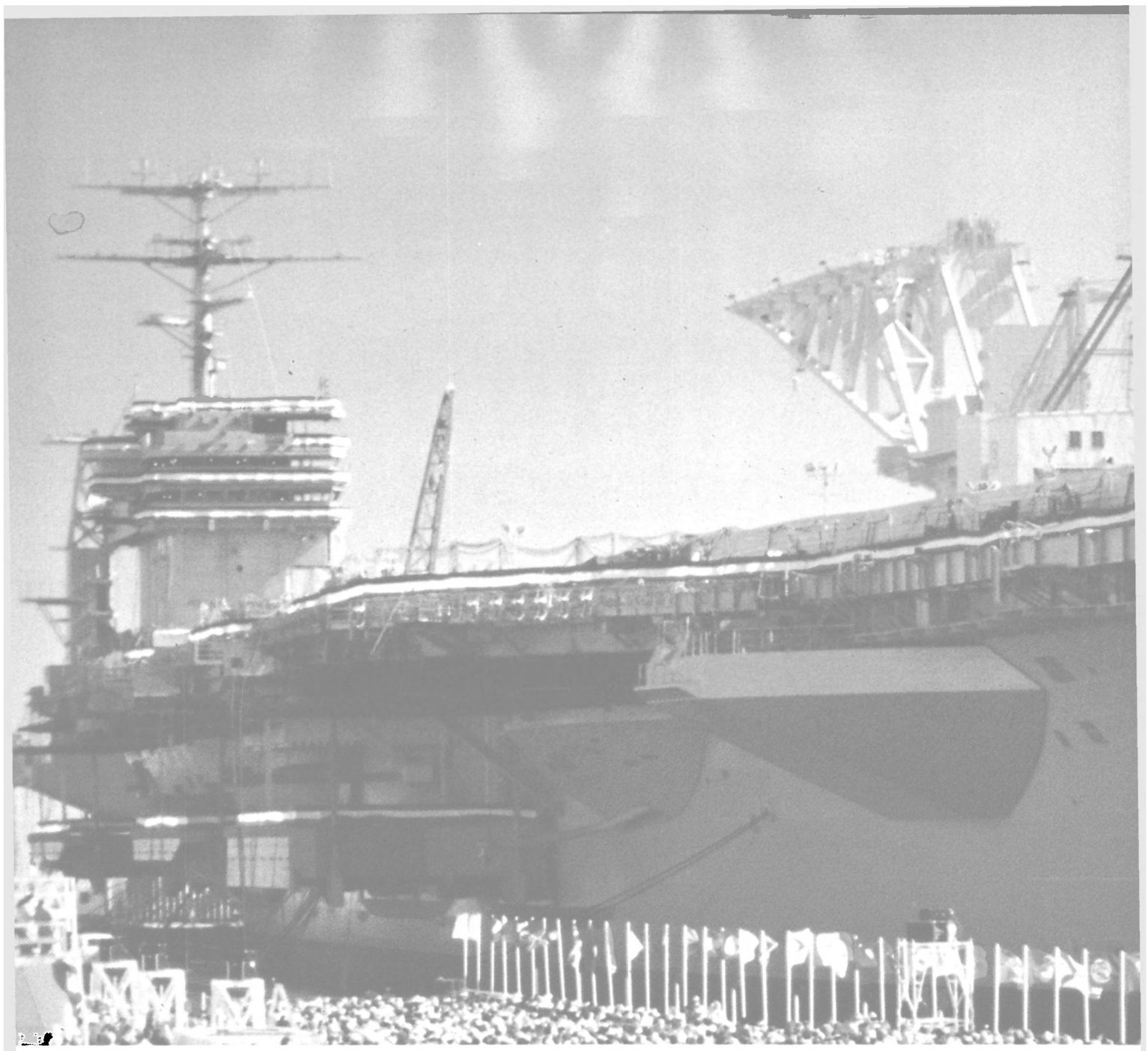

A.S.N.E. DAY '88

'100 Years Of N
May 3-7, W

Celebrating 100 Years of Naval Engineering

The year 1988 marks the 100th anniversary of the American Society of Naval Engineers (ASNE). To commemorate this important event, and their 100 years of achievement, ASNE Day '88 will consist of a Centennial Week of Celebration at the Omni Shoreham Hotel in Washington, D.C., May 3-7.

The event includes technical papers on 100 years of naval engineering, special historical panels, tours of the Washington Navy Yard, David Taylor Naval Ship Research and Development Center, the U.S. Coast Guard Yard and the Smithsonian Institute and numerous exhibits on naval products, services and equipment.

The society, which was formed in 1888 to publish a professional jour-

A CENTENNIAL CELEBRATION

l Engineering'
ington, D.C.

nal and provide a forum for exploring and exchanging new ideas and technology while sharing experiences in naval engineering, represents over 8,500 military and civilian naval engineers. About 200 exhibitors will be on hand to demonstrate their products and services.

Regarded annually as ASNE Day, the five-day event will begin Tuesday evening, May 3, at the Washington Navy Yard, one of the first naval shipyards in the United States, followed by a reception at the yard's Navy Museum.

Traditionally the best-attended annual Navy show, ASNE Day primarily focuses on Naval vessels—ship design, ship machinery, equipment and engineering advances.

On Wednesday, May 4, activities begin at the Omni Shoreham Hotel with special sessions designed to look at the past, present and the future of naval engineering. Session I is titled "Once Upon A Time," and Session II, "Memoirs," includes a skit set in 1888.

Session III, "Recent Engineering Developments," will focus on the present, followed in the afternoon by a distinguished panel discussion in Session IV, "Visions of the Future."

At noon, the Centennial luncheon will feature Adm. **Kinnaird R. McKee,** USN, director, Naval Nuclear Propulsion and provide the

(continued)

ASNE Day

(continued)

opportunity to present a commemorative gift for display in the Reagan Presidential Library.

That afternoon, tours will depart from the Omni Shoreham Hotel for the David Taylor Research Center in Carderock, Md., and the Naval Surface Warfare Center in White Oak, Md.

Thursday the standard ASNE activities begin at the Shoreham with the opening of industry exhibits. Corporations representing the naval engineering community will be on hand to display the latest in naval engineering technology, services and equipment. Later that evening, the Annual Exhibit Hall Reception honors the industry participants in the program.

Also on Thursday, two days of technical sessions begin with more than 20 presentations on topics such as ship design, combat systems, propulsion systems, electromagnetic logistics, ship machinery and materials. The May 5 luncheon will honor the authors of these papers and provide a forum for the presentation

of the Solberg and "Jimmie" Hamilton Awards.

The "Jimmie" Hamilton Award is presented annually to the author(s) of the original technical paper of the greatest value and significance to naval engineering and published in the Naval Engineers Journal during the year.

The Solberg Award is given to the U.S. citizen who has made the most significant contribution to naval engineering through personal research carried out during or culminating in the three-year period ending in the year of consideration.

On May 6, following the Friday morning technical sessions, the ASNE Isherwood Lecture Series will be inaugurated in recognition of the profession of naval engineering as an evolving analytical discipline. This lecture series will sponsor a philosophical and objective perspective from Dr. **Robert A. Frosch,** vice president, General Motors Research Institute.

Later on Friday, the annual reception and banquet will be held in the Omni Shoreham's Blue Room and Regency Ballroom. The banquet, a tradition at ASNE Day, will include the Navy Band, a Military Color Guard and presentation of the society's Gold Medal and Harold E. Saunders Awards.

The Gold Medal Award is given annually to the U.S. citizen who, in the field of naval engineering, has made the most significant engineering contribution through personal effort, or through the direction of others, during or culminating in the five-year period ending in the year of consideration.

The Saunders Award is presented annually to the U.S. citizen who has demonstrated productivity, growth and outstanding accomplishment in the field of naval engineering over the years, with ultimate wide recognition by his peers as a leader in the field and of such prestige as to merit acclamation by the naval engineering community.

On Saturday, May 7, a choice of several tours including a trip to the U.S. Coast Guard Yard and Baltimore's recently renovated Inner Harbor, a trip to the U.S. Naval Academy in Annapolis with a stop at the David Taylor Research Center, or a trip to the Naval Surface Warfare Center at Dahlgren.

Saturday night will wrap up ASNE Day '88, "100 Years of Naval Engineering," with a special Centennial Reception and a formal Centennial Ball. The black tie affair will be held at the Omni Shoreham from 7 p.m. to midnight. The event will feature a 15-piece stage band, cocktails, dinner and dancing.

ASNE will publish a history, "100 Years of Naval Engineering," that will chronicle many important engineering accomplishments made dur-

ing the life of the society. A video covering the same time period and a history of the society are also being prepared.

ASNE History

CENTENNIAL 1888-1988

1888-1988

The American Society of Naval Engineers (ASNE) was born in the age of wooden-hulled Navy ships which were propelled by reciprocating steam engines with coal-fired boilers and armed with muzzle-loaded guns.

The magnitude of the advances in naval engineering technology since that time can be measured by today's use of guided missile systems, nuclear propulsion, gas turbine engines and modern electronics.

However, even with all the numerous technological breakthroughs and advances in naval technology, the society still has its same basic purpose—to advance the knowledge and practice of naval engineering; to enhance the professionalism and well-being of its members; and to promote naval engineering as a career field.

The society was founded in 1888 by a small group of 20 officers of the Engineering Corps of the U.S. Navy. They met in the Bureau of Steam Engineering in Washington, D.C., with the intention of developing a means of dissemination of technical information to the Navy relative to the naval engineering field. One of the officers present, Assistant Engineer A.M. Mattice, proposed that an organization known as the American Society of Naval Engineers be formed for purposes of promoting naval engineering professionalism and prestige. Included in the discussion was the possibility of presenting and preserving papers pertaining to debatable and developing topics in naval engineering. Under the guidance of Rear Adm. G. W. Baird, USN, who would be the society's second president, the officers accepted this proposal and decided to publish a quarterly journal to carry out the major objectives and ideas of the society. ASNE's first president was Chief Engineer Nathan P. Towne, USN.

Since its first three months when its membership stood at 102, the society has grown to represent more than 8,500 military and civilian naval engineers. Its journal is read in over 50 countries.

The annual ASNE Day, an event which has become a tradition, is a major technical, social and business function of the society. ASNE Day, which consists of business meetings, a reception and luncheon, technical sessions, a banquet and a large number of industry and government exhibits, can trace its roots back to 1889. During the period of 1889-1898, annual meetings of the society included the presentation of technical papers. However, the practice was discontinued until 1962, when the term "ASNE Day" was instituted.

ASNE Day '62 consisted of a luncheon attended by about 500 members and guests, an afternoon technical session featuring five papers and a banquet attended by about 1,500 participants. The first exhibits were introduced at ASNE Day '67.

For further information about the American Society of Naval Engineers, contact: ASNE, 1452 Duke Street, Alexandria, Va. 23214; telephone: (703) 836-6727.

ASNE DAY 1988
Thursday A.M., MAY 5
Palladian Room—Session 1A

Moderator: **Peter P. Palermo**
Robert Williams, Assistant

0845: NAVY SHIP DESIGN—EVOLUTION OR REVOLUTION? by Capt. **Barry F. Tibbitts,** USN, **Robert G. Keane Jr.** and **Robert J. Riggins**

0930: NTDS—A PAGE IN NAVAL HISTORY by Capt. **Erick N. Swenson,** USNR (Ret.) and Capt. **Joseph S. Stoutenburgh,** USNR (Ret.) and Capt. **Edmund B. Mahinske,** USN (Ret.).

(continued)

ASNE Day

(continued)

1015: FROM TYPHON TO AEGIS—THE ISSUES AND THEIR RESOLUTION by Capt. **Bryce D. Inman,** USN (Ret.).

Hampton Room—Session 1B

Moderator: **Larry J. Argiro**
James L. Corder, Assistant

0845: PATROL BOAT HABITABILITY NOISE CONTROL by **Raymond W. Fischer.**

0930: A SURFACE NAVY VIBRATION PROGRAM OVERVIEW: STANDARDIZATION AND STATE OF THE ART by **Bruce R. Marshall.**

1015: STATIC AND UNDERWAY ALIGNMENT OF MAIN PROPULSION SHAFT SYSTEMS by **Lyssimachos Vassilopoulos**

Thursday P.M., MAY 5
Palladian Room—Session 2A

Moderator: Capt. **John Dachos,** USN
Donald J. Liberatore, Assistant

1445: INTEGRATED MACHINERY CONTROL—THE WAY OF THE

(continued)

Stay on Course with Cat In-Hull Overhaul Kits

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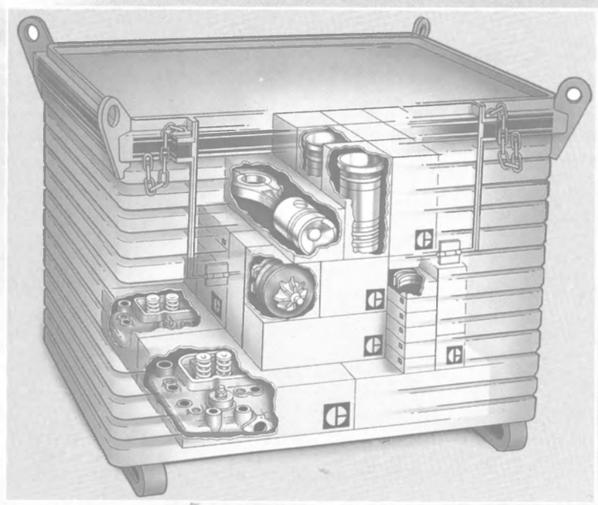

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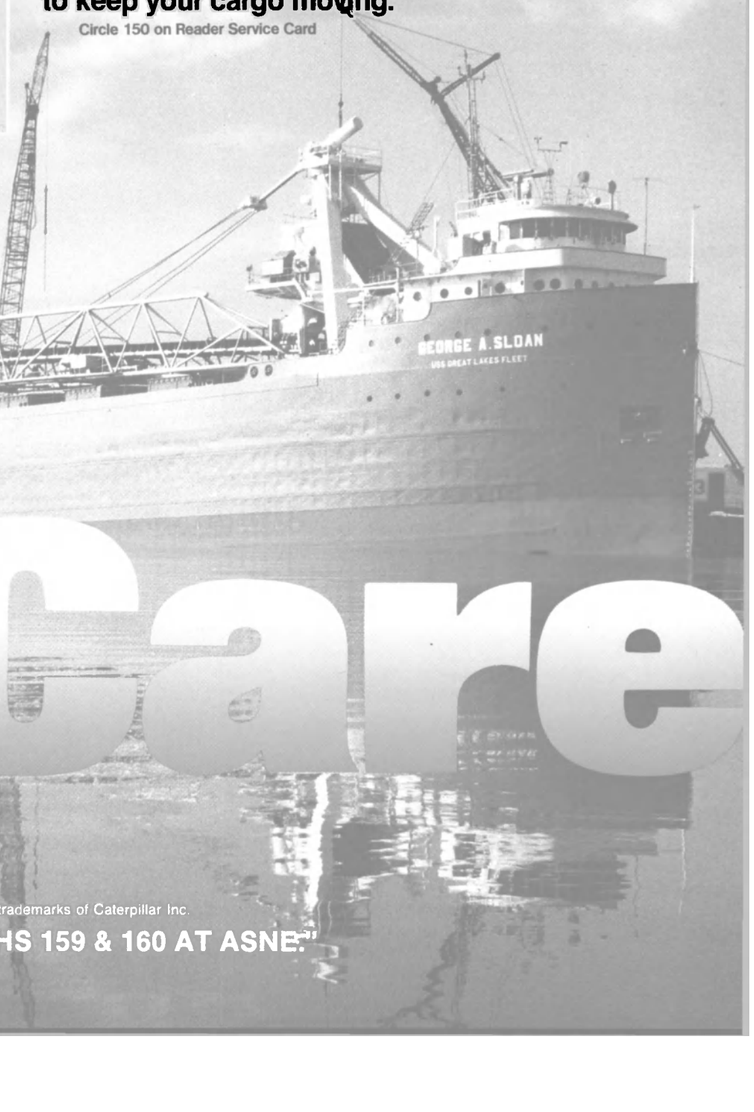

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ASNE Day

(continued)

FUTURE by **Barry Taylor** and **Rashid Khan.**

1530: TEST AND EVALUATION OF THE REVERSIBLE CONVERTER COUPLING REVERSE REDUCTION GEAR by **Robert P. Nufrio.**

1615: ADVANCED DAMAGE CONTROL SYSTEM by **David Geer.**

Thursday P.M., MAY 5
Hampton Room—Session 2B

Moderator: RAdm. **Lowell J. Holloway,** USN
Capt. **Gilbert L. Kraine,** USCG (Ret.).

1445: SHIP EM DESIGN TECHNOLOGY by **Shing Ted Li,** Ph.D.; **James C. Logan,** and **John W. Rockway,** Ph.D.

1530: PROTECTIVE DEVICES IN NAVY SHIPBOARD ELECTRICAL POWER SYSTEMS by **John I. Ykema.**

1615: COMBAT SYSTEM UPGRADE ENGINEERING by **Richard A. Holden.**

Friday A.M., MAY 6
Palladian Room—Session 3A

Moderator: RAdm. **Robert L. Topping,** USN
James F. Horton, Assistant

0845: ORDNANCE ON TARGET: THE IMPROVED 16-IN GUN WEAPON SYSTEM by LCdr. **Richard W. White,** USN, and **Thomas H. Antoniuk**

0930: SEA LANCE WEAPON DEVELOPMENT—SYSTEM AND NAVAL ENGINEERING ASPECTS OF THE CAPSULE by LCdr. **Ronald "J" Booth,** USN (Ret.).

1015: ROCKET MOTOR DESIGN FOR UNDERWATER SHOCK by **Jon J. Yagla,** Ph.D.

Hampton Room—Session 3B

Moderator: Capt. **Robert E. Kramek,** USGC
Allen G. Ford, Assistant

0845: THE ADVENT OF THE PAPERLESS SHIP by **John E. Chickering.**

0930: HISTORY OF COAST GUARD SURFACE EFFECT SHIP PERFORMANCE IMPROVEMENTS by **Gary Larimer, Joseph McCollum, Benton Schaub,** Cdr. **Donald Van Liew,** USCG, and **Charles Whipple.**

1015: A COMPUTATIONAL PROCEDURE FOR PREDICTING STRUCTURAL LOAD AND RESPONSE OF A SWATCH SHIP IN WAVES by **Edward T. Reilly, Yung S. Shin,** and **Ersnt H. Kotte.**

Friday P.M., MAY 6
Palladian Room—Session 4A

Moderator: **Robert J. Scott**
Bruce H. Barber, Assistant

1430: APPLICATION OF A GENERAL PURPOSE COMPUTER-AIDED DESIGN SYSTEM IN THE DDG-51 CLASS SHIP DESIGN PROCESS by **Randy E. Ayers, Patrick J. Callahan,** and **Ben Kassel.**

1515: AUXILIARY SHIP HULL FORM DESIGN AND RESISTANCE PREDICTION by **Siu C. Fung.**

Hampton Room—Session 4B

Moderator: **Norman O. Hammer**
Terrence R. Applebee, Assistant

1430: A MODULARIZED SHIPBOARD HELICOPTER SUPPORT SYSTEM by **Eugene J. Rodrick, David M. Maurer,** and **Raymond B. Gorchowski.**

1515: NAVAL ENGINEERING ANALYSIS by **Dale K. Pace** and **Richard J. Hunt.**

SPECIAL SESSION
Palladian Room

Moderator: RAdm. **H.L. Young,** USN

1600: USS STARK LESSONS LEARNED—MEETING FUTURE SURVIVABILITY CHALLENGES by Capt. **Raymond T. Michelini,** USN.

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ASNE Section To Hold Navy Symposium & Exhibit October 12-13 In Virginia

The American Society of Naval Engineers (ASNE) and the Commander in Chief, U.S. Atlantic Fleet will sponsor a symposium on "Naval Ship Maintenance and Modernization from the Viewpoint of Cost-Effective Readiness" on October 12-13, 1988 at the Virginia Beach Pavilion, Virginia Beach, Va.

The symposium, which is being held by the Tidewater Section of ASNE in recognition of 100 years of naval engineering by the organization, will feature major exhibits and technical papers. Some of the topics covered in the papers will include: maintenance strategy, alteration planning, ILS documentation, contracting initiatives, CAD/CAM technology, maintenance databases, new production techniques, phased maintenance, overhaul planning cycle and quality assurance items.

Booths are still available. For those interested in exhibiting at the symposium, contact: **Richards P. Dunbar,** Exhibits Chairman, Tidewater Section-ASNE, Technology Applications, Inc., 2551 Eltham Avenue, Suite M, Norfolk, Va. 23513-2484; telephone: (804) 855-2736.

MarAd Awards Contracts For RRF Ship Upkeep

The Maritime Administration (MarAd) recently awarded contracts to 10 companies to maintain 71 Ready Reserve Force (RRF) merchant ships.

The contracts, which will run five years, were for varying amounts and numbers of ships.

The following table provides details on the companies receiving contracts, value of the first year of the award and the number of ships to be maintained.

Company	1st Year $ Value (in thousands)	# Of Ships
All Marine Services	735	5
American Foreign Shipping	637	5
Amer. Overseas Marine	1,900	12
Amer. Pres. Lines	1,200	10
Int'l Marine Carriers	914	3
Interocean Mgmt	1,600	8
Marine Carriers (USA), Inc.	1,900	10
Marine Transport Lines	786	4
OMI Corp.	1,200	8
PWC Engineering	729	6

CDI Marine Appoints Gluse Operations Manager Of New Division

Michael R. Gluse

CDI Marine Company has announced the appointment of **Michael R. Gluse** to the position of operations manager for the newly established Systems Support Services (S^3) Division. This division will augment the traditional naval architecture and marine engineering support provided by CDI Marine Company by offering additional service capability in the areas of training, maintenance support and planning, direct fleet support, test and evaluation and overhaul planning.

ENVISIONS Awarded $1.3-Million Navy Contract

Enginnering Visions, Inc. (ENVISIONS) of Chula Vista, Calif., has been awarded a $1.3-million U.S. Navy contract for ship's force work package management services.

Under the five-year contract, ENVISIONS, a naval architecture and engineering firm, will serve all the surface combatants called in for overhaul on the West Coast at Pearl Harbor, Yokosuka, Japan or Subic Bay, Philippines.

Free Brochure Offered On Valve Grinders

New England Valve Grinding, Inc., South Lyme, Conn., is offering a free brochure on the Valve Grinder, a special portable tool for valve maintenance and repair.

New England Valve Grinder is the sole importer of the Valve Grinder, along with the Wire Rope Greaser, both of which are manufactured by Norwegian Valve Grinder A/S of Moss. The Valve Grinder is used to grind gate, parallel slide, globe and safety valves as well as valve gates.

The Valve Grinder is offered in three models—gate model, combi-model and globe model. The full range of machines will accommodate valve dimensions from 40 mm to 800 mm. They can be used for in-place valves and in any position between temperatures ranging from −29° to 100°C. The grinders are all easily transportable since they are packed in one or two carrying cases.

For a free copy of the Valve Grinder brochure, which contains photographs, a drawing and technical data,

Circle 80 on Reader Service Card

Aeroquip Offers Free Hose Line Training Bulletin

Efficient fluid piping—whether it means reducing downtime, minimizing maintenance problems, reducing inventory, cutting costs or speeding up production—is a concern of almost every industry.

Aeroquip Training Bulletin 582A, "How to Identify, Select and Install Hose Lines," offers helpful information on three major subjects: (1) How to identify hose and fittings; (2) How to select the proper hose; and (3) How to route and install hose lines to increase the service life of equipment and its piping components.

Aeroquip Corporation of Jackson, Mich., is a Trinova company. A worldwide leading manufactuer of fluid power and fluid system components, Aeroquip produces flexible hose, fittings and assemblies; quick disconnect and V-Band couplings; hydraulic and pneumatic cylinders; swivel joints; custom engineered rubber products; spring brakes; cargo control equipment; refrigeration/air conditioning components; diagnostic monitoring devices; and aerospace, automotive and railroad products.

For additional information and a free copy of Bulletin 582A,

Circle 28 on Reader Service Card

Woodward Governor Forms International Operations Division

Woodward Governor Company's president, **Mark Leum,** announced that vice president **Peter Gomm,** former general manager of the company's Engine and Turbine Controls Division, has been appointed general manager of the company's newly formed International Operations Division. In his new position, Mr. **Gomm** is responsible for all resources, plant, and personnel outside of North America.

John Halbrook, former operations manager of Woodward's Fort Collins plant, will replace Mr. **Gomm** as the general manager of the Fort Collins plant and the Engine and Turbine Controls Division.

According to Mr. **Leum,** the formation of the new division will allow Woodward Governor Company to more narrowly focus on its overseas business opportunities by providing products and services to an expanding marketplace. The new division also will maintain a staff dedicated to its operational needs. For the present, the new division remains headquartered in Fort Collins, Colo.

Mr. **Gomm** joined Woodward Governor Company in 1959, and was appointed a vice president of the company in 1983. He was appointed general manager of the Fort Collins plant in October, 1986.

Mr. **Halbrook** joined Woodward Governor Company in 1984. He first held the position of production manager, and was appointed operations manager in 1986. Before joining Woodward, Mr. **Halbrook** was operations manager for McGraw Edison.

The company designs and manufactures controls for prime movers. It has headquarters in Rockford, Ill., and plants in Fort Collins, Colo.; Steven Point, Wis.; Slough, England; Hoofddorp, the Netherlands; Campinas, Brazil; Tomisato, Japan; and Sydney, Australia.

For more information and free literature on Woodward Governor Company,

Circle 85 on Reader Service Card

Les Sutton Joins Ingram Barge Company As President

Les Sutton

Les Sutton has joined Ingram Barge Company as president, according to an announcement by **Neil N. Diehl,** chairman and chief executive officer.

Prior to his association with Ingram, Mr. **Sutton** was, for nine years, president of Dravo Mechling Corporation, a New Orleans-based barge company. He has also served as president of the Riverway Company in Minneapolis and has held various positions with Continental Oil, where he began his career.

Mr. **Sutton** presently serves on the Inland Waterways Users Board and was appointed by the Governor of Louisiana to the Louisiana Shallow Draft Ports and Waterways Commission. A past chairman of the National Waterways Conference, he has also chaired and been a member of the American Waterways Operators Executive Committee.

Oil Leasing In Alaska Wildlife Refuge Approved By Senate Panel

The Senate Energy & Natural Resources Committee recently approved legislation which would permit oil and gas leasing in Alaska's Arctic National Wildlife Refuge. The measure is seen as an important step toward opening of the region's coastal plain to energy exploration and development. Oil production in the area could provide a meaningful amount of work for the U.S.-flag tanker fleet.

The LCU-1680, powered by twin Detroit Diesel 12V71TI engines, was recently delivered by Moss Point Marine, Escatawpa, Miss., to the U.S. Navy.

Moss Point Marine Delivers First Of Two Navy Landing Craft

The first of two 135-foot, Landing Craft Utility (LCU) vessels being built by Moss Point Marine, Inc., Escatawpa, Miss., under an $8.6-million contract with the U.S. Navy, has been delivered.

The all-steel, twin-engine landing craft, designated LCU-1680, is capable of carrying three M-48 tanks and other vehicles or artillery and their associated personnel over hinged bow ramps directly on to the beach. After a beach landing or loading, the boat is able to retract from the beach under its own power.

The LCU is 134 feet 9 inches in length, with a 29-foot beam, and a molded draft (to top of bulwark) of 12 feet 6 inches. Displacement at full load is 404 tons. The boat's two Detroit Diesel 12V71TI diesel engines develop a total of 850 shp and can drive the vessel at 11 knots.

Accommodations for a crew of two officers and 12 enlisted men are provided.

Moss Point Marine, Inc., is one of the Trinity Marine Group shipyards which are owned by Trinity Industries, Inc., Dallas, Texas. Other shipyards in the group are Halter Marine Inc.'s facilities at Moss Point, Miss., and Lockport, La., Equitable/Halter shipyards in New Orleans and Madisonville, La., and Gretna Machine and Iron Works in Harvey, La.

For free literature on the shipbuilding and ship-repairing facilities of Trinity Industries,

Circle 15 on Reader Service Card

Unitor Completes Refrigeration Service Division Revitalization

Unitor Ships Service has recently completed a scheduled revitalization of the Refrigeration Service Division after five years in operation.

Kenneth Arntzen, who has just completed his first year as the Refrigeration Service manager for North America, says that there is a need for specialized support on most vessels today due to an increased demand on the reduced crews and the special skills required to maintain refrigeration systems.

Mr. **Arntzen** also states that Unitor's Preventive Technical Inspection/Service and Repair (PTI/SAR) program is widely accepted as a means to reduce operation costs and increase system reliability.

A refrigeration course for marine engineers will be taught at Unitor's Houston office in the near future For information on the course, contact **Kenneth Arntzen** at (212) 732-4245.

For more information and free literature on Unitor,

Circle 82 on Reader Service Card

$234,000 Contract Awarded Lexair To Provide Valves For Canadian Frigates

Lexair, Inc. of Lexington, Ky., was recently awarded a contract in excess of $234,000 ($300,000 Canadian) to provide control valves for the Canadian Navy's new patrol frigates.

Initial construction of these ships is underway at Saint John Shipbuilding, Saint John, New Brunswick. Lexair, Inc. will provide valves for six ships; there are approximately 170 valves in each shipset. The majority of these valves are electropneumatic three- and four-way valves of bronze and stainless steel construction. The controls will be manufactured in Lexington, Ky.

For free literature giving complete information on the full line of valves from Lexair,

Circle 83 on Reader Service Card

Six-Patrol-Boat 'Package' Completed By Halter Marine For Ecuadoran Navy

Halter Marine, Inc., New Orleans, La., has completed a six-patrol-boat "package" with the Navy of Ecuador. It included the production of two of the 44-foot vessels in the United States, the "kitting" and shipment of four additional boats for assembly in Ecuador, and a training program for shipyard personnel.

The all-aluminum boats, similar to the U.S. Coast Guard 42-foot cutters were designed by Halter in cooperation with the Eduadoran Navy for coastal patrol, rescue, drug interdiction and fisheries patrol.

The kitting program consisted of computerized cutting of all aluminum plates, subassembly of some components, coding of all pieces, and shipment of all machinery and equipment to complete the boats at the Astinave shipyard in Guayaquil.

Two hulls and superstructures have now been fabricated in Guayaquil.

As Astinave's workers were familiar with aluminum repair, but had little new aluminum construction experience, eight shipbuilders participated in a six-weeks training session at the Equitable/Halter shipyard in New Orleans.

They were taught aluminum welding, fitting, sandblasting and painting, machinery installation, electrical wiring, equipment installation, and carpentry and joiner work.

Each of the patrol boats is 44 feet long, with a 13.5-foot beam, and 6-foot 8-inch depth. Loaded draft is 3.5 feet.

They are powered by two military rated Detroit Diesel 8V71T1 diesels driving through Twin Disc 509 down angle gears which give the boats a service speed of 26 knots.

A partial list of communications and navigation equipment includes: VHF and SSB radios; a Furuno 2400 radar; a depth finder and magnetic compass.

Each boat also has a 250-gpm fire monitor for fighting off-ship fires.

For additional information and free literature on Halter Marine,

Circle 84 on Reader Service Card

ELECTRONICS UPDATE

Two New Low-Cost Products From Furuno: Temperature Sensor, And Net Sounder

Furuno recently introduced two new products: a low-cost temperature sensor, and a low-cost net sounder.

Furuno's new T-2000 digital temperature sensor is designed for sport fishermen.

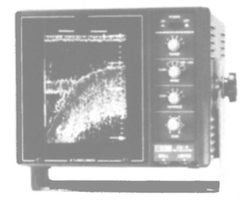
Furuno's new T-2000 digital temperature sensor is a compact, low-cost unit designed to provide accurate surface water temperature readouts for sport fishermen. The measuring range covers, for example, +23 to 95° with an accuracy of +/−0.4°F. The user has a choice of Fahrenheit or Celsius units presented on a large, backlit LCD. Trend indicator arrows show whether the temperature is rising or falling, or whether there is an abrupt change, or shear, at a current rip.

