Proceedings
of the Marine Safety Council

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Proceedings
of the Marine Safety Council

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Concerned about the escalating costs of diesel fuel and the shortage of trained personnel needed to maintain remotely sited lighthouses and their generators, the Coast Guard initiated a project in 1979 aimed at developing alternate power sources. A report on the prototype wind machine being tested at the Cape Henry (Virginia) light station begins on page 207.

Cooperation Requested During World's Fair

The Nashville District of the U.S. Army Corps of Engineers would like to remind waterway users that certain restrictions will be in effect through October 31, 1982, during the World's Fair in Knoxville, Tennessee.

A great many recreational vessels are expected in the area during the fair. Also, several barge exhibits, excursion boats, helper boats, and floating docks are temporarily moored along the right bank, Mile 647 - 648. Official boats used by city, state, and Federal agencies and authorized ferries will be allowed to temporarily moor to the two floating docks between the Southern Railway Bridge and the Henley Street Bridge. No other vessels will be allowed to moor to these docks. Controlled recreational mooring will be permitted to the temporary dock upstream of the Henley Street Bridge, but at no time will these boats be allowed to extend into the channel further than the right channel pier of the bridge (approximately 80 feet from the shoreline).

Pilots on all tows are requested to contact the M/V SHIRLEY B (helper boat) on Channel 13 or other vessels in the area well in advance of arrival to ascertain navigation conditions and advise of their plans. It may be necessary for tows to double-trip through the restricted (135-foot-wide) channel span of the railroad bridge at Mile 647.2.

Please enclose your mailing label when sending in a change of address.

Workshop on Hazardous Materials Offered

The training/consulting firm Eugene H. Schreiner & Associates will be offering summer workshops in cities across the country on the transport of hazardous materials and substances.

Each of the one-day workshops is to be tailored to the needs of the participants. The workshops are designed to give participants a "nuts-and-bolts" understanding of what they must do to comply with regulations promulgated by the U.S. Department of Transportation and the International Maritime Organization (formerly the Inter-Governmental Maritime Consultative Organization). Attendees will also take home copies of a 100-page manual that will serve as a guide for future problems in understanding regulations.

Further details are available from Eugene H. Schreiner & Associates, 22916 Runnymede Street, Canoga Park, CA 91307; (213) 347-4196.

New Edition of Chemical Data Guide Released

The Coast Guard's Technical and Hazardous Materials Division recently completed work on the 6th edition of the Chemical Data Guide for Bulk Shipment by Water, CIM 16616.6 (old CG-388). This guide was developed in 1965 to provide a convenient, easy-to-use reference on properties and emergency procedures for bulk liquid cargoes. The new edition contains data on over 300 cargoes.

In addition to the data on cargoes, the guide includes an update on chemical compatibility, a list of known or suspected carcinogens, and a description of the CHRIS system and the CHRIS manuals.

Copies of the guide can be ordered from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402 (GPO Stock No. 050-012-00186-3). The price of the volume is $9.00.

OSHA Consolidates Standards for Shipyard Employment

In a final rule published in the FEDERAL REGISTER on April 20, 1982, the Occupational Safety and Health Administration consolidated its existing standards pertaining to shipyard employment. The standards previously comprised Parts 1915, 1916, and 1917 of Title 29 of the Code of Federal Regulations, covering ship repairing, shipbuilding, and shipbreaking, respectively. Since many of the standards are the same for each of the three operations, there was much duplication. OSHA's action consolidates the standards into a single, comprehensive Part 1915.

By eliminating repetitive provisions, OSHA will reduce the volume of the shipyard standards by approximately two-thirds. Further, by consolidating the standards, it will make them easier to use and simplify future revisions.

OSHA wishes to emphasize that this consolidation action involves only editorial and other minor changes to the shipyard standards. It does not alter the substantive requirements of the standards themselves, nor does it change their present scope and application.

The rule went into effect May 20, 1982. For further information, contact M. Robert Daly, Office of Maritime Safety Standards, Occupational Safety and Health Administration, Room N3471, U.S. Department of Labor, 200 Constitution Ave. NW, Washington, DC 20210; (202) 523-7234.

Stability of Surface Effect Ship Studied

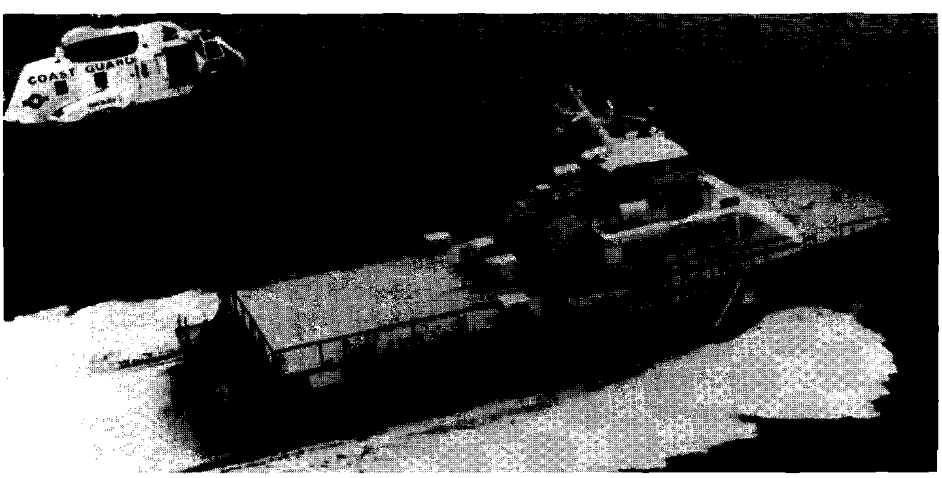
Among modern high-performance marine vessel concepts, the surface effect ship, or SES, is receiving much attention, both as a commercial vessel and as a candidate for Coast Guard use. Because of the ship's unconventional design, much needs to be learned about the relative safety of the SES, especially when it is moving at high speeds.

The Coast Guard's Office of Research and Development has completed a study examining several types of hazards and adverse ship motions that an SES can encounter while traveling at high speeds. Some of these hazards and motions are:

- plow-in (burying the bow in the water) as a result of shifting or gross misalignment of cargo,
- broaching (veering dangerously so as to be broadside to the wind) as a result of severe wind and sea conditions, and
- capsizing in high-speed turns.

From scale-model and full-scale test information, a mathematical model was developed and stability guidelines created for the SES designer. The guidelines will enable the designer to determine whether or not a proposed SES design should have adequate stability.

Copies of the project report, "Development of Intact Stability Standards for Rigid-Sidehull Surface-Effect Ships," can be obtained from the National Technical Information Service, Springfield, VA 22161, by specifying Report No. CG-D-53-81, Accession No. AD A110-567.



The unconventional design of the high-performance Surface Effect Ship makes special stability considerations necessary.

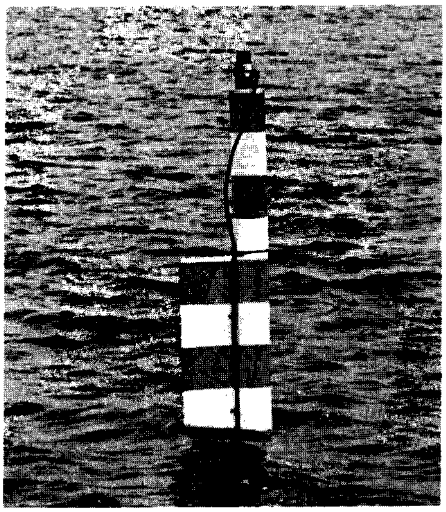
"Articulated Spar": A Better Short-range Aid?

The Coast Guard presently maintains close to 27,000 aids to navigation buoys in harbors, rivers, lakes, and coastal areas in the U.S. In addition, the aids to navigation system includes many fixed structures ranging from small daymarks to offshore towers.

Standard lighted buoys are typically anchored by a rectangular concrete block linked to the floating buoy by an iron chain. Usually the length of this chain is two to three times the depth of the water in the vicinity of the buoy. This provides sufficient slack to compensate for variations in tide, wind, waves, and current. Unfortunately, this also permits the buoy to stray from a precise location and thereby makes the aid inaccurate for purposes of navigation.

Fixed aids are preferred to buoys because of their stable position. Nevertheless, floating debris, ice, or passing vessels occasionally strike them, sometimes rendering them useless as aids or even creating a submerged hazard to mariners.

As an alternative to both buoys and fixed aids, the Office of Research and Develop-



The Coast Guard hopes the "articulated spar" buoy will be free of the problems that plague chained buoys and fixed aids.

ment is considering the merits of an "articulated spar" buoy. This type of buoy consists of an anchor, universal joint (or similar pivoting joint), and rigid cylinder (the spar) extending from the anchor joint to above the water surface. Being free to pivot at its attachment point, the aid is less subject to damage from impact. Moreover, the range of motion of the exposed top would generally be much less than with chained buoys.

A report just released by the Coast Guard's Office of Research and Development provides a prediction model to estimate the amount of listing of the articulated spar buoy subjected to the forces of wind and water. The analytical model was verified by comparison with laboratory and field test data.

Copies of this reports, "Design of an Articulated Spar Buoy," can be obtained from the National Technical Information Service Springfield, VA 22161, by specifying Report No. CG-D-71-81, Accession No. AD A110-561.

Thirteenth Country Ratifies Marpol

The Federal Republic of Germany became the 13th country to ratify the international convention for the Prevention of Pollution from Ships as modified by the Protocol of 1978 (Marpol 73/78). The convention will enter into force one year after being accepted by 15 countries whose combined merchant fleets amount to 50 percent of world gross tonnage. The countries which have ratified the convention so far control fleets representing 41 percent of the world tonnage. If Greece and Italy ratify this convention, the requirements could enter into force as soon as the first quarter of 1983.

(Reprinted from the March 1982 Safety Bulletin *of Imperial Oil, Ltd.)*

Invitation to Participate in Film Festival

Interested persons from industry, government, conservation groups, societies, and research institutes, as well as exhibitors and conference participants are invited to submit films to be shown at a film festival during the 1983 Oil Spill Conference.

The four-day international meeting will be held February 28 - March 3, 1983, at the San Antonio Convention Center, San Antonio, Texas. Sponsors will be the American Petroleum Institute, the U.S. Environmental Protection Agency, and the U.S. Coast Guard.

This will be the eighth such conference held under industry/government co-sponsorship. Approximately 1,100 persons attended the last conference in 1981, and a comparable turnout is expected at the 1983 conference.

Because of the film festival's popularity in the past, it is expected that the festival will run throughout the conference. Films shown will cover a broad range of oil pollution prevention and control subjects.