As different species of fish are likely to group within well defined temperature ranges, both high and low alarms are provided on the T-2000 to indicate visually and audibly when the temperature falls within this present zone.

The T-2000 display can be bracket or flush mounted, and the sensor is available as transom or thru-hull configurations.

Temperature data is output as Furuno CIF or NMEA 0183 formats for interfacing with a wide variety of video sounders, plotters, or printers. The T-2000 operates from 10-15 VDC and requires less than 1 W.

Furuno's newest color net sounder system, the CN-8, was specifically designed for smaller bottom draggers and midwater trawlers. Like other Furuno systems, the CN-8 is a wireless system, eliminating the need for cumbersome coax cable and heavy winch systems. The headrope unit and mounting board weigh only 11 pounds and the paravane weighs only 20 pounds, with cable.



The CN-8 net sounder, designed for smaller bottom draggers and midwater trawlers.

The CN-8 has six basic sounding ranges to 160 fathoms, with five bottom lock ranges to 20 fathoms. An eight-color display is shown on a high resolution eight-inch CRT, and may be displayed either headline-locked or a combination of headline-lock and bottom-lock expansion on the lower third of the screen. Normal headrope unit orientation is down-looking where echoes of fish, footrope and bottom are shown. This enables the user to monitor net deployment and proper set of the doors.

The acoustic data link can be as much as 350 fathoms astern of the boat and the internal NiCd may be recharged in as little as one hour, and will last up to 10 hours between charges.

Furuno's CN-8 net sounder system: compact, inexpensive, easy to use and designed for the widest range of applications for the smaller fishing vessel, or as the perfect backup unit for the largest vessels.

For more information and free literature on Furuno's new T-2000 digital temperature sensor,

Circle 12 on Reader Service Card

For free literature giving full details on Furuno's CN-8 net sounder system,

Circle 14 on Reader Service Card

Phillyship Awarded $3.8-Million Contract For Navy Frigate Work

Philadelphia-based yard Phillyship has been awarded a $3,805,219 U.S. Navy contract for the Selected Restricted Availability (SRA) for the USS Estocin (FFG-15). The Supervisor of Shipbuilding, Conversion and Repair, Brooklyn, N.Y., awarded the contract (N00024-85-H-8202).

New Company Formed For Hagglunds' Marine And Offshore Business

Hagglunds Marine & Offshore AB is the title of a new company recently formed, comprising the former Marine Division of AB Hagglund & Soner, Ornskoldsvik, Sweden. The new company, created to provide even better service to customers in the marine and offshore industries, also opened a new sales and service subsidiary in Singapore: Hagglunds South-East Asia Pte. Ltd.

Hagglunds Marine & Offshore AB, one of the world's leading manufacturers of deck and offshore cranes, is parent to the manufacturing subsidiaries Hagglunds Lidan (Sweden), Hagglunds MTT (Norway), and Hagglunds Kenz (Netherlands), as well as sales and service companies in seven other countries. There are licensees in six countries.

Besides cranes, products also include winch and mooring systems. For free literature on the products and services offered by Hagglunds Marine & Offshore,

Circle 86 on Reader Service Card

Circle 104 on Reader Service Card ➔

JJH Inc. Appoints Peter K. Weinrich Naval Architect

J.R. Miller, vice president and general manager of JJH Inc.'s Portsmouth, Va., operation, recently announced that **Peter K. Weinrich** has been appointed to the position of naval architect.

In his new postions, Mr. **Weinrich** will perform naval architectural calculations, drydocking engineering, structural analysis and other routine work in the Portsmouth office scientific department.

Prior to joining JJH, Mr. **Weinrich** worked as a naval architect at the Norfolk Naval Shipyard in the naval architectural branch, Code 253.

JJH Inc. is a leading naval engineering firm with facilities in Crystal City, Va., Portsmouth, Va., Bath, Maine, Cherry Hill, N.J., Panama City, Fla., and Long Beach, Calif.

OFFSHORE TECHNOLOGY CONFERENCE 20 1969-1988

OTC-'88

20th ANNIVERSARY SPECIAL PREVIEW

May 2-5, Houston, Texas

This year's Offshore Technology Conference (OTC '88), to be held in the Astrodomain Complex in Houston, Texas, May 2-5, will mark the event's 20th anniversary with an extensive technical program and major exhibition featuring hardware and services from the world's leading suppliers to the offshore industry. Additionally, OTC is planning to assemble a special museum to display the immense development and range of offshore technology produced during the last 20 years.

OTC primarily serves offshore industry engineers, managers, marine-related personnel and scientists from around the world. More than 1 million participants from over 90 nations have attended the combined technical programs and exhibitions of OTC since its inception in 1969. Some 30,000 are expected to attend this year's meeting, making the conference the largest Houston-area convention during 1988.

OTC currently stresses prudent management and economics of offshore operations, including petroleum exploration and production. The OTC exhibition also emphasizes efficient and cost-effective products, equipment and services for the offshore industry.

Technical Program

Over the years, the OTC technical program has earned a reputation of presenting papers that are on the leading edge of technology and cover the world in all areas of ocean resource development.

The 1988 program may well be remembered as one of the most significant ever assembled by the 130-member program committee. Eight special sessions, six topical luncheons, a management session with keynote addresses by high-ranking industry and government officials, and 30 regular sessions constitute one of the most outstanding programs in the conference's 20-year history.

The eight special sessions focus on the latest major industry projects such as the subsidence management project at Ekofisk and the Campos Basin deepwater development project. Teams of engineers, scientists and managers from Marathon Oil Co., Phillips Petroleum Co., Placid Oil Co., Elf Aquataine, Reading and Bates, Petrobras, and Hamilton Brothers have developed these sessions.

The topical luncheons at OTC will provide registrants with the opportunity to hear industry experts speak informally on a number of issues.

Some of the subjects focused on in the topical luncheons include: "The USS Monitor: Sanctuary, Resource,

(continued)

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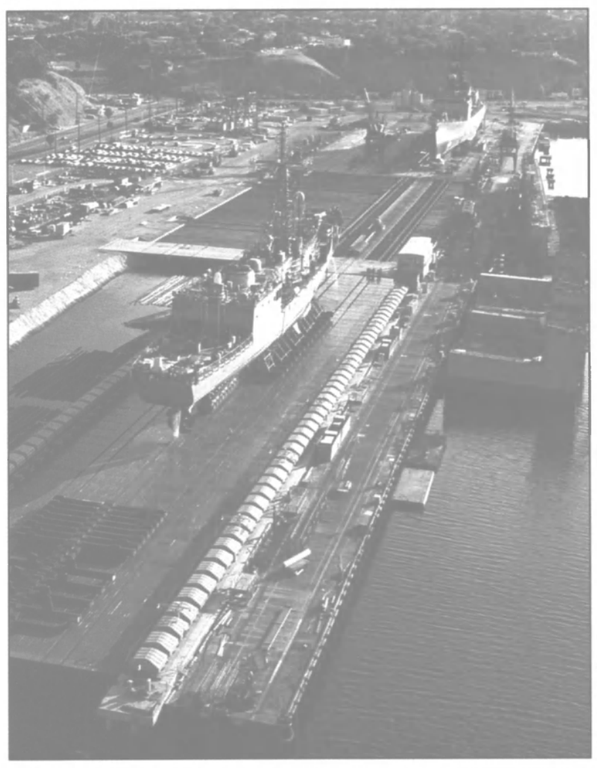
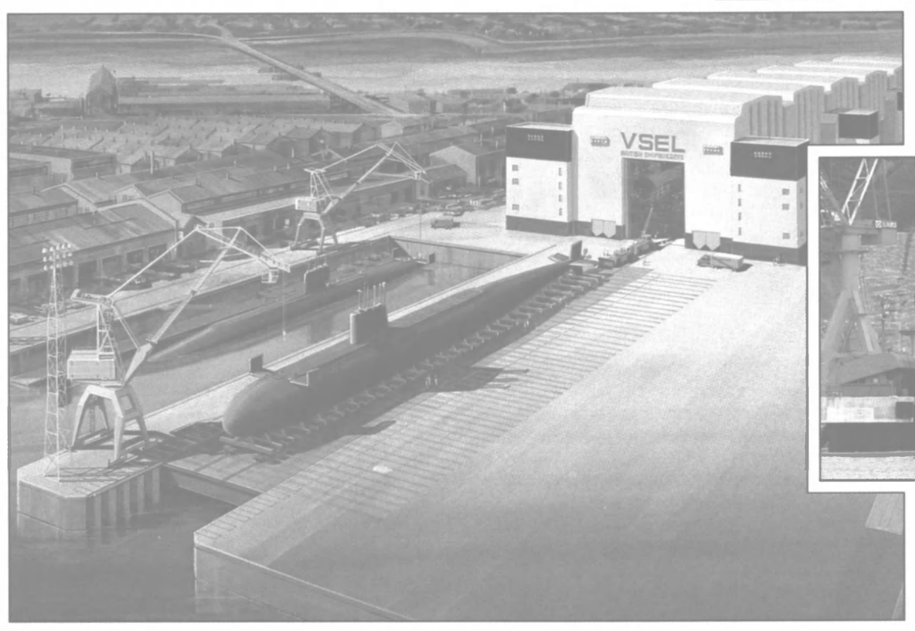


Photo by Joseph Ernest



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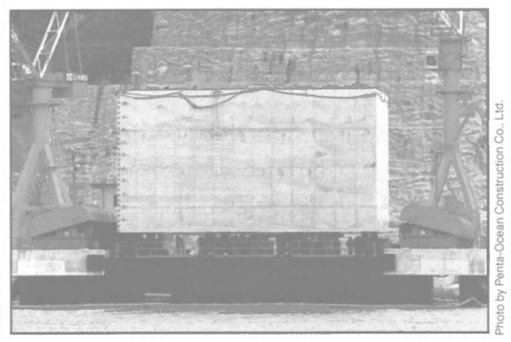

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and Challenge," by **James F. Jenkins,** U.S. Naval Civil Engineering Laboratory; "Twenty Years—Past and Future," a panel discussion with **Dillard S. Hammett,** vice president of technical and marketing for Ensco; **Dennis E. Gregg,** general manager of Conoco Inc.'s international operations; and **Benard Andrier,** vice president of research and development from E.T.P.M. of France; and "Campos Basin Discoveries," by **Wagner Freire Oliveira e Silva,** vice president of exploration and production from Petrobras.

Many other sessions stand out, as does the fact that authors and companies from 22 countries have chosen OTC as the conference for the first-ever presentation of their work.

General Session

The Canadian offshore, which carries both veteran and frontier status, is the focus of the OTC '88 general session, Wednesday afternoon, May 4. Leading industry spokesmen and government officials will discuss prospects and incentives for developing Canada's east coast, Beaufort Sea, and west coast regions. Recent legislative changes and policy amendments will be outlined. Federal and provincial government overviews will be presented along with industry's views on the technical and economic challenges. Coupled with the keynote address of Canada's Minister of Energy, Mines and Resources, **Marcel Masse,** on Tuesday, May 3, a dynamic picture of the Canadian offshore will be revealed.

Canada has long played a significant role in developing conventional and innovative offshore technology. Recent discoveries and developments in Canadian provinces and Canada's offshore frontiers rapidly are becoming key focal points for new developments.

CONFERENCE SCHEDULE

At A Glance

Monday, May 2	
Registration	8 a.m.-5 p.m.
Exhibition	9 a.m.-5 p.m.
Technical Program	9 a.m.-noon
	2-5 p.m.
Topical Luncheons	12:15-1:45 p.m.
Tuesday, May 3	
Registration	8:30 a.m.-5 p.m.
Exhibition	9 a.m.-5 p.m.
Technical Program	9 a.m.-noon
	2-5 p.m.
Awards Luncheon	12:15-1:45 p.m.
Wednesday, May 4	
Registration	8:30 a.m.-5 p.m.
Exhibition	9 a.m.-5 p.m.
Technical Program	9 a.m.-noon
	2-5 p.m.
Topical Luncheons	12:15-1:45 p.m.
Thursday, May 5	
Registration	8:30 a.m.-3 p.m.
Exhibition	9 a.m.-3 p.m.
Technical Program	9 a.m.-noon

Technical Exhibition

The OTC exhibition is the offshore industry's leading international event. More than 1,000 of the world's foremost manufacturers and suppliers of offshore equipment and services will occupy more than 17 acres of exhibit space in the Astrodomain Complex and outdoor exhibition area.

As in the 19 previous OTCs, manufacturers and suppliers of offshore equipment and services create an international marketplace.

This year's technical exhibition features companies from 16 nations, including Brazil, Canada, Finland, France, Germany, Hungary, Italy, Japan, Mexico, Monaco, the Netherlands, Norway, Sweden, Switzerland, the U.K. and the U.S.

Practical, cost-saving equipment for virtually every offshore application can be found in the OTC exhibition, from exploration, drilling and production equipment to processing, communications and transportation.

In all, some 230 product and service categories ranging from helicopters to submersible pumps will be found at the OTC exhibition.

To accommodate the vast number of visitors, the conference and exhibits will open at 9 a.m., Monday through Thursday. OTC will close at 5 p.m. on May 2-4, and at 3 p.m. on May 5.

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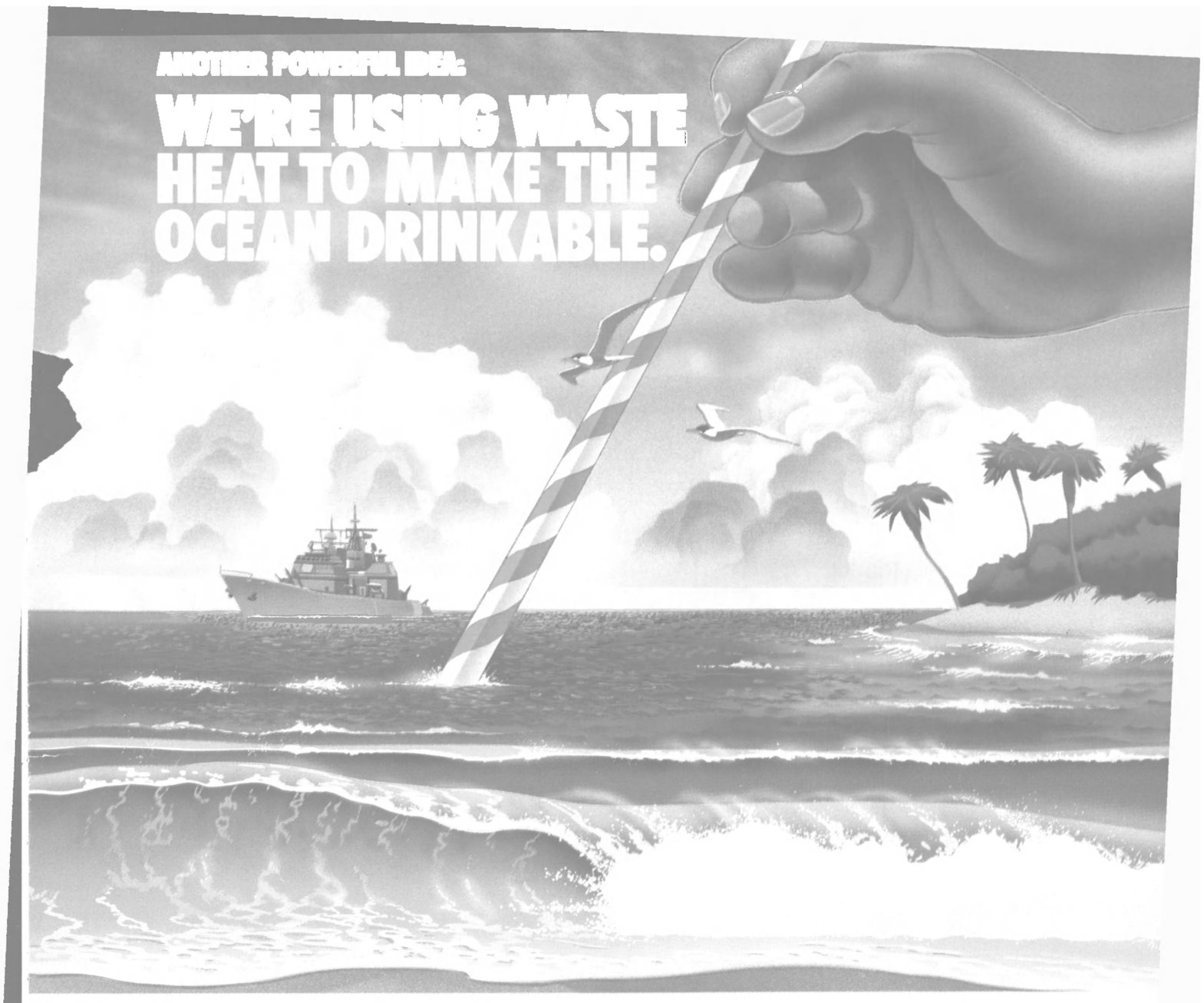

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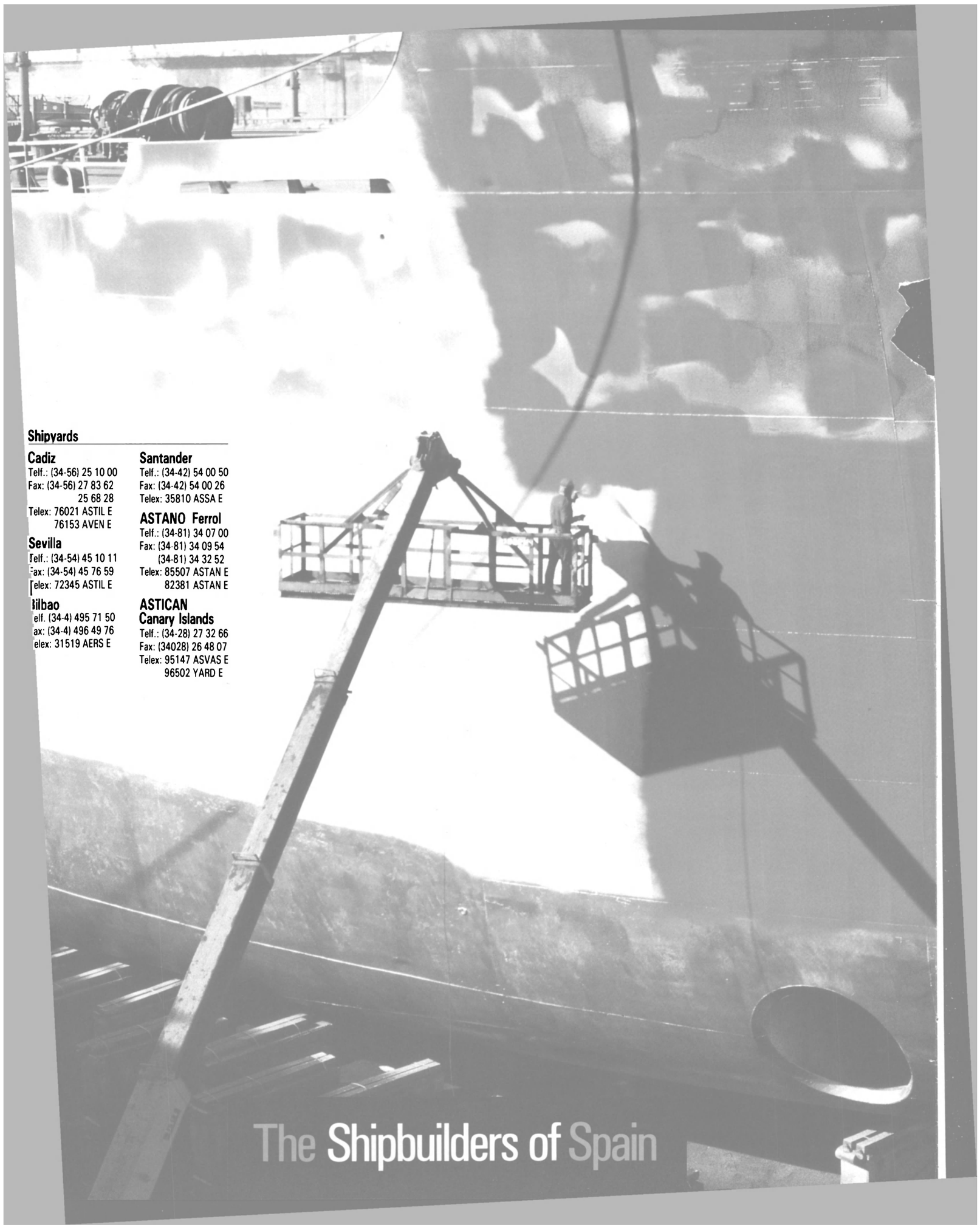

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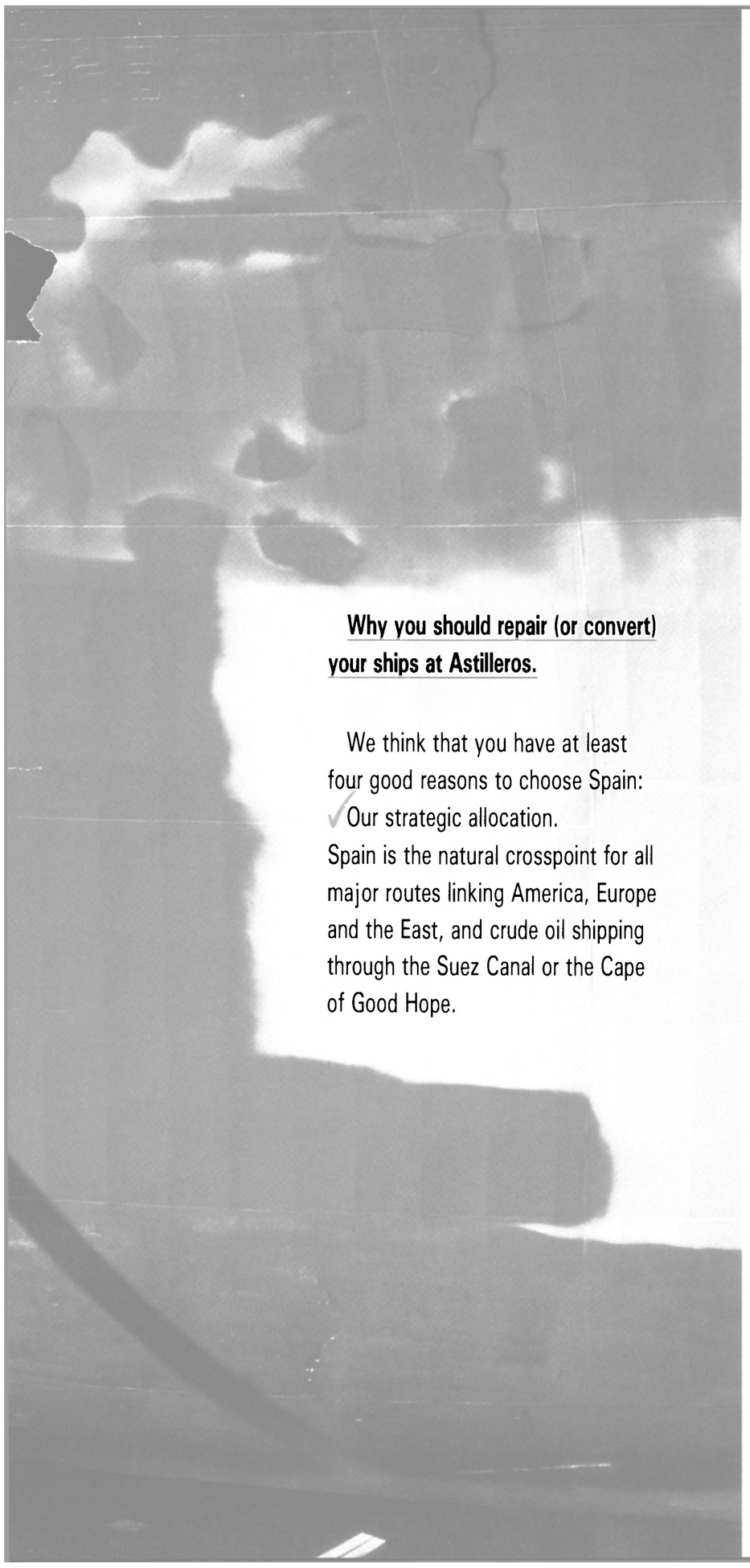

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Achievement Awards

William H. Silcox and Norwegian Contractors have been named 1988 recipients of the OTC Distinguished Achievement Award for individuals and organizations, respectively. The awards will be presented at the OTC Awards Luncheon, Tuesday, May 3.

Mr. **Silcox,** recently retired assistant general manager of Chevron Corporation's engineering department, has been recognized for his technical contributions to subsea and deepwater technology. He is credited with being the leader in the design and installation of the first deepwater subsea well completion offshore California and the first anywhere in 250 feet of water, and the first multiwell subsea template and well completion. He pioneered many other advancements that have been incorporated in 2,500-foot water depths, Arctic seas, and on floating and tension-leg structures.

Norwegian Contractors have been recognized for their pioneering work in the development, fabrication and deployment of concrete platforms for offshore oil and gas drilling and production. The company and its parent organizations constructed the world's first offshore concrete structures, including Ekofisk and Beryl A in the North Sea. Since its beginning in 1973, the company has advanced designs for deepwater, Arctic and marginal field environments to as much as 1,000 meters.

The Offshore Technology Conference represents one of the largest and comprehensive interdisciplinary, cooperative ventures in the engineering and scientific communities. OTC is one of the leading forums for the development of ocean resources. The conference is sponsored by 11 societies, including: American Institute of Mining, Metallurgical, and Petroleum Engineers; Society of Mining Engineers; The Metallurgical Society; Society of Petroleum Engineers; American Association of Petroleum Geologists; American Institute of Chemical Engineers; American Society of Civil Engineers; American Society of Mechanical Engineers—Petroleum Division; Marine Technology Society; Institute of Electrical and Electronics Engineers—Oceanic Engineering Society; Society of Exploration Geophysicists; and Society of Naval Architects and Marine Engineers.

Technical Program

Monday, May 2 • 9 a.m.–Noon

Phillip's Management of Subsidence at Ekofisk I • Room 117

OTC

5618 **Reservoir Aspects of Ekofisk Subsidence**
R.M. Sulak and J. Danielsen, Phillips Petroleum Co

5619 **Measurement of Ekofisk Subsidence**
H.C. Rentsch and M.J. Mes, Phillips Petroleum Co.

5620 **Compaction Monitoring in the Ekofisk Field**
M.L. Menghini, Phillips Petroleum Co.

5621 **Rock Mechanics of the Ekofisk Reservoir in the Evaluation of Subsidence**
J.P. Johnson, D.W. Rhett, and W.T. Siemers, Phillips Petroleum Co.

5622 **Forecasting of Ekofisk Reservoir Compaction and Subsidence by Numerical Simulation**
R.R. Boade, L.Y. Chin, and W.T. Siemers, Phillips Petroleum Co.

5623 **Casing Deformation**
A. Yudovich, L.Y. Chin, and D.R. Morgan, Phillips Petroleum Co

Reading & Bates "Zane Barnes" Drilling Rig • Room 114

OTC

Introduction to Project
R.W. Mowell, Reading & Bates Drilling Co.

5624 **Station Keeping in Deep Water—An Alternative to Dynamic Positioning**
C.V. Wolff, Reading & Bates Drilling Co.; C.J. Lohr, Shell Offshore Inc.; and D.J. Wudtke, Skagit Products

5625 **Integrated Motion, Stability, and Variable Load Design of the Trendsetter Class Semisubmersible "Zane Barnes"**
R.J. Allan, Reading & Bates Drilling Co.

5626 **Drilling and Handling Systems on the "Zane Barnes**
A. Bakonyi, Reading & Bates Drilling Co.

5627 **Subsea and Surface Well Control Systems and Procedures on the "Zane Barnes"**
G.L. Marsh, Shell Offshore Inc., and J.A. Altermann III, Reading & Bates Drilling Co.

Closing Statement on the Operating history of the "Zane Barnes"
Bruce Collip, Shell Offshore Inc.

Slowly Varying Drift Forces • Room 108

OTC

5628 **Prediction of Large Amplitude Motions and Stability of Intact and Damaged Mobile Platforms**
M. Soylemez and A. Incecik, U of Glasgow

5629 **The Influence of Directional Spreading of Waves on Mooring Forces**
J.A. Pinkster, Maritime Research Inst

5630 **Statistics of High and Low Frequency Motions of a Moored Tanker**
J.A. Pinkster, Maritime Research Inst.

5631 **Wave-Current Interaction Effects on Moored Tankers in High Seas**
J.E.W. Wichers, Maritime Research Inst.

5632 **Wave Drift Damping Influences Upon the Time Domain Simulations of Moored Structures**
G.E. Hearn, S.M. Lau, and K.C. Tong, U. of Newcastle Upon Tyne

5633 **On the Complete Quadratic Transfer Function of Slowly-Varying Wave Drift Forces and the**

Applicability of Existing Approximation Methods
M.H. Kim and D.K. Yue, Massachusetts Inst. of Technology

Offshore Platform Concepts • Room 105

OTC

5634 **Laminated Concrete for Deep Ocean Construction**
M. Karsteter, Florida State U., and W. Karsteter and M.E. Iorns, Environmental Concrete Design Inc.

5635 **Steel/Concrete/Steel Sandwich Composites in the Containment of Cryogenic Liquids Offshore**
D. Berner, Ben C. Gerwick Inc.

5636 **Concrete Hulls for Tension-Leg Platforms**
J. de Oliveira, Conoco Norway Inc., and S. Fjeld, Norwegian Contractors

5637 **The Single Leg Tension-Leg Platform: A Cost Effective Evolution of the TLP Concept**
C.N. White, P.R. Erb, and F.R. Botros, Conoco Inc.

5638 **The Compliant Composite Leg Platform: A New Configuration for Deepwater Fixed Platforms and Compliant Towers**
D. Morrison, S. Will, and D. Calkins, Hudson Engineering Corp.

5639 **The Pre-Installed Foundation Concept Jacket: A Case History**
W.G. Riles, Thronson Engineering Corp., and W.L. Thornton Jr., Cities Service Oil & Gas

Seismic Acquisition & Processing • Room 100

OTC

5640 **A Marine Digital Vibrator: Part I—Concepts and Coding Techniques**
J.V. Bouyoucos and D.E. Nelson, Hydroacoustics Inc.

5641 **A Marine Digital Vibrator: Part II—Implementation and Performance**
M.H. Houston and D.J. Martin, Western Atlas Intl.

5642 **Marine Vibrators and the Doppler Effect**
W.H. Dragoset, Western Atlas Intl.

5643 **Airgun Signature Estimation and Wavelet Processing of Marine Seismic Data**
Y. Li and R.L. Sengbush, Colorado School of Mines

5644 **Filling a Dredged Channel With Refractions**
J. Ralph and N. Masri, Geophysical Service Inc.

5645 **3D Seismic Gridding**
J.W. Lin and T.C. Holloway, Pennzoil Co.

Multiphase Flow Systems & Multiphase Pumps • Room 102

OTC

5646 **With Poseidon Technology Towards Year 2000**
E. Furuholt and T.A. Torp, Statoil

5647 **One Megawatt Subsea Mateable Electric Connector–Key to Multiphase Pump Drive Assembly—Now Field Proven**
B. Darde, Total Compagnie Française des Pétroles

5648 **Development of a Two-Phase Oil Pump for Evacuating Subsea Production Without Processing Over Long Distances "Poseidon Project 3"**
M. Arnaudeau, Inst. Français du Pétroles

5649 **A Slug Length Distribution Law For Polypnasic Transportation System**
M. Bernicot and J.M. Drouffe, Total Compagnie Français des Pétroles

5650 **An Oil Pipeline Multiphase Pressure Drop Correlation**
V. Ilic, Csiro Division of Energy Chemistry, and M. Behnia, U. of New South Wales

5651 **Experts Systems Integrity Monitoring of Submarine Pipelines**
J.J. Harvey, Alcatel Esc., and P. Tam, J.P. Kenny & Partners

Monday, May 2 • 2-5 p.m.

Phillip's Management of Subsidence At Ekofisk II • Room 117

OTC

5652 **Conceptual and Design Considerations Along the Road to Jacking**
A.G. Smith, T.E. Smith, and T. Monshaugen, Phillips Petroleum Co.

5653 **Ekofisk Jacking Project, "The Working Parts"—Jacks, Hydraulic Systems and Controls**
M. Hobley, Phillips Petroleum Co.

5654 **Jack Control System Test Bench—Testing and Simulation of Operation**
P.M. Berrefjord, Phillips Petroleum Co.

5655 **Project Management of Subsidence and Ekofisk Jacking Project**
D.J. Smith, Phillips Petroleum Co.

5656 **Communication as Secret Arms**
S. Kvendseth, Philips Petroleum Co.

5878 **Ekofisk 2/4 Tank Subsidence: Hydrodynamic Model Testing and Analysis**
P. Broughton, Phillips Petroleum Co. Norway; R.G. Standing, British Maritime Technology; and M. Vache, Doris Engineering

20 Years At & Beyond the Shelf Edge: Part I–North & South America • Room 114

OTC

Introduction to Session
S. Snelson, Shell Oil Co., and J.D. Edwards, Pecten Intl. Co.

5657 **RJS 199: First Deep Water Test in Offshore Brasil**
J. Sancho, Elf Aquitaine

5658 **Petrobras and Brazil's Offshore Exploration: 20 Years–A Review**
G. Bacoccoli and M. Bentes, Petrobras

5659 **The Role of Turbidites in Brazil's Offshore Exploration: A Review**
G. Bacoccoli and L.C. Toffoli, Petrobras

5660 **Results of Shelf and Slope Exploration Offshore U.S.A. East Coast**
B.E. Prather, Shell Offshore Inc.

5661 **An Exploration Case Study of a World Record Deep Water Wildcat Well Drilled in the Orphan Basin, Newfoundland: Blue H-28**
T. Koning, R.H. Campbell, D.C. Hibbs, and G.W. Leonhardt, Texaco Canada Resources Ltd.

Fatigue • Room 109

OTC

5662 **The Implications of New Data on the Fatigue Life Assessment of Tubular Joints**
J.J.A. Tolloczko and M. Lalani, Steel Construction Inst.

5663 **Fatigue Properties of Exemplary High Strength Steels in Sea Water**
R. Krishnakumar, A. Sablok, and W.H. Hartt, Florida Atlantic U.

5664 **New Data on Crack Growth Characteristics of Fatigue Loaded Complex Tubular Joints**
D.M. Stannard, Wimpey Offshore; and P. Forsyth and M. Lalani, Steel Construction Inst.

5665 **A Finite Element Evaluation of the Stress Intensity Factors of Surface Cracks in a Tubular T Joint**
X. Huang and J.W. Hancock, U. of Glasgow

5666 **Estimations of Stress Concentration Factor for Fatigue Design of Welded Tubular Connections**
S.Y.A Ma and I.E. Tebbett, Wimpey Offshore

5667 **Fracture Mechanics Investigation of Thickness Effects on Fatigue Life**
H.C. Rhee, Conoco Inc.

Subsea Control System Technologies • Room 108

OTC

5880 **Electrohydraulic Multiplex BOP Control Systems for Deep Water**
A.N. Vujasinovic, NL Shaffer/NL Industries Inc.

5669 **A New Generation Multiplexed B.O.P. Control System**
C.T. Tucker, Consultant

5668 **An Overview of Multiplexed E/H Subsea Control Systems**
I.M.G. Fabbri, Ferranti Subsea Systems Ltd.

5670 **Standardization of North Sea Multiplexed Control Systems for Diver Assisted Developments**
H.A. Herwig and J.M. Cattanach, Ferranti Subsea Systems Ltd.

5671 **Novel Approaches to Underwater Mateable Electric Connectors Provide Greater Design Flexibility and High Reliability**
L. van den Steen, Koninkijke Shell E&P Laboratorium

5879 **Conductive Wet Mate in North Sea Waters**
G. Porter, Kintec Inc.

Mooring Analysis & Modeling • Room 105

OTC

5672 **Model Testing of a Deepwater SALM/Tanker System**
G.D. Watson, S.P. Koch, M.J. Every, and J.D.K. Wilson, Exxon Production Research Co.

5673 **Verification of Computer Analysis on a Unique Deep Water Mooring System**
L.C. Kwok, Arctec Offshore Corp.

5674 **A Summary of a Multi-Faceted Physical Model Test Program of a Floating Drilling and Production System**
T.L. Johnson, J.E. Halkyard, B. Smith, and L.C. kwok, Arctec Offshore Corp.; D. Peterson, Maxwell Laboratories; and S. Hanna, Placid Oil Co.

(continued)

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OTC 88

(continued)

5675 **Model Test of a Pile Founded Guyed Tower**
F. Rajabi and A. Mangiavacchi, Brown & Root U.S.A. Inc.

5676 **Practical Estimation of Mooring Line Damping**
E. Huse, Marintek A/S

5677 **Validation of a Static Mooring Analysis Model With Full-Scale Data**
S.R. Karnoski and P.A. Palo, Naval Civil Engineering Laboratory

Seismic Imaging • Room 100

OTC

5678 **Forward Modeling Gives Enhanced Geologic Interpretation In Complex Borehole Geometries**
E. Adams, Schlumberger Offshore Services

5679 **The Salt Solution: An Integrated Interpretation Around a Salt Dome Structure in the Gulf of Mexico**
K. Kreigh, Schlumberger Offshore Services

5680 **Seismic Imaging of Salt: A Panel Discussion**
J.D. Johnson, Amoco Africa & Middle East

Arctic Technology • Room 102

OTC

5682 **Ice Impact Simulation**
V. Vivatrat, Simtex Inc.

5683 **Arctic Platform Upgrading by Structural Grouting**
M.G. Jefferies, Gulf Canada Resources Ltd.

5684 **Mollkpaq Core Densification With Explosives at Amauligak F-24**
H.R. Stewart, Gulf Canada Resources Ltd., and W.E. Hodge, Phoenix Engineering Ltd.

5685 **Experience With Drillship Operations in the U.S. Beaufort Sea**
S.L. Thibodeaux and R.M. Hinkel, Union Oil Co. of California, and A. Hippman, Canadian Marine Drilling Ltd.

5686 **Arctic Island Abandonment: Planning and Implementation for Mukluk Island**
L.M. Anderson and C.B. Leidersdorf, Standard Alaska Production Co.

5687 **An Experimental Study on Abrasion of Concret Due to Sea Ice**
Y. Itoh, A. Yoshida, M. Tauchiya, and K. Katoh, Taisei Corp., and K. Sasaki and H. Saeki, Hokkaido U.

Tuesday, May 3 • 9 a.m.–Noon

Hamilton Brothers Argyle & Duncan • Room 117

OTC

5688 **Overview of Block 30/24 UKCS Operations**
E.A. Blair, Hamilton Brothers Oil & Gas Ltd.

5689 **The Subsea Systems of the Block 30/24 Fields**
D.S. Huber, Hamilton Brothers Oil & Gas Ltd., and R.C. Burnett, Coflexip (UK) Ltd.

5690 **The U.K. Department of Energy's View of the Design and Operation of Subsea Gas Lift Systems**
T.A.F. Powell, U.K. Department of Energy

5691 **Acoustic Telemetry, A Comparison of Theory and Practice**
R.J. Trett, Ferranti Subsea Systems Ltd.

5692 **Conversion of the "Deepsea Pioneer"**
R.A. Byrans, Hamilton Brothers Oil & Gas Ltd.

5693 **The Operational Aspects and Reliability of Floating Production Systems**
L.V. McGuire and J. Kerns, Hamilton Brothers Oil & Gas Ltd.

20 Years at & Beyond the Shelf Edge: Part II—Gulf of Mexico • Room 114

OTC

5694 **Deep Water Exploration Patterns in the Gulf of Mexico: An Overview and Historical Perspective of Past Successes and Failures**
R.D. Beu, Chevron U.S.A. Inc.

5695 **Evolution of Facies Interpretation of the Shelf-Slope: Application of the New Eustatic Framework to the Gulf of Mexico**
J.B. Sangree, P.R. Vail, and R.M. Sneider, Richardson, Sangree & Sneider

5697 **East Breaks 160 Field: A Model for Deep-Water Exploration and Development**
J.W. Schanck, C. Cobb, and M. Ivey, Unocal

5696 **East Breaks 160 Field on the Offshore Texas Shelf Edge: A Model for Deep Water Deposition of Sands**
P. Braithwaite, J.M. Armentrout, C.E. Beeman, and S.J. Malecek, Mobil E&P Services Inc.

5698 **The Deep Water Jolliet Field: The Evolution of a Flexure Trend Oil Discovery**
M. Dildine, W. Prescott, and S. Scott, Conoco Inc.

Design & Analysis of Bottom Founded Structures • Room 108

OTC

5699 **Calibration of the Draft LRFD-RP2A for Fixed Platforms**
F. Moses and R.D. Larrabee, Shell Oil Co.

5700 **Tubular Member Strength Equations for LRFD**
J.W. Cox, TERA Inc.

5701 **Structural Upgrading of Original Bass Strait Platforms**
C.D. Shinners and R.J. Edwardes, Esso Australia Ltd., and J.R. Lloyd, Exxon Production Research Co.

5702 **An External Scheme for Strengthening Offshore Platforms**
W.J. Game and B.F.W. Clement, Esso Australia Ltd.

5703 **Development of AIM (Assessment, Inspection, Maintenance) Programs for Fixed and Mobile Platforms**
R.G. Bea and F.J. Puskar, PMB Systems Engineering Inc.; C. Smith, Minerals Management Service; and J.S. Spencer, U.S. Coast Guard

5704 **Pile Driving Dynamic Loads on Offshore Structures**
N. Ellis and M.M. Salama, Conoco Inc.

Diving & Repair Operations • Room 105

OTC

5705 **An Investigation Into the Dynamics of the ESV ICLAIR Wet-Diving Bell During Launch and Recovery**
D. Vassalos, D. Dutta, and P.G. MacGregor, U. of Strathclyde

5706 **Efficiency of Divers in Working Depths of Down to 600 m**
P.B. Bennett, Duke U. Medical Ctr., and J. Holthaus, H-G. Schafstall, and K. Schmidt, GKSS Research Ctr.

5707 **Diving Data Bank—A Unique Tool for Diving Procedures Development**
J.P. Imbert and M. Bontoux, Comex Services

5708 **Using the RS125 Welding Robot for Offshore Nodes Construction**
J. Berne and G. Livet, Ateliers et Chantirs de Marseille Provence

5709 **Repair of Cracked and Dented X-Node on an Offshore Platform**
D.E. Williams and M.D. Callan, Earl & Wright Consulting Engineers

5710 **The Strength of Grout Filled Damaged Tubular Members**
L.F. Boswell and C. D'Mello, The City U.

Geophysical Interpretation • Room 100

OTC

5711 **Preliminary Analysis of Petroleum Potential of Offshore California State Lands From Point Arguello to the Santa Maria River**
R.A.P. Gaal, California State Lands Commission, and A.J. Garber Jr., Garber Geophysical Inc.

5712 **Geophysical Investigation of Potential Geologic Constraints, Offshore Point Arguello to the Santa Maria River, CA**
R.A.P. Gaal, California State Lands Commission, and D. Cummings, Leighton & Assocs. Inc.

5713 **A Geophysical Survey of the Sierra Leone Continental Margin**
E.J.W. Jones and B.R. Clayton, U. College London; and C.C.S. Mgbatogu, U. of Benin

5714 **Shallow Gas in the Oseberg, Brage, and Troll Fields, North Sea**
S.R. Ostmo and G. Butenko, Norsk Hydro

5715 **The Seismic Expression of the Jurassic Norphlet Pinchout, Wiggins Arch, Southwest Alabama, U.S.A.**
J.R. Halverson, Seismic Interpretations Inc.

5716 **Neogene Third and Fourth Order Seismic Cycles in Louisiana Offshore**
A. Lowrie and K. Hoffman, Consultant

Mooring Components • Room 102

OTC

5757 **Floating Hose-Strings Attached to a CALM Buoy**
T. O'Donaghue and A.R. Halliwell, Papua New Guinea U. of Technology

5718 **Factors Influencing the Endurance of Steel Wire Ropes for Mooring Offshore Structures**
A.E. Potts, C.R. Chaplin, and N.R.H. Tantrum, U. of Reading

5719 **A Method of Evaluating and Extending the Useful Life of In-Service Anchor Chain**
M. Dowdy and D. Graham, Diamond M Co.

5720 **Tension and Bending Fatigue of Synthetic Ropes**
S.R. Karnoski and F.C. Liu, Naval Civil Engineering Laboratory

5721 **OCIMF Hawser Guidelines and Procedures**
J.F. Flory, Tension Technology Intl.

5722 **New Approach to TLP Tethering**
J. Rasmussen, Gotaverken Arendal AB

Tuesday, May 3 • 2–5 p.m.

Subsea Production Facilities • Room 117

OTC

5723 **A Review of the Satellite Production System for Ness Development**
R.J. Emptage, Cameron Iron Works Ltd.

5724 **A Review of the Development of the SWOPS Subsea Production System**
R. Wilson, Cameron Iron Works Ltd.

5725 **Postmortem of the Ship Shoal No. 274: Underwater Completion No. 1**
R.L. Wilkins, Cameron Iron Works USA Inc., and J.D. Smith, Shell Offshore Inc.

5726 **Low Cost Wireline and Logging Operations on a Satellite Well Using a Subsea Wireline Lubricator Deployed From a Dynamically Positioned Monohull**
A.S. Warne and D.G. Clarke, BP Petroleum Development Ltd.

5727 **Underwater Testing of Oseberg ROV Tooling**
E.W. Hughes and R.D. Jolly, Ocean Systems Engineering Inc.

5728 **A New Approach to Subsea Intervention**
K. Hoglund, Asea Oil & Gas

20 Years At & Beyond the Shelf Edge: Part III—Europe & Scientific Ocean Drilling • Room 114

OTC

5729 **The Petroleum Geology and Resource Potential of the Norwegian Offshore**
H.C. Ronnevik and W.G. Karlsson, Saga Petroleum

5730 **Deep Offshore Exploration in the Southern Adriatic Sea**
G. Paulucci, L. Novelli, D. Bongiorni, and R. Cesaroni, AGIP S.p.A.

5731 **Hydrocarbon Shows in Scientific Ocean Drilling**
B.J. Katz, Texaco Inc., and K-C. Emeis, Texas A&M U.

5732 **Exploration on the Goban Spur: A Deep Plateau on the Continental Margin Southwest of Ireland**
D.R. Cook, Esso E&P U.K. Ltd.

5733 **The Occurrence and Significance of Sub-Seafloor Gas**
G.F. Claypool, Mobil R&D Corp., and G.N. Foss, Texas A&M U.

5734 **Casablanca Oilfield, Spain: A Karsted Carbonate Trap at the Shelf Edge**
D.E. Orlopp and K.R. Williamson, Chevron Oil Co. of Spain

Wind & Wave Environment • Room 109

OTC

5735 **Wind Spectra and Gust Factors Over Water**
G.Z. Forristall, Shell Development Co.

5736 **Wind Turbulent Spectra for Design Consideration of**

Applicability of Existing Approximation Methods
M.H. Kim and D.K. Yue, Massachusetts Inst. of Technology

Offshore Platform Concepts • Room 105

OTC

5634 **Laminated Concrete for Deep Ocean Construction**
M. Karsteter, Florida State U., and W. Karsteter and M.E. Ioms, Environmental Concrete Design Inc.

5635 **Steel/Concrete/Steel Sandwich Composites in the Containment of Cryogenic Liquids Offshore**
D. Berner, Ben C. Gerwick Inc.

5636 **Concrete Hulls for Tension-Leg Platforms**
J. de Oliviera, Conoco Norway Inc., and S. Fjeld, Norwegian Contractors

5637 **The Single Leg Tension-Leg Platform: A Cost Effective Evolution of the TLP Concept**
C.N. White, P.R. Erb, and F.R. Botros, Conoco Inc.

5638 **The Compliant Composite Leg Platform: A New Configuration for Deepwater Fixed Platforms and Compliant Towers**
D. Morrison, S. Will, and D. Calkins, Hudson Engineering Corp.

5639 **The Pre-Installed Foundation Concept Jacket: A Case History**
W.G. Riles, Thronson Engineering Corp., and W.L. Thornton Jr., Cities Service Oil & Gas

Seismic Acquisition & Processing • Room 100

OTC

5640 **A Marine Digital Vibrator: Part I—Concepts and Coding Techniques**
J.V. Bouyoucos and D.E. Nelson, Hydroacoustics Inc.

5641 **A Marine Digital Vibrator: Part II—Implementation and Performance**
M.H. Houston and D.J. Martin, Western Atlas Intl.

5642 **Marine Vibrators and the Doppler Effect**
W.H. Dragoset, Western Atlas Intl.

5643 **Airgun Signature Estimation and Wavelet Processing of Marine Seismic Data**
Y. Li and R.L. Sengbush, Colorado School of Mines

5644 **Filling a Dredged Channel With Refractions**
J. Ralph and N. Masri, Geophysical Service Inc.

5645 **3D Seismic Gridding**
J.W. Lin and T.C. Holloway, Pennzoil Co.

Multiphase Flow Systems & Multiphase Pumps • Room 102

OTC

5646 **With Poseidon Technology Towards Year 2000**
E. Furuholt and T.A. Torp, Statoil

5647 **One Megawatt Subsea Mateable Electric Connector–Key to Multiphase Pump Drive Assembly—Now Field Proven**
B. Darde, Total Compagnie Française des Pétroles

5648 **Development of a Two-Phase Oil Pump for Evacuating Subsea Production Without Processing Over Long Distances "Poseidon Project 3"**
M. Arnaudeau, Inst. Français du Pétroles

5649 **A Slug Length Distribution Law For Polyphasic Transportation System**
M. Bernicot and J.M. Drouffe, Total Compagnie Français des Pétroles

5650 **An Oil Pipeline Multiphase Pressure Drop Correlation**
V. Ilic, Csiro Division of Energy Chemistry, and M. Behnia, U. of New South Wales

5651 **Experts Systems Integrity Monitoring of Submarine Pipelines**
J.J. Harvey, Alcatel Esc., and P. Tam, J.P. Kenny & Partners

Monday, May 2 • 2-5 p.m.

Phillip's Management of Subsidence At Ekofisk II • Room 117

OTC

5652 **Conceptual and Design Considerations Along the Road to Jacking**
A.G. Smith, T.E. Smith, and T. Monshaugen, Phillips Petroleum Co.

5653 **Ekofisk Jacking Project, "The Working Parts"—Jacks, Hydraulic Systems and Controls**
M. Hobley, Phillips Petroleum Co.

5654 **Jack Control System Test Bench—Testing and Simulation of Operation**
P.M. Berrefjord, Phillips Petroleum Co.

5655 **Project Management of Subsidence and Ekofisk Jacking Project**
D.J. Smith, Phillips Petroleum Co.

5656 **Communication as Secret Arms**
S. Kvendseth, Phillips Petroleum Co.

5878 **Ekofisk 2/4 Tank Subsidence: Hydrodynamic Model Testing and Analysis**
P. Broughton, Phillips Petroleum Co. Norway; R.G. Standing, British Maritime Technology, and M. Vache, Doris Engineering

20 Years At & Beyond the Shelf Edge: Part I–North & South America • Room 114

OTC

Introduction to Session
S. Snelson, Shell Oil Co., and J.D. Edwards, Pecten Intl. Co.

5657 **RJS 199: First Deep Water Test in Offshore Brasil**
J. Sancho, Elf Aquitaine

5658 **Petrobras and Brazil's Offshore Exploration: 20 Years–A Review**
G. Bacoccoli and M. Bentes, Petrobras

5659 **The Role of Turbidites in Brazil's Offshore Exploration: A Review**
G. Bacoccoli and L.C. Toffoli, Petrobras

5660 **Results of Shelf and Slope Exploration Offshore U.S.A. East Coast**
B.E. Prather, Shell Offshore Inc.

5661 **An Exploration Case Study of a World Record Deep Water Wildcat Well Drilled in the Orphan Basin, Newfoundland: Blue H-28**
T. Koning, R.H. Campbell, D.C. Hibbs, and G.W. Leonhardt, Texaco Canada Resources Ltd.

Fatigue • Room 109

OTC

5662 **The Implications of New Data on the Fatigue Life Assessment of Tubular Joints**
J.J.A. Tolloczko and M. Lalani, Steel Construction Inst.

5663 **Fatigue Properties of Exemplary High Strength Steels in Sea Water**
R. Krishnakumar, A. Sablok, and W.H. Hartt, Florida Atlantic U.

5664 **New Data on Crack Growth Characteristics of Fatigue Loaded Complex Tubular Joints**
D.M. Stannard, Wimpey Offshore; and P. Forsyth and M. Lalani, Steel Construction Inst.

5665 **A Finite Element Evaluation of the Stress Intensity Factors of Surface Cracks in a Tubular T Joint**
X. Huang and J.W. Hancock, U. of Glasgow

5666 **Estimations of Stress Concentration Factor for Fatigue Design of Welded Tubular Connections**
S.Y.A Ma and I.E. Tebbett, Wimpey Offshore

5667 **Fracture Mechanics Investigation of Thickness Effects on Fatigue Life**
H.C. Rhee, Conoco Inc.

Subsea Control System Technologies • Room 108

OTC

5880 **Electrohydraulic Multiplex BOP Control Systems for Deep Water**
A.N. Vujasinovic, NL Shaffer/NL Industries Inc.

5669 **A New Generation Multiplexed B.O.P. Control System**
C.T. Tucker, Consultant

5668 **An Overview of Multiplexed E/H Subsea Control Systems**
I.M.G. Fabbri, Ferranti Subsea Systems Ltd.

5670 **Standardization of North Sea Multiplexed Control Systems for Diver Assisted Developments**
H.A. Herwig and J.M. Cattanach, Ferranti Subsea Systems Ltd.

5671 **Novel Approaches to Underwater Mateable Electric Connectors Provide Greater Design Flexibility and High Reliability**
L. van den Steen, Koninklijke Shell E&P Laboratorium

5879 **Conductive Wet Mate in North Sea Waters**
G. Porter, Kintec Inc.

Mooring Analysis & Modeling • Room 105

OTC

5672 **Model Testing of a Deepwater SALM/Tanker System**
G.D. Watson, S.P. Koch, M.J. Every, and J.D.K. Wilson, Exxon Production Research Co.

5673 **Verification of Computer Analysis on a Unique Deep Water Mooring System**
L.C. Kwok, Arctec Offshore Corp.

5674 **A Summary of a Multi-Faceted Physical Model Test Program of a Floating Drilling and Production System**
T.L. Johnson, J.E. Halkyard, B. Smith, and L.C. kwok, Arctec Offshore Corp.; D. Peterson, Maxwell Laboratories; and S. Hanna, Placid Oil Co.

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5675 **Model Test of a Pile Founded Guyed Tower**
F. Rajabi and A. Mangiavacchi, Brown & Root U.S.A. Inc.
5676 **Practical Estimation of Mooring Line Damping**
E. Huse, Marintek A/S
5677 **Validation of a Static Mooring Analysis Model With Full-Scale Data**
S.R. Karnoski and P.A. Palo, Naval Civil Engineering Laboratory

Seismic Imaging • Room 100

OTC
5678 **Forward Modeling Gives Enhanced Geologic Interpretation in Complex Borehole Geometries**
E. Adams, Schlumberger Offshore Services
5679 **The Salt Solution: An Integrated Interpretation Around a Salt Dome Structure in the Gulf of Mexico**
K. Kreigh, Schlumberger Offshore Services
5680 **Seismic Imaging of Salt: A Panel Discussion**
J.D. Johnson, Amoco Africa & Middle East

Arctic Technology • Room 102

OTC
5682 **Ice Impact Simulation**
V. Vivatrat, Simtex Inc.
5683 **Arctic Platform Upgrading by Structural Grouting**
M.G. Jefferies, Gulf Canada Resources Ltd.
5684 **Mollkpaq Core Densification With Explosives at Amauligak F-24**
H.R. Stewart, Gulf Canada Resources Ltd., and W.E. Hodge, Phoenix Engineering Ltd.
5685 **Experience With Drillship Operations in the U.S. Beaufort Sea**
S.L. Thibodeaux and R.M. Hinkel, Union Oil Co. of California, and A. Hippman, Canadian Marine Drilling Ltd.
5686 **Arctic Island Abandonment: Planning and Implementation for Mukluk Island**
L.M. Anderson and C.B. Leidersdorf, Standard Alaska Production Co.
5687 **An Experimental Study on Abrasion of Concret Due to Sea Ice**
Y. Itoh, A. Yoshida, M. Tsuchiya, and K. Katoh, Taisei Corp., and K. Sasaki and H. Saeki, Hokkaido U.

Tuesday, May 3 • 9 a.m.–Noon

Hamilton Brothers Argyle & Duncan • Room 117

OTC
5688 **Overview of Block 30/24 UKCS Operations**
E.A. Blair, Hamilton Brothers Oil & Gas Ltd.
5689 **The Subsea Systems of the Block 30/24 Fields**
D.S. Huber, Hamilton Brothers Oil & Gas Ltd., and R.C. Burnett, Coflexip (UK) Ltd.
5690 **The U.K. Department of Energy's View of the Design and Operation of Subsea Gas Lift Systems**
T.A.F. Powell, U.K. Department of Energy
5691 **Acoustic Telemetry, A Comparison of Theory and Practice**
R.J. Tratt, Ferranti Subsea Systems Ltd.
5692 **Conversion of the "Deepsea Pioneer"**
R.A. Byrans, Hamilton Brothers Oil & Gas Ltd.
5693 **The Operational Aspects and Reliability of Floating Production Systems**
L.V. McGuire and J. Kerns, Hamilton Brothers Oil & Gas Ltd.

20 Years at & Beyond the Shelf Edge: Part II—Gulf of Mexico • Room 114

OTC
5694 **Deep Water Exploration Patterns in the Gulf of Mexico: An Overview and Historical Perspective of Past Successes and Failures**
R.D. Beu, Chevron U.S.A. Inc.
5695 **Evolution of Facies Interpretation of the Shelf-Slope: Application of the New Eustatic Framework to the Gulf of Mexico**
J.B. Sangree, P.R. Vail, and R.M. Sneider, Richardson, Sangree & Sneider
5697 **East Breaks 160 Field: A Model for Deep-Water Exploration and Development**
J.W. Schanck, C. Cobb, and M. Ivey, Unocal
5696 **East Breaks 160 Field on the Offshore Texas Shelf Edge: A Model for Deep Water Deposition of Sands**
P. Braithwaite, J.M. Armentrout, C.E. Beeman, and S.J. Malecek, Mobil E&P Services Inc.
5698 **The Deep Water Jolliet Field: The Evolution of a Flexure Trend Oil Discovery**
M. Dildine, W. Prescott, and S. Scott, Conoco Inc.

Design & Analysis of Bottom Founded Structures • Room 108

OTC
5699 **Calibration of the Draft LRFD-RP2A for Fixed Platforms**
F. Moses and R.D. Larrabee, Shell Oil Co.
5700 **Tubular Member Strength Equations for LRFD**
J.W. Cox, TERA Inc.
5701 **Structural Upgrading of Original Bass Strait Platforms**
C.D. Shinners and R.J. Edwardes, Esso Australia Ltd., and J.R. Lloyd, Exxon Production Research Co.
5702 **An External Scheme for Strengthening Offshore Platforms**
W.J. Game and B.F.W. Clement, Esso Australia Ltd.
5703 **Development of AIM (Assessment, Inspection, Maintenance) Programs for Fixed and Mobile Platforms**
R.G. Bea and F.J. Puskar, PMB Systems Engineering Inc.; C. Smith, Minerals Management Service; and J.S. Spencer, U.S. Coast Guard
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Wind & Wave Environment • Room 109

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5735 **Wind Spectra and Gust Factors Over Water**
G.Z. Forristall, Shell Development Co.
5736 **Wind Turbulent Spectra for Design Consideration of**

Offshore Structures
M.K. Ochi, U. of Florida, and Y.S. Shin, American Bureau of Shipping

5737 **The Assessment of a Microwave Directional Wave Measurement System on a Floating Production Platform**
I. Borthwick, BP Intl. Ltd.; O. Gronlie, MIROS; and L. Vartdal, SINTEF

5738 **Three Simple Models of Hurricane-Driven Waves and Currents**
C. Cooper, Conoco Inc.

5739 **The Measurement and Analysis of Typhoon Generated Waves in South China Sea Near Hong Kong**
C.W. Li, S.T. Luk, and K.K. Wong, Hong Kong Polytechnic; and J.C. Chen and Q.G. Cai, South China Sea Inst. of Oceanology

5740 **The Development of an Environmental Database**
C.K. Grant, BP Intl.

Offshore Pipelines—Design and Operation • Room 108

OTC

5741 **Sour Gas Pipelines**
J. Leslie and J.A. King, British Petroleum Co. plc

5742 **Point Arguello Rield Trunkline Directionally Drilled Shore Crossing**
D.K. Black, P.R. Seligman, and L.C. McClure, Chevron Pipe Line Co.

5743 **Cleaning of the Valhall Offshore Oil Pipeline**
R. Marshall, Amoco Norway Oil Co.

5744 **Use of Glass Fiver Reinforced Plastics (GRP) in Sea Water Pipe Systems Offshore**
R. Stokke, Center for Industrial Research

5745 **The Problem of Gas Permeation in the Flexible Pipe**
Y. Makino, T. Okamoto, Y. Goto, and M. Araki, Furukawa Electric Co. Ltd.

5746 **A High Performance Thermal Insulation Coating for Subsea Pipelines**
S. Aabo, and J.M. Lunde, A/S ScanPaint, and A. Grutter, Ciba-Geigy

Mooring & Offloading Systems • Room 105

OTC

5747 **Statfjord "A" Offshore Loading System (UKOLS)**
K. Mork, Ugland Engineering A/S

5748 **High Pressure Gas Swivel to Enhance Production From Floating Units**
B.B. D'Hautefeuille, Single Buoy Moorings Inc.; M.J.W. Schouten, Technische U. Eindhoven; and D. Taylor-Jones, Single Buoy Moorings Inc.

5749 **The Deepest Multi-Articulated Column Application for Permanent Mooring System**
R. Jenin and G. Alexis, E.M.H.

5750 **Disconnectable Mooring System for the First Floating Production Storage and Offloading Unit in Bohai Bay (People's Republic of China)**
Z.Q. Zhao, China Natl. Offshore Oil Corp., and G. Haythornthwaite and O. Jeannin, Single Buoy Moorings Inc.

5751 **Offshore Petroleum Discharge System: Application of Commercial Technology to Military Operational Requirements**
M.D. Brightwell, SOFEC Inc.; J.R. Exell, U.S. Dept. of the Navy; and W.R. Stevens, Uniroyal Manuli Rubber (U.S.A.) Inc.

5752 **A Portable, Rapid-Installable Mooring Dolphin System**
T.S. Lin, Naval Civil Engineering Laboratory

Marathon Studies the Near Surface • Room 100

OTC

5753 **Seismic No-Data Zone, Offshore Mississippi Delta: Part I—Acoustic Characterization**
A.R. Tinkle, K.R. Wener, C.A. Meeder, J.F. Huff, D.M. Johns, and J.A. May, Marathon Oil Co.

5754 **Seismic No-Data Zone, Offshore Mississippi Delta: Part II—Using Geologic Information to Predict Acoustic Properties**
J.A. May, C.A. Meeder, A.R. Tinkle, and K.R. Wener, Marathon Oil Co.

5755 **Seismic No-Data Zone, Offshore Mississippi Delta: Part III—Modeling Statics Corrections**
C.A. Meeder, J.A. May, A.R. Tinkle, K.R. Wener, and J.F. Huff, Marathon Oil Co.