Films must be submitted for review before January 5, 1983. Films submitted should be timely, related to the topic of the conference, and in English. Only industry standard 16mm films with optical sound will be considered. No sales-oriented films will be accepted. Videotape will not be accepted.

Films should be sent to:

Charles H. Rentz
Public Affairs Coordinator, Port Arthur
Texaco U.S.A., Inc.
P.O. Box 712
Port Arthur, TX 77640
Tel.: (713) 983-2066

Inaugural Seafarers Health Improvement Program (SHIP) Sessions Held

Under the new sponsorship of the Maritime Administration, the reorganized Seafarers Health Improvement Program (SHIP) held inaugual meetings in Washington, DC March 31 - April 1, 1982. Approximately 100 participants from government, management, and labor participated under an agenda and procedural guidelines set by the 15-member SHIP Executive Committee, which met three times prior to these sessions.

In opening the meetings, MarAd administrator Admiral Shear emphasized several areas of weakness in maritime medical matters and tasked SHIP with developing seafarer physical standards, alternative sources of medical attention, and training and other medical treatment standards, and establishing a control center for seafarers' health records within 6 to 12 months.

Memberships were announced for Working Groups on Physical Standards for Seafarers, Access to Care Ashore, Care and Services at Sea, Shipboard Occupational and Environmental Health, and Medical Data and Records. Each group initiated work programs and drafting efforts in accordance with its terms of reference. All recommendations and similar documentation generated by SHIP Working Groups will pass through the Executive Committee for its ultimate consideration and acceptance by the SHIP Committee of the Whole.

Arthur W. Friedberg, Director, Office of Maritime Labor and Training, MarAd, is Moderator of SHIP, Chris Krusa, Office of Maritime Labor and Training, MarAd, is Administrative Secretary, and Captain Robert E. Hart, President, Marine Index Bureau, Inc., is Executive Secretary/Spokesman of SHIP.

The procedures of the SHIP structure are designed to ensure total participation and review by all involved constituencies prior to any implementing actions.

(Reprinted from the Activities Letter *of the American Institute of Merchant Shipping, April 19, 1982)* ⚓

Keynotes

The following items of general interest were published between April 22, 1982, and May 20, 1982:

Final rules: CGD 82-044 Safety and Security Zones Quarterly List, April 29, 1982. CGD 09-80-01 Anchorage Regulations; Lake Winnebago, Oshkosh, Wisconsin, April 29, 1982. CGD 09-82-02 1982 Cleveland National Air Show, April 29, 1982. CGD 09-82-05 Regatta Regulations; Joe Gimborne Memorial Regatta, April 29, 1982. CGD 01-07-82 Drawbridge Operation Regulations; Weymouth Fore River, Weymouth, Massachusetts, April 29, 1982. CGD 09-82-07 Drawbridge Operation Regulations; Wolf River, Wisconsin, April 29, 1982. CGD 80-157 Implementation of Inland Navigation Rules, correction, April 29, 1982. CGD 81-032 Optional Simplified Admeasurement Method for Commercial Vessels, April 29, 1982 *(See the Keynotes in the March 1982 issue).* CGD 13-82-04 Regatta Regulations; Columbia River, Washington, April 29, 1982. CGD 09-82-03 Regatta Regulations; B and T Icebreaker Regatta, Niagara River, New York, April 29, 1982. CGD 09-82-01 Special Local Regulation; Duluth Harbor Fireworks, Duluth, Minnesota, April 29, 1982. CGD 81-104 Discharge Review Board Regulation, May 3, 1982. CGD 11-80-08 Anchorage Regulations; Los Angeles—Long Beach Harbor, California, May 6, 1982. CGD 82-029 Regulation Update for Inland Navigation Rules, May 6, 1982. CGD 81-040 Shipping Safety Fairways, Adoption of U.S. Army Corps of Engineers Designations, May 6, 1982. CGD 03-77-212A Anchorage Regulations; Delaware Bay and River, May 10, 1982. CGD 09-82-04 Establishment of Special Anchorage Area, Fish Creek Harbor, Fish Creek, Wisconsin, May 10, 1982. CGD 77-136 1972 COLREGS, correction, May 10, 1982. CGD 02-82-01 Drawbridge Operation Regulations; Muskingum River, Ohio, May 10, 1982. CGD 03-81-034 Drawbridge Operation Regulations; Passaic River, New Jersey, May 17, 1982. CGD 03-82-04R Safety Zone; Penns Landing Park, Delaware River, May 17, 1982. CGD 05-82-02R Marine Event; Norfolk Harborfest, Norfolk, Virginia, May 20, 1982.

Notices of proposed rulemaking (NPRMs): CGD 09-80-02 Anchorage Regulations; Little Traverse Bay, Lake Michigan, Harbor Springs, Wisconsin, May 6, 1982. CGD 08-82-10 Safety Zone, Calcashieu Channel, Lake Charles, Louisiana, May 14, 1982. CGD 12-82-01 Drawbridge Operation Regulations; San Joaquin River, California, May 17, 1982.

Notices: CGD 82-045 National Boating Safety Advisory Council; Meeting, April 22, 1982. CGD 82-048 Towing Safety Advisory Council; Request for Applications, May 10, 1982. CGD 82-047 Qualification as a U.S. Citizen; Dundee Cement, May 10, 1982. CGD 82-049 Qualification as a U.S. Citizen; Texasgulf, Inc., May 10, 1982. CGD 82-050 Equipment, Construction, and Materials; Approval Notice, May 14, 1982. CGD 82-052 Ship Structure Committee; Meeting, May 17, 1982.

Questions concerning regulatory dockets should be directed to the Marine Safety Council (G-CMC), U.S. Coast Guard, Washington, DC 20593; (202) 426-1477.

* * *

ASME Stamp Approved for Pressure Vessels (CGD 77-147)

The Coast Guard has issued regulations that will require that Class I, II, and III pressure vessels be inspected and stamped in accordance with the American Society of Mechanical Engineers' Boiler and Pressure Vessel Code. In the past, the Coast Guard had to approve the vessel's construction plan and conduct a shop inspection. ASME inspectors are more readily available to perform the shop inspections than the Coast Guard is. The regulation will also require that the pressure vessel be certified by a registered professional engineer. This will minimize the time needed for Coast Guard preinstallation inspections.

For further information, contact Howard Hime, U.S. Coast Guard (G-MTH-2), Washington, DC 20593; (202) 426-2160.

Tank Vessel Restrictions for Puget Sound Finalized (CGD 78-041)

The waters of Puget Sound have long been recognized for their great value to the people of western Washington. Commercial and sport fishing, hunting, and recreational boating contribute hundreds of millions of dollars annually to the region's economy. The waters have been designated "extraordinary," the highest classification possible, by the Washington State Department of Ecology.

Puget Sound is also extensively used by ships. Of particular concern have been tank vessels. As a result of the congested vessel traffic and the concern of local residents over the impact a large oil spill would have on the local marine environment, regulations were passed to first establish a Puget Sound Vessel Traffic Service in July 1974. With only minor modifications, these regulations remain in effect today.

Since March 1978 there has been a restriction on the size of tank vessels that may sail through Puget Sound. An interim navigation rule prohibited the operation of tank vessels in excess of 125,000 deadweight tons in the Sound. This limit was adopted based on studies of probable oil spills and the desire of the area's residents that some action be taken to prevent a large oil spill before an accident occurred.

The final rule, signed by the Secretary of Transportation on April 20, 1982, continues the restriction. Tank vessels in excess of 125,000 DWT are prohibited from entering Puget Sound east of a line extending from Discovery Island Light to New Dungeness Light. This action will continue to provide a high level of protection to the marine environment in the Puget Sound area.

The effective date of the rule was June 10, 1982. For further information, contact Daniel Ziegfeld, U.S. Coast Guard (G-WWM/16), Washington, DC 20593; (202) 755-6146.

Safety Rules on Hazardous Liquids Amended (CGD 78-128)

The Coast Guard has revised its regulations concerning safety rules for self-propelled vessels carrying hazardous liquids. Editorial changes were made, confusing points clarified, impractical provisions deleted, and a number of new provisions added. The changes adopted are generally in keeping with the standards adopted by IMO, the International Maritime Organization (formerly the Inter-Governmental Maritime Consultative Organization). Included in the amendment is a list of cargoes that are regulated under Part 153 of Title 46 of the Code of Federal Regulations, which includes carriage requirements.

For further information, contact LCDR James W. Gormanson, U.S. Coast Guard (G-MTH-1), Washington, DC 20593; (202) 426-1217.

Changes in Requirements for Foreign-flag Tankers Proposed (CGD 81-052)

On May 10, 1982, the Coast Guard published an NPRM for the purpose of soliciting public comment on a Coast Guard proposal to revise the rules for self-propelled vessels carrying hazardous liquids and bulk liquefied gases.

In the past, foreign-flag tankers had to obtain a Letter of Compliance to carry hazardous liquids or liquefied gases in U.S. waters. This policy was developed at a time when there were no international standards for chemical and liquefied gas tankers and when there was little operational experience with these types of vessels. Because IMO (formerly IMCO) has since adopted construction and equipment codes, the Coast Guard believes that a complete plan review and a subsequent examination of the constructed vessel are no longer necessary. Under the proposed rule, the special Letter of Compliance would be replaced by the Certificate of Compliance now issued to all foreign-flag vessels carrying oil and hazardous materials in bulk.

For further information, contact LCDR Winston Jones, U.S. Coast Guard (G-MTH-1), Washington, DC 20593; (202) 426-1217.

Consolidation of Licensing/Certification Centers Proposed (CGD 82-032)

In the past, the licensing and certification of seamen could be done at any Coast Guard Marine Safety Office or Marine Inspection Office. Because of future budgetary limitations, the Coast Guard has proposed that 16 Regional Examination Centers (RECs) be established to perform the licensing and certification. An NPRM to this effect was published on May 3, 1982.

The following locations are being proposed for the 16 RECs:

Boston
New York
Baltimore
Miami
Charleston, South Carolina
New Orleans
Houston
Memphis
St. Louis
Toledo, Ohio
Long Beach, California
San Francisco
Seattle
Anchorage
Juneau
Honolulu

The selection process was based on the availability of existing Coast Guard examining facilities, access to public transportation and lodging, and proximity to maritime academies and approved schools. At least one REC is in to be located in each of the 12 Coast Guard Districts.

For further information, contact CDR Scott D. McCowan, U.S. Coast Guard (G-MVP-5/14), Washington, DC 20593; (202) 426-2240.

Written Warnings to be Issued for Visual Distress Signal Violations (CGD 82-040)

On May 17, 1982, the Coast Guard published a final rule authorizing the issuance of written warnings for violations of Visual Distress Signal (VDS) regulations. The intended effect of this amendment is to emphasize the educational rather than punitive stance of the Coast Guard regarding enforcement of VDS regulations.

This warning procedure is being adopted because Coast Guard enforcement policy is tempered by an understanding of the problems encountered by the boating public. Coast Guard policy permits the issuance of written warnings for certain violations of boating laws and regulations. These warnings may be issued by the boarding officers who discover the violations. The issuance of a written warning, as opposed to an action for the assessment of a monetary penalty, has been determined to be an effective way for boarding officers to handle minor boating violations that involve first offenders who indicate that discrepancies will be quickly corrected.

There is a specific list of violations for which the boarding officer, at his discretion, may issue a warning. This list is found in Section 1.08-1 of Title 33 of the Code of Federal Regulations. The amendment will extend that list to include Subpart C of Part 175 of Title 33 (Visual Distress Signals). It will authorize the issuance of written warnings to operators of boats not in compliance with Federal regulations for Visual Distress Signals when good faith in bringing about compliance is demonstrated.

For further information, contact William B. Sobeck, U.S. Coast Guard (G-BEL), Washington, DC 20593; (202) 426-1476. ⚓

A Reminder on Inland Rules Date Change

The Coast Guard's Office of Navigation would like to remind our readers once again that the effective date for the new Inland Navigation Rules on the Great Lakes has been changed. Rather than going into effect on July 1, 1982 (as reported in the April 1982 issue of the *Proceedings*), the Inland Navigation Rules will not go into effect on the Great Lakes until March 1, 1983.

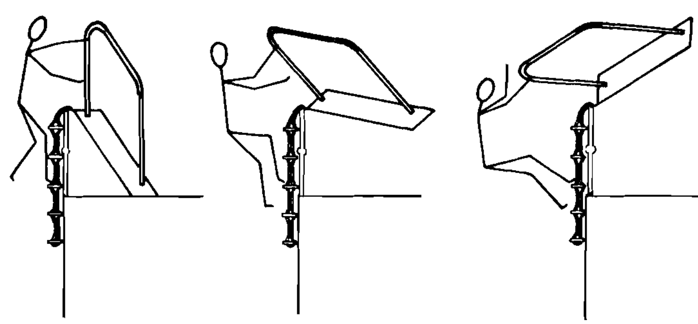
For further information, contact LCDR Kent Kirkpatrick, U.S. Coast Guard (G-NSR-3), Washington, DC 20593; (202) 245-0108.

Pilot Ladder Safety

by Captain Malcolm C. Armstrong, Pilot

Since it was first published in 1980, Malcolm C. Armstrong's book Pilot Ladder Safety *(now in its 3rd Edition) has become an internationally accepted reference work on safe procedures for boarding and disembarking by pilot ladders. It is directed at all individuals who at some time might be required to climb a pilot ladder, to rig one, or to check international requirements. It will also provide guidance to naval architects and shipbuilders with regard to pilot ladder equipment and pilot access points. The book is an illustrated commentary on Chapter V, Regulation 17, of the International Convention for the Safety of Life at Sea, 1974 (SOLAS 1974).* Pilot Ladder Safety *is aimed not only at explaining regulations but at giving those concerned a practical understanding of the intent behind the regulations. An excerpt from the book appeared in the December 1981 issue of the* Journal of the Australian Institute of Navigation. *The following article is adapted from that excerpt.*

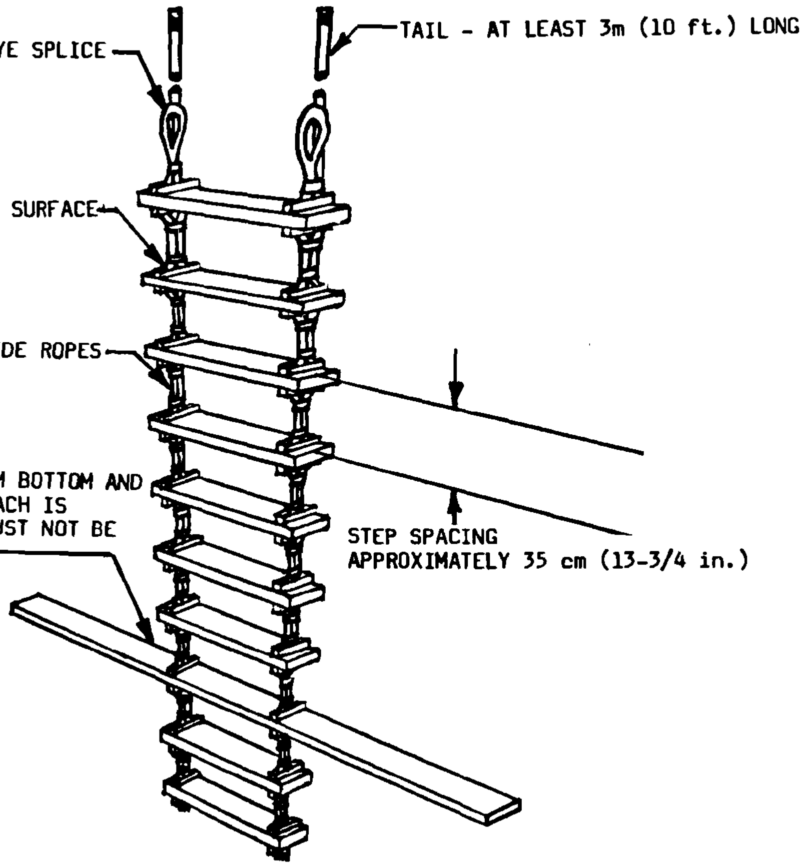
An Australian customs officer boarding a small ship in the port of Sydney was thrown back onto the deck of his launch when the bulwark ladder came loose and flipped over. As shown in the illustration above, the accident occurred because the bulwark ladder was not secure and there were no bulwark stanchions for him to hold when passing over the bulwark. These stanchions are as important as the pilot ladder itself; SOLAS regulations specify correct length, thickness, and fitting. Even so, stanchions are often neglected or badly made.



An insecure bulwark ladder and the absence of stanchions can lead to a bad accident.

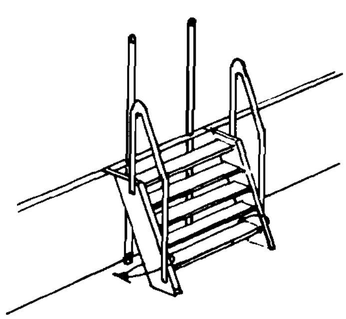
A more recent Australian fatality occurred when a pilot at a Queensland port fell from the top of the pilot ladder to the deck of the pilot vessel. As in the case just described, the bulwark ladder fell over the side with him.

Captain Armstrong is a practicing pilot at the Australian ports of Sydney and Botany Bay and is a member of the technical committee of the International Maritime Pilots' Association. He was vice president of the Association from 1974 to 1978 and was elected an honorary member in 1978. In 1981 he was elected a Fellow of the Australian Institute of Navigation. In addition to writing and publishing Pilot Ladder Safety, *Captain Armstrong has written* Practical Ship Handling, *published in Scotland by Brown, Son & Ferguson Ltd.*



TYPICAL COAST GUARD-APPROVED PILOT LADDER

The illustration below shows a bulwark ladder secured to the ship; proper stanchions are fitted. A man rope, at least 2½ inches but preferably 4 inches in circumference, should be rigged from the top of each stanchion so that the pilot can grasp the ropes when climbing up or down without holding the pilot ladder (some pilots choose not to use man ropes, but it is nevertheless a requirement that man ropes be supplied). It is interesting to note that the British Government Pilot Ladder Regulations state that "Stanchions or handrails shall not be attached to the bulwark ladder." Some bulwarks are so high that handrails are essential, but the British regulations emphasize the fact that bulwark stanchions must be quite separate from the bulwark ladder.



Bulwark ladder and stanchions must be independently secured to the ship.

Every pilot who uses substandard equipment is endangering his fellow pilots. In darkness and bad weather it is sometimes difficult for him to detect deficiencies before stepping on the ladder, but all deficiencies should be reported and corrected as soon as they are noticed. Ships' personnel who seldom, if ever, climb a pilot ladder may not be aware of the hazards involved and do not always pay sufficient attention to detail even if they are aware of the SOLAS regulations; a few words of explanation can usually set them straight.

The choice of material used in the assembly of pilot ladders is extremely important. A decline in the amount of good-quality fiber being grown for making manila rope has led to the manufacturing of poor grades of rope. SOLAS regulations state "manila," but they do not state "first-grade manila." Lower grades of manila are being used, and these are not only inferior in strength and durability but are very rough and uncomfortable to hold in the hands.

The SOLAS Convention allows alternative materials to be used if they have properties equivalent to those of manila and are approved by a country's government. Alternatives should be approved only after careful consideration and thorough testing. An excellent polyester rope has been developed especially for pilot ladder construction and has been used in one ladder approved by the U.S. Coast Guard. This rope is far superior to manila in strength, durability, resistance to sunlight and chemicals, water absorption, and touch, and it has a colored core which serves as a warning if the rope is damaged. However, there are many synthetic ropes which are quite unsuitable for pilot

In May 1980 the International Convention for the Safety of Life at Sea, 1974 (SOLAS 1974) came into force. With it came a complete revision of the requirements for pilot ladders and pilot boarding arrangements. U.S. vessels, as well as vessels registered in other countries that have ratified SOLAS 1974, must comply with these new requirements. The requirements are found in Chapter V, Regulation 17, of SOLAS 1974. The following is a summary:

- The pilot ladder must have a number of required features. For U.S. vessels, this means that a vessel must use a Coast Guard-approved pilot ladder that has an approval number on the bottom of each step that begins "163.003/. . ." The old style of approved ladder with two-rung steps does not meet the requirements. Some of the important features of the Coast Guard-approved SOLAS 1974 ladder are shown in the figure on the preceding page.

- The rigging of the ladder as well as the boarding and disembarking of the pilot must be supervised by an officer of the vessel.

- The ladder must be secured so that each step rests firmly against the side of the vessel and in a location away from overboard discharges.

- The ladder must be arranged so that the pilot can board the vessel or an accommodation ladder leading to the point of access to the vessel after climbing at least 1.5 meters (5 feet) but not more than 9 meters (30 feet).

- Where access to the vessel is by means of a gate in the rail or bulwark, handholds must be provided.