5756 **Cost Effective Marine Static Application**
J. Kruppenbach, M. Carter, and S. Mobley, Energy Analysts Inc., and E. Lawrence and R. Matthews, TLC Data Processing Center Inc.

5757 **The Importance of Integrated Studies to Deepwater Site Investigation**
K.J. Campbell, G.W. Quiros, and A.G. Young, McClelland Engineers Inc.

5758 **Technical Advances in High Resolution Hazard Surveying, Deep Water, Gulf of Mexico**
D.B. Prior, Louisiana State U., E.H. Doyle, Shell Offshore Inc; M.J. Kaluza, and M.M. Woods, McClelland Engineers Inc.; and J.W. Roth, Shell Offshore Inc.

Foundations & Soil Behavior • Room 102

OTC

5759 **Chemical Grouting of Soil Beneath the North Rankin "A" Platform, Australia**
P.K. Curne, Koninklijke Shell E&P Laboratorium; C.J. Kenter, Woodside Offshore Petroleum; D.L. Roberts, Koninklijke Shell E&P Laboratorium; and P. Whitehead, Woodside Offshore Petroleum

5760 **Behavior of Piles Under Axial Cyclic Loading**
M.D. Lambson, McClelland Ltd., and W.H. Craig, U. of Manchester

5761 **Reserve Capacity Design of Piled Foundations for Deep Water Compliant Platforms**
J.M.E. Audibert, The Earth Technology Corp.; J.L. Mueller, Conoco Inc.; and S.R. Bamford and J.D. Bogard, The Earth Technology Corp.

5762 **Potential Effects of Jackup Spud Can Penetration on Jacket Piles**
U.A. Mirza, M. Sweeney, and A.R. Dean, McClelland Ltd.

5763 **Non-Linear Seismic Response Analysis of an Offshore Platform in Liquifiable Soil**
R. Vanzini, AGIP S.p.A.; P. Rossetto, Tecnomare S.p.A.; and G. Ferro and G.M. Manfredini, D'Appolonia S.p.A.

5764 **Scour Around Jackup Rig Footings**
M. Sweeney and R.M. Webb, BP Intl. Ltd., and R.W. Wilkinson, HRL

Wednesday, May 4 • 9 a.m.–Noon

Elf's East Frigg Development Project • Room 117

OTC

5765 **The East Frigg Development Concept**
B. Renard, J.I. Pedersen, and M. Freudenreich, Elf Aquitaine Norge A/S

5766 **East Frigg Subsea Station**
M. Freudenreich, D. Maupu, and A. Viard, Elf Aquitaine Norge A/S

5767 **The East Frigg Remote Control System**
D. Maupu, G. Barnay, and S. Austboe, Elf Aquitaine Norge A/S

5768 **East Frigg Subsea Wells**
D. Simondon, Elf Aquitaine Norge A/S

5769 **Design, Installation and Connection of Subsea Lines on East Frigg Field**
R. Pelleau, J. Rouillon, and T. Fausa, Elf Aquitaine Norge A/S

5770 **Diverless Installation of Templates and Pipeline on East Frigg Field**
H. Lomenech, K. Ohm, and P. Longuet, Elf Aquitaine Norge A/S

Platform Construction & Installation • Room 114

OTC

5771 **Some Practical Aspects of Offshore Grouting Operations**
J.G. Mayfield, Lowell Johnston & Assocs., and E.E. Strohbeck, Shell Oil Co.

5772 **Development of a Swaged Pile/Sleeve Connection System for Application on a North Sea Jacket**
J. Clarke, J.W. Peel, and J.M. Lowes, BP Intl. Ltd.

5773 **Fabrication of the Harmony and Heritage Jackets for 1200 Feet and 1075 Feet of Water in California's Santa Barbara Channel**
R.K. Fry and D.E. Rhude, Exxon Co. U.S.A.

5774 **Overview of the Brae "B" Platform Installation**
B.T. McCaslin and N.J. Cresswell, Marathon Oil U.K. Ltd.

5775 **Record Breaking Air Lifting Operation on the Gullfaks C Project**
G. Kure and O.J. Lindaas, Norwegian Contractors

5776 **Subsea Installation Using Vibratory Piling Hammers**
G. Jonker and P. Middendorp, Intl. Construction Equipment B.V.

Seafloor Surveying & Mapping • Room 109

OTC

5777 **Low Cost Rotating Hydrophone Arrays for Three-Dimensional Underwater Acoustic Mapping**
I.G. Bryden, Heriot-Watt U.

5778 **Adding Synoptic Sub-Bottom Profiles to Side-Scan Images and Swath Bathymetry**
J.G. Blackinton and D.M. Hussong, Seafloor Surveys Intl. Inc.

5779 **High-Resolution Acoustic Seafloor Mapping**
D.M. Hussong, D. Hills, J.F. Campbell, and D. Peat, Seafloor Surveys Intl. Inc.

5780 **Accurate Acoustic Position Monitoring of Deep Water Geophysical Towfish**
N.C. Kelland, Sonardyne Ltd.

5781 **Appplicaiton of Side-Scan Sonar for Inspection of Coastal Structures**

(continued)

J. Clausner and J. Pope, USAE Waterways Experiment Station

5782 **Sinup: A New Equipment for Acquisition and Processing of Very High Resolution Seismic Reflection**
G. Lericolais, J.P. Allénou, S. Berné, and J. Hervéou, Inst. Francais pour l'Exploitation de la MER

Structure Response to Wind, Waves, & Currents • Room 108

OTC

5783 **Compliant Tower Response Prediction Procedures**
K.M. Steele, L.D. Finn, and K.F. Lambrakos, Exxon Production Research Co.

5784 **Random Wave Design Procedures**
C.Y. Chen and Steve Will, Hudson Engineering Corp.

5785 **Measured and Predicted Dynamic Behavior of the Gullfaks A Platform**
M. Hoeklie, Norwegian Contractors, and O.E. Hansteen, Norwegian Geotechnical Inst.

5786 **Damping and Natural Frequencies During Towout and Installation of the Gullfaks A. Platform**
T. Lokna and K.A. Nyhus, Norwegian Contractors

5787 **Measured and Predicted Wave Forces on Offshore Platforms**
R.G. Bea, S.F. Pawsey, and R.W. Litton, PMB Systems Engineering Inc.

5788 **Verification of a Wave Loading Model for Non-Linear Analysis of Wave Induced Response of Offshore Structures**
N. Spidsoe and H.P. Brathaug, SINTEF

Drilling Technology & Equipment • Room 105

OTC

5789 **Intelligent Status Analysis for Real Time Rig Site Drilling Engineering**
P. Parigot, Total Marine Norsk A/S, and L. Havrevold, Nordic Offshore Systems A/S

5790 **Application of a Modified Subsea Wellhead System on Molikpaq, A Mobile Arctic Caisson Rig in the Canadian Beaufort Sea**
K.J. Fardy and S.P. Singeetham, Gulf Canada Resources Ltd.

5791 **Prediction of Casing Running Loads in Directional Wells**
E.E. Maidla and A.K. Wojtanowicz, Louisiana State U.

5792 **Redevelopment of Helder Field With Horizontal Wells**
B. Davis, C. Stewart, and D. Williamson, Unocal Netherlands B.V.

5793 **Surface Gas Detector for Oil-Based Drilling Mud**
P. Skalle and A.L. Podio, U. of Texas, and H.K. Johnsen, Petreco A/S

5794 **The Ocean Drilling Program: Results From the Third Year of Field Operations**
P.D. Rabinowitz, L.E. Garrison, J.G. Baldauf, S. DeVoge, B. Harding, R. Merrill, A.W. Meyer, and R.E. Olivas, Texas A&M U.

Marine Riser Systems • Room 100

OTC

5795 **Vibrations of Lazy "S" Risers Due to Vortex Shedding and in-Line Forces Under Lock-In**
K. Zare and T.K. Datta, Indian Inst. of Technology

5796 **Comparison of Dynamic Response of Alternate Flexible Riser Products**
S. Karve and J.F. McNamara, McDermott Intl. Inc.

5797 **Laboratory Testing of High Performance Composite Tubes for TLP Production Risers**
C.P. Sparks, Inst. Français du Pétrole, and P. Tamarelle, Aerospatiale

5798 **At-Sea Test of the Structural Response of a Large Diameter Pipe Attached to a Surface Vessel**
L.A. Vega, Pacific Intl. Center for High Technology Research

5799 **Dynamic Behavior and Cost Comparison of Surface and Nonsurface Piercing Deep Water Production Risers**
E. Valenzuela, Cameron Offshore Engineering Inc.

5800 **Analysis of a 6,000 Meter Riser System**
J. Teräva, K. Ikonen, and M. Pakarinen, Rauma-Repola RR Oceanics

Floating Drilling & Production • Room 102

OTC

5801 **Model Tests of a Generic Semisubmersible Related to a Study Assessing Stability Criteria**
J.I. Collins, Arctec Offshore Corp., and T.W. Grove, American Bureau of Shipping

5802 **Development of a New Stability Criteria for Mobile Offshore Drilling Units**
S.G. Stiansen, Y.S. Shin, and G. Shark, American Bureau of Shipping

5803 **The Effects of Gas-Aerated Seas Upon the Buoyancy and Stability of Floating Drilling Vessels**
K.J. Wilson, Marathon Oil Co.

5804 **Floating Production Vessel Cost Consideration**
V. von Hoffman, Gotaverken Arendal AB

5805 **Ocean El Dorado: A Deepwater Floating Production System**
L.G. Chabot and E.N. Corona, Ocean Drilling & Exploration Co.

5806 **Facilities Design in the UKCS-Setting Weight Objectives by Multi-Variant Analysis of Past Designs**
D.D. Ruie, Esso Exploration & Production UK Ltd., and R.R. Huddleston, Matthew Hall ECNON Ltd.

Wednesday, May 4 • 2–5 p.m.

Petrobras Campos Basin Deep Water Development • Room 114

OTC

5807 **An Overview on Campos Basin**
W. Freire, Petrobras

5808 **Deepwater Drilling**
A.L. Cordeiro and L.C. Chita, Petrobras

5809 **Critical Points for the Project of Very Deep Subsea Completions**
J.M.F. Filho, Petrobras

5810 **Campos Basin Production Efficiency: A Failure Mode Analysis**
J.B. de Oliveira, Petrobras

5811 **Production and Utilization of Natural Gas Using Floating Production Systems**
A.R. Patricio, Petrobras

5812 **Technological Constraints in Deep Offshore Exploitation**
P. Barusco and C. Vianna, Petrobras

Welding • Room 109

OTC

5813 **Friction Welding Duplex Stainless Steel**
D. Nicholas, The Welding Inst., and R.A. Teale, Brown & Root

5814 **Repair and Analysis of Cracking in the Murchison Flare Boom**
E.R.G. Bell and D.G. Morgan, Conoc (U.K.) Ltd.

5815 **Automated, Hyperbaric Trunkline Tie-Ins at Platform Hermosa, Point Arguello Field**
D.K. Black, P.R. Seligman, D.J. Sullivan, and D. Marshall, Chevron Pipe Line Co.

5816 **Welding Pollution Within the Atmosphere of an Underwater Simulator**
H. Boie, K. Schmidt, and W. Schnegelsberg, GKSS Research Ctr.

5817 **Abrasive Water Jetting: A New Aid to Welded Fabrications**
C.G. King, The Welding Inst.

5818 **Welding Method Down to 500 msw**
P. Loebel, I.F. dos Santos, H.G. Schafstall, and P. Szelagowski, GKSS Research Ctr.

Construction, Support & Service Vessels • Room 108

OTC

5819 **Computer Analysis of Heavy Lift Operations**
H.J.J. van den Boom, R.P. Dallinga, and J.N. Dekker, Maritime Research Inst. Netherlands

5820 **On the Upgrading of SSCV Hermod to Increase Its Lifting Capacity and the Dynamics of Heavy Lift Operations**
F.C. Michelsen and A. Coppers, Heerema Engineering Services B.V.

5821 **Hydrodynamic Responses of Derrick Vessels in Waves During Heavy Lift Operation**
P. Mukerji, McDermott Inc.

5822 **Prediction of Motion, Wave Load, and Sling Tension of Crane Vessels During Heavy Lift Operations**
X. Zheng and R.C. McGregor, U. of Glasgow

5823 **World's First Convertible Floating Dry Dock**
R.E. Heger, Crandall Dry Dock Engineers Inc.

5824 **Full Scale Measurements on the Semi-Submersible "Uncle John"**
G.E. Jackson and D. Wilson, British Maritime Technology Ltd.

Completion Technology & Equipment • Room 105

OTC

New Design Considerations for Tubing and Casing Buckling in Inclined Wells
J.B. Cheatham and Y.C. Chen, Rice U.

New Platform Well Tieback System Reduces Installation Time and Construction Costs
T.C. Tyer, W.A. Abreo, and B.J. Saucier, Cameron Iron Works U.S.A. Inc.

Well Logging in Extended-Reach and Horizontal Boreholes
W.H. Fertl, Western Atlas Intl. Inc.
Completion and Stimulation of Monterey Formation Pt. Pedernales Field, Santa Maria Offshore Basin
T.J. McCollum, Unocal, and A.F. Frederick, Dowell Schlumberger
Deepwater North Sea Development—Snorre Field Concept
L. Olen, Sagga Petroleum A/S/Esso Norge A/S, and J. Sandnes, Saga Petroleum a.s.

Offshore Platforms/Structural Member Design • Room 100

OTC

5831 **New Data on the Ultimate Strength of Tubular Welded K-Joints Under Moment Loads**
S.Y.A. Ma and I.E. Tebbett, Wimpey Offshore

5832 **Large Scale Ultimate Strength Testing of Tubular K-Braced Frames**
K.G. Grenda, Exxon Production Research Co.; W.C. Clawson, Consultant; and C.D. Shinners, Esso Australia Ltd.

5833 **New Test Data on the Strength of Grouted Connections With Closely Spaced Weld Beads**
P. Forsyth and I.E. Tebbett, Wimpey Offshore

5834 **Experimental Study of Ultimate Strength of Stiffened Circular Cylindrical Shell**
K. Sekita, H. Kimura, H. Okubo, and Y. Takahashi, Nippon Steel Corp.

5835 **How Ring Stiffeners Can Affect Tubular Node Fatigue and Failure Mode**
G.M. Brown, R. Holmes, and J. Kerr, natl. Engineering Laboratory

5836 **Design of Concentric Tubular Members**
G.R. Imm and B. Stahl, Amoco Production Co.

Production Facilities & Process Technology • Room 102

OTC

5837 **An Offshore Dehydration System for the Production of the Norphlet Sour Gas in Mobile Bay**
R.A. Alexander, Mobil E&P Southeast Inc.

5838 **Process in Motion: Experience With Oil-Water Separation on the Hutton TLP**
E.R.G. Bell, F. Skilback, A. Stirling, and N. Meldrum, Conoco (U.K.) Ltd.

5839 **Operating Experience and the Expansion of Water Injection Facilities on the Statfjord Field to Over 1 Million Barrels Water/Day**
W.P. Hancock, Statoil

5840 **New, Compact Nitrogen Injection System may be Installed at Ekofisk.**
H.G. Gran, G. Hartmann, A. Vatne, and H.K. Delback, Norsk Energi

5841 **Design and Commissioning of the Gullfaks "A" Gas Compression System**
K. Solemslie and T. Bradley, Statoil

5842 **Use of Unmanned Platforms in an Offshore Environment**
A.W. C. Chui, Esso Production Malaysia Inc.

Thursday, May 5 • 9 a.m.–Noon

Placid's Gulf of Mexico Project • Room 117

OTC

5843 **An Overview of Green Canyon Block 20 Development**
A. Gautreaux, Placid Oil Co.

5844 **Deepwater Moorings for Green Canyon Block 29 Development**
P.G.S. Dove and G.B.H. Breese, Omega Marine Services intl., and S. Hanna, Placid Oil Co.

5845 **Modification of the Penrod 72 for Green Canyon Block 29 Project**
J.J. Filson, Omega Marine Engineering Systems Inc., B. Pickard, Placid Oil Co.; and L. Edelblum and A. Henderson, Omega Marine Engineering Systems Inc.

5846 **Non-Integral Production Riser for Green Canyon Block 29 Development**
E.A. Fisher, Cameron Offshore Engineering Inc., and D. Schnittker, Placid Oil Co.

5847 **Subsea Template and Trees for Green Canyon Block 29 Development**
M. Teers, Vetco Gray Inc.; T. Stroud, Placid Oil Co.; and T. Masciopinto, Vetco Gray Inc.

5848 **Production and Workover Control System for Green Canyon Block 29 Development**
M. Prichar, and D. Smith, Vetco Gray Inc., and K. Walsh, Placid Oil Co.

5849 **Subsea Pipelines and Flowlines for Green Canyon Block 29 Development**
R.J. Brown, R.J. Brown and Assocs., and B. Pickard and K. Walsh, Placid Oil Co.

Offshore Pipelines—Stability • Room 114

OTC

5850 **Effect of Spoilers on Submarine Pipeline Stability**
C.H. Hulsbergen and R. Bijker, Delft Hydraulics

5851 **Forces on Pipelines in Trenches and on Partially Buried Pipelines**
V. Jacobsen, Danish Hydraulic Inst.

5852 **Field Measurements of Wave Forces in Submarine Pipelines**
R.H. Wilkinson and A.C. Palmer, Hydraulics Research Ltd

5853 **Lateral Resistance of Marine Pipelines on Sand**
A. Palmer, Andrew Palmer & Assocs. Ltd.; J. Stenfeldt, Danish Geotechnical Inst.; and V. Jacobsen, Danish Hydraulic Inst.

5854 **Wave Induced Forces on Pipelines Buried in a Poro-Elastic Sea Bed**
K. Kokkinowrachos and J. Herb, Technical U. Aachen

5855 **Self Burial of Laterally Loaded Offshore Pipelines in Weak Sediments**
D.V. Morris, R.E. Webb, and W.A. Dunlap, Texas A&M U.

Geotechnical Engineering • Room 109

OTC

5856 **Storm-Induced Cyclic Effects on Seafloor Soils**
T. Kagawa, Wayne State U.

5857 **Physical Modeling of Absorption Gradients in Marine Sediments**
P.R. Ogushwitz, Consultant

5858 **Growth of Plastic Zone in Porous Medium Around a Wellbore**
C. Hsiao, Halliburton Services

5859 **Rheologic Mechanism for the Remnant Stress in Pressure-Grouted Soils**
C.E. de M. Fernandes, Tecnosolo S.A.

Ocean Minerals & Mining • Room 108

OTC

5860 **Marine Minerals: Technology for Mining and At-Sea Processing**
W.E. Westermeyer, U.S. Congress Office of Technical Assessment

5861 **Marine Minerals Research and Development at the Universities of Hawaii and Mississippi**
H.J. Olson, P.K. Takahashi, and E.C. Higgins, U. Hawaii

5862 **An Innovation in the Integrated Ocean Mining and Transportation System**
G.N. Mukherji and S.C. Misra, Goa Group of Companies Consultancies

5863 **Finnish Programs Related to Deep Sea Mining**
P. Pale Rauma-Repola Ocean Mining

5864 **Use of Shallow Seismic Surveys in the Exploration of Nearshore Placers Off Maharashtra Coast, India**
G.V. Rajamanickam, A.R. Gujar, and M.V. Ramanna, Tamil U.

5865 **Seabed Mining Complex Project**
V.A. Fedoseev, Inst. of Ocean Economics

Acoustic Photo Imaging & Microwave Instrumentation • Room 105

OTC

5866 **A Unique High Resolution Seismic Reflection System Using An Electomagnetic Acoustic Source and a Surface Reflection Canceling Hydrophone**
E.E. Sylvester, Williamson & Assocs. Inc., and C.R.B. Lister, U. of Washington

5867 **Multiple Sound Source Synchronizer for Seafloor Surveying**
J.C. Phillips, J.L. Abbott, and C. de Moustier, Scripps Inst. of Oceanography

5868 **Acoustic Emission Monitoring of Corrosion Fatigue in Large Scale Model Testing**
M. Hval, SINTEF, and M. Eriksen, ROBIT A/S

5869 **Underwater Detection and Monitoring of Fatigue Cracks on A Dynamic Loaded K-Node With Internal Stiffeners**
H. Haugland and S. Lövaas, Norsk Hydro

5870 **Photon Backscatter Imaging Devices for NDT Inspection of Offshore TLP Riser, Tendons, and Other Subsea Components**
LL. Morgan, IDM Corp., and R.M. Crane and F.P. Kealey, VMW Industries

5871 **A Microwave-Based Wellhead Water-Cut Monitor**
J.D. Marrelli and E.L. Dowty, Texaco

Platform Reuse & Safety • Room 102

OTC

5872 **Drain System Modifications Enhance Platform Safety**
J. Wong, Esso Production Malaysia Inc.

5873 **Offshore Testing of a Personnel Transfer System**
H. El Tahan and D. Howard, Arctec Newfoundland Ltd.

(continued)

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5874 **Evaluation of Alternative International Standards for Removal of Disused Offshore Platforms**
D.M. Bovet, G. Margolis, and C.J. Reinhardt, Temple, Barker & Sloane Inc.

5875 **Engineering the Cost Out of Platform Removals and Salvage**
D.J. Hardin, T.G. Jackson, and W.L. Alexander Jr., Brown & Root U.S.A. Inc.

5876 **Case History for Rigs to Reefs: A Cost Effective Alternative for Platform Abandonment**
W.L. Thornton Jr. and J.C. Quigel, Cities Service Oil & Gas Corp.

5877 **Model Test and Field Survey for a Floating Artificial Reef Moored by New Parallel Wire Cable**
K. Sekita, H. Kimura, H. Okubo, and Y. Takahashi, Nippon Steel Corp

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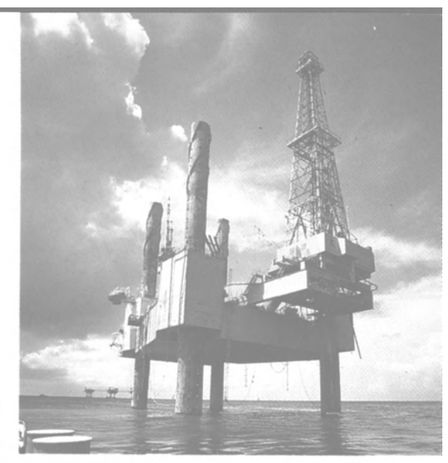

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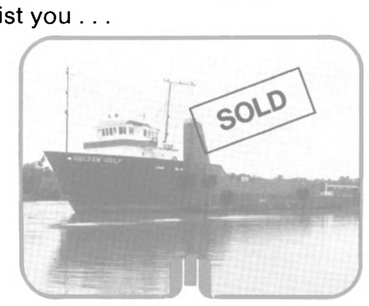

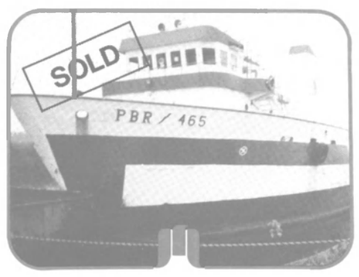

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  STRAINSERT
CHEMLINK PETROLEUM
CIA BRASILEIRA DE AMARRAS -
  BRASILAMARRAS
COASTEL COMMUICATIONS
COFLEXIP
COMPOSITE CATALOG
COMPRESSION COAT
COMPRESSOR ENGINEERING
COMPUTERIZED OILFIELD SERVICES
COMSAT MARITIME SERVICES
CONDUX S.A. DE C.V.
CONFAB INDUSTRIAL
CONMACO
CONNECTOR SYSTEMS DIV.
CONSORZIO BERGAMO EXPORT
CONSTRUCCIONES FLUVIALES Y
  MARITIMAS
CONSTRUCCONES MARITIMAS
  MEXICANAS
CONSTRUCCIONES PROTEXA
CONSTRUCCIONES Y EQUIPOS
  LATINOAMERICANOS

CONSUB EQUIPAMENTOS E SERVICOS
COUGAR TOOL DIV. OF OIL PATCH GROUP
CPI SALES
CRADDOCK ENGINEERING
CROMARTY INDUSTRIES GROUP
  CROMARTY FIRTH ENGINEERING
  CROMARTY FIRTH PORT
  DIAGNOSTICS AND MEASURING SYSTEMS
  HIGHLAND DEEPHAVEN
  MCDERMOTT
  OSPREY ELECTRONICS
  PETROPROJECTS
  PROFESSIONAL AND TECHNICAL MARKETING SERVICES
  TISEST
  WELDEX (INVERGORDON)
CRONIN TUBULARS
CROON ELEKTROTECHNIEK
CROUSE-HINDS ELECTRO
CUDD PRESSURE CONTROL
CUMMINS ENGINE
CUSTOM DIE AND INSERT
THE DASPIT COMPANIES
  DASPIT BROS. MARINE DIVERS
  DASPIT
  DASPIT MFG.
  SAFE DIVE SYSTEMS
DATASONICS
DAVID TAYLOR RESEARCH CENTER
DAVIS-LYNCH
DE HOOP GROENPOL
  SUBMARINE PIPELINE SPOILER
DELMAG-PILECO
DEL NORTE TECHNOLOGY
DEN-CON TOOL
DENHOLM OFFSHORE
DERRICK EQUIPMENT
DETECTOR ELECTRONICS
DIAB-BARRACUDA
DIAGNOSTICS AND MEASURING SYSTEMS
DIAMANT BOART STRATABIT (DBS)
DIGITRAN
DIXIE ELECTROPLATING
DOCK EXPRESS CONTRACTORS
DORIS SURVEY
THE DOUBLE LIFE
DOWNING WELLHEAD EQUIPMENT
DRACO SPRING MFG.
DRAGERWERK AKTIENGESELLSCHAFT
DRECO ENERGY SERVICES
  ABCOR EQUIPMENT
  GRIFFITH OIL TOOLS
  KREMCO
DRILLING SPECIALTIES
DUCTOS MARTIMOS MEXICANOS
DUKANE CORP., SEACOM DIV.
DUNLOP OFFSHORE
DUNLOP OIL & MARINE
  DUNLOP ARMALINE
  DUNLOP SEAMARKS
DVC ENERGY PRODUCTS
DYER EQUIPMENT
E-KON-O VALVES
EARMARK, INC.
EBAC
ECA/CSI
EES
EG & G ENVIRONMENTAL EQUIPMENT DIV.
ELECTRONIC RIG STATS
EMERSON & CUMING, INC./ A GRACE
ENERGY, MINES & RESOURCES CANADA
ENERPAC
ENGINEERING CYBERNETICS
ENGINEERING SPECIALTIES
ENI GROUP COMPANIES
  AGIP (ENI GROUP)
  NUOVO PIGNONE (ENI GROUP)
  SAIPEM (ENI GROUP)
  SNAM
  SNAMPROGETTI (ENI GROUP)
  TECNOMARE (ENI GROUP)
EPC LABS
EQUIPAMENTOS VILLARES
ERA HELICOPTER
ERICHSEN INDUSTRIES
ESAB ENGINEERING
ESGARD
EVERGREEN HELICOPTERS
  EVERGREEN AIR CENTER
  EVERGREEN AIRCRAFT SALES AND LEASING
  EVERGREEN AVIATION GROUND LOGISTICS ENTERPRISES
  EVERGREEN INTERNATIONAL AIRLINES
F L SURPRENANT WIRE AND CABLE
F.H. MALONEY/ENVIRONOCON
FAHRAMET STEEL CASINGS
  (DIV. OF FALCONBRIDGE)
FAIREY MARINTEKNIK
FARR CANADA
FAST SYSTEMS
FERRANTI PLC
FERRANTI COMPUTER SYSTEMS
FERRANTI OFFSHORE
FERRANTI SUBSEA SYSTEMS
FIBERGLASS UNLIMITED
FINCANTIERI
FINNISH FOREIGN TRADE ASSOCIATION
  MARIOFF
  METSA-SERLS GROUP
  NELES LOKOMO
  RAUMA-REPOLA OFFSHORE
  RAUMA-SUBSEA
  WIIK & HOGLUND
FIRST
FISHER CONTROLS
JOHN W. FISK CO. (INSURANCE)
FLEETWOOD OFFSHORE SURVIVAL CENTRE
FLUENTA
FMC CORP., PETROLEUM EQUIPMENT GROUP
  FMC FLUID CONTROL
  WELLHEAD EQUIPMENT OPERATION
FOCAL MARINE
FORAQUIP INTERNATIONAL SERVICES
  FORASERV OF AMERICA
  OBR OILFIELD PRODUCTS
FOWLER RESOURCES
FRANKLIN ELECTRIC
FRENCH EXPOSITIONS
  COFLEXIP
  DORIS SURVEY
  ECA/CSI
  FIRST
  GEP
  PEROLO
  TECHNIP
THE FURUKAWA ELECTRIC
L. F. GAUBERT & CO.
  KEYSTONE STEEL & WIRE
  MARINE INDUSTRIAL CABLE

Circle 162 on Reader Service Card →

Electric Drive.

This Vessel Is Powered By One Of The Few Systems That Wasn't Built By GE.