- Where access to the vessel is over the bulwark, a bulwark ladder must be provided which is securely attached to the bulwark rail or platform. Two handhold stanchions at least 40 mm. (1½ inches) in diameter must be provided on either side of the point of access spaced 0.7 meters (27 inches) to 0.8 meters (31 inches) apart and extending at least 1.2 meters (47 inches) above the top of the bulwark. The stanchions must be secured to the vessel structure at the base and also at a higher point.

- Two man-ropes at least 65 mm. (2½ inches) in circumference must be secured to the vessel at the pilot ladder and kept ready for use, along with a safety line (heaving line).

- At night, lighting must be provided over the side, and a lifebuoy with attached water light must be kept at hand.

- The pilot ladder must be kept clean and in good order.

- Broken pilot ladder steps must be replaced with permanent replacement steps as soon as possible. Approved replacement steps will be available from the manufacturer of the ladder and are to be attached to the ladder in the same manner as the original steps. Temporary replacement steps secured in a manner different from the original construction may be used as long as there are not more than two in the ladder.

- If a powered pilot hoist is used, it must be identified as Coast Guard-approved. A pilot ladder must be provided on deck adjacent to the hoist, ready for immediate use. This ladder is provided in case the pilot hoist fails. Also, many pilots prefer not to use powered pilot hoists.

ladder construction. Polypropylene rope develops burrs or whiskers which are sharp and dangerous; nylon is slippery and too elastic.

The timber used for making pilot ladder steps is often of dubious quality. Steps are often made, for example, of green timber that warps, cracked timber, or timber with splinters. These are not only dangerous to the pilot but also to the people rigging the ladder. Pilots and ships' personnel should reject any ladder that is inferior, even if it appears to have been assembled in accordance with regulations.

Synthetic material is permissible in lieu of hardwood if it has equivalent relative density, strength, durability, and buoyancy. Aluminum is not permissible, although it is used on some ships and is favored in arctic conditions because it can be more easily freed from ice.

U.S. Coast Guard rules require that each step and the ladder as a whole be able to withstand 2,000 pounds. Although there is no pilot who weighs in at 2,000 pounds, it is possible that a strain that great might be put on the ladder if it gets caught between ship and pilot vessel. It is important not only that the steps be strong but also that they be well secured to the side ropes. Marline seizings work loose and rot and take a long time to replace. It is likely that a more permanent method of securing the steps will supersede the old system. [The new U.S. Coast Guard pilot ladder regulation prohibits the use of marline seizings.]

When a pilot is climbing a ladder, it is important that he be able to keep the same rhythm all the way up. Therefore, all steps must be equally spaced. It would also be helpful if the spacing between steps and the clear space between side ropes were standardized for all ladders. Within the range allowed by the SOLAS regulations there can be a wide variation from one ladder to another. The 3rd Edition of *Pilot Ladder Safety* includes an illustration with suitable measurements as a guide for makers of pilot ladders.

Pilot hoists should be mentioned here because they are still being manufactured and fitted. They are optional extra equipment and in no way relieve the ship of any of the requirements regarding pilot ladders. The International Maritime Pilots' Association and the American Pilots' Association discourage their use, and the European Maritime Pilots' Association has asked its members to refuse to use hoists. Many pilots decline to use them at any time.

Excessive height from water line to point of access is a serious problem for pilots. The maximum allowed by SOLAS is 9 meters (30 feet). There is a feeling among pilots that this maximum should be reduced to 7 meters (23 feet). There are many ships in which the height exceeds 9 meters; often it is exceeded only marginally and is not considered important by people who do not actually have to climb the ladder. The number of ships on which this height restriction becomes important has increased considerably in the last few years as the number of tankers, other bulk carriers, vehicle carriers, and container ships has grown.

The solution to the height problem is simple—perhaps easier said than done, but not impossible with today's technology. Very large passenger ships have been around for as long as most people can remember, and there are no ships afloat today that are any higher than the largest of passenger ships. These ships have always been boarded through doors in the side; the same method could be used on any large ship if the effort were made in the design and building stages. On some ships, side doors have been fitted for engine room access or bunkering attachments (the pilot is still expected to go 20 meters up the ship's side). Fitting a door in the side for the pilot is simply a matter of cost, ingenuity, application, and—most significantly—priorities. The pilot's job is to look after millions of dollars' worth of ship; how much is the shipowner prepared to spend on the safety of the pilot?

A side door for pilot access must open inward and must be placed so that it is neither too high nor too low. The International Maritime Pilots' Association has drawn up guidelines on this matter. At least one shipowner in recent years has disregarded these guidelines; he spent many thousands of dollars on side doors only to find that they were rejected by pilots because they opened outward and were so placed that they were a serious hazard to anyone on the deck of the pilot vessel. These doors have now been sealed and alternative boarding arrangements fitted. It is important to have prior consultations with the right people before fitting new equipment.

SOLAS regulations allow the use of an accommodation ladder in conjunction with a pilot ladder. This system is often used on large ships. The ship's regular accommodation ladder may be used if it is amidships and leads aft, or there may be a short accommodation ladder installed solely for use with the pilot ladder.

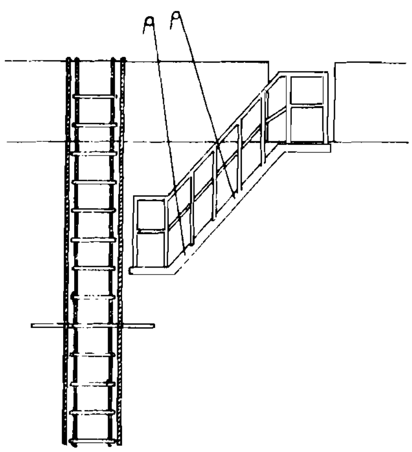
The accommodation ladder platform must be high enough to be clear of the pilot vessel's superstructure and clear of the heads of crewmembers on the pilot vessel's deck; it must be held firmly against the ship's side so that it does not swing outward with the rolling of the ship. In Australia the pilot ladder and man ropes must also be held into the ship's side if they extend more than 2 meters above the platform. The author recommends that this policy be followed in all cases; otherwise, the ladder and man ropes pendulate away from the ship's side and make climbing all the more difficult. IMCO* Resolution A.426(XI) sets out most of the requirements for the safe rigging of an accommodation ladder when it is used in conjunction with a pilot ladder. *(See text at end of article)*

The illustration to the left below shows an accommodation ladder rigged close to a pilot ladder. If the pilot ladder is suspended from the platform, the lifting wires must be connected to the platform and give direct support to the pilot ladder. Such a system requires very careful design and construction to be safe. It would be dangerous to hang a pilot ladder from the accommodation ladder unless the pilot ladder were also supported independently from the deck. The illustration on the right shows the Welin pilot platform system, which has been designed especially for pilots and has proved to be very safe and convenient. The pilot ladder hangs from the platform, and there is a suspension wire from each corner of the platform. The pilot climbs through the platform.

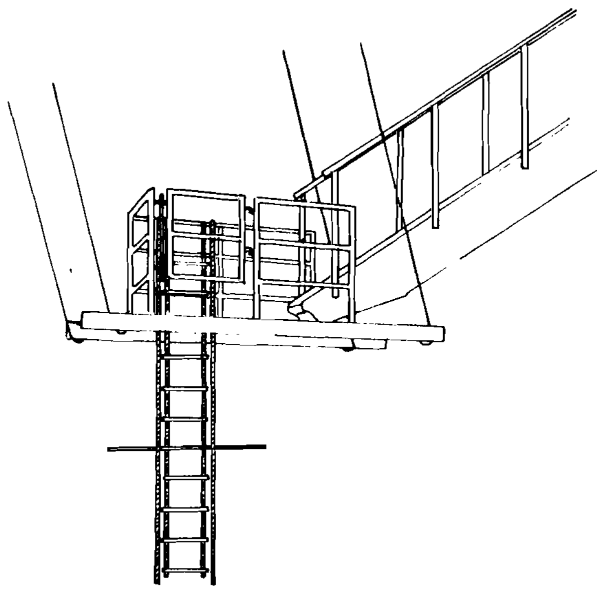
Proper facilities for boarding and disembarking must be provided on every ship that may ever take a pilot—and that means virtually every ship that floats. Facilities must be on both sides. There is no valid excuse for not providing proper boarding arrangements, but there are many ships which fail to do so and there are many ships which consider it sufficient to make the provision on one side only. This is contrary to international regulations and shows a lack of consideration for the safety of pilots. In 1975 IMCO passed a resolution calling on governments "to ensure the provision of a safe means of embarking and disembarking pilots in all vessels, including those whose size, design, or function incorporates unusual features, by a critical examination in the early design stages of the plans and facilities proposed." It is quite clear that many people in ships, shipyards, and shipping company offices are not aware of this Resolution (A.331(IX)).

There are many seagoing tugs, ferries, and fishing vessels that regularly take pilots whose boarding arrangements are, in some cases, nonexistent. On small vessels it may be necessary only to fit stanchions, man ropes, and a short ladder, but there must be safe and convenient access.

Pilot ladders in use on U.S. ships until recently were considered by most pilots to be



Pilot ladder rigged adjacent to accommodation ladder.



Pilot platform with accommodation ladder.

* Editor's note: IMCO, the Inter-Governmental Maritime Consultative Organization, changed its name to IMO, the International Maritime Organization, on May 22, 1982.

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far from satisfactory. Among the common faults were steps made from two or more pieces of wood, ladders made from two or more separate lengths shackled together, steps of different widths in the same ladder, side pieces so large that it was almost impossible to get a hand around the side ropes, and spreaders lashed between steps instead of being integral with the steps. A new American pilot ladder known as the COMAR Mark I is, in the opinion of the author, probably the best pilot ladder in the world and has been developed in close consultation with pilots to satisfy their requirements.

Shipowners and masters will find it wise to buy good-quality pilot ladders that will last a long time with little or no maintenance rather than poor-quality ladders that may not even see them past the first port. Pilots should not be expected to risk their lives on substandard equipment.

Captain Armstrong's book, Pilot Ladder Safety, *complete with explanations of SOLAS regulations and the recommendations and requirements of IMO (formerly IMCO) and the International Maritime Pilots' Association, can be purchased for $3.00, including postage, from:*

Coast Marine & Industrial Supply, Inc.
398 Jefferson Street
San Francisco, CA 94133

The text of the Annex to IMCO Resolution A.426(XI),

"RECOMMENDATION ON ARRANGEMENTS FOR EMBARKING AND DISEMBARKING PILOTS IN VERY LARGE SHIPS,"

reads as follows:

1. In all ships where the distance from sea level to the point of access to, or egress from, the ship exceeds 9 metres, and when it is intended to embark and disembark pilots by means of the accommodation ladder in conjunction with a pilot ladder, the ship should carry an accommodation ladder on each side, unless the accommodation ladder is capable of being transferred.