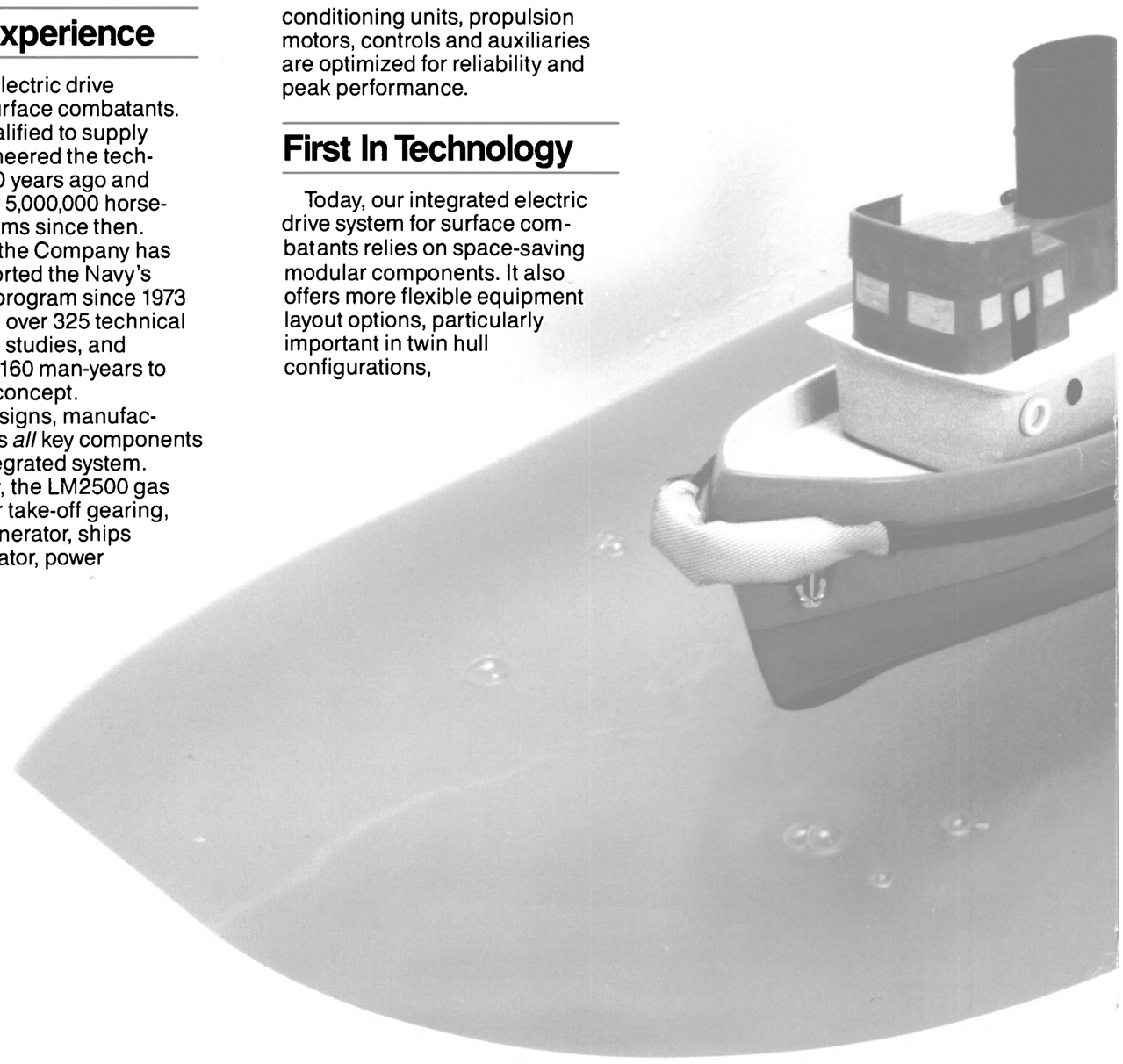
First In Experience

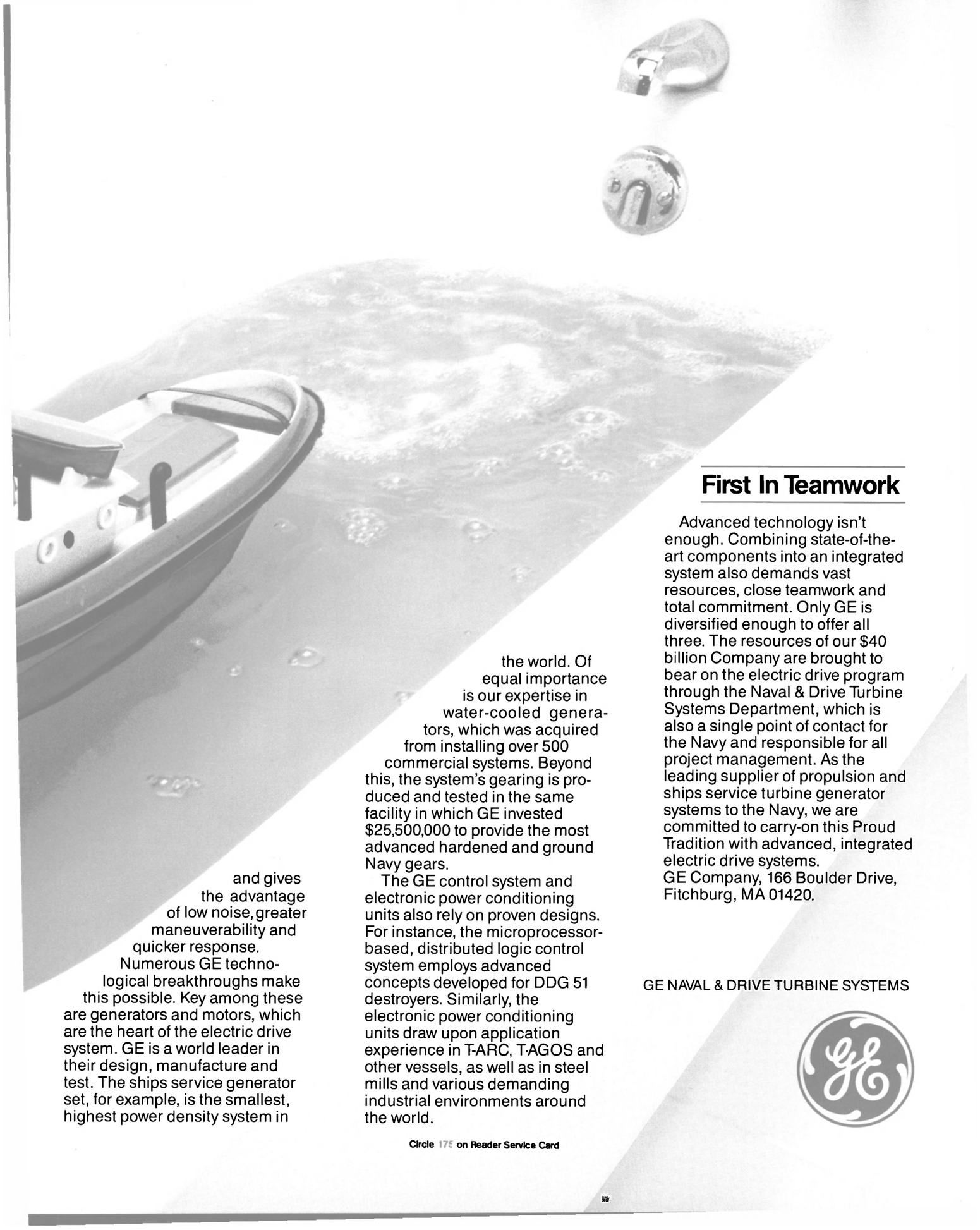
Advanced electric drive systems for surface combatants. GE is best qualified to supply them. We pioneered the technology over 80 years ago and delivered over 5,000,000 horsepower of systems since then. Furthermore, the Company has actively supported the Navy's electric drive program since 1973 by conducting over 325 technical and analytical studies, and devoting over 160 man-years to engineer the concept.

Only GE designs, manufactures and tests *all* key components into a fully integrated system. Consequently, the LM2500 gas turbine, power take-off gearing, propulsion generator, ships service generator, power conditioning units, propulsion motors, controls and auxiliaries are optimized for reliability and peak performance.

First In Technology

Today, our integrated electric drive system for surface combatants relies on space-saving modular components. It also offers more flexible equipment layout options, particularly important in twin hull configurations,





First In Teamwork

Advanced technology isn't enough. Combining state-of-the-art components into an integrated system also demands vast resources, close teamwork and total commitment. Only GE is diversified enough to offer all three. The resources of our $40 billion Company are brought to bear on the electric drive program through the Naval & Drive Turbine Systems Department, which is also a single point of contact for the Navy and responsible for all project management. As the leading supplier of propulsion and ships service turbine generator systems to the Navy, we are committed to carry-on this Proud Tradition with advanced, integrated electric drive systems.
GE Company, 166 Boulder Drive, Fitchburg, MA 01420.

and gives the advantage of low noise, greater maneuverability and quicker response.
Numerous GE technological breakthroughs make this possible. Key among these are generators and motors, which are the heart of the electric drive system. GE is a world leader in their design, manufacture and test. The ships service generator set, for example, is the smallest, highest power density system in the world. Of equal importance is our expertise in water-cooled generators, which was acquired from installing over 500 commercial systems. Beyond this, the system's gearing is produced and tested in the same facility in which GE invested $25,500,000 to provide the most advanced hardened and ground Navy gears.
The GE control system and electronic power conditioning units also rely on proven designs. For instance, the microprocessor-based, distributed logic control system employs advanced concepts developed for DDG 51 destroyers. Similarly, the electronic power conditioning units draw upon application experience in T-ARC, T-AGOS and other vessels, as well as in steel mills and various demanding industrial environments around the world.

GE NAVAL & DRIVE TURBINE SYSTEMS

GEARHART INDUSTRIES
GEARHART GEODATA SERVICES
GEOSOURCE
GEARMATIC WINCH
GEC AVIONICS
GECO GEOPHYSICAL
GEMOCO
GEOPHYSICAL RESEARCH
GEOSOURCE
GEP
GHALLENGER INTERNATIONAL SERVICES
GIRARD INDUSTRIES INC., POLLY PIG DIV.
GLASGOW UNIVERSITY
GLASS-STEEL
GOODALL RUBBER
B.F. GOODRICH
W.L. GORE & ASSOCIATES
INDUSTRIAL SEALANT GROUP
GOTAVERKEN ARENDAL
GRACE MEMBRANE SYSTEMS
GRIFFITH OIL TOOLS
GROOTINT
GRUPO PROTEXA
BUCEO Y TECNICAS SUBMARINAS
(OFFSHORE OPERATION DIV.)
CELASA
CONDUX
CONSTRUCCIONES FLUVIALES Y MARITIMAS
CONSTRUCCIONES MARITIMAS MEXICANAS
CONSTRUCCIONES PROTEXA
CONSTRUCCIONES Y EQUIPOS LATINOAMERICANOS
DUCTOS MARITIMOS MEXICANOS
PERFORACIONES MARITIMAS MEXICANAS
PROTEXA DRILLING CO. (DRILLING DIV.)
PROTEXA, S.A. (MANUFACTURING DIV.)
SERVICIOS DE INGENIERIA MARITIMA
TECNICAS DE MANTENIMIENTO NAVAL
GULTON GRAPHIC INSTRUMENTS DIV.
GUSTO ENGINEERING
GVA
H2O INC.
HACKER-PYRAMID
HAGGLUND & SONER
HALLIBURTON
BROWN & ROOT
HALLIBURTON SERVICES
HOWARD SMITH SCREEN
OTIS ENGINEERING
SPECIAL PRODUCTS DIV.
TAYLOR DIVING & SALVAGE
TRA (TESTING & RESERVOIR ANALYSIS)
VANN SYSTEMS
WELEX
HAMANAKA INTERNATIONAL
HANDY CHEMICALS
HARCO
THE HEEREMA COMPANIES
BLUEWATER TERMINALS
HEEREMA ENG. (U.S.) INC.
HEEREMA MARINE CONTRACTORS
HIGHLAND DEEPHAVEN
HILMAN ROLLERS
HOLLAENDER MFG.
HOLLANDSCHE AANNEMING MAATSCHAAPIJ (HAM)
HOT-HED
HOTSY OF HOUSTON
HOUSTON HELICOPTERS
HOUSTON LIGHTING & POWER
HOWARD SMITH SCREEN CO., A HALLIBURTON COMPANY
HOWDEN COMPRESSORS
HUMPHREY
HUNTING PARK ENGINEERING
HURRICANE RESCUE CRAFT
HURSTWELL ENGINEERING
HYDRA-DYNAMICS
HYDRA RIG
HYDRA RIG CRYOGENICS
HYDRAUDYNE
HYDROCARBON PROCESSING
HYTORC, DIV. UNEX
I M P GROUP, PLASTICS DIV.
I.C.E./T.N.O.
IHC HYDROHAMMER
INDUSTRIAS REUNIDAS CANECO
INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, - OCEANIC ENGINEERING SOCIETY
INSTITUTE OF MARINE ENGINEERS
INTERLOCK TECHNOLOGIES
INTERNATIONAL DRILLING FLUIDS
INTERNATIONAL HARD SUITS
INTERNATIONAL MARKETING & CONSTRUCTION
INTERNATIONAL MARKETING
INTERNATIONAL SUBMARINE ENGINEERING
INTERNATIONAL TOOL
INTERTRADE INDUSTRIES
MARINE PRODUCTS DIV.
IRAD GAGE
ISAAC BENTLEY & CO.
ISHIKAWAJIMA ESTALEIROS DO BRASIL
ITALIAN TRADE COMMISSION/ITALIAN INST. FOR FOREIGN TRADE
CONSORZIO BERGAMO EXPORT
J & W OFFSHORE
JACOBSSON & WIDMARK
JAMES HOWDEN & CO.
JANDL MFG.
JAPAN OCEAN INDUSTRIES ASSOCIATION
THE FURUKAWA ELECTRIC
JARAGUA S/A INDUSTRIAS MECANICAS
JET-LUBE
JJJ INJECTION SYSTEMS
RICHARD L. JOHNSON CO.
KEMLON PRODUCTS
KEYSTONE ENGINEERING
KEPNER PLASTICS FABRICATORS
THE KERITE CO., A SUB. OF HUBBELL
KEYSTONE STEEL & WIRE
KEYWAY INTERNATIONAL
J.C. KINLEY
A.P.&T.
CALIPER REPORT
KINLEY CALIPER
KINTEC, INC.
SCOTT WILSON KIRKPATRICK
KLEIN ASSOCIATES
IRAD GAGE
KLEPO
KOBELT MANUFACTURING
KON VOLKER STEVIN
KREMCO

L.T.C. INTERNATIONAL
LAND AND MARINE ENGINEERING
LANTEC IND.
LARSON FOUNDRIES
  LARSON ALUMINUM DIV.
  LARSON IRON DIV.
  LARSON STEEL DIV.
LEUTERT INSTRUMENTS
THE LINCOLN ELECTRIC
LINEAR MEASUREMENTS
LONE STAR SCREW CO. OF HOUSTON
  JANDL MFG.
  PROTECTIVE COATINGS
LONE STAR STEEL
LUMMUS CREST
LYNN INTERNATIONAL
MM&M CONSULTANTS
M.A.C. INSTRUMENT
MAKO COMPRESSORS
MALONEY STEEL
MALONEY/ENVIRO CON.
MAMMOET TRANSPORT
MAMPAEY OFFSHORE INDUSTRIES
  MAMPAEY INDUSTRIES
  MAMPAEY INTERNATIONAL
MANCHESTER TANK & EQUIP.
MANIFOLD SYSTEMS, INC. (MSI)
MANITEX
MARATHON LETOURNEAU MARINE
  MARATHON LETOURNEAU CO.,
    GULF MARINE DIV.
  MARATHON LETOURNEAU CO.,
    MARINE DIV.
MARIN
MARINE CONTRACTOR SERVICES
  LYNN INTERNATIONAL
  MCS - HYDRALOK
MARINE INDUSTRIAL CABLE
MARINE RESEARCH FACILITY
MARINE TECHNOLOGY SOCIETY
MARIOFF
MAXIM EVAPORATOR PRODUCTS,
  DIV. OF RILEY-BEAIRD
MAXIM SILENCER PRODUCTS,
  DIV. OF RILEY-BEAIRD
MBB HELICOPTER
MC CULLOUGH
MCDANIEL CONTROLS
MCDERMOTT
MCS - HYDRALOK
MELCO BLOWOUT PREVENTOR
  SPECIALTIES
METROX
METSA-SERLA GROUP
MICOPERI S.P.A.
MICRO GAGE
MISSION TUBULAR SALES OF LA.
MONITOR SYSTEMS PRODUCTS
LEE C. MOORE
MORRIS INDUSTRIES
MORSE/HEMCO
MSI DATA
FRANK W. MURPHY MFG.
  ENGLAND DIV.
  SOUTHERN DIV.
MURRAY & PATTERSON
NL MWD
NAO, INC. (THE NATIONAL AIROIL GROUP)
NATIONAL ENGINEERING LABORATORY
NATIONAL OILWELL
NAVAL OCEAN RESEARCH &
  DEVELOPMENT ACTIVITY
NDT SYSTEMS
NEDDRILL NEDERLAND
NELES LOKOMO
NESDA
NETHERLANDS COUNCIL FOR
  TRADE PROMOTION NCH
  ALLSEAS GROUP
  CROON ELEKTROTECHNIEK
  DE HOOP GROENPOL
    -SUBMARINE PIPELINE SPOILER
  GROOTINT
  HOLLANDSCHE AANNEMING
    MAATSCHAAPIJ (HAM)
  HYDRAUDYNE
  I.C.E./T.N.O.
  IHC HYDROHAMMER
  KLEPO
  KON VOLKER STEVIN
  MAMMOET TRANSPORT
  MARIN
  NEDDRILL NEDERLAND
  NETHERLANDS INDUSTRIAL COUNCIL
    FOR OCEANOLOGY (IRO)
  SAS GOUDA
  VAN RIETSCHOTEN & HOUWENS
SCHOTTEL-LIPS
SMIT INTERNATIONAL
VAN SEUMEREN TRADING
VRIJHOF ANKERS
KON. VOLKER STEVIN
  VOLKER STEVIN OFFSHORE
NETHERLANDS INDUSTRIAL COUNCIL
  FOR OCEANOLOGY (IRO)
NEWFOUNDLAND AND LABRADOR
  GOVERNMENT
  DEPARTMENT OF DEVELOPMENT &
  TOURISM
NKK (NIPPON KOKAN K.K.)
NL PETROLEUM SERVICES
  NL ATLAS BRADFORD
  NL BAROID
  NL MWD
  NL SPERRY-SUN
NOAA, NAUTICAL CHARTING DIV.
  U.S. DEPT. OF COMMERCE
NORRISEAL CONTROLS
  DIV. DOVER RESOURCES
NORTH SEA CABLES
THE EXPORT COUNCIL OF NORWAY
  AKER ENGINEERING
  COMPUTERIZED OILFIELD SERVICES
  DET NORSKE VERITAS
  FLUENTA
  NORWEGIAN CONTRACTORS
  SIMRAD ALBATROSS
  THE SKEIE GROUP/MARITIME
    HYDRAULICS
NOVA SCOTIA DEPT. OF DEVELOPMENT
NOVACORP INTERNATIONAL
NOWSCO SERVICES
NOWSCO WELL SERVICE LTD.
NUOVO PIGNONE (ENI GROUP)
NUPRO
D.G. O'BRIEN
OBR OILFIELD PRODUCTS
OCEAN DRILLING & EXPLORATION CO.
  (ODECO)
OCEAN INDUSTRY
OCEAN STEEL AND CONSTRUCTION
OCECO/DIV. OF AMCA INTERNATIONAL
OEM COMPONENTS

OFFSHORE DATA SERVICES
  OFFSHORE FLEET ECONOMICS
OFFSHORE ENGINEER
OFFSHORE ENGINEERING DIV., SANTA FE BRAUN
OFFSHORE SUPPLIES OFFICE
OIL CENTER RESEARCH
OIL, GAS & PETROCHEM EQUIPMENT
OIL STATES INDUSTRIES/LTV ENERGY
OIL, GAS & PETROCHEMICALS ABROAD
OILMOP
OLYMPUS CORP./INDUSTRIAL FIBEROPTICS DIV.
THE OREGON PORTS GROUP
OSPREY ELECTRONICS
OTC GROUP SEALED POWER OTC POWER TEAM
OTIS ENGINEERING CORP., A HALLIBURTON COMPANY
P.J. INTERNATIONAL INC.
PACCAR WINCH DIV., PACCAR INTERNATIONAL BRADEN WINCH CARCO GEARMATIC WINCH
PANEX CORP.
PARSONS MANUFACTURING
PAULUHN ELECTRIC MFG.
PELICAN PRODUCTS
PERFORACIONES MARITIMAS MEXICANAS
PEROLO
PERRY OFFSHORE
PETROBRAS AND BRAZILIAN TECHNOLOGY
  CEC EQUIPAMENTOS MARITIMOS INDUSTRIAIS
  CIA BRASILEIRA DE AMARRAS - BRASILAMARRAS
  CONFAB INDUSTRIAL
  CONSUB EQUIPAMENTOS E SERVICOS
  EQUIPAMENTOS VILLARES
  INDUSTRIAS REUNIDAS CANECO
  ISHIKAWAJIMA ESTALEIROS DO BRASIL
  JARAGUA S/A INDUSTRIAS MECANICAS
  PIRELLI S/A - CIA INDUSTRIAL BRASILEIRA
  TENENGE TEC. NAC. DE ENGENHARIA
  ULTRATEC ENGENHARIA
  VEROLME ESTALEIROS REUNIDOS DO BRASIL
PETROLEUM COMMUNICATIONS
PETROLEUM ENG. INT'L
PETROLEUM EXTENSION SERVICE, UNIVERSITY OF TEXAS AT AUSTIN
PETROLEUM PRODUCTION & PROCESSING
PETROLITE
  PETROLITE EQUIPMENT & INSTRUMENTS
PETROPROJECTS
PHILIPS WELDING
PIPE LINE CATALOG
THE PIPE LINE DEVELOPMENT (PLIDCO) PLIDCO INTERNATIONAL
PIPE LINE INDUSTRY
PIRELLI GROUP
  PIRELLI CABLE
  PIRELLI TREG
  SOCIETA' CAVI PIRELLI
PIRELLI S/A - CIA INDUSTRIALD BRASILEIRA
PLAINSMAN MANUFACTURING
PLIDCO INTERNATIONAL
PMI INDUSTRIES
POLY CORR
POWER-TORK HYDRAULICS
POWER UP
PRECISION URETHANE & MACHINE
PRECISION GENERAL
  E-KON-O VALVES
  MONITOR SYSTEMS PRODUCTS
PROFESSIONAL AND TECHNICAL MARKETING SERVICES
PROPAK SYSTEMS
PROTECTIVE COATINGS
PROTEXA DRILLING (DRILLING DIV.)
PROTEXA (MANUFACTURING DIV.)
PYRAMID MANUFACTURING
  HACKER-PYRAMID
Q SPEC U.K.
QUALITY TUBING
RAM DRILLING TOOLS
RAMNAES
RAUMA-REPOLA OFFSHORE
RAUMA-SUBSEA
RAY OIL TOOL
READING & BATES DRILLING
RECO CRANE
  RECO MARINE CRANE
RED WING SHOE
  RED WING INTERNATIONAL
REED DOWDCO
REED TOOL
REYNOLDS INTERNATIONAL
C.A. RICHARDS & ASSOC.
RILEY-BEAIRD
  BELEX PRODUCTS
  MAXIM EVAPORATOR PRODUCTS
  MAXIM SILENCER PRODUCTS,
ROGAN & SHANLEY
ROLLS ROYCE (CANADA)
WM. ROME
ROPE MASTER
ROWAN COMPANIES
  ERA HELICOPTER
ROXBY ENG.
ROYAL SERVICES & RENTALS
SAFE DIVE SYSTEMS
SAFE OFFSHORE
SAIPEM (ENI GROUP)
SANTA FE DRILLING
  A DIV. OF SANTA FE INT'L.
  OFFSHORE ENGINEERING DIV., SANTA FE BRAUN
  SANTA FE OFFSHORE CONSTRUCTION
SAS GOUDA
  VAN RIETSCHOTEN & HOUWENS
SCHAT MARINE SAFETY

SCHLUMBERGER WELL SERVICES
SCHONSTEDT INSTRUMENT
SCHOTTEL-LIPS
SCHUMACHER INDUSTRIES
  DIXIE ELECTROPLATING
  SCHUMACHER
  SPRAYMETAL
SCORPION HYDRAULIC TONG
SEA LEVEL SUPPLY
SEAFLOOR SURVEYS INTERNATIONAL
SEAMARK SYSTEMS
SEAWARD INTERNATIONAL
SEDCO-FOREX
SEIMAC
SELLERS SALES
SERVICIOS DE INGENIERIA MARITIMA
SHAMROCK TURBINE SPECIALISTS
SHETLAND OIL INDUSTRIES GROUP
SIGMA ENTERPRISES
SIMRAD ALBATROSS
THE SIMTRAN
SINGLE BUOY MOORINGS
  GUSTO ENGINEERING
  TERMINAL INSTALLATIONS
SIOUX STEAM CLEANER
SITE OIL TOOLS
THE SKEIE GROUP/MARITIME
  HYDRAULICS
SKOOKUM
SMIT INTERNATIONAL
SMITH INTERNATIONAL
  SMITH DRILLING SYSTEMS
  SMITH TOOL
SNAM
SNAMPROGETTI (ENI GROUP)
SNAP-ON TOOLS
  INDUSTRIAL DIVISION
SNO-TRIK
SOCIETA' CAVI PIRELLI
SOCIETY OF EXPLORATION
  GEOPHYSICISTS
SOCIETY OF MINING ENGINEERS
SOCIETY OF NAVAL ARCHITECTS AND
  MARINE ENGINEERS
SOCIETY OF PETROLEUM ENGINEERS
SOIL MACHINE DYNAMICS
SOLAR TURBINES
SOLAREX
  SOUTHWEST PHOTOVOLTAIC SYSTEMS
SONARDYNE
SOUTHWEST RESEARCH INSTITUTE
SOUTHWESTERN WIRECLOTH
SPECIAL PRODUCTS, A DIV. OF
  HALLIBURTON SERVICES
SPECIALTIES CO. - COPPER STATE
  RUBBER
SPECIFIC EQUIPMENT
  OFFSHORE/MARINE DIV.
  PURE WATER DIV.
SPECTRAFLOW
NL SPERRY-SUN
SPM
SPRAYMETAL
STANLEY-PROTO INDUSTRIAL TOOLS
STOCK ALLOYS
STRAINSERT
STRATHCLYDE INDUSTRIAL
  DEVELOPMENT
  ANDERSON STRATHCLYDE
  BELLSHILL ENGINE SALES
  BUCHANAN OIL
  DENHOLM OFFSHORE
  GLASGOW UNIVERSITY
  HOWDEN COMPRESSORS
  HURSTWELL ENGINEERING
  SCOTT WILSON KIRKPATRICK
  MURRAY & PATTERSON
  PHILIPS WELDING
  WM. ROME
  STOCK ALLOYS
  SWEDISH CALEDONIAN MARINE
    MANAGEMENT
  TURNER DIESEL
SUB-SEA SYSTEMS
SUBMAR
  MALONEY/ENVIRO CON.
  METROX
  ROXBY ENG.
  SEAMARK SYSTEMS
  SONARDYNE
  SUB-SEA SYSTEMS
  UDI GROUP
SUBMARINE PIPELINE SPOILER
SUPERIOR OILFIELD PRODUCTS
SURVIVAL INTERNATIONAL
SURVIVAL SYSTEMS INTERNATIONAL
SWAGELOK
  CAJON
  NUPRO
  SNO-TRIK
  SWAGELOK QUICK-CONNECT
  WHITEY
SWECO OILFIELD SERVICES
SWEDISH CALEDONIAN MARINE
  MANAGEMENT
SWEDISH TRADE COUNCIL
  ESAB ENGINEERING
  GOTAVERKEN ARENDAL
  GVA
  HAGGLUND & SONER
  J&W OFFSHORE
  JACOBSSON & WIDMARK
  RAMNAES
  SAFE OFFSHORE
SYSTRON DONNER SAFETY SYSTEMS DIV
TAM INTERNATIONAL
TAURUS HUNGARIAN RUBBER WORKS
TAYLOR DIVING & SALVAGE
  A HALLIBURTON COMPANY
TAYLOR FORGE CANADA
TAYLOR TOOLS
TECH DEVELOPMENT
TECHNIP
TECNICAS DE MANTENIMIENTO NAVAL
TECNOMARE (ENI GROUP)
TELEDYNE HYDRA POWER
TENENGE TEC. NAC. DE ENGENHARIA
TERMINAL INSTALLATIONS
TEXAS A&M UNIVERSITY—
  SEA GRANT COLLEGE PROGRAM
TEXAS NAMEPLATE
TEXAS OIL TOOLS
TGS OFFSHORE GEOPHYSICAL
THE METALLURGICAL SOCIETY
THERMAL SUPPLY
THREADMASTERS
TIDELAND SIGNAL
TIMCO
TISEST
TITAN TECHNOLOGIES
TRA (TESTING & RESERVOIR
  ANALYSIS),
  A HALLIBURTON COMPANY
TRANSDUCER TECHNOLOGIES
TRICO INDUSTRIES

TRICO SUBMERSIBLE SYSTEMS
TURMERIC
TURNER DIESEL
TXT-TEXSTEAM
U.S. COAST GUARD
U.S. NAVY LABORATORIES
DAVID TAYLOR RESEARCH CENTER
NAVAL OCEAN RESEARCH & DEVELOPMENT ACTIVITY
OFFICE OF CHIEF OF NAVAL RESEARCH
UDI GROUP
ULTRATEC ENGENHARIA
ULVEN FORGING
ROPE MASTER
SKOOKUM
UNION CARBIDE COATINGS SERVICE
UNITED KINGDOM
ALCAN OFFSHORE
ASSOCIATION OF BRITISH OFFSHORE INDUSTRIES
ATLANTIC DRILLING
BELL VALVES
BRIDON
BRITISH STEEL
BSC GENERAL STEELS
BSC STAINLESS
BSC TUBES
THOMAS BROADBENT & SONS
BRUCE ANCHOR
BRUSH ELECTRICAL MACHINES
C R P MARINE
CRONIN TUBULARS
DEPARTMENT OF TRADE AND INDUSTRY NATIONAL ENGINEERING LABORATORY
DUNLOP OFFSHORE
DUNLOP OIL & MARINE
DUNLOP ARMALINE
DUNLOP SEAMARKS
FAIREY MARINTEKNIK
FERRANTI
FERRANTI COMPUTER SYSTEMS
FERRANTI OFFSHORE
FERRANTI SUBSEA SYSTEMS
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James L. Lander Awarded Contract To Convert Trawler

James L. Lander & Co., naval architects, Stamford, Conn., have been awarded a contract to convert the 110-ton trawler Cape Blanco to a research vessel for the center of Marine Development and Research at Kingsborough Community College of The City University of New York.

Versatile Pacific Wins $9-Million Contract For Two Container Cranes

Versatile Pacific Shipyards Inc. of Vancouver, Canada, has been awarded a contract valued at $9.15 million for the supply of two container cranes for the Port of Tacoma, Wash. The cranes will be designed by Kone of Finland under a joint arrangement with VPSI.

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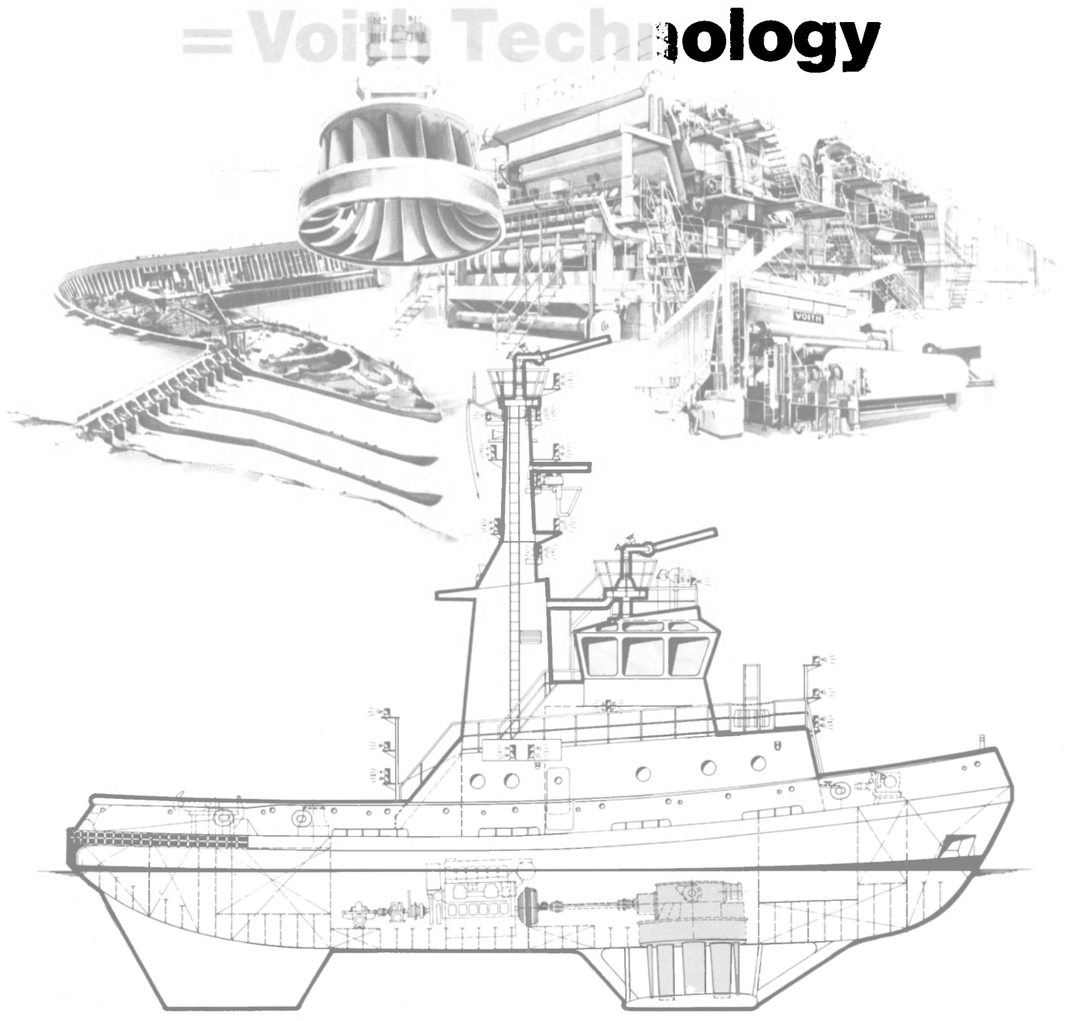

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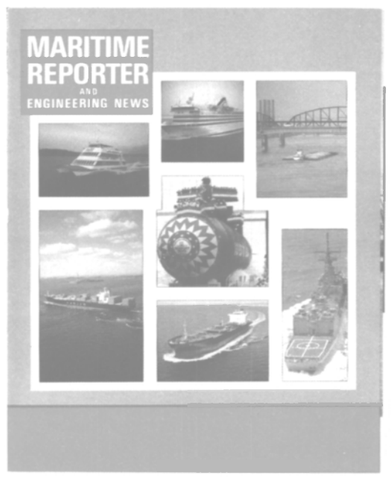

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THE ADVERTISING LEADER in 1987, a larger number of advertisers placed more pages of advertising in MARITIME REPORTER than in the No. 2 magazine.