2. The ladder should be sited leading aft. When [the ladder is] in use, the lower end of the ladder should rest firmly against the ship's side within the parallel body length of the ship and within the mid-ship half section and clear of all discharges. Equally safe arrangements which might be more suitable for special types of ships should be acceptable.

3. The length of the accommodation ladder should be sufficient to ensure that its angle of slope does not exceed 55 degrees.

4. The lower platform of the accommodation ladder should be in a horizontal position when [the ladder is] in use.

5. Intermediate platforms, if fitted, should be self-levelling. Treads and steps of the accommodation ladder should be so designed that an adequate and safe foothold is given at the operative angles.

6. The ladder and platforms should be equipped on both sides with stanchions and rigid handrails, but if handropes are used they should be tight and properly secured. The vertical space between the handrail or handrope and the stringers of the ladder should be securely fenced.

7. The pilot ladder should be rigged immediately adjacent to the lower platform of the accommodation ladder and the upper end should extend at least 2 metres above the lower platform.

8. Lighting should be provided at night such that the full length of the ladder is adequately lit.

9. If a trap door is fitted in the lower platform to allow access from and to the pilot ladder, the aperture should be not less than 750 x 750 mm. In this case the after part of the lower platform should also be fenced as in paragraph 6, and the pilot ladder should extend above the lower platform to the height of the handrail.

10. Accommodation ladders, together with any suspension arrangements or attachments, fitted and intended for use in accordance with this recommendation, should be to the satisfaction of the [government of the country of registration]. ⚓

There's a new source of power in the wind

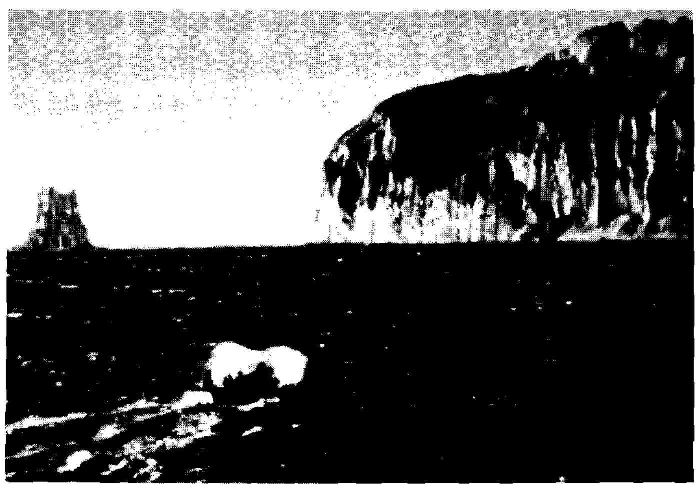
by William McCloskey

Within the enclosed compound of the Cape Henry (Virginia) light station, in a clearing protected by sand dunes from the direct assault of the ocean, stands a very important 60-foot tower. The tower is part of a project being conducted by the Johns Hopkins University Applied Physics Laboratory (APL) for the U.S. Coast Guard. Its goal: to test a prototype wind machine that can provide at least 50 percent of the energy needed for operating a lighthouse. The test is part two of a four-phase APL/Coast Guard project designed to find an alternative to diesel oil for powering remote, unmanned facilities.

Cape Henry lighthouses have been guiding Atlantic Ocean mariners into the mouth of the Chesapeake Bay since 1792. The U.S. Coast Guard mans the Cape Henry station, providing not only a nightly flashing beacon and a fog signal when needed but also marine radio and weather monitoring of the area. The present vertical black-and-white striped tower--170 feet high and visible at sea for 19 miles--has itself been a landmark since it was built in 1881 to replace the original lighthouse, which still stands as a historical monument.

It is a simple matter to drive straight to the door of the Cape Henry light station from either Norfolk or Virginia Beach. Many of the other more than 200 U.S. lighthouses, however, are surrounded by miles of water, rock, or other forms of wilderness. Reaching them can be a problem.

I can recall my own experience as a young



Cape St. Elias, Alaska, 1952, before the days of automation: except for the mail and equipment that was air-dropped to the four men living at the station, all supplies had to be brought in by small craft over a treacherous shoreline. Photo copyright © William McCloskey

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William McCloskey, a staff member of the Johns Hopkins University Applied Physics Laboratory, is the author of Highliners *(McGraw-Hill, 1979 and 1981), a documentary novel about fishermen (and Coast Guardsmen) in Alaska. He was once a line officer in the U.S. Coast Guard, stationed aboard the cutter SWEETBRIER in Alaska.*

Coast Guard officer during the early 1950s. The ship on which I served once had to wait three weeks off the Cape St. Elias light station in Alaska before the sea became calm enough for us to deliver winter supplies and fuel through the surf for the four men stationed there. Less dramatic were the times we routinely waited off the remote Alaskan stations at least a day or two after our arrival until landing conditions became safe enough for us to bring in a boat. The delivery itself was a wet and occasionally dangerous trip. We would steer a small boat through water that surged against boulders, then either scale the cliffs, shouldering heavy boxes over tide-exposed slippery rock and in hip-deep icy surf, or land through the surf. We pumped fuel ashore from a special barge that we anchored in as close as possible. Two engineering chiefs tended the barge, shivering for hours on its slick deck despite their thermals and oilskins.

The Coast Guard found it difficult to keep men at these stations--and increasingly expensive. A decade ago it began to automate the stations, as the technology became available to operate the lights without constant maintenance, to provide radio signals from more accessible locations, and to monitor weather by satellite.

At this point, the most remote light stations (including those in Alaska) have been automated, although the Coast Guard will not be able to complete its automation program for a few more years because of budgetary constraints. Modernization has already brought dramatic changes to the life of a Coast Guard "wickie" (old Coast Guard slang for a lighthouse keeper). Recently I rode with the Coast Guard aboard an H-3 helicopter out of Kodiak, Alaska, to service the Cape St. Elias light station 150 miles away (the station I remembered so vividly from a quarter century before). We left after breakfast, crossed the rough Gulf of Alaska, looking below at whitecaps on the water, landed close to the breaking surf on a new helo pad beneath the lighthouse, transferred fuel, checked the generator, light, and fog systems, even wandered briefly through the boarded up and deserted living quarters, and made it back to Kodiak in time for dinner.

The automated stations receive power from either submarine cables or diesel generators. Most of the approximately 65 stations on diesel, like the Cape St. Elias station, are supplied by helicopter—an expensive process even on stations now free of occupants and on those where various efficiencies have been introduced. There is no question that a natural source of energy would reduce the cost of operations still further.

For the past three years APL has been investigating for the Coast Guard ways to improve the efficiency and performance of aids to navigation which are frequently inaccessible. In a feasibility study completed last September, APL proposed networks of solar-powered aids

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Says Dean Scribner, the Coast Guard's project officer for alternate power sources at lighthouses:

"In energy planning and analysis, the bottom line is economics. At remote lighthouses, this includes reducing the amount of diesel fuel consumed by as much as possible as well as reducing servicing costs. Ultimately, as many as 50 to 100 lighthouses could conceivably be converted to alternate energy sources. Therefore, we are very interested in the technical aspects and associated costs of alternate power sources used at lighthouses.

"The APL study shows that 87 percent of the lighthouses currently powered by diesel generators might be able to operate at 14 - 25 percent of their present costs. All of these lighthouses are in regions where strong winds prevail. In general, we have found that, in the U.S., wind machines are more economical than solar cells for all except the southern onshore lighthouses. This is not surprising in view of the nature of the earth's wind patterns in the northern hemisphere. The average wind speeds tend to increase with increasing northern latitude in the coastal and offshore regions. Thus, the average wind speeds measured along the coast of Maine are significantly greater than those along the coast of Florida. In the immediate vicinity of the coastline there is usually a sea breeze blowing toward the shore during the day and away from the shore during the night.

"Many of the remote lighthouses are located on offshore islands. In these locations there are no surface obstructions as there would be over land surfaces, and wind velocities tend to build up to much higher speeds."

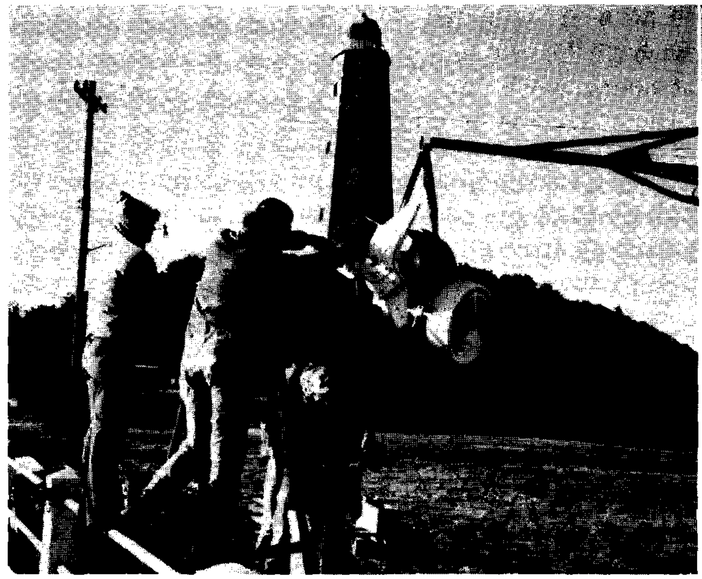
to navigation linked by conventional VHF radio or by satellite. The microprocessor data system would feed into a shore-based computer. The computer would synchronize flash patterns for better recognition within a group of buoys, report the daily operational status of each buoy (whether it was on station and functioning), and, in the event of a malfunction, provide diagnostic information for a maintenance crew.

The Cape Henry wind machine project is part of a longer-range study. Under the direction of engineer Dick (William R.) Powell, the APL team is investigating energy sources that could be used as an alternative to diesel oil to provide a steady supply of storable energy for large navigational aids. Phase One of the project was a feasibility study to determine the most universally applicable and economical energy the Coast Guard could use. This study resulted in a recommendation to investigate wind power. Solar photovoltaic arrays have proven successful for powering lighted buoys in southern waters. However, solar does not appear to be a practical means of delivering the volume of energy needed for the high-load fog signals and strong night beacons required of a lighthouse--particularly one located in an area of frequent fog, overcast skies, and storms.

Phase Two, now underway, involves testing the prototype wind machine at Cape Henry. The year-long project will involve monitoring, data collection, hardware testing, and initial work to develop the controls of an integrated system combining diesel power and wind power. The goal of Phase Three is a thoroughly engineered system which can be replicated. In Phase Four the equipment will be placed in a design form that can be manufactured economically.

To begin Phase Two, the APL team first designed the wind machine test, then assembled the components at its facilities in Howard County, Maryland. The propeller blades and the generator were fitted to the tower's dimensions, and the initial conditions of the wind machine were carefully measured. Also being developed was the equipment that would load, control, and monitor the wind machine. The wind machine itself had been developed by North Wind Power Company for the Department of Energy, while APL had designed the test and built the ground equipment.

Erection of the wind machine at Cape Henry took place last October. A month earlier, the APL group had supervised the pouring of a six-foot deep concrete platform. Such a depth was considered necessary to keep the tower stable in sand.



The generator portion of the wind machine is hoisted to a mount prior to the machine's installation atop the 60-foot tower. In the background is the original Cape Henry lighthouse, now a historical monument.

On the morning of the big day, groups assembled from the Coast Guard, APL, North Wind, and Bay Tower (which erected the tower). A chilly breeze blew in from the ocean. (Had the breeze been stronger, it would have been necessary to postpone the raising of the tower.) A crane was towed in to hoist the 60-foot tower, which lay on its side in the sand. An APL truck drove up with the wind machine, which a North Wind/APL team carefully unpacked, lowered to the ground, and assembled. The sun glinted on the varnished wooden propeller blades being bolted to the hub, as the long shadow cast by the 170-foot-high lighthouse loomed alongside.

Along the horizontal tower of cross-hatched steel struts, APL meteorologist James Meyer affixed a series of corrosion monitors. He had placed similar displays of the two-inch square steel plates at various heights outside the lighthouse, in locations where they could be reached through windows off the spiral inner stairs. Periodic checks on corrosion from the salt air and abrasion from blowing sand at a variety of heights will help predict the effects of weathering on wind machines erected at the sites of specific lighthouses.

Erecting the tower took all day. It included a wait while a crewman from a Coast Guard helicopter calibrated the station radio beacon so that we would have a basis for correction if the new wind machine tower caused interference. (It did not.) Once the tower had been raised, workmen from Bay Tower bolted it to the steel shafts embedded in the concrete platform. Then they climbed with the workmen 60 feet into the air, and the crane delivered the assembled generator, followed by the propeller mount. It required some fitting and on-the-spot modification, but everything went smoothly. When the workmen needed a tool or part, they lowered a bucket for it. In late afternoon, the propellers began to turn and register a charge on the monitoring equipment below. Everybody gave a cheer.

The propellers are built so that they will tilt back on a coil spring if the wind reaches too great a velocity. Tilting slows them down and prevents either an overcharge of power into the system or damage to the blades.

The wind machine can generate 2½ kilowatts of power in a 30-miles-per-hour wind. A sudden strong wind can push this to 4 kilowatts for a second or two before the propellers tilt. The mechanical energy generated by the turning propellers is converted within the wind machine into a form of three-phase AC power. A set of rectifiers converts this into DC power, which is transmitted below to a charging circuit which both controls the current and allows the monitoring of the load placed on the wind machine. Following the test period, electricity will be stored in batteries, where it changes into chemical form. The chemical energy changes back into DC energy, which can be used directly for some purposes—the fog horn power supply, for example. However, most of the Coast Guard load applications require AC power, which must be supplied from the batteries through an inverter.

While the Cape Henry light station is manned by several Coast Guardsmen (some living with their families in the compound), the wind machine is an independent project which involves them only in the event of an emergency. For the next year, the APL team plans to visit the machine periodically to collect recorded data and experiment with feeding different load increments into the system.

The wind machine, Dick Powell points out, is still only a prototype. The data it provides will be fed into a mathematical computer simulation model back at APL. The model will be able to calculate the relations between energy stored in the batteries and other energy being used directly. This will help determine the times when the back-up diesel power must be used at an actual light station and when it can be shut off.

Wind energy for U.S. lighthouses, if the APL project for the Coast Guard proves to be a success and becomes operational, will represent one more step in a long evolution of power sources. Records of the old Cape Henry lighthouse show that a wick lamp burning fish oil provided the initial mariners' light in 1792. Fuels improved over the years--sperm oil, colza oil, lard oil, and finally kerosene after the discovery of petroleum in 1859. When the present tower began operation in 1881, the lantern had a "first-order lens" with five concentric wicks. Other new features included a steam siren fog signal. In 1912 an incandescent oil-vapor lamp burning kerosene vapor replaced the wick lamp. This improvement increased the light's candlepower from 6,000 (magnified from the light source by the lens) to 22,000. The present Cape Henry light has 80,000 candlepower. How much of it can be powered by wind remains to be seen, but the outlook, after a few months of propeller blades turning atop the new 60-foot tower, appears good. ⚓

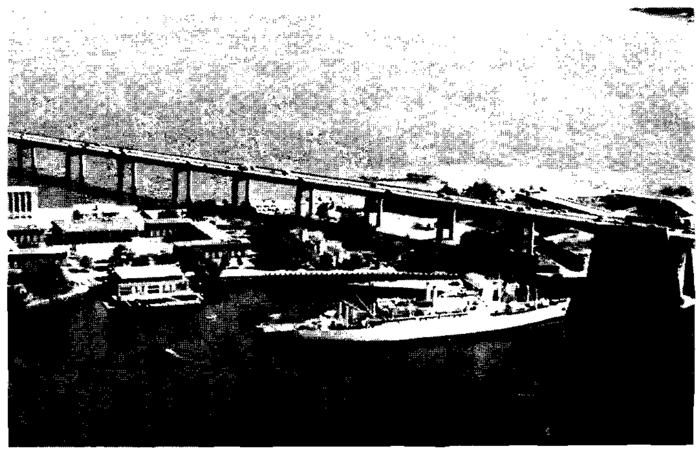
Riggers atop the 60-foot tower prepare to install the wind machine being lifted by crane. The attached bucket was used to lower the tools or other equipment they needed.

Pairing "Schoolships" with Scholarship: SUNY Maritime College

The State University of New York Maritime College at Fort Schuyler has played a prominent role in the development of maritime education and training since its very inception in 1874. The college owes its start to a gentleman named Stephen B. Luce.

Luce, who later became an admiral in the U.S. Navy and founded the Naval War College, was concerned about the poor quality of many of the men with whom he served in the Union Navy during the Civil War. After the war, he developed a plan for a training program for future merchant marine officers. His program included "schoolships." Luce's "schoolship" concept was based on the principle that simply working on a ship did not constitute adequate training. He felt that seaman needed academic instruction as well as practical, sea-going experience.

Thanks to Luce, the Morrill Act of 1862 (which established the land-grant colleges) was extended in 1874 to include nautical education. The "Marine Schools" Act of June 20, 1874, passed by Congress to "promote nautical education," authorized the Navy to loan the states ships to be used for public marine schools. The sloop-of-war ST. MARY'S was fitted out under Luce's personal supervision and opened as the New York State Nautical School on June 11, 1875. Luce also wrote a textbook for the students, *The Young Seaman's Manual.*



The Maritime College campus is located at Fort Schuyler on the historic Throgs Neck of the Bronx, New York. Photo by Robert Hogg

In 1913 the school became the New York State Merchant Marine Academy, and in 1938 it moved to its permanent campus ashore (the newly renovated Fort Schuyler on the Throgs Neck in the Bronx). In 1948 the state legislature passed a bill creating the State University of New York. At that time the name of the school was changed to the State University of New York Maritime College. It today offers fully accredited baccalaureate degree studies in nine different academic majors combined with preparation for licensure as either a deck or engineering officer in the Merchant Marine. A Master of Science degree program in Transportation Management is also offered.

As it has evolved, the "schoolship" concept has retained the all-important aspects of training and instruction at sea. And, as ships and industry functions have become increasingly sophisticated, the Maritime College has expanded its curriculum to meet the growing need of the industry for well-educated professionals.

The curriculum paths fall into two major groups: deck license and engineer license. Deck license candidates can pursue majors in either Marine Transportation (with the option of further specializing in either management or economics) or Meteorology and Oceanography. Engineer license candidates have their choice of Marine Engineering, Naval Architecture, Nuclear Science and Engineering, or Ocean Engineering. Computer Science and Electrical Engineering majors are available to cadets preparing for either type of license.

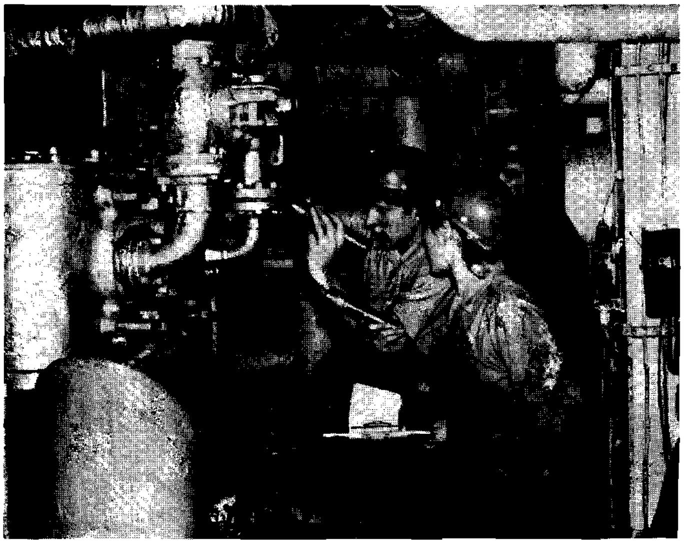
Students prepare for licensing as either a Third Mate—oceans unlimited or Third Assistant Engineer—unlimited horsepower (steam and motor). Electrical Engineering, Marine Engineering, and Naval Architecture degree programs are accredited by the Accrediting Board for Engineering and Technology. All engineering degree programs are recognized for professional engineer (PE) license purposes by the State of New York.

Boatswain George Pontine, with his 40 years' experience, instructs cadets in the art of marlinspike seamanship. Photo by Hugh Rogers

Intensive studies during the students' time at sea reinforce hands-on experience. The controlled experience of a schoolship sea term makes it possible for the seaman to be exposed to situations and techniques which regular ship personnel might encounter only once in a career. During the first of three two-month training cruises (six months of schoolship sea time is required for eligibility to sit for a Coast Guard license), cadets take on the responsibilities and work of an entry-rating employee (ordinary seaman or wiper) in the deck or engine department. During the second sea term, cadets are expected to perform at the Able Seaman or QMED fireman/watertender/oiler level of competence. The third or "First Class" cruise requires cadets to meet the responsibilities of junior third mates or third assistant engineers in both watchstanding and maintenance. All cadets are intimately involved with ship's maintenance as well as operations. Foreign port calls provide rest and relaxation and a glimpse of one of the most rewarding sides of the seafaring profession.