Astilleros Espanoles Yards Report Full Orderbooks Well Into 1989

The Andalucia yards of the Spanish state-owned shipbuilder Astilleros Espanoles SA (AESA) are assured of work orders well into 1989, according to the company.

According to the company, its Cadiz yard has a full complement of orders, including recently completed work for Gotaas Larsen and a bulk carrier conversion project for Navimin of Mexico.

AESA also recently received a contract to build two 140,000-dwt tankers for Refineria de Petroleos del Norte (Petronor). The vessels are expected to be delivered in 1989.

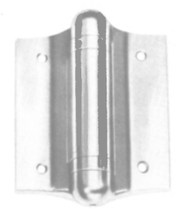
The group's Puerto Real yard is constructing a 61,000-dwt carrier for Spanish shipowner Elcano and two reefer vessels for Del Monte Tropical Fruit Co. The Sevilla yard is building four more smaller reefers for Del Monte.

In addition, the AESA also received a three-year contract to repair the fleets of two Cuban shipping companies, Mambisa and Navicaribe. The group's yards at Cadiz, Ferrol, Las Palmas, Santander and Sevilla will provide services under the contract.

For free literature containing detailed information on the shipbuilding and ship-repairing services and facilities offered by Astilleros Espanoles,

Circle 45 on Reader Service Card

HMS Marine Hardware Offers Literature On Navy-Approved Hinges



The Nik-O-Lok Series 200M hinges is available in stock, eliminating the normal long-lead planning required for Navy specification hardware. The hinges are made of zinc and stainless steel components.

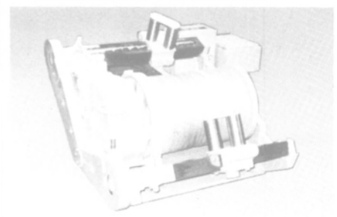
HMS Marine Hardware, Inc., Valley Stream, N.Y., specialists in U.S. Navy shipboard hardware, recently announced the availability of the Navy-approved Nik-O-Lok Series 200M spring hinges for mounting water closet doors on naval vessels. The Naval Sea Systems Command's newly revised type drawing No. 612-4834972 F now specifies "Nik-O-Lok Series 200M hinges or equal."

Nik-O-Lok Series 200M hinges display clean, modern lines, and are completely replacement-interchangeable with the traditional series 1011 hinges.

For free literature detailing the shipboard hardware offered by HMS Marine Hardware,

Circle 79 on Reader Service Card

Markey Machinery Delivers Compact Research Winch —Literature Available



Markey Machinery's model DESF-4 compact winch weighs about 3,500 pounds without wire.

The Markey Machinery Co., Inc., recently delivered a compact, special purpose research winch to the Sea Education Association of Woods Hole, Mass.

The winch, type DESF-4, has a drum which can carry 5,000 meters of ¼-inch wire rope and is driven through a two-speed gearbox by a 7½-hp brushless DC electric motor. The reversing, proportional controller and amplifier operate from the ship's 240-volt DC battery pack. The compact, lightweight winch, it weighs less than 3,500 pounds without wire, is fitted with two opposing level wind units for alternate line leads, a drum clutch and a manually operated drum brake.

For free literature on the full line of winches, as well as other deck and cargo equipment from Markey Machinery,

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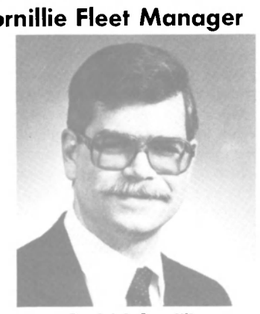
Inland Steel Names Cornillie Fleet Manager



Daniel J. Cornillie

Daniel J. Cornillie has been promoted to fleet manager in the materials and services department of Inland Steel Company. Mr. **Cornillie,** formerly section manager, fleet operations, succeeds **James L. (Red) Williams,** who retired.

Mr. **Cornillie** joined Inland in 1984 as assistant fleet manager, following service with a major Great Lakes shipping company.

Mr. **Cornillie** graduated from the University of Michigan at Ann Arbor in 1973 and the U.S. Coast Guard Officer Candidate School at Yorktown, Va., in 1974.

New 52-Page Catalog On Lighting Offered By Aqua Signal

Aqua Signal Corporation of West Chicago, Ill., has published an elaborate 52-page catalog that illustrates the latest state-of-the-art lighting techniques for shipping, offshore, industry and sporting areas. The catalog offers more than just plain product information: it contains hints on economic lighting solutions, and much useful information that can help customers solve their particular lighting problems.

Included in the contents are navigation lights, special purpose lights, switch and control panels, floodlights, inside and outside luminaires, and accommodation area lighting. The accompanying explanatory text for each category is complemented by specification tables, exploded view drawings, mechanical drawings, and many photographs.

Also given is such information as the recommended application for various types of lighting; type of approval (USCG/other); type of housing and housing color; protection class; optics; minimum visibilities; type of bulk; wiring and installation; mounting; special features, etc.

In addition, an exploded view drawing of spare parts/extras for the different types of lighting covered in the publication is included.

For more information and a free copy of the 52-page catalog on light from Aqua Signal,

Circle 95 on Reader Service Card

For literature on Aeroquip products, circle the appropriate number on the reader service card: RISIC Couplings—**Circle 261;** Hose & Fittings—**Circle 262;** T-J Cylinders—**Circle 263;** Teflon Hose—**Circle 264;** Quick-disconnect Couplings—**Circle 265.**

Radio Holland USA Opens New Service Centers

Last year, Radio Holland USA opened new service depots in the San Francisco, Portland and Seattle areas. Now, the company has opened two additional depots in Norfolk, Va., and Ft. Lauderdale, Fla.

The new branch manager of the Norfolk—in Virginia Beach—is **Kenneth Ravenna,** formerly with Sperry Aerospace & Marine Groups.

The new branch manager at the Ft. Lauderdale center is **George L. Toma,** also formerly of Sperry.

The Ft. Lauderdale depot will support the company's cruise and deepsea markets, as well as Radio Holland dealers active in the yachting market in the Florida area.

Radio Holland USA bv, a member of the global group of Radio Holland companies, offering sales and service of marine communication and navigation equipment, now has a total of 11 service centers in the U.S., with its head office in Houston, Texas.

For full details on the complete line of electronic navigation and communication equipment offered by Radio Holland,

Circle 87 on Reader Service Card

The Northern Enterprise is shown above after conversion. The crabber/processor is powered by two EMD 12-567-BC diesels with Falk 2.98:1 reverse/reduction gears.

Halter Converts Supply Boat To Crabber/Processor In 90 Days

A 180-foot supply vessel which once served offshore oil and gas rigs in the Gulf of Mexico was converted in 90 days by Halter Marine's Moss Point, Miss., shipyard to a crabber/processor for use in the Bering Sea.

The "new" Northern Enterprise began life in 1980 at Halter's Moss Point yard as the Summer Sun. She was purchased by her new owner, Arctic Alaska Seafoods of Seattle in 1987.

John Dane III, president of the Trinity Marine Group which includes the Halter shipyards, said the abundance of idled offshore oil field boats and their low prices make them ideal for conversion for other uses.

Halter removed the vessel's drilling mud tanks below decks and sandblasted, painted, and insulated that area, turning those spaces into a 26,000-cubic-foot refrigerated hold. Miscellaneous offshore equipment and the wooden aft deck was removed and replaced with a 1,400-square-foot processing room.

Two hydraulically driven Alaskan Marine knuckle boom cranes with 50-foot booms on 12-foot pedestals, a hydraulic double pot launcher, a Marco power block, and a Halter-built picking boom were installed along with stability enhancing rolling chocks.

The Northern Enterprise's electrical system was also redesigned to support the extensive processing and refrigeration equipment. Two Detroit Diesel 8V71T engines were added to drive two new 250-kw generators, and a Detroit Diesel 12V92T engine was installed to drive a 425-kw generator.

The boat's propulsion is provided by two EMD 12-567-BC diesels with Falk 2.98:1 reverse/reduction gears.

The Northern Enterprise is the fourth vessel built or converted by Halter for the Arctic Alaska Seafoods fleet. Her Enterprise sisters are the Alaskan, Northwest, and Aleutian Enterprise. A fifth sister, the much larger 224-foot U.S. Enterprise will join the fleet soon.

Halter Marine Inc. is part of the Trinity Marine Group which is owned by Trinity Industries, Inc., Dallas. The group includes Halter's shipyards in Moss Point, Miss., and Lockport, La., Equitable/Halter shipyards in New Orleans, and Madisonville, La., Moss Point Marine, Inc., in Escatawpa, Miss., and Gretna Machine and Iron Works, in Harvey, La.

For free literature giving full details on the facilities and capabilities of Halter Marine,

Circle 88 on Reader Service Card

ELECTRONICS UPDATE

POSITION/LIMIT SENSING SOLUTIONS IN HARSH ENVIRONMENTS

by Ron Ries, Sr. Product Manager

Salt water is one of the toughest environments when it comes to exposed machinery. Common untreated metals are eroded in a matter of months and expensive equipment can become useless in half that time.

One particularly vulnerable part of such equipment can be positioned sensing or limit detection devices. These devices protect the equipment from overtravel conditions and prevent damage to the equipment or personnel. However, these devices are particularly vulnerable to harsh environmental conditions and can become non-functional, creating a hazard to both man and machinery. Recently, electronic proximity sensors specifically designed for the marine environment that address such problems have come on the market.

This article briefly looks at the currently available sensing techniques, their strengths and weaknesses, and presents several case studies where operators are now using the new ruggedized electronic sensors to solve some particularly demanding application problems.

Types of Sensing Devices

Basically there are two main categories of sensing devices: contacting and non-contacting.

In the contacting category are primarily mechanical limit switches. These switches contain contact closures within a sealed container and have external actuating arms or plungers that contact a moving element of the monitored equipment. When the moving element exceeds a set limit or position, the switch interrupts the power circuit or sets an alarm indicating an unusual condition. Because of wear factors and other physical changes, these switches require regular maintenance.

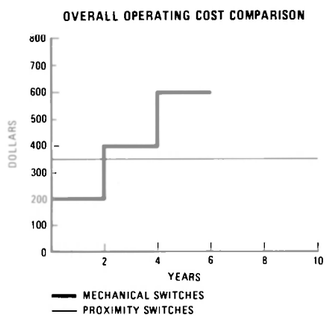
Non-contacting sensing devices, on the other hand, make no contact with the moving element and have no moving parts. All sensing is done electronically using techniques such as metal sensing, magnet sensing, optical path interruption, and detection of changes in capacitance. The devices, commonly known as electronic proximity switches, require much less maintenance than contacting devices and last considerably longer.

In summary, the choice is between mechanical switches and electronic proximity switches to solve position/limit sensing needs.

Strengths and Weaknesses

In considering the strengths and weaknesses of the two categories of switches, it is important to evaluate these products in the context of environmental and cost factors.

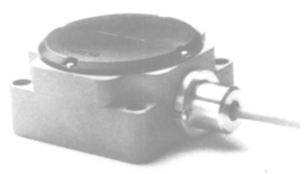
When using these devices in an application that is exposed to the marine environment, there are several factors to consider, particularly when the application is exposed to green water. First is the question of watertight integrity for the switching elements and, second, the materials used in the construction of the device itself. Unless a switching device has been built specifically for the marine environment, either of these factors can render a switch useless in a very short period of time, causing costly downtime and excessive maintenance/replacement expenditures.



Mechanical limit switches, because of their intrusive mechanical coupling, are inherently weak in these areas resulting in early contact corrosion failures. Proximity switches are particularly strong in these areas because of the lack of mechanical coupling, and because typically, they are potted in an epoxy resin which protects the internal switching elements and electronics.

Other important considerations are mechanical shock and vibration when choosing a sensing solution. Again, proximity switches excel in this area because of their one piece epoxy impregnated design. Unlike mechanical switches, the contact closure in these solid state switches will not vibrate out of adjustment and wear out as a function of the number of operational cycles. They are typically capable of many millions of cycles rather than the finite number of contact closures that are characteristic of mechanical devices.

Another consideration for proximity switches is the question of RFI/EMI (Radio Frequency Immunity/Electro-Magnetic Immunity). Our environment is jammed with static and interference, radio signals, TV signals, and radar transmissions. Electronic devices, if not properly protected, are susceptible to interference from these conditions. Mechanical switches are virtually unaffected by such signals. Industrial grade proximity switches are protected to a small degree, but are not designed to operate in strongly radiating fields such as radio transmitters and radar. However, properly constructed proximity switches designed to operate in these strongly radiating fields will perform similarly to the mechanical switches. These proximity switches are designed to meet MIL-STD 461 for stringent military applications.



This Eldec non-contacting switch uses electronic sensing technology, with no moving parts to corrode or wear out.

Are there differences in cost among the choices available for position/limit sensing applications. Yes, there are, although the true cost of a particular product may not be obvious from acquisition cost alone.

On the low end of the scale, industrial grade proximity switches and mechanical switches are available for less than $100. However, these units will not survive harsh environments very well and, in the case of the industrial grade proximity switch, will not perform well in RFI/EMI environments. Higher grade mechanical switches that will better survive the harsh marine environment are available in the $100-300 range. In the $300-450 range are top-of-the-line proximity switches designed specifically to withstand the rigors of the marine environment.

Acquisition cost does not tell the whole story, however. In a tough environment, long term operational costs should be considered as well. Only then can the true cost of a particular solution be measured.

On the low end of the scale, industrial grade devices have a very small initial outlay. However, the devices will not survive for any great length of time. Additional purchases must be made and the cost of labor to re-install each time figures prominently into the overall cost. Additionally, there's the cost of lost productivity and other factors/costs associated with downtime to consider.

Higher quality mechanical devices that better withstand the environment can be acquired for a slightly higher initial cost, but such devices are subject to moisture intrusion because of their mechanical coupling. They also have a limited contact life in terms of the number of cycles of operation. In fact, all mechanical switch applications have more routine maintenance and adjustment than proximity devices because of the wear factors in the switches themselves as well as the wear factors in the equipment. Although not as often as with the industrial grade devices, these higher grade mechanical switches must also be replaced regularly.

The best grade of proximity switch has a higher initial outlay but has superior environmental characteristics. As there is no physical contact with the moving element, and solid state switching is used to dramatically increase the number of operational cycles, MTBF (Mean Time Between Failures) is very high, in excess of 125,000 operational hours. Statistically, associated replacement and labor costs are very low, downtime is minimal, routine maintenance and adjustment is nil and reliability far exceeds the other choices. Although the initial outlay is slightly higher, the overall cost savings over the life of the product will add to the operator's bottom line in terms of lower overall operational costs.

Several case studies illustrate how these high grade proximity sensing devices have been used to solve demanding problems.

Application No. 1: The U. S. Navy uses a Bow Ramp and Stern Gate deployment system on the LST class of ships. The system allows vehicles to move from the inner decks of the ship up over the bow and onto the beach. The stern gate is a platform that is lowered from the stern of the ship to create a ramp that allows the launch of amphibious vehicles to carry troops to the beach.

The problem: The Navy was using industrial grade proximity switches for position sensing. The switches used a two piece design that had a separate amplifier and output switch. The problem was the switch did not function well in this particular environment and application. LST's, being flat bottomed ships for convenient shallow water access, do not ride well in rough seas and therefore take a lot of green water over the bow.

The solution: The ELDEC Corporation, in conjunction with the U. S. Navy, jointly developed a standard proximity switch specifically designed to withstand the rigors of this application and provide the kind of reliability that is required by the Armed Forces. These switches have been successfully installed on 90% of the 20 ships in the class and have been performing very well for the past year and a half. During that time, there have been no operational failures in almost 800 switch installations.

Application No. 2: On board the Navy's carriers is a system of elevators whose primary purpose is to bring weapons/cargo to the hangar deck. In most applications these elevators move between 3 and 7 decks and have full size access hatches at most levels. System requirements are that all hatches be secured before the platform will move. An elevator controller monitors all door closures, level sensing, and speed switches for proper operation. Previously, most of these sensors were mechanical rotary arm switches.

The problem: Flight operations on a carrier require proper fire prevention in case of emergency landing/spilled fuel. When the threat of fire does occur, the Navy's AFFF (Aqueous Film Forming Foam) is applied to the ship's equipment and decks. Afterward, this extremely corrosive fluid is washed from the deck with seawater. This combination of seawater an AFFF then spills into the elevator shafts and escalates the corrosion/failure of the mechanical sensing devices contained in the shaft.

The solution: The Navy now has a long term program to replace these mechanical switches with highly reliable MIL qualified proximity switches. Cost projections show that program will save the U.S. Navy a significant amount of money over the long term.

Application No. 3: Crowley Maritime, a major barge towing operation, needs to monitor any slippage of the cable winch during towing operations. If the drum slips, sensing devices activate a switch closure and sound an alarm.

The problem: The port engineer was using mechanical limit switches with a lever arm extending into the structural spokes on the winch drum. Due to relatively low freeboard on seagoing tugs, a fair amount of green water comes over the gunwales in rough seas, corroding these switches. Every six months each mechanical switch had to be replaced at a cost of $125 plus electrician's labor of $35.

The solution: Crowley changed to environmentally hardened proximity switches better suited to the task. They report no failures in two years.

Conclusion

The above applications all had common difficulties: harsh, hostile environments and corrosive fluids. Cost effective solutions for these difficult situations demand a durable product with reliable operation at a reasonable total expenditure. Industrial grade proximity solutions have the lower initial cost but incur significant replacement and maintenance expenses. Higher grade mechanical solutions have the same drawbacks over the longer term. The higher grade proximity switches are the best choice for cost effectiveness, durability, and superior reliability. For those applications where downtime and profit margins are affected by employing a less than satisfactory solution, it is imperative that the proper choice be made. In the harsh environs of the sea, it can be costly to select less than what the job demands.

For free literature on higher grade proximity sensing switches from Eldec,

Circle 70 on Reader Service Card

Navy Awards $9.1-Million Contract To Southwest Marine

Southwest Marine, Inc., San Diego, Calif., has been awarded a $9.1-million U.S. Navy contract for the overhaul of the frigate USS Stein (FF-1065).

Ingalls Shipbuilding Awarded $769-Million Navy Contract To Build Four Aegis Cruisers

The U.S. Navy has awarded Ingalls Shipbuilding division of Litton, Pascagoula, Miss., a $769.1-million contract to build four additional Ticonderoga (CG-47) Class Aegis guided-missile cruisers.

This award brings the total number of Aegis cruisers awarded Ingalls to 19 of the 27 ships authorized in the program. Nine of the ships have been delivered by Ingalls to the Navy and two more will be delivered later this year. Ingalls is the lead shipyard for the cruiser program, which began in 1978.

"The award of four out of five ships to Ingalls is significant for our shipyard and our employees," said **Jerry St. Pe**, president of Ingalls and senior vice president of Litton Industries.

"It is the direct result of outstanding performance by Ingalls's work force recorded to date in building the 15 Aegis cruisers, currently under contract on time and within budget, and it reflects the success of our continuing efforts to further improve the efficiency of our shipyard operation," he continued.

Mr. **St. Pe** said the four-ship award would contribute to stabilizing future work force levels, and help sustain high levels of employment that will be reached within the next three years. Overall employment at the shipyard is currently 11,500.

For information on the shipbuilding services, facilities and capabilities of Ingalls,

Circle 11 on Reader Service Card

Riedel International Announces Key Promotions

Jamshed Dastur | Francis J. Bradach | Robert B. Bittner

Arthur A. Riedel, chairman and chief executive officer of Riedel International Inc., recently announced three key promotions.

Jamshed (Jim) Dastur has been named president of Riedel International Constructors, a subsidiary of Riedel International, Inc.

Mr. **Dastur,** a highly educated and experienced veteran of more than 25 years in engineering design and construction, has spent the last 14 years of his career with the Riedel companies.

Besides his new position, Mr. **Dastur** will remain executive vice president of the construction and dredging groups.

Francis J. Bradach has been named executive vice president and general manager of the dredging group for Riedel International, Inc., Portland's worldwide marine construction and dredging contractor.

Mr. **Bradach** has been with Riedel companies for more than 25 years, and has served in a number of executive capacities.

Robert B. Bittner, a 17-year veteran of various assignments with

Riedel International, Inc., has been promoted to senior vice president of the organization, and to executive vice president of its subsidiary, Riedel International Constructors.

Mr. **Bittner,** a vice president of the company since 1985, will retain his responsibilities as manager of engineering and estimating group of the far-flung Riedel operations.

Kloster Cruise Limited Changes Name And Moves Offices To New Address

Kloster Cruise Limited d/b/a Norwegian Caribbean Lines has announced that it is now known as Kloster Cruise Limited d/b/a Norwegian Cruise Line.

The change in no way affects the ownership or identity of the carrier in any manner whatsoever, and merely reflects the name under which the carrier currently does business.

Additionally, the company announced that it has moved its offices to Two Alhambra Plaza, Coral Gables, Fla. 33134, phone (305) 447-9660.

Underwater Propeller Polishing Performed By Muldoon Marine Services

Muldoon Marine Services (MMS) of Terminal Island, Calif., recently completed a series of underwater propeller polishings that significantly improved propeller blade surfaces. The result has been increased propeller efficiency leading to substantially reduced bunker costs.

The underwater propeller polishing is performed by MMS diver/technicians using hydraulic polishers. Special 3M Marine Cleaning Discs remove fouling and polish the propeller surfaces to a satin-smooth finish. A detailed report, complete with before and after color photographs, is provided with each job.

Muldoon Marine Services is an underwater service company offering innovative cost reduction technology and commercial diving services in West Coast harbors.

For more information and free literature,

Circle 1 on Reader Service Card

MAN GHH WOLFF CRANES—The huge offshore oil rig platform Polyconfidence, located in the North Sea, has been equipped with three electrohydraulic cranes supplied by MAN GHH Krantechnik GmbH of Heilbronn, West Germany. At present, the platform is serving as additional temporary accommodations for crews working in the Oseberg oilfield. One of the MAN GHH cranes has a capacity of 100 tons, while the other two units have 50-ton capacities. These models have been developed and uprated from Wolff "North Sea Class" offshore cranes. For free literature detailing the extensive line of cranes offered by MAN GHH,

Circle 22 on Reader Service Card

Halter Marine Converts Crewboat For Fisheries Patrol Service

Halter Marine, Inc., New Orleans, La., has converted the 100-foot, aluminum crewboat Southern Light, into a fisheries security vessel for the Republic of the Marshall Islands.

As the boat will patrol the territorial waters of the Marshall archipelago, her fuel capacity was expanded from 2,400 gallons to 9,000 gallons and crew accommodations were increased from six to 12. New communications, navigation, and detection equipment was installed and a new, larger mast was included to serve the new radars, antennae, and sensors.

The Southern Light also received a water maker, gun mounts, deck awning, rescue platform, general hull repairs, and a bright new paint scheme.

She made the trip from New Orleans to her Pacific home, port of Majuro, under her own power.

Halter Marine, Inc., is part of the Trinity Marine Group which is owned by Trinity Industries, Inc., Dallas, Texas. Other shipyards in the group are Halter's Moss Point, Miss., and Lockport, La., shipyards, Equitable/Halter shipyards in New Orleans and Madisonville, La., Moss Point Marine, Inc., in Escatawpa, Miss., and Gretna Machine and Iron Works in Harvey, La.

For free literature on the shipbuilding, conversion and ship-repair services of Halter Marine,

Circle 42 on Reader Service Card

The newly converted Southern Light made the trip from the New Orleans yard of Halter Marine to her new home in the Pacific under her own power.

$8-Million Order To Keppel Shipyard

Keppel Shipyard, a major operating division of Keppel Corporation, has secured an S$16-million (about $8,000,000) contract from Sudoimport of the USSR to upgrade its fish factory ship, the 18,000-grp Severodonetsk.

Under the contract, Keppel Shipyard will renew all existing equipment of the fish meal plant and fish factory. Six auxiliary engines will also be renewed and new freezer equipment installed. Upgrading of the vessel is expected to take four to five months.

Keppel Shipyard's experience ranges from repairs on general cargo ships to sophisticated work on specialized vessels. It has modern facilities capable of handling all types of vessels, including ULCCs.

For free literature containing complete information on the facilities and capabilities of Keppel Shipyards,

Circle 52 on Reader Service Card

The Cummins-powered Jean Nicolet, built by Skipperliner Shipyards of LaCrosse, Wis., will be homeported in Sturgeon Bay in the spring.

Skipperliner Shipyards Delivers Cummins-Powered Passenger Vessel

The new 150-passenger vessel Jean Nicolet was recently launched and delivered by Skipperliner Shipyards, Inc., LaCrosse, Wis., to owners **Robert** and **Marlys Falkner** of Bomar Cruise Lines of Sturgeon Bay, Wis.

The vessel, which is currently in Stuart, Fla., for the winter season, is patterned after the combination freight and passenger vessels that operated on the Great Lakes in the late 1800s and early 1900s. She was designed by Timothy Graul Marine Design of Sturgeon Bay.

With an overall length of 65 feet, breadth of 24 feet and draft of 4 feet 8 inches, the Jean Nicolet is powered by two Cummins N855-M marine diesel engines rated at 235 hp each at 1,800 rpm. The engines were supplied by Cummins Great Lakes, Inc., Chippewa Falls, Wis.

Unlike most passenger vessels, the Jean Nicolet will not be operated on a set route. A portion of her Wisconsin 1988 season will be scheduled with bus tours. The tour bus will discharge passengers at one of several locations within the Sturgeon Bay, Green Bay, Door County and Fox River areas. The passengers will then board the Jean Nicolet for point-to-point tours.

The Jean Nicolet has facilities for serving meals and holding corporate meetings.

For information on the shipbuilding facilities and capabilities of Skipperliner Shipyards,

Circle 89 on Reader Service Card

Additionally, if you would like free literature detailing Cummins complete line of marine diesel engines,

Circle 90 on Reader Service Card

JEAN NICOLET
Equipment List

Main engines (2)	Cummins
Propellers	Michigan Wheel
Generator engine	Cummins
Generator	Marathon
Reduction gears	Twin Disc
Engine controls	Morse
Steering controls	Char-Lynn Hydraulics
Fire pump	Peabody Barnes
Bilge Pump	ITT Jabsco
Whistle	Kahlenberg

Pasilac Therm Offers New Freshwater Distiller

The Danish Company Pasilac Therm A/S is now introducing the second generation of their freshwater distiller, with a capacity of up to 40 m³/24 h.

As one of the major producers of plate heat exchangers in the world, Pasilac Therm has, naturally, transferred the principle of the plate heat exchanger technology to the freshwater distiller. The plates which are used in the distillers are made of titanium. They do not corrode and the plate patters used only cause a very small scaling.

Pasilac Therm A/S is concentrating on the branch of marine industry that demands a continuous supply of fresh water. To meet this demand, the new freshwater distiller is built up of modules. "This means," says **C.K. Postborg,** managing director, "that instead of offering 1 x 12 m³/24 h, for instance, we can offer 2 x 6 m³/24 h and still only use a minimum of space. Having two distillers working in parallel, a minimum production, even if one of the distillers has been taken out of operation, is ensured."

For more information and free literature on Pasilac Therm's freshwater distiller,

Circle 91 on Reader Service Card

Spanish Shipyard To Overhaul Cruise Ship For Florida Owner

Union Navale de Levante shipyard, Valencia, Spain, has received a contract to overhaul a 10,000-ton cruise ship from Crown Cruise Line of Palm Beach, Fla.

The 500-passenger vessel, the Las Palmas de Gran Canaria, will be renamed the Crown Del Mar and used in Caribbean and Gulf of Mexico cruise service.

She is expected to be delivered in the third quarter of this year.

PROPULSION UPDATE

Schaffran Offers Advanced, Compact Controllable Pitch Propeller

—Color Literature Available—

Since delivering their first controllable-pitch propeller (CPP) systems to Menzer Werft for use aboard a new 22-knot police boat two decades ago, Schaffran Propeller Lehne & Co. GmbH & Co. KG, Lübeck, West Germany, has been designing, developing and manufacturing advanced and innovative CPP systems for the worldwide marine market.

One of the most innovative CPP designs offered by Schaffran is the Compact Hub Type VK. Used in Finnish winter shipping for several years, these Schaffran systems proved to be extraordinarily sturdy and reliable, even under the most severe ice conditions. One of the most recent ships to be fitted with a Schaffran CPP system is the Thea S. Built with an asymmetrical stern for fuel economy by the Heinreich Brand yard in Oldenburg, she was fitted with a four-blade 4.5-meter CP propeller.

The basis of this CPP system's design is the integral hub unit which is calculated and optimized in accordance with finite-elements methods. The blade base bearings as well as the servo-piston guide are contained in the component. Thus, possible faults in the plane are avoided in the otherwise common plane parts, the maximum comparable stresses are reduced and distributed over the whole length of the hub, so that in an emergency, exceeding the yield point or even failure point can be avoided. From a hub diameter of 1,000 mm the servo-piston guide is housed in a separate hood construction.

The thrust of the servo-piston is transferred directly to the crank arms of the fork-shaped variable flanges, via rigid arms of a flanged to crossbar, which enclose a highly load-bearing and impact resisting universal joint for each controllable pitch propeller blade. Thus, the thrust is directly transformed into the required blade spindle torque.

With this design, the servo-piston, with its widely spaced guides at the piston skirt and at the piston rod guide, remains practically free of radial forces, so that the only friction is in the universal joints and the blade base bearings.

The inherent low number of force-connected parts in the design of the propulsion components provides for solid construction so that the whole servo power can be concentrated on one single crank steering, without stressing any part of this driving chain beyond its yield point.

The individual blades are fixed on the outside with high-tensile CrNi steel bolts. The inner blade base remains untouched when changing blades, so that in some cases even underwater blade replacement is possible.

With a maximum hydraulic oil pressure of only 20 bar, the life expectancy of the unit's complete hydraulic system is considerably increased.

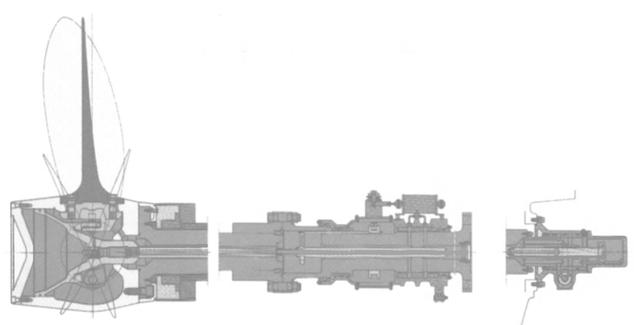
In addition, as a safety precaution, in case of a sudden drop in hydraulic oil pressure, the existing pitch position is maintained for a longer period of time by an automatic blocking device with a hydraulic valve in the servo-piston, closing immediately with a tight-fitting piston ring gasket.

For bridge remote control of pitch and rpm, fine pneumatic control valves for impulse and profile manometers for indication are preferred. Pitch and speed can be regulated together or individually depending on the type of operation required.

The patented Schaffran CP Propeller VK represents an innovative development towards increased compactness and reduction of parts in the driving mechanism, which in fact contributes to reliability and easy assembly and servicing.