Students rate the sea term among their most rewarding and satisfying experiences. Cadet First-class John Dabbar, of Bartelsville, Oklahoma, praised his sea terms as "a chance to put my book knowledge to use and to develop my practical operating skills." Cadet First-class Susan Farmer, of Ocean, New Jersey, called her hands-on experience "far more interesting and productive than any single course I have taken." Cadet Third-class Edward A. Yeats, of Lexington, Kentucky, pointed out that demonstrating operational knowledge was not enough: "capabilities of leadership and responsibility . . . are expected above all." The other cadets seconded him in praising the sea term as a time to both witness leadership and exercise their own leadership abilities.

If there is any criticism to be made of "schoolship" sea time, it is that cadets do not get the true "feel" of modern merchant ship operations—the awesome sense of responsibility of being the only person on the bridge, the intensity of some in-port operations, the quiet of a ship with 40 crewmembers rather than hundreds, supervision of cargo operations, etc. These are things which are experienced by the cadet when he or she sails as a cadet observer.



Engineering cadets review operation of the fuel oil transfer system in the engine room in preparation for "floorplate" exams. Photo by Hugh Rogers

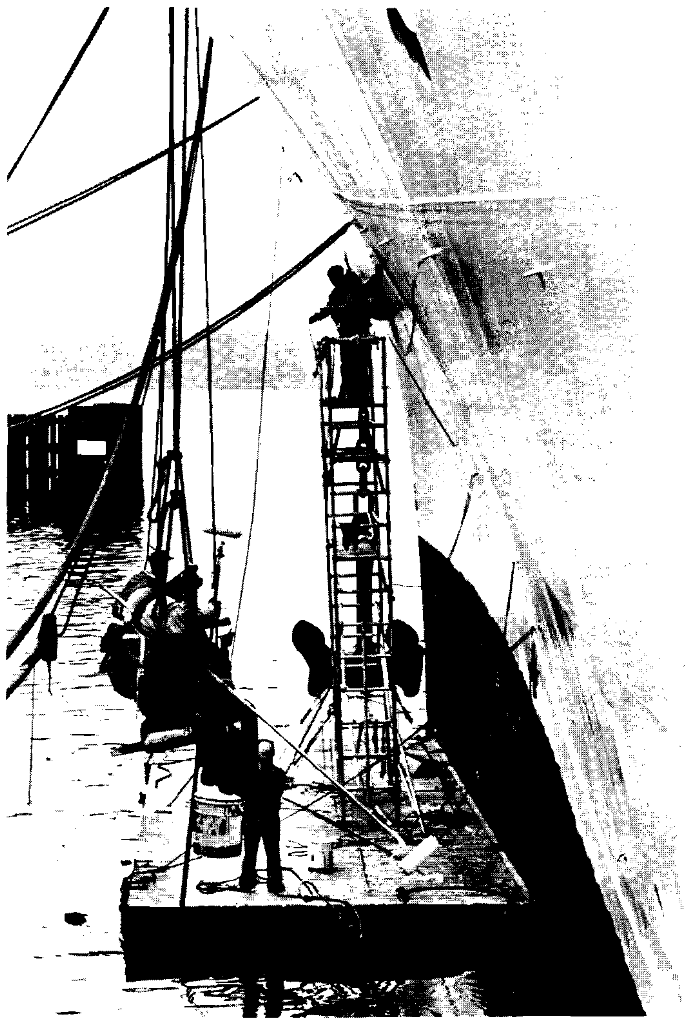
New York Maritime cadets apply for cadet shipping during Christmas and summer vacation periods. Industry support for this mutually beneficial cadet shipping is excellent.

College faculty and staff who possess both professional and academic credentials form the nucleus of the schoolship staff. They develop curriculum, conduct courses, supervise watches, and conduct "floorplate" exams—the grueling oral exams conducted one-on-one between instructor and student in the engineering spaces and on the bridge; these are especially true indicators of a cadet's understanding of systems and situations.

The college's 56-acre campus at Fort Schuyler contains an extensively equipped science and engineering building, a student activities building/boathouse, a physical education complex, dormitories, and dining halls in addition to the renovated Fort building which houses classrooms, the library, and administrative offices. While the students, who are organized as a Regiment of Cadets, do not have a great deal of extra time for a traditional college social life, many participate in such activities as sports, clubs, religious and professional organizations, publications, and band.

The 930 cadets enrolled during the 1981-82 academic year came from 30 different states and 18 countries. The enrollment of women (there are presently 68 women at the college) and American students of minority descent is strongly encouraged, but the Admissions Office reports that the number of cadets from these groups is still disappointingly low.

The vast majority of Maritime College graduates sail on their licenses in the Merchant Marine when opportunities exist. During periods when sea-going positions are scarce, as in the early to mid-1970s, shoreside positions as professional staff members in various areas of the marine industry are sought. In addition, all graduates are eligible for commissioning as an officer in the Navy, Coast Guard, and the Commissioned Corps of the National Oceanic and Atmospheric Administration. Many pursue graduate or other professional studies (the most common is law). This is often accomplished during vacation periods while sailing. The college estimates that 90 to 95 percent of each graduating class is initially associated with the marine industry or pursues a career in Federal service. An estimated 75 percent make their



Preparing for the summer sea term: deck cadets are responsible for hull maintenance, including the never-ending chipping and painting. Photo by Hugh Rogers

Deck cadets do maintenance work on the ground tackle and anchor windlass. Supervisors are first- or second-class cadets, depending on the nature of the work to be done. Photo by Hugh Rogers

careers in one or more areas of the marine industry.

The State University of New York Maritime College has been preparing professionals for the marine industry for over 100 years. From its beginnings on a specially fitted-out sloop-of-war to its present position as an educational institution with fully accredited degree programs, the college has sought to provide the type of well-rounded maritime education envisioned by Stephen B. Luce.

Inquiries concerning the college or its programs should be directed to:

Office of Admissions
State University of New York
Maritime College
Fort Schuyler, Bronx, NY 10465
(212) 892-3000

An Update on Navigation and Vessel Inspection Circulars

The following Navigation and Vessel Inspection Circulars have been published since our last update in the December 1981 issue. They can be obtained free of charge from local OCMIs (Officers in Charge of Marine Inspection) or by writing or calling Commandant (G-MP-4/14), U.S. Coast Guard Headquarters, Washington, DC 20593; (202) 426-2163.

A comprehensive list of available NVCs will be published in the December 1982 issue of the *Proceedings*.

10-81	Coast Guard Certification and Inspection of Certain Categories of Existing Vessels
11-81	Renewal of Deck Officers' Licenses
12-81	Operators' and Motorboat Operators' Licenses
13-81	Recall of Smith & Wesson Line Thrower Rockets
14-81	Stability Tests; Waiving of for "Sister Vessels"
15-81	Guidelines for Conducting Stability Tests
1-82	Acceptance of Certificates of Admeasurement Issued by the American Bureau of Shipping (ABS)
2-82	Letter Form Temporary Certificate of Identification/Service
3-82	Use of Underwriters Laboratories Listed Fire Extinguishers
4-82	Uninspected Commercial Vessel Safety
5-82	Fixed Ballast
6-82	Servicing and Inspection of Inflatable Liferafts Utilizing Voluntary and Third Party Inspection Organizations
7-82	Sample Format of Vessel or Facility Station Bill
8-82	Load Line Certificates
9-82	MSD Certification
10-82	Acceptance of Plan Review and Inspection Tasks Performed by the American Bureau of Shipping for New Construction or Major Modifications of U.S.-flag Vessels
11-82	Deck Foam Systems for Polar Solvents

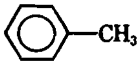
Chemical of the Month

This is the second in a series of four articles discussing derivatives of the chemical benzene.

Xylene: C_8H_{10} or $C_6H_4(CH_3)_2$

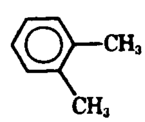
	o-xylene	m-xylene	p-xylene
Synonyms:	ortho-xylene 1,2-dimethylbenzene	meta-xylene 1,3-dimethylbenzene	para-xylene 1,4-dimethylbenzene
Physical Properties			
boiling point:	144°C (292°F)	139°C (282°F)	138°C (281°F)
freezing point:	-25°C (-13°F)	-47°C (-53°F)	13°C (55°F)
vapor pressure at 20°C (68°F):	7 mm Hg	9 mm Hg	9 mm Hg
Threshold Limit Values (TLV)			
time weighted average (TWA):	100 ppm; 435 mg/m^3	100 ppm; 435 mg/m^3	100 ppm; 435 mg/m^3
short term exposure limit (STEL):	150 ppm; 655 mg/m^3	150 ppm; 655 mg/m^3	150 ppm; 655 mg/m^3
Flammability Limits in Air			
lower flammability limit (LFL):	1.0% by vol.	1.1% by vol.	1.1% by vol.
upper flammability limit (UFL):	6.0% by vol.	7.0% by vol.	7.0% by vol.
Combustion Properties			
flash point (o.c.):	32°C (90°F)	27°C (81°F)	27°C (81°F)
autoignition temperature:	463°C (867 °F)	527°C (982 °F)	528°C (984 °F)
Densities			
liquid (water = 1.0):	0.88	0.87	0.86
vapor (air = 1.0):	3.7	3.7	3.7
Identifiers			
U.N. Number:	1307	1307	1307
CHRIS Code:	XLO	XLM	XLP
Cargo Compatibility Group No.	32 (Aromatic Hydrocarbons) for all isomers		

Last month, as you'll recall, we discussed the chemical toluene, a simple derivative of benzene having one methyl group ($-CH_3$) attached to the benzene group.

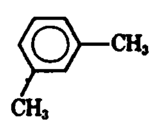


This month we'll discuss the chemical xylene (ZYE-leen).

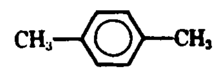
Xylene is composed of a benzene group and two methyl groups. In toluene, since there is but one methyl group, its attachment to the benzene group can be at any of the carbon atoms of benzene (any of the points on the hexagon above used by chemists as shorthand for the benzene ring). Xylene, having two methyl groups, presents a much more interesting situation. The two methyl groups can be attached to the benzene group in three different orientations. Thus, there are in reality, three different xylenes, in other words, three different *isomers* of the molecule xylene. These are the ortho (or o-) isomer, the meta (or m-) isomer, and the para (or p-) isomer. Chemists call them "1,2-dimethylbenzene," "1,3-dimethylbenzene," and "1,4-dimethylbenzene." The numbers indicate the relative points of attachment of the two methyl groups ("di" meaning two) on the benzene group. These isomers can be depicted as:



o-xylene



m-xylene



p-xylene

Many of the properties of the three xylene isomers are very similar, as can be seen from the properties chart above. This similarity of properties presents problems in the production of high-purity individual isomers because it makes it difficult to separate the isomers from each other. The production process used consists of separating the isomers from "BTX" (benzene-toluene-xylene) strings. The problems are further complicated by the contamination of the xylene mixture by ethylbenzene, another derivative of benzene which has many properties similar to the xylenes.