For free color literature on the Schaffran Compact VK Controllable Pitch Propeller and other propulsion systems from the company,

Circle 36 on Reader Service Card



CP-Propeller Type VK | Control Unit Type T | Control Unit Type G

Bath To Build Aegis Cruiser For $226.1 Million

Bath Iron Works (BIW) Corporation, Bath, Maine, has been awarded a $226.1-million Navy contract to build an Aegis guided-missile cruiser (CG-47 Class).

Port of Genoa Attracts New Container Business Under Innovative Leadership

—Free Brochures Offered—

In 1984, the Port of Genoa was in need of a major restructuring. Under the burden of labor problems and obsolete systems, procedures and equipment, the port suffered critical financial losses.

Today, under the adept and innovative guidance of **Roberto D'Alessandro,** the president of the Port of Genoa, the port is a thriving European center for container and RO/RO traffic, ship repair, passenger travel and crude oil product handling.

"The situation I was confronted with on that first day could briefly be summarized as a continuous decrease of traffic plagued by outrageous costs, exorbitant tariffs, chronic inefficiency and nonexistent competitiveness," said Mr. **D'Alessandro.** "In bare figures, the port had accrued losses for $420 million."

Faced with the issues of lack of employee motivation, bureaucracy, high labor costs, inefficiency, financial losses, lack of funding and investment, obsolete equipment and facilities and customer dissatisfaction, Mr. **D'Alessandro** enacted a number of structural and organizational solutions.

Labor costs, for example, which once had exceeded revenues by more than 15 percent, declined to 50 percent of total sales through labor agreements.

Through changes in the organizational structure of the port, a new, more effective decision-making mechanism was created.

In addition, capital investment was obtained from domestic banks as well as international financial institutions such as Citibank, Irving Trust Co., Manufacturers Hanover Trust and the Bank of Boston.

According to Mr. **D'Alessandro,** the port's "winning formula" for raising its productivity was the combination of the new decision-making process, a series of capital investments and a significant reduction in labor costs.

Results of the "winning formula" show that port traffic has grown 35 percent since 1985.

Some of the plans under way at the port include:

• The realization of a system of terminals dedicated to container and RO/RO traffic that will enable Genoa to handle a total capacity of 1 million TEUs annually by the 1990s (up from only 200,000 TEUs in 1983). The plan calls for $50 million improvements to the present terminal (upgraded to handle 400,000 TEUs per year); the construction of a new terminal for Calata Sanita, which will handle 200,000 TEUs per year; the new Voltri port, which will also handle 400,000 TEUs; and an increase in the portainer number from four to 14;

• The $100-million improvement of non-containerized traffic areas;

• The construction of a large passenger terminal;

• The building of an international airport surrounded by hotel complexes and commercial outlets;

• The restructuring of the old port, with the construction of a marina and the rehabilitation, within the port area, of historic city centers, following the example of the large revitalization in American ports such as Baltimore, New York and San Francisco;

• And the creation of a technologically advanced telecommunications network for service to the port and the commercial city. This is said to

Roberto D'Alessandro

Left: Artist's conception of the container-handling facilities located at the Port of Genoa; Right: Container-handling cranes at the Port of Genoa.

be the first Teleport in the Mediterranean.

Genoa is not alone, however, in improving its container handling technology and port facilities. Dozens of ports in and around the Mediterranean and the world are investing millions of dollars in order to capture increasingly important trade routes to the Far East from both Europe and the U.S. West Coast.

The Port of Genoa, however, has greatly improved its chances through its investments, since it already offers a prime location in the region.

According to Mr. **D'Alessandro,** the port broke even last year, and expects to earn a profit of about $20 million in 1988.

"I firmly believe that we are the masters of our destiny," said Mr. **D'Alessandro.** "If we are bold enough to accept technological innovation, to create competitive conditions in a political and social environment which is not always favorable to changes, then I think we may claim that our ports are ready to meet the challenge of the 21st Century. And this is exactly what I've been trying to do," he concluded.

For free color literature and brochures detailing the ship repair, oil terminal, multipurpose terminal and container terminal facilities of the Port of Genoa,

Circle 21 on Reader Service Card

Perkins Marketing Light Marine Engines As Power Prestige Line —Literature Available

According to a recent announcement, Perkins' range of light commercial marine diesel engines have been given a new look. The engines, comprising 16 different units, will now be marketed as Power Prestige.

This range includes Perkins' newest Prima and Perama small diesels, the well-established four and six-cylinder medium-sized Range 4 engines and the V8 and V12 units built at Perkins' Shrewsbury (U.K.) factory.

Power Prestige makes a clear separation between Perkins' light commercial engines and its range of heavy-duty commercial units known as HD Power.

Perkins' marine sales manager **John Spencer** explained that, "Power Prestige reflects our commitment to building marine engines tailored to precise market needs. It means the customer knows certain that the engine he is buying has been developed specifically for his kind of use."

Perkins North America, Atlanta, Ga., has been in the diesel engine market for over 25 years. Perkins offers diesel engines for a wide range of applications, from 10 to 1,200 hp.

For detailed literature describing the complete line of Perkins Power Prestige diesel engines,

Circle 30 on Reader Service Card

Literature Offered On Marine Cross Reference Data Base Compact Disc

Inventory Locator Service, Inc. (ILS), Memphis, Tenn., is now offering its Cross Reference Data Base of more than 22 million part numbers on compact disc.

Named CD-Fiche, the ILS CD-ROM (read only memory) is offered to subscribers as an alternative to on-line access to the ILS Cross Reference Data Base. Using the CD-Fiche and any of several types of part numbers, a subscriber can now scan one of the largest marine part technical data bases, looking for such information as design data, manufacturing details, product improvements, alternate parts, manufacturers, other users and summary information about costs. Once the part in question has been located by the CD-Fiche, it will cross reference the part with all other parts providing similar form, fit and function, and provide a listing of all related part numbers.

CD-Fiche can be integrated with all popular PC database packages.

ILS is one of the leading suppliers of marine parts availability information. Their service lists suppliers of more than 1½ million marine parts.

For literature detailing the CD-Fiche from Inventory Locator Service,

Circle 87 on Reader Service Card

PROPULSION UPDATE

Caterpillar Announces 1.1-Liter Family Of Marine Diesel Engines

—Literature Available—

Caterpillar Engine Division recently announced the availability of a new family of marine diesels, each with 67 cubic inches (1.1 L) displacement per cylinder. The new engines are aimed at powering smaller boats than previously served by the company's product line. In most cases, they will compete in a power range, served until now mostly by gasoline engines.

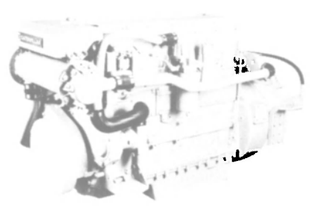
Both the 4-cylinder 3114 and the 6-cylinder 3116 are in-line, direct injected, four-stroke cycle diesels offered in turbocharged and turbo-aftercooled versions. Rated at 2,800 rpm, the engines are available in a high performance range from 160 to 300 hp (119 to 224 kW).

The engines are designed to provide optimum performance for boats in the approximate 25- to 40-foot range. The proper engine-to-boat matchup depends on hull characteristics and the number of engines installed. For optimum installation flexibility, both seawater heat exchanger cooled and keel-cooled versions are available.

"These engines bring a new standard of diesel performance and reliability to the smaller engine user," said **Larry Wilson,** manager of product development for Caterpillar. "They have many of the heavy-duty features of the 3208 TA; and, like the 3208, the 3114 and 3116 are price competitive compared with other diesel engines." (The 3208, rated at up to 375 hp, is well accepted in boats in the approximate 32 to 60-foot range.)

RATING SUMMARY

Engine Version	Ratings High Performance	Continuous
3116 TA	300 hp/222 KW	205 hp/152 kW
3116 T	250 hp/185 kW	165 hp/122 kW
3114 TA	200 hp/148 kW	135 hp/100 kW
3114 T	160 hp/118 kW	105 hp/ 78 kW



Caterpillar's new family of marine diesel engines is aimed at powering smaller boats than previously served by the company's product line. The engines are designed to provide optimum performance for boats in the approximate 25- to 40-foot range.

To ease servicing in tight spaces, both engines feature a removable plate for easy access to cam roller followers; intake and exhaust manifolds are located conveniently on the same side; water and oil pumps are easy to reach.

Caterpillar's worldwide product support is more complete and accessible than small diesel engine owners have been accustomed to. As evidence, the maker cites a present worldwide parts availability for existing Cat Marine Engines of 98 percent in less than 24 hours and 99.6 percent in less than 48 hours.

For more information and free literature on the new family of marine diesel engines from Caterpillar,

Circle 92 on Reader Service Card

Datamarine's 'Chartlink' Adds New Dimension To Loran/Satnav Navigation

Datamarine adds a new dimension to loran and Satnav navigation with the introduction of the Model 7000 Datamarine Chartlink.

The Chartlink delivers vital navigation information quickly and in an easy-to-understand form by translating loran or Satnav information into an easily recognizable electronic plot of the boat's position, track of where it has been, and course to new waypoints. The visual presentation of charted information also makes the Chartlink a very useful tool for preliminary cruise planning without the necessity of searching through a pile of charts.

The Chartlink is operated by moving the tracking ball or pushing a button to call up various charts, zoom in or out or then to three or more levels of magnification, and store up to 100 waypoints, providing an instant determination of the latitude and longitude of waypoints and the boat's range and bearing to them.

Charts that show major navigational features are stored on low-cost cartridges that can hold an average of 10 charts. Charts for most parts of the world are available on cartridges.

For additional information and free literature on the Model 7000 Datamarine Chartlink,

Circle 98 on Reader Service Card

MARINESAFETY/CAORF DEMONSTRATION to assist in design improvements for New York Harbor was recently performed for visitors at the Computer Aided Operations Research Facility (CAORF) at Kings Point, N.Y. Since Port Authorities must now share the cost of harbor improvements, they are very interested in the cost savings that can result from design simulation studies. Shown on the bridge of the MarineSafety facility are, left to right: **Paul Krinsky,** Superintendent of the U.S. Merchant Marine Academy; Dr. **Eugene Guest,** director of MarineSafety International; **Robert Steiner,** deputy director, port department of the Port Authority of N.Y. and N.J.; and **Erik Stromberg,** president of the American Association of Port Authorities.

For free literature from MarineSafety International,

Circle 19 on Reader Service Card

ELECTRONICS UPDATE

Robertson-Shipmate's Multi-Station Commercial VHF Radiotelephone Now Approved For Use In U.S.

The new RS-7100 VHF radiotelephone is a heavy duty commercial grade system that permits use of up to six full-function remote stations. Extremely popular in Europe, the RS-7100 is now approved for use in the United States. This is a full duplex radio, with dual watch, designed primarily for commercial applications such as larger ships, drilling platforms and workboats, but it is also ideal for the largest yachts.

The new RS-7100 VHF radiotelephone.

The RS-7100 is a synthesized radio with all U.S., international and weather channels. System functions are controlled through a splash-proof keypad, and selected channels and operating functions are displayed on a backlighted LCD. Construction is of diecast aluminum and the unit can be mounted on tabletop, bulkhead, or 19-inch rack. Remote stations are extremely compact and have control panels identical to the master station. All sta-

tions have built-in internal monitoring and self-test programs.

The system operates from 12 or 24 VDC, as well as 110/220 VAC.

For more information and free literature from Robertson-Shipmate,

Circle 20 on Reader Service Card

Reiss Purchases Rexnord Defense Systems —Renamed TANO Corp.

Rexnord Defense Systems Inc., the New Orleans-based manufacturer of marine automation and control systems, has been purchased by its former president and renamed TANO Corporation.

James J. Reiss Jr. has purchased all outstanding stock of Rexnord Defense Systems from its parent company, Rexnord Inc. of Milwaukee, Wis., in a cash transaction. The acquisition was finalized recently, but the terms were not disclosed.

Mr. **Reiss** regains ownership of the company through the transaction. He was one of the founders of TANO Corporation in 1972. In 1984, Rexnord purchased TANO and changed the firm's name, retaining Mr. **Reiss** as president of the subsidiary.

He is chief executive officer of the new TANO, which will remain at 4301 Poche Court West in New Orleans. The company's operations and management team also will remain the same.

R. W. (Pete) Emerling, a 16-year veteran of the company, serves as general manager of the marine systems operation.

The company employs approximately 90 persons in the design and manufacturing of automation and control systems for military ships and industrial applications, and also practice ordnance for military training.

TANO marine automation systems have been installed on more than 240 ships for the U.S. Navy, Coast Guard, Military Sealift Command, and U.S. Merchant Marine.

For free literature detailing the complete line of TANO marine automation systems,

Circle 29 on Reader Service Card

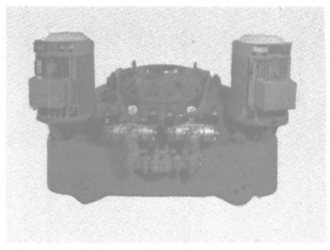
Free Literature Offered On Full Line Of Steering Gears From Tenfjord

Tenfjord Inc. of Norway (represented in the U.S. by Tenfjord Inc. of Hoboken, N.J.) is offering free literature on steering gears manufactured to their rotary piston design.

The Tenfjord unit is very compact, especially the M-type with its integral pump units, and space-saving is an important factor within the after part of a ship's structure where the steering gear must necessarily be placed.

The robust nature of the Tenfjord steering gear's construction makes it ideal for installation on deck, there are no exposed moving parts susceptible to damage and because the unit is completely enclosed there is little possibility of seawater or sand ingress into the gear.

Over the years Tenfjord steering gears have proved themselves to be reliable in service and trouble free in operation, making these units



universally popular with owners of all types of vessels but especially among fishermen. According to the manufacturer, over 5,000 vessels from more than 45 different countries have Tenfjord steering gears installed.

For free literature giving full information on the rotary hydraulic Tenfjord steering gear,

Circle 59 on Reader Service Card

Rear Adm. **Paul L. Krinsky** (left), superintendent of the U.S. Merchant Marine Academy, receives a plaque signifying his honorary membership in the American Society of Naval Engineers from Dr. **Alfred Skolnick,** the organization's president.

Academy Chief Elected To ASNE

Rear Adm. **Paul L. Krinksy,** superintendent of the U.S. Merchant Marine Academy, has been elected an honorary member of the American Society of Naval Engineers (ASNE) by the group's council.

A plaque signifying Admiral **Krinksy's** membership was presented to him by ASNE's president, Dr. **Alfred Skolnick.**

Admiral **Krinsky** was named chief of the academy last July. He is the seventh person to hold the superintendent's post since the federal maritime school was dedicated in 1943. A 1950 academy alumnus, he sailed aboard United States Lines passenger vessels after graduation and served in the U.S. Navy before joining the academy's faculty in 1958. He held numerous administrative posts, including academic dean and deputy superintendent, prior to taking command on the institution.

The academy, located in Kings Point, Long Island, N.Y., is operated by the Maritime Administration of the U.S. Department of Transportation. Its mission is to train young men and women from across the nation in a four-year, accredited college program to become officers aboard U.S.-flag merchant ships, maritime industry leaders and U.S. Naval Reserve officers.

PROPULSION UPDATE

Deutz MWM Diesel Engine Series Offer Distinct Advantages For Passenger Boat Propulsion

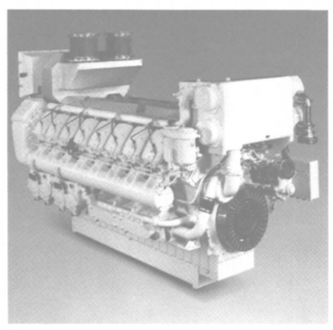
—Detailed Literature Available—

The trade name Deutz MWM not only represents medium and large diesel engines for the marine market, but also compact, high-speed units covering lower power ranges.

The range of Deutz MWM passenger boat propulsion engines includes extremely compact, high- and medium-speed diesel units. These engines are light weight, compact and smooth-running, combining fuel economy and environmental compatibility. Four engine series are available covering a power range from 20 to 3,470 kw (27 to 4,720 hp).

The lower end of the power range, 20 to 150 kw (27-204 hp), is represented by the 226B Series engines. They are available in two-, three-, four- and six-cylinder versions, whose maximum cylinder power is between 18 and 25 kw, depending on whether the engine is a naturally aspirated or turbocharged unit with or without charge air cooling. The diesels are rated for speeds between 1,500 and 2,500 rpm.

Powers up to 1,800 kw (2,448 hp) are covered by twin-engine installations consisting of 234 Series engines rated for 100 to 900 kw (136 to 1,224 hp) each at speeds between 1,500 and 2,300 rpm. The 234 Series includes engines in Vee configurations with six, eight, 12 and 16 cylinders. Their best weight per unit power value in maritime duty is as low as 2.5 kg/kw (1.84 kg/hp), while the power per unit volume is around 400 kw/cu.m (544 hp/cu.m).



The compact high-speed diesel engines of the Deutz MWM 604B Series cover a power range from 570 to 2,630 hp at speeds of 1,000 to 1,800 rpm.

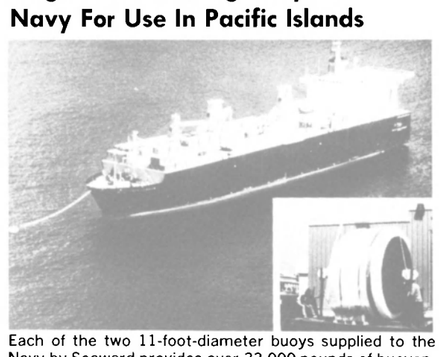
The compact series 604B high-speed engines represent the next higher power class, with ratings up to 4,000 kw (5,440 hp). Introduced in 1985, these engines have performed very well, particularly as propulsion units for fast ships. Their power range extends from 420 to 1,935 kw (570 to 2,630 hp) at speeds from 1,000 to 1,800 rpm. The optimal fuel consumption is as low as 190 g/kwh (140 g/hph). A simple throttle-plate control provides for optimal intake-air supply of the

(continued on page 70)

The 201-foot, Italian-built II Vagabondo is equipped with 12-cylinder Deutz MWM 628 Series engines. The 1,050-ton passenger boat can reach speeds of 18 knots.

PROFESSIONAL

Seaward International Supplies Large Fleet Mooring Buoys To Navy For Use In Pacific Islands



Each of the two 11-foot-diameter buoys supplied to the Navy by Seaward provides over 33,000 pounds of buoyancy and is capable of sustaining a mooring load of more than 150 tons.

Seaward International, Inc. has recently supplied two large fleet mooring buoys to the U.S. Navy. These 11-foot-diameter buoys were installed in approximately 300 feet of water off the island of Tinian, by the Chesapeake Division of the Naval Facilities Engineering Command and its prime contractor, VSE Corporation.

Tinian, the scene of a famous World War II battle, is located about 100 miles north of Guam in the Mariana Group of Pacific islands. It now serves as a home port base for several of the Navy's preposition ships, forming part of the rapid deployment strategy. These ships are loaded with food, fuel, vehicles and other material required to support military operations.

Each buoy provides over 33,000 pounds of buoyancy and is capable of sustaining a mooring load of more than 150 tons. Seaward has worked with Navfac to pioneer the development of resilient foam-filled mooring buoys for fleet moorings. These buoys have a number of advantages over the traditional steel mooring buoys. These include lighter weight, lower maintenance and the ability to sustain collisions without damage to the buoy or vessel.

Seaward has worked closely with the U.S. Navy for many years, providing dock and shipboard fenders, buoys and specialized coatings.

For additional information on Seaward's complete line of Sea Cushion®, Sea Guard®, Sea Float and buoys and Donut marine fenders,

For more information and free literature from Seaward,

Circle 75 on Reader Service Card

New Marine Travelift 500BFM Now 'At Work' In Abu Dhabi

Marine Travelift, Inc.'s new 500-ton-capacity mobile boat hoist has been installed and is now operating at Abu Dhabi, United Arab Emirates. The customer, Delma Co-op Society, is a service and repair facility for oceangoing tugs and fish trawlers in Abu Dhabi.

The 500BFM is capable of hauling a wide variety of sizes and shapes of boats and modules weighing up to 500 tons. Marina and shipbuilding operators will experience a substantial savings in time, labor and storage space and save the high cost of conventional immobile haulout installations used by most of the existing larger repair yards. Delma Co-op now has the expertise to repair and build a large range of boats—from 27-foot-wide boats to 45-foot-wide barges.

A large diesel engine provides all hydraulic power for two-speed travel and hoisting. It has travel speeds to 50 feet per minute. Six hydraulic-powered individual hoist drums provide separate or simultaneous hoisting for leveling and lifting the boat in the slings.

For free information on Marine Travelift's full line of mobile hoists with from 15 to 500-ton capacities,

Circle 72 on Reader Service Card

Deutz

(continued from page 66)

four-valve cylinder heads, thus ensuring clean fuel-efficient combustion over a wide speed range, even under part-load condition.

For passenger boat propulsion, the Deutz MWM product line is topped by medium-speed diesel engines highlighted by economy and smooth-running characteristics.

For example, more than 1,000 628 Series engines have been sold, with about 60 percent of these for marine main propulsion or auxiliary sets. The current power range covered by the 628 Series, which are offered in six-, eight-and nine-cylinder in-line versions and 12- and 16-cylinder V-types, extends from 755 to 3,470 kw (1,027 to 4,720 hp) at speeds from 720 to 1,000 rpm.

For free literature detailing the features and applications of the full line of Deutz MWM diesel engines,

Circle 10 on Reader Service Card

SASMEX '88 To Be Held April 26-28 In London

The 1988 Safety at Sea and Marine Electronics Exhibition and Conference (SASMEX '88) will be held at the New Hall, Royal Horticultural Society's Halls, Westminster, London, England, from April 26 to 28.

The SASMEX '88 Conference will cover various aspects of shipboard fires, including: firefighting equipment and training; contingency planning by port authorities; ship stability; various methods of alternative evacuation; and inflatable rescue boats. Electronics are also featured at the conference, the second day of which is devoted to different safety aspects of marine navigation. The papers to be presented cover such subjects as safety in command; the training and certification of watchkeepers; navigation in confined waters; and the use of digital charts in marine navigation. This latter subject will be covered by a manufacturer of such systems, Disc Navigation, and also by Rear Adm. **R. O. Morris,** the Hydrographer of the Navy.

The exhibition is a three-day event, April 26 to 28. The conference is of two days' duration, April 27 to 28.

Further details are available from **Sandra White,** SASMEX '88, Queensway House, 2, Queensway, Redhill, Surrey, HR1 1QS, England, phone (0737) 768611, telex 948669 TOPJNL G, telefax (0737) 760564.

IHI Receives Order To Build Gas Carrier

Ishikawajima-Harima Heavy Industries Co., Ltd. (IHI) of Japan has received an order from Scotland-based Tarquin Shipping for a 4,000 m^3 gas carrier.

The 4,500-dwt vessel is expected to be delivered in September of this year.

MarAd Agrees To Offer By Shell To Buy Three LNG Carriers

The Maritime Administration (MarAd) has agreed to an offer by Shell International Inc., London, for the option to purchase three liquefied natural gas (LNG) carriers owned by the agency. Shell has made the offer on behalf of an American citizen company which was not revealed.

The vessels are the Arzew, Gamma and Southern built by Newport News Shipyard, Newport News, Va., and delivered in 1978 and 1979.

The purchase option is for a three-year period, expiring December 31, 1990, and provides for an annual payment to MarAd of $1.3 million per vessel.

Under the terms of the option, the vessels could be purchased for $12 million each in 1988, $12.7 million each in 1989, or $13.5 million each in 1990.

The option is subject to the inspection of two of the LNG carriers, the Arzew and Southern. MarAd is requiring that the purchaser agree not to resell the vessels before December 31, 1995, and said the participants must consent to the options no later than May 31, 1988.

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Hyundai Heavy Industries To Build Ethylene Carriers

Hyundai Heavy Industries (HHI) of Korea recently won several contracts to build ethylene carriers for some of the leading overseas shipowners.

Among the contracts is one for a 4,000-cubic-meter ethylene carrier for Olaf Pedersen's Rederi A/S of Norway.

The carrier will have two cargo holds to accommodate two individual pressure vessel type cargo tanks. The hull in the cargo tank area will be of a single bottom, double-side shell and single upper/trunk deck. The bottom of the hull is to be strengthened to permit regular grounding on the seabed for cargo loading and discharging.

Each tank will be constructed of 9 percent nickel steel and insulated with 150-mm polyurethane foam.

The carrier will have an approximate length of 322½ feet, beam of 49 feet, and depth of 24½ feet. She will be powered by a MAK 6M 551 main engine developing a mcr of 4,500 at 450 rpm.

The new vessel will be able to load cargo from both over-pressure and atmospheric tanks, which means that she will be able to use almost any terminal in the world. She will be equipped with highly sophisticated cargo handling and monitoring systems and all items of cargo handling equipment will be fully instrumented for safe and efficient use.

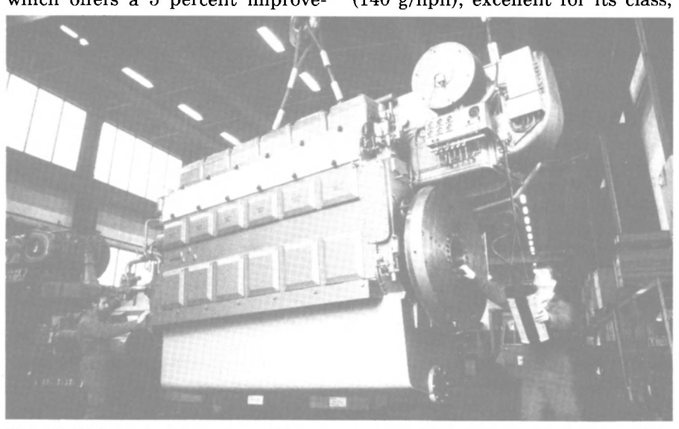
For free literature giving complete details on the Shipbuilding Division of Hyundai Heavy Industries,

Circle 74 on Reader Service Card

PROPULSION UPDATE

MAN B&W's New 28/32A Diesel: Improved Fuel Economy With Same Reliability

MAN B&W Diesel A/S, Alpha Diesel, has introduced an "A" version of their popular medium-speed 28/32 type marine diesel engine which offers a 5 percent improvement in fuel efficiency. Through simple modifications, the new 28/32A engine achieved a specific fuel consumption of less than 190 g/kwh (140 g/hph), excellent for its class, while retaining reliability and serviceability.



The 28/32A engine type has 280-mm bore/320-mm stroke. The engine type is available with 6, 8, and 9 cylinders in-line and with 12 and 16 cylinders in V-form. The output is 1,320-3,520 kw (1,800-4,800 bhp) at 750 r/min.

The upgrading was based upon service experiences of the L/V 28/32 engine. MAN B&W Holeby and MAN B&W Alpha supplied about 200 of these engines with an aggregate output of over 330,000 kw (450,000 hp).

Through slight modifications of the engine's combustion chamber and air ducts in the cylinder heads, MAN B&W engineers will be able to enhance the engine's fuel economy.

Tests conducted on a six-cylinder L/8232 engine (with a turbocharger) at the group's Augsburg works showed the engine speed to be 750 rpm; the power per cylinder as 220 kw (300 hp); Bmep as 17.9 bar; maximum combustion pressure as 145 bar; exhaust temperature as 315 degrees C; and Sfoc as 190 g/kwh (140 g/hph).

The test engine results have been confirmed by initial data from the first 6L28/32A production engine on a testbed at Alpha Diesel in Frederikshavn.

The moderate brake mean effective pressure and the retention of the original safe engine timing are expected to ensure that the exhaust valve overhaul interval can at least be maintained at—or even extended from—8,000 to 10,000 hours on heavy fuel oil and 12,000 to 18,000 hours on MDO, depending on the operational mode and the fuel specification.

The engine is designed for operation on fuels up to 700 cst/50 degrees viscosity.

Demonstrations to potential customers are offered at any power setting up to 1,500 kw (2,000 hp) and at up to 10 percent overload.

The first 28/32A engines have already been delivered to Norwegian and Danish shipowners.

The new 28/32A is available in six, eight and nine-cylinder in-line versions, with a power range of 1,320 kw (1,800 hp) to 1,980 kw (2,700 hp) and in Vee versions with 12 and 16 cylinders, with a range of 2,640-3,520 kw (3,600-4,800 hp).

For free literature detailing the new 28/32A diesel engine from Alpha Diesel,

Circle 44 on Reader Service Card

Jotun Cathodic Protection Is New Name Adopted By Skarpenord Corrosion AS

Skarpenord Corrosion AS, a cathodic protection enterprise and part of the international Jotun group, recently announced that its name has been changed to Jotun Cathodic Protection AS.

The new name highlights the company's specialist business and emphasizes its role in the comprehensive activities of the Jotun organization in corrosion prevention and materials protection.

For free literature giving full details on Jotun Cathodic Protection,

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Maritime Power Corp., 200 Henderson Street, Jersey City, NJ 07302
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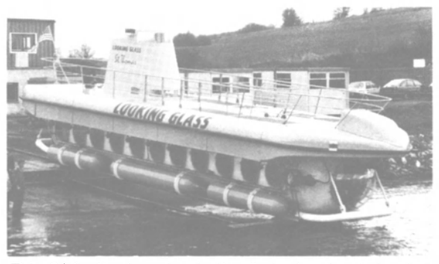
Serck GmbH, Tilsiter Str 90, D-2000 Hamburg 70, WEST GERMANY
FANS—VENTILATORS—BLOWERS
Carling Turbine Blower Company, 10 Nebraska St., P.O. Box 88, Worcester MA 01613
Jon M. Liss Associates, Inc., 411 Borel Ave., P. O. Box 5554, San Mateo, CA 94402
Robinson Industries, P.O. Box 100, Zelienople, PA 16063
FASTENERS
Action Threaded Products Inc., 7440 W. 100th Place, Bridgeview IL 60455
Lee Brass Company, P. O. Box 1229, Anniston AL 36202
Non-Ferrous Bolt & Mfg Co., Inc., 3650 W. Russell Rd., Las Vegas NV 89118
FENDERING SYSTEMS/BUOYS—Dock & Vessel
Intertrade Ltd., Marine Products Div., 15301 Transistor Lane, Huntington Beach CA 92649
Johnson Rubber Co., Duramax Marine Div., 16025 Johnson St., Middlefield, OH 44062
Kohlenberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241
Milligan Marine Supply Inc., 5832 Harvey Wilson, Houston TX 77020
Schuyler Manufacturing, 16901 Woodinville-Redmond Rd, Woodinville WA 98072
Seaward International, Inc., Clearbrook Industrial Park, P.O. Box 98, Clearbrook VA 22624
FILTERS
Marketec, Inc., 27 Bowers Lane, Chatham NJ 07928
Parker Filter Division, 16810 Fulton County Rd., #2, Metamora, OH 43540
FUEL ADDITIVE
Drew Ameroid Marine, One Drew Chemical Plaza, Boonton NJ 07005
U.S. Borax, Industrial Chemicals, 3075 Wilshire Blvd., Los Angeles CA 90010
FURNITURE
Bailey, Carpenter & Insulation Co., 2323 Randolph Avenue, Avenel, NJ 07001
GALLEY EQUIPMENT
Gaylord Industries, P.O. Box 558, Wilsonville OR 97070
Greitzer, Inc., 101 Riverdale Rd., Riverdale NJ 07457
GANGWAYS, LADDERS
American Mason Safety Tread Company, 153 Essex St., Haverhill MA 01830
Rampmaster Inc., 9825 Osceola Blvd., Vero Beach, FL 32960
Wooster Products Inc., 1000 Spruce St., P.O. Box 896, Wooster, OH 44691
HATCH & DECK COVERS—Chain Pipe
American Mason Safety Tread Company, 153 Essex St., Haverhill MA 01830
HEAT EXCHANGERS
Alfa Laval Inc., 2115 Linwood Ave., Fort Lee NJ 07024
ITT Standard Heat Transfer Technology, Buffalo, NY 14240
MECO (Mechanical Equipment), 861 Carondelet St., New Orleans LA 70130
Riley-Beaird, P.O. Box 31115, Shreveport, LA 71130
Serck GmbH, Tilsiter Str 90, D-2000 Hamburg 70, WEST GERMANY
HORNS/WHISTLES
Kohlenberg Bros Co., P.O. Box 358, Two Rivers, WI 54241
HYDRAULICS
Aeroquip Corporation, 300 South East Ave., Jackson, MI 49203
Cunningham Marine Hydraulics Co., 201 Harrison St., Hoboken NJ 07030
Del Gavio Marine Hydraulics Inc., 207 W Central Ave., Maywood NJ 07607; telex: 132610 DELMARINE
Parker Hannifin Corporation, 17325 Euclid Avenue, Cleveland, OH 44112
Titeflex Corporation, P.O. Box 54, Springfield, MA 01109
INSULATION—Cloth, Fiberglass
Bailey, Carpenter & Insulation Co., 2323 Randolph Avenue, Avenel, NJ 07001
The Claremont Company, 174 State Street, P. O. Box 952, Meriden CT 06450
Duracote Corp., 350 North Diamond St., Ravenna, Ohio 44266
Soundcoat, One Burt Drive, Deer Park NY 11729
JOINER—Watertight Doors—Paneling—Ceiling Systems
Astech, 3030 S. Red Hill Ave., Santa Ana, CA 92711
Bailey Distributors, Inc., 2323 Randolph Avenue, Avenel, NJ 07001
Dampa Inc., The Gatehouse at North Park, Suite 106-108, Hunt Valley MD 21030
Simpson Timber Co., Third & Franklin, Shelton WA 98584
Walz & Krenzer Inc., 1390 Mt. Read Blvd., Rochester NY 14606
KEEL COOLERS
R.W. Fernstrum & Co., 1716 Eleventh Ave., Menominee, MI 49858
Johnson Rubber Co., Duramax Marine Div., 16025 Johnson St., Middlefield, OH 44062
Kahlenberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241
The Walter Machine Co., Inc., 84-98 Cambridge Avenue, Jersey City, NJ 07307
LIGHTING EQUIPMENT—Lamps, Fixtures, Searchlights
Carlisle & Finch, 4562 W. Mitchell Ave., Cincinnati OH 45232
Phoenix Products Company, Inc., 4769 North 27th Street, Milwaukee, WI 53209
LINE BLINDS
American Piping Products Inc., Box 1056, New Hyde Park, NY 11040
LUBE-OIL CENTRIFUGES
Keith Dixon Warehouse Supplier, Authorized distributor for Spinner II, 650 Whitehead Rd., Lawrenceville NJ 08648
Spinner II Products Div., T.F. Hudgins Inc., P.O. Box 920946, Houston, TX 77292
MACHINERY MAINTENANCE, REPAIR, OVERHAUL, AND TESTING
Del Gavio, 207 W. Central Ave., Maywood, NJ 07607. Telex: 132610 DELMARINE
Goltens, 160 Van Brunt St., Brooklyn, NY 11231
MEDICAL SUPPLIES
Universal Marine Medical Supply, 69-06 3rd Ave., Brooklyn NY 11209
METAL MARKER
J. P. Nissen Company, P.O. Box 188, Glenside PA 19038
NAVAL ARCHITECTS, MARINE ENGINEERS, SURVEYORS
Advanced Combat Systems Engineering & Analysis Corp., 19240 Nordhoff St., Ste 206, P.O. Box 47, Northridge, CA 91324
Advanced Marine Enterprises, Inc., 1725 Jefferson Davis Hwy., Arlington, VA 22202
Aero Nav Laboratories, Inc., 14-29 112 St., College Point, NY 11356
American Systems Engineering Corp., P.O. Box 8988, Virginia Beach, VA 23452
Amirikian Engineering Co., Chevy Chase Center Bldg., Suite 505, 35 Wisconsin Circle, Chevy Chase, MD 20015
B.C. Research, 3650 Wesbrook Mall, Vancouver, B.C. Canada V6S 2L2
Del Breit Inc., 326 Picayune Place (Suite 201), New Orleans, LA 70130
CDI Marine Co., 900 Regency Square Blvd., Suite 203, Jacksonville, FL 32211
C.T. Marine, 18 Church Street, Georgetown, CT 06829
Childs Engineering Corp., Box 333, Medfield, MA 02052
Crandall Dry Dock Engrs., Inc., 21 Pottery Lane, Dedham, MA 02026
Crane Consultants, 15301 First Ave S., 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
E.Y.E. Marine Consultants, Belmont House, 33 Alderney Dr., Suite 350, Dartmouth, NS CANADA B2Y 2N4
Encon Management & Engineering Consultant Services, P.O. Box 7760, Beaumont, TX 77706
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., 600 Mutual Life Bldg., 605 First Ave., Seattle, WA 98104
Morris Guralnick Associates, Inc., 620 Folsom Street, Suite 300, San Francisco, CA 94107
Hi-Test Laboratories, Inc., P.O. Box 226, Buckingham C.H., VA 23921
Hydrocomp, Inc., 45 James Farm-Lee, P.O. Box 865, Durham, NH 03824
Intramarine, Inc., P.O. Box 53043, Jacksonville, FL 32201
JJH Inc., 1101 Kings Hwy, Suite 206, Cherry Hill, NJ 08034
R.D. Jacobs & Associates, 11405 Main St., Roscoe, IL 61073
Korkut Engineers Inc., P. O. Box 7515, Metairie LA 70011
James S. Krogen, 1515 NW 7th St., Suite 124, Miami FL 33125
Rodney E. Lay & Associates, 13891 Atlantic Blvd., Jacksonville, FL 32225
Clyde Leavitt Inc., 45 Puerto Dr, Ocean Springs, MS 39564
Alan C. McClure Associates, Inc., 2600 South Gessner, Houston, TX 77063
McElroy Machine & Mfg Co., Inc., P.O. Box 4454, Biloxi, MS 39535-4454
John J. McMullen Associates, Inc., 1 World Trade Center, New York, NY 10048
MacPherson Maritime Services, 141 Jefferson Ave., Westfield NJ 07090
Fendall Marbury, 9 Neal Street, Annapolis MD 21401
Marine Power Associates, 1010 Turquois St., Ste 217, San Diego, CA 92109
Maritime Design, Inc., 2955 Hartley Rd., Jacksonville, FL 32217
R.J. Mellusi & Co., 71 Hudson St, New York, NY 10013
Nelson & Associates, Inc., 610 Northwest 183rd St., Miami, FL 33169
Northern Marine, P.O. Box 1169, Traverse City, MI 49685
Capt. H.L. Olsen, Marine Surveyors Company, P.O. Box 283, Port Jefferson NY 11777
Omega Marine Engineering Systems Inc., 11757 Katy Freeway, Suite 390, Houston TX 77079
Pyrotech Technical Institute, Delgado Community College, New Orleans, LA
Q.E.D. Systems Inc., 4646 Witchduck Rd., Virginia Beach, VA 23455
M. Rosenblatt & Son, Inc., 350 Broadway, New York, NY 10013 and 667 Mission St., San Francisco, CA 94105
Sargent & Herkes Inc., 611 Gravier St., New Orleans, LA 70130
SEACOR Systems Engineering Corp., 520 Fellowship Rd., Ste C306, Mt. Laurel NJ 08054
STV/Sanders & Thomas, Inc., 7900 Westpark Dr., McLean VA 22102
Sea School, 3770 16th Street North, St. Petersburg, FL 33704
Seaworthy Systems Inc., P. O. Box 338, Essex, CT 06426; 17 Battery Pl., New York, NY 10004; P.O. Box 205, Solomons MD 20688; 2 Skyline Pl., 5203 Leesburg Pike, Falls Church VA 22041.
Seaworthy Electrical Systems, 17 Battery Pl. N.Y. N.Y. 10004
George G. Sharp, Inc., 100 Church St., New York, NY 10007
T.W. Spaetgens, 156 W. 8th Ave., Vancouver BC CANADA V5Y 1N2
R.A. Stearn, Inc., 253 N. 1st Ave., Sturgeon Bay, WI 54235
TIMSCO, P. O. Box 91360, Mobile AL 36691
Tracor Hydronautics, Inc., 7210 Pindell School Rd., Laurel, MD 20707
VSE Corporation, 1417 No Battlefield Blvd, Chesapeake VA 23320
Thomas B. Wilson, Associates, 1258 North Avalon Blvd., Wilmington, CA 90744
NAVIGATION & COMMUNICATIONS EQUIPMENT
AT&T, 412 Mt Kemble Ave., Room N420, Morristown NJ 07960
Atkinson Dynamics, 10 W Orange Ave., So San Francisco CA 94080
Comsat Maritime Services, 950 L'Enfant Plaza SW, Washington DC 20024
Furuno U.S.A., 271 Harbor Way, S. San Francisco, CA 94080
General Electric Company, Mobile Communications Division, Lynchburg, VA 24502
Harris Corporation, RF Communications Group, 1680 University Ave., Rochester NY 14610
Henschel Corporation, 9 Hoyt Dr., P.O. Box 30, Newburyport MA 01950
Hose McCann Telephone Company, Inc., 9 Smith Street, Englewood, NJ 07631
ITT Mackay, 441 U.S. Highway #1, Elizabeth, NJ 07202
Kelvin Hughes Ltd., New North Rd., Hainault, Ilford, Essex 1G6 2UR England
Mackay Communications, 441 US Hightway #1, P. O. Box 331, Elizabeth NJ 07207
Ocean Satellite Televion Ltd., Avmar House, 61 Brushfield St., London E1 6AA ENGLAND

Fluid Energy Launches 64-Foot Passenger Submarine

Fluid Energy Ltd. recently launched the first of a line of Scottish-built, 48-seat leisure submarines. Designed and built at the company's yard at Firth of Forth in Scotland, the 64-foot submarine will be delivered to Submarine Tours of St. Thomas, Inc., for operation in the Caribbean.

Built at a cost of $2.7 million, the Looking Glass LG50 submarine displaces 95 tons, and has a pressure hull diameter of 8½ feet. Although rated for a maximum depth of 250 feet, the submarine will operate at depths of 90 to 150 feet, offering hour-long underwater tours. Her hull has 11 large portholes along each side, viewing bubbles at her bow and stern, a battery of floodlights and feeding jets to attract fish.

In addition, she carries a miniature remotely operated vehicle (ROV) in her deck housing, which can be deployed to take video or still pictures for or of the passengers.



This 64-foot submarine is the first of a line being built by Fluid Energy Ltd. for the tourist market. She will be operated in the Caribbean by Submarine Tours of St. Thomas, Inc.

Painted yellow, reminiscent of the Beatles' song, "Yellow Submarine," the LG50 is the culmination of a dream for **Mike Angove,** Fluid Energy's managing director and founder.

"I have been fascinated by the idea of the leisure submarine since I was a boy, when I read of the submarine built by the **Picard** family in the 1950s and operated on Lake Geneva," Mr. **Angove** said. "I always believed that a leisure submarine was viable, given the right size vehicle, cost-efficient operations and savvy marketing."

Designing submersibles for the offshore oil market since 1983, Fluid Energy already has a second order from Looking Glass Cruises of Bermuda, and is expected to announce additional contracts in the near future.

For free literature on the submarine designed by Fluid Energy Ltd.,

Circle 71 on Reader Service Card

Waugh To Supply Rockwool TNF Joiner System For USNS 'Mercy'

The Waugh Co. of Jacksonville, Fla., has won the order to supply the Rockwool TNF Joiner System for the control enclosure on board the USNS Mercy (hospital ship) at North West Marine Iron Works, Portland, Ore.

The Rockwool TNF System was required due to its high sound reduction and quick installation characteristics.

Petroleum Communications Inc. (Petrocom) Head Office: 5901 Earhart Expwy., New Orleans LA 70123; 556 Jefferson St., Suite 100, Lafayette LA 70501; Allied Bank Plaza, Suite 5440, 1000 Lousisian St., Houston TX 77002
Radar Devices Inc., 2955 Merced St., San Leandro, CA 94577
Radio-Holland USA, Inc., 6033 South Loop East, Houston, TX 77033
Raytheon Marine Company, 46 River Rd., Hudson NH 03051
Raytheon Service Company, 5740 East Bayside Rd., Virginia Beach VA 23455
Robertson Shipmate Inc., 3000 Kingman St., Suite 207, Metairie LA 70006
S P Radio A/S, DK 9200 Aalborg DENMARK
SPT Audio, 8928 Kirby Dr., Houston TX 77054
Standard Communications, P.O. Box 92151, Los Angeles CA 90009
Standard Radio & Telefon AB, P.O. Box 501, S-162 15 Vallingby, SWEDEN
Telesystems, 2700 Prosperity Ave., Fairfax, VA 22031 USA
Watercom Communications Systems, 453 E. Park Place, Jefferson IN 47130

OILS—Marine—Additives
B P North America Petroleum, 555 US Route 1, So. Iselin, NJ 08830
Chevron USA, 575 Market St., San Francisco, CA 94105
Texaco, International, 2000 Westchester Avenue, White Plains NY 10650

OIL/WATER SEPARATORS
Alfa Laval Inc., 2115 Linwood Ave., Fort Lee NJ 07024
Centrico, Inc. (Westfalia Separators), 100 Fairway Court, Northvale, NJ 07647
FAST Systems Inc., 1717 Sublette Ave., St Louis MO 63110
Marketec, Inc., 27 Bowers Lane, Chatham NJ 07928
Microphor, Inc., 452 E Hill Rd., P.O. Box 1460, Willits, CA 95490

PAINTS—COATINGS—CORROSION CONTROL
American Mason Safety Tread Company, 153 Essex St., Haverhill MA 01830
Magnus Maritec, division of Drew Chemical, One Drew Plaza, Boonton NJ 07005
Palmer International, P.O. Box 8, Worcester, PA 19490

PIPE-HOSE—Cargo Transfer Clamps, Couplings, Coatings, Supports
Aeroquip, 300 South East Ave., Jackson, MI 49203
Deutsch Metal Components, 14800 S. Figueroa, Gardena, CA 90248
Stauff Corporation, 21-23 Industrial Park, Waldwick NJ 07463

PLASTICS—Marine Applications
SFGP Inc./Industrial Plastics, 2330 16th St. So., P.O. Box 875, Wisconsin Rapids, WI 54494

PORT SERVICES
Port of Iberia, P.O. Box 897, New Iberia LA 70561

PROPULSION EQUIPMENT—Bowthrusters, Diesel Engines, Gears, Propellers, Shafts, Turbines
Allison Gas Turbine Division, General Motors Corp., P.O. Box 420 Speed code U6, Indianapolis, IN 46206
Bird Johnson Company, 110 Norfolk St., Walpole, MA 02081
Bergen Diesel A/S, P.O. Box 924, N-5001 Bergen NORWAY
Bergen Diesel Inc., 2701 Delaware Ave., Kenner LA 70062
Boston Metals Co., 313 E. Baltimore St., Baltimore, MD 21202
Burmeister & Wain Alpha Diesel AS, DK-1400 Copenhagen K, Denmark
Caterpillar In., 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
Combustion Engineering, Inc., Windsor, CT 06095
Deutz Corp., 7585 Ponce de Leon Circle, Atlanta, GA 30340
Fincantieri, Diesel Engines Division—GMT, Bagnoli della Rosandra 334, Trieste, ITALY
GE Naval & Drive Turbine Systems Department, 166 Boulder Dr., Fitchburg MA 01420
General Motors, Electro-Motive Division, LaGrange, IL 60525
Isotta Fraschini Motori SpA (Fincantieri Group), Via Milano n. 7, 21047 Saronno (Va), ITALY
KHD Canada Inc., 180 Rue de Normandie, Boucherville, Quebec J4B 5S7, Canada
Kohlenberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241
Krupp MaK, P.O. Box 90 09, D-2300 Kiel 17, WEST GERMANY
Lips Propellers, 3617 Koppens Way, Chesapeake, VA 23323
Marine Gears, Inc., P.O. Box 689, Greenville MS 38707
Markisches Werk, Halve, P.O. Box 1442, D-5884 Halver WEST GERMANY
MAN B&W Diesel, 50 Broadway, New York, NY 10004
MAN B&W Diesel A/S, Ostervej 2, DK-4960 Hoelby, Denmark
MAN B&W Diesel A/S, Alpha Diesel, Niels Juels Vej 15. DK-9900 Frederikshavn Denmark
MAN B&W Diesel GmbH, Stadtbachstrasse 1, D-8900 Augsburg 1 Germany
Michigan Wheel Corp., 1501 Buchabab Ave., SW, Grand Rapids MI 49507
MTU of North America, 10450 Corporate Dr, Houston TX 77478
North American Marine Jet P.O Box 1232 Benton, AR 72015
Northwest Marine Services Corp., 6452 So. 144th St., Tukwila WA 98168
Schottel-Werft, Josef Becker GmbH, KG, D-5401 Spay, WEST GERMANY
Sulzer Brothers, Dept. Diesel Engines, CH-8401 Winterthur, Switzerland
Sulzer/Escher Wyss, Ravensburg WEST GERMANY
Tenfjord Inc., 200 Jackson Ave., Hoboken, NJ 07030
Ulstein Maritime Ltd., 96 North Bend Street, Coquitlam BC CANADA V3K 6H1
Ulstein Propellers, N-6065 Ulsteinvik, NORWAY
Ulstein Trading Ltd. A/S, N-6-65, Ulsteinvik, Norway
J.M. Voith GmbH, Marine Division, Postfach 1940, 7920 Heidenheim/Brenz, WEST GERMANY Voith Schneider America Inc., 121 Susquehanna Ave., Great Neck, NY 11021
Wartsila Power Inc., 5132 Taravella Rd., P.O. Box 868, Marrero, LA 70072

PUMPS—Repairs—Drives
Del Gavio, 207 W. Central Ave., Maywood, NJ 07607. Telex: 132610 DEL-MARINE
Goltens, 160 Van Brunt St., Brooklyn, NY 11231
Imo-Delaval, Inc., IMO Pump Division, Box 447, Monroe NC 28810
Jim's Pump Repair, 48-55 36th St., Long Island City NY 11101
Megator Corporation, 562 Alpha Drive, Pittsburgh, PA 15238
Vita Motivator Co., 84 Wall St., Farmingdale, NY 11735
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
Allied Signal Inc., Fibers Division, 1411 Broadway, New York, NY 10018
American Manufacturing Co., Cordage Div., P.O. Box 52125, Lafayette LA 70505

SANITATION DEVICES—Pollution Control
Envirovac Inc., 1260 Turret Dr., Rockford, IL 61111
FAST Systems Inc., 1717 Sublette Ave., St Louis MO 63110
Microphor, Inc., 452 E Hill Rd., P.O. Box 1460, Willits CA 95490
Research Products/Blankenship (Incinolet), 2639 Andjon, Dallas, TX 75220

SCALE MODELS
Sturgeon Bay Model Shop, 187 N Ninth Ave., Sturgeon Bay WI 54235

SCUTTLES/MANHOLES
L.S. Baier & Assoc., 7527 NE 33rd Dr., Portland OR 97211
Juniper Industries, 72-17 Metropolitan Ave., Middle Village, NY 11379
Mock Manufacturing Inc., 777 Rutland Rd., Brooklyn, NY 11203

SHIPBREAKING—Salvage
Zidell Explorations, Inc., 3121 S.W. Moody St., Portland, OR 97201

SHIPBUILDING EQUIPMENT
American Marine, P.O. Box 8126, New Orleans LA 70182
Hilman Inc., 2604 Atlantic Ave., Wall, NJ 07719
M.A.N.—GHH, Sterkrade Werfsrabe 112 D-4100 Duisburg 18, West Germany
MAN—GHH, P.O. Box 110240, D-4200 Oberhausen 11, West Germany
NEI Syncrolift, Inc., 8970 S W 87th Ct., Miami FL 33176

SHIPBUILDING—Repairs, Maintenance, Drydocking
Aluminum Boats Inc., 304 Midway Dr., River Ridge LA 70123
Astilleros Espanoles S.A., Padilla 17, 28006 Madrid, SPAIN
Bay Shipbuilding Corp., 605 N. 3rd Ave., Sturgeon Bay, WI 54235
Blount Marine, Box 368, Warren RI 02885
Bollinger Lockport & Larose, P.O. Box 250, Lockport LA 70374
Burmeister & Wain Skipsvaerft A/S, P.O. Box 2122, Refshaleoen, DK-1015 Copenhagen, DENMARK
Curacao Drydock (U.S.A.) Inc., 26 Broadway, Suite 741, New York, NY 10004
Danyards A/S, P.O. Box 719, DK-9900 Frederikshavn DENMARK
Fincantieri SpA Cantieri Navali Italiani, Via Cipro 11, 16129 Genoa ITALY
Gladding Hearn Shipbuilding, One Riverside Ave., P.O. Box 300-W, Somerset, MA 02726
Hitachi Zosen Corp., 1-1-1 Hitotsubashi, Chiyoda-ku, Tokyo 100, Japan
Houston Ship Repair, 1621 Woods Dr., P.O. Box 489, Channelview, TX 77530
Hyundai Corporation, ShipSales Dept., 140-2 Kye dong, Chongro-ku, Soeul, KOREA
Hyundai Mipo Dockyard Ltd., 456 Cheonha-Dong, Ulsan, KOREA
Keppel Shipyard Limited, 325 Telok Blangah Road, P.O. Box 2169, Singapore 0409
Koch Ellis Barge & Ship Service, P.O. Box 9130, Westwego, LA 70094
Paul Lindenau GmbH, & Co., Schiffswerft u. Maschinenfabrik, D-2300 Kiel-Friedrichsort, West Germany
Lisnave, Apartado 2138, 1103 Lisbon, Codex PORTUGAL
Lockheed Shipbuilding and Construction Co., 2929 16th Avenue, S.W., Seattle, WA 98134
M.A.N. GHH Sterkrade, P.O.B. 110240, D-4200 Oberhausen 11, West Germany
Marco, Inc., 2300 W Commodore Way, Seattle, WA 98199
Marinette Maine Corporation, Marinette, WI 54143
Moss Point Marine Inc., P.O. Box 1310, Escatawpa, MS 39552
Munson Manufacturing, 150 Dayton, Edmonds WA 98020
Newport News Shipbuilding, 4101 Washington Ave., Newport News, VA 23607
Nichols Brothers Boat Builders Inc., P.O. Box 580, 5400 S. Cameron Rd., Freeland, WA 98249
Portland Ship Repair Yard, 5555 N Channel Ave., Portland, OR 97217
Ryan Marine Inc., P.O. Box 400, Port Bienville Industrial Park, Pearlington MS 39572
Samsung Shipbuilding & Heavy Industries Co., Ltd., Samsung Main Bldg. 250, 2Ka, Taepyong-ro, Chung-ku, Seoul, Korea
Service Marine Industries, P.O. Box 3606, Morgan City LA 70381
Southwest Marine, Inc., P.O. Box 13308, San Diego, CA 92113
Versatile Pacific Shipyards, Inc., P. O. Box 86099, North Vancouver BC Canada
Wartsila Marin Industri AB, P.O. Box 1090, SF 00101 Helskini, FINLAND
Zidell Explorations, Inc., 3121 S.W. Moody Street, Portland, OR 97201

SHIP MANAGEMENT
Texaco Marine Servcies Inc., P. O. Drawer 1028, Port Arthur, TX 77641

SHIPPING—PACKING
Pilotage Consultants, Inc., P.O. Box 2046, New Hyde Pork, NY 11040

SIMULATOR TRAINING
Marine Safety International, Marine Air Terminal, LaGuardia Airport, NY 11371

SILENCERS
Riley-Beoird, P.O. Box 31115, Shreveport, LA 71130

STUFFING BOXES
Johnson Rubber Co., Duramax Marine Div., 16025 Johnson St., Middlefield, OH 44062
Kohlenberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241

SURVIVAL EQUIPMENT
Parkway/Imperial, 241 Raritan St., So. Amboy, NJ 08879

TANK CLEANING
Houston Ship Repair, 1621 Woods Dr., P.O. Box 489, Channelview, TX 77530
Marketec, Inc., 27 Bowers Lane, Chatham NJ 07928

TANK LEVELING INDICATORS
Imo-Delaval, Inc., Gems Sensors Division, One Cowles Rd., Plainville CT 06062
King Engineering Corp., P.O. Box 1228, Ann Arbor MI 48106
Marine Moisture Control, 60 Inip Dr., Inwood, NY 11696

TORSIONAL VIBRATION SPECIALISTS
T.W. Spaetgens, 156 W. 8th Ave., Vancouver, Canada, V5Y 1N2

TOWING—Barges, Vessel Chartering, Lighterage, Salvage, etc.
Curtis Bay Towing, World Trade Center, Suite 800, Baltimore MD 21202
Jack Faulkner, 1005 W. Harimaw Ct., Metairie, LA 70001
McAllister Bros., Inc., 17 Battery Pl., New York, NY 10004

VALVES AND FITTINGS
Aeroquip, 300 South East Ave., Jackson, MI 49203
Bailey, Division of CMB Industries, P.O. Box 8070, Fresno, CA 93747
Cajon Co., 9760 Shepard Rd., Macedonia, OH 44056
Chemiquip Products Co., Inc., 3 W. 18th St., New York, NY 10011
Circle Seal Controls, Brunswick Corporation, P.O. Box 3666, Anaheim, CA 92803
Cla-Val Co., P.O. Box 1325, Newport Beach, CA 92663
Crawford Fitting Company, 29500 Solon Road, Solon, OH 44139
Deutsch Metal Components, 14800 S. Figueroa, Gardena, CA 90248
Elliott Manufacturing Co., Inc. (Remote Valve Operating Equipment), P.O. Box 773, Binghamton, NY 13902
Lexair Inc., Airmatic/Beckett, 299 Gold Rush Rd., Lexington KY 40503
Loeffler Machine, US #1 & Robbins Ave., Penndel PA 19047
Newman's Inc., 7500 E Redding Place, Box 1856, Tulsa OK 74101
Nupro Co., 4800 E. 345th St., Willoughby, OH 44094
Pancoast Marine Division, Front & Porter St., Philadelphia, PA 19148
Parker Hydraulic Valve Division, 520 Ternes Avenue, Elyria, OH 44035
Parker Actuator Division, 9948 Rittman Road, P.O. Box 450, Wadsworth, OH 44281-0450
Parker Systems Division, 651 Robbins Drive, Box 3500, Troy, MI 48007-3500
Swagelok Company, 5171 Hudson Dr., Hudson, OH 44236
Tate Andale Inc., 1941 Landsdowne Rd., Baltimore, MD 21227
Teleflex Inc., 771 First Ave., King of Prussia, PA 19406
Waukesha Bearings Corp., 405 Commerce St., P.O. Box 798, Waukesha, WI 53186
Whitey Co., 318 Bishop Road, Highland Heights, OH 44143

VIBRATION ANALYSIS
DLI Engineering Corp., 253 Winslow Way West, Bainbridge Island, WA 98110
Vibranalysis Engineering Corp., 4380 S. Wayside, Suite 100, Houston TX 77087

WASTEWATER TREATMENT
EES Corporation/Omnipure, An Eltech Systems Company, 12850 Bournewood Dr., Sugarland TX 77478

WATER PURIFICATION TREATMENTS
Electrocatolytic Inc., 2 Milltown Ct., Union NJ 07083

WATER PURIFIERS
Alfa Laval Inc., 2115 Linwood Ave., Fort Lee NJ 07024
Atlas-Danmark Desalination Systems A/S, Stamholmen 93, 2650 Hvidovre (Copenhagen), Denmark
Everpure, Inc., 660 N. Blackhawk Dr., Westmont, IL 60559
Riley-Beaird, P.O. Box 31115, Shreveport, LA 71130

WEATHER CHART RECORDERS
Alden Electronics, 40 Washington St., Westborough, MA 01581

WELDING
Miller Electric Mfg. Co., P.O. Box 1079, Appleton, WI 54912

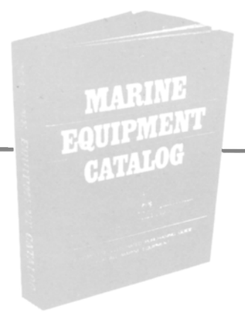
WIRE ROPE LUBRICATION SYSTEMS
Dynalube, The Kirkpatrick Group, 415 N. Loop 12 at Pioneer Dr., P.O. Box 150907, Irving TX 75014

WINCHES AND FAIRLEADS
Braden Carco Gearmatic, P.O. Box 547, Broken Arrow, OK 74013
Fritz Culver, Inc., P.O. Box 569, Covington, LA 70434
Gearmatic—see 'Braden Carco Gearmatic' above.
Markey Machinery Co., 79 South Horton St., Seattle, Washington 98134
Nashville Bridge Co., P.O. Box 239 Nashville TN 37202
Smith Berger Marine Inc., 516 S. Chicago St., Seattle, WA 98108

WINDOWS
Kearfott Marine Products, A Singer Co., 550 South Fulton Avenue, Mt. Vernon, NY 10550

WINDOW WIPERS
Marketec, Inc., 27 Bowers Lane, Chatham NJ 07928

WIRE AND CABLE
Seacoast Electric Supply Corp., 225 Passaic St., Passaic, NJ 07055
Seacoast Electric Supply Corp., 1505 Oliver St., Houston, TX 77007



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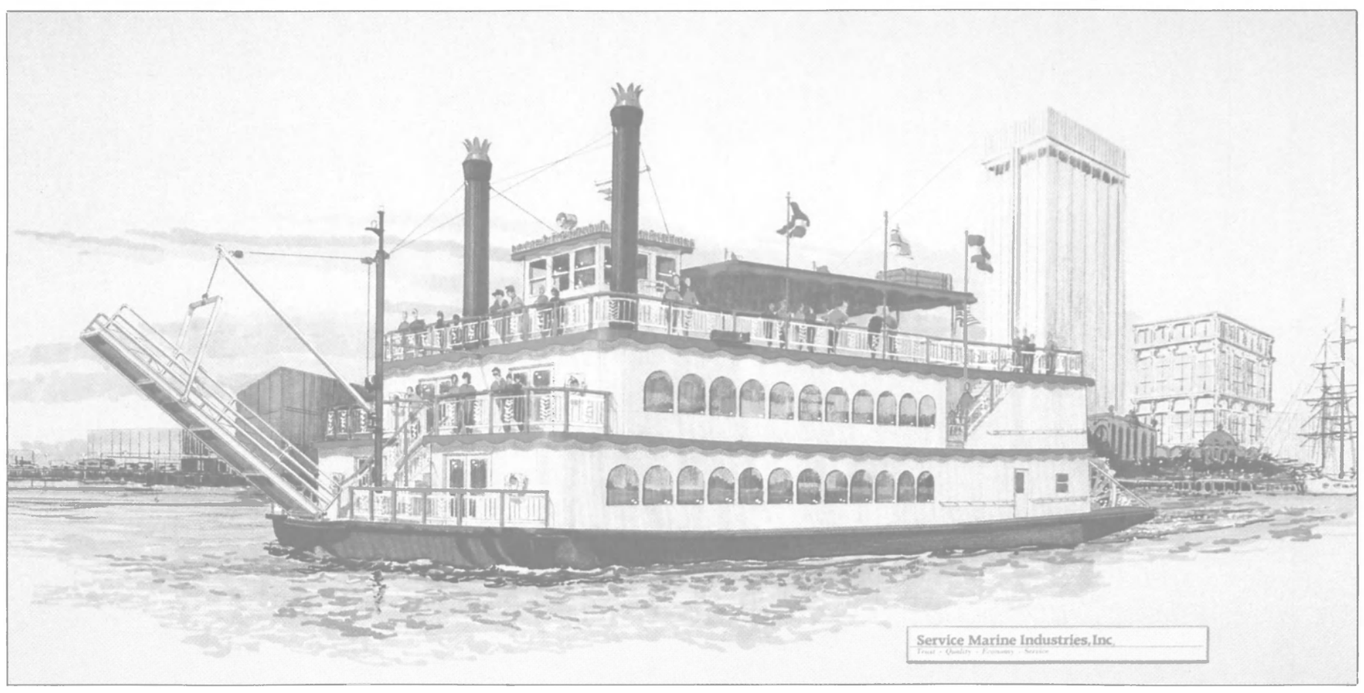

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