Chemical production figures for 1981, taken from the May 3, 1982, issue of *Chemical and Engineering News*, show that xylene (all three isomers) ranked 23rd in terms of volume produced, while p-xylene alone ranked 30th.

Each of the individual xylene isomers is what is called an "intermediate" for a variety of chemical products such as plasticizers and synthetic resins and fibers. The p-xylene isomer is commercially the most important isomer. Xylene mixtures, called "commercial xylene" and made up predominantly of m-xylene, are used as solvents for paints, among other things, and are a component of high-quality octane blending agents used in fuels.

Xylene is a clear, colorless-to-light-yellow liquid with a characteristic odor. (Xylene and ethylbenzene are members of what are called the "C_8 aromatics)." Xylene is highly flammable, and this is its primary hazard. As is the case with many hydrocarbons (organic compounds consisting primarily of carbon and hydrogen), its vapor is heavier than air and, if released, will flow along the ground or deck. Should it come into contact with a source of ignition, it can flash back to the source of the vapor, causing a fire. Effective firefighting agents are foam, dry chemical, and carbon dioxide. Water fog or spray are effective for cooling but may not work as extinguishants. The products of combustion, such as carbon dioxide and acrid fumes and vapors, may be toxic, and firefighters should use respiratory protection such as a self-contained breathing apparatus.

Xylene can affect the body through skin and eye contact, ingestion (swallowing) of the liquid, or inhalation of the vapor. The effects of short-term overexposure to the vapor are irritation of the eyes, nose, and throat. If inhaled at high concentrations, xylene can cause severe breathing difficulties, which may not appear until some time later. Other symptoms of overexposure are dizziness, staggering, drowsiness, and sometimes unconsciousness. Reversible damage to the kidneys and liver is also a possibility. Liquid xylene can be absorbed through the skin, and long-term exposure may cause a skin rash. Repeated exposure of the eyes to xylene vapor can result in reversible eye damage.

In extreme cases, exposure to xylene can be fatal. About ten years ago, three workers who had entered a fuel tank were grossly overexposed to xylene vapors (the concentration was estimated to have been 10,000 parts per million) and were not discovered for over 18 hours. One worker died of respiratory complications, but the other two recovered completely after a few days.

To protect themselves from exposure to liquid xylene, personnel should wear impervious clothing, gloves, and face shields/splash-proof safety goggles. Contaminated clothing should be removed and thoroughly washed before being reworn (note: keep it away from sources of ignition). Affected skin areas should be washed with soap and water and the eyes flushed with plenty of water. In cases of ingestion, vomiting should not be induced because of the danger of aspiration: if xylene gets into the lungs, it can cause chemical pneumonia. Inhalation overexposure is treated by removal of the victim to fresh air and, if necessary, artificial respiration.

As was the case with toluene, xylene's structural relationship to benzene gave rise to fears that it would cause similar toxicity problems of the blood and blood-forming organs (leukemia). Once again, these fears proved unfounded. Pure xylene does not seem to have these toxic effects. Toxicity is a problem only with impure grades contaminated with varying amounts of benzene. Results of human and animal tests indicate that "alkylation" (the addition of the methyl groups to the benzene ring) results in a loss of the myelotoxic activity (destruction of bone marrow) exhibited by benzene. The major toxicity problem of xylene is its narcotic effects, which are readily reversible and easily avoided by simple precaution.

Xylene is regulated by the U.S. Coast Guard as a Subchapter D commodity, Grade D combustible liquid. IMO, the International Maritime Organization (formerly the Inter-Governmental Maritime Consultative Organization) does not regulate it. The U.S. Department of Transportation classifies xylene as a flammable liquid. Both the Environmental Protection Agency and IMO consider it a Class C pollutant.

Hazard Evaluation Branch
Marine Technical and
Hazardous Materials Division

Next month: ethylbenzene

THE HIGH COST OF SMALL DETAILS

Two recent tankship casualties point out the need for constant attention to details, even when it appears that a situation is the same as it has been in the past.

The Collision

The first incident involves a tanker that was in the Gulf of Mexico en route to a Texas port and was taking a shortcut through the oil fields. The captain considered the safety fairways to be too congested with foreign-flag shipping, and he had used the same trackline through the oil fields for years. Two things made this transit different. First, a hurricane had blown through the area a few days before and disabled the navigation lights on many structures. Second, a new oil and gas production structure was under construction in his trackline.

The voyage ended with the tanker impaled on the structure, exploding and burning. Both the vessel and the structure were total losses. Monetary losses measured in the tens of millions of dollars. Why did the watch officer on the bridge of the tanker fail to detect the new platform until seconds before running right over the middle of it?

To begin with, the navigation lights on the new structure were not functioning. This should have posed no problem for a tanker with two radars and a lookout on a clear, calm, warm night. Although the new structure did not have the platform, house, and machinery installed on it and presented a reduced radar target, there should have been a good image from that much steel framework. However, the radar presentation was affected by another problem.

There was a mast forward of the bridge that created a masking or shading of the radar display in the area directly ahead of the ship. The investigating officer concluded that it probably did not completely obscure that sector and the radar was considered functional. However, questions remain because the officer on watch did look at the radar several times prior to the collision. Also, the collision avoidance system which used that radar as the source of its information showed no indication of the structure.

The mast that interfered with the radar was no longer used, and the master had requested that it be removed. Granting that there are masts and other obstructions that cannot be removed from vessels, what should be done about radar obstructions? To begin with, both radars could have been used, and they would not have had the same obscured area directly forward. One should also question why the first radar antenna was not placed off the centerline of the vessel, which would have prevented interference with the image directly ahead.

Another detail was the location of the lookout. From his normal clear-weather station on the bridge wing, he thought the structure was a barge and saw it only moments before the collision. Had he been on the bow, the low, dark structure might have been noticeable sooner.

The final detail was the use of an inaccurate navigation chart. The captain and the navigator did not subscribe to or obtain the latest Notice to Mariners which noted the construction of the structure and listed its location for correcting charts.

The correction of any one of these details might have prevented the collision. Each of them served to deprive the individuals responsible for that vessel of one vital piece of information.

The Explosion

The second incident involves a tanker that experienced a severe explosion resulting in about $20,000,000 in damages. Luckily, there were few people on board at the time, and everyone escaped without serious injury. Because a packing gland on the propellor shaft was leaking, there was more bilge water than the after peak tank could hold. The excess was being routed through an auxiliary bilge line, through the after pump room, up onto the main deck, and through an old butterworth hose into the aftermost center cargo tank through a butterworth opening. The cargo tank was not gas-free.

At the time of the explosion, the auxiliary bilge line was not in use, but the butterworth plate had not been replaced. The Chief Engineer directed a member of the engineering department to perform maintenance on the bilge piping system, which included welding a reducer nipple into the auxiliary bilge line that ran to the main deck. The crewman cut the hole and tack-welded the nipple into place and then went to lunch. At this time, the valve on the main deck was open and the nipple was open, allowing air to flow through the line. The hose attached to the bilge line was at least in the vicinity of the butterworth opening and more likely still in it.

Shortly after the crewman started welding again after lunch, the explosion occurred. The Coast Guard investigating officer concluded that the actual source of ignition could not be determined but that the most probable source of ignition was the welding operation. This probability must be considered high, because very little else was happening on the ship and every other possible source was checked (including such subtle things as the autoignition of pyrophoric iron sulfide deposits, a form of rust, in the cargo tank). After the explosion, several persons who inspected the vessel noted air being emitted from the hole in the bilge line with the new nipple. This lends weight to the idea that explosive vapors were drawn into that line during the two hours that work stopped for lunch.

It appears that the welding was the source of ignition, but it is certain that the pathway to the non-gas-free tank was through the butterworth opening that was left open, unattended, and without a firescreen. Had the butterworth opening been secured in accordance with Federal regulations (Part 35.30-10 of Title 46 of the Code of Federal Regulations), the explosion would not have occurred. Just as in the collision, a sense of complacency probably contributed to this casualty. In this case, confused lines of responsibility between the deck and engineering departments also played a role. With reduced manning, responsibility for activity on deck was not properly addressed.

All ten members of the crew escaped the fire on the tankship that exploded in port, and the fire was brought under control as quickly as could be expected, considering that the casualty occurred in a remote area. Fortunately, the Coast Guard Cutter CLAMP was working not far from the explosion, and the crew of the CLAMP saw the fireball and heard the explosion. The Officer in Charge, Senior Chief Boatswain's Mate Lawrence Mitthauer, got CLAMP underway immediately. The cutter and its crew were nosed into the tankship in the center of the explosion area, spudded into the river bottom, and fighting the fire within 30 minutes. The small boat from the CLAMP had already been launched and was rescuing seven men from the stern of the tanker. A few minutes later the fire trucks from the Port Arthur and Port Neches (Texas) Fire Departments began arriving on the scene. At the same time, the ocean tug DOMAR CAPTAIN nosed into the side of the tanker and also began fighting the fire. Within 50 minutes, the two duty officers from the Coast Guard Marine Safety Office in Port Arthur arrived on scene. LTjg Robin Kutz boarded the CLAMP to direct firefighting from the water side, and LTjg Thomas Tansey joined the firefighters on the shoreside. Shortly after that, four patrol boats from MSO Port Arthur arrived and joined in the firefighting effort.

The fine cooperative effort displayed by the fire departments and the Coast Guard Marine Safety Office was a result of planning and training exercises conducted by the Sabine-Neches Chiefs Association. The investigating officer, in his report, recommended special recognition for the crews of the CLAMP and DOMAR CAPTAIN, the MSO Port Arthur duty officers, and the Port Arthur and Port Neches Fire Departments. ⸸

Nautical Queries

The following items are examples of questions included in the Third Mate through Master examinations and the Third Assistant Engineer through Chief Engineer examinations.

DECK

1. A six-strand composite rope made of alternate fiber and wire strands around a fiber center, commonly designated as 6X3X19, is called

A. spring-lay rope.
B. lang-lay rope.
C. hawser-lay rope.
D. cable-lay rope.

REFERENCE: Knight's

2. Stability information based on the results of the stability test shall be prepared by the owners of the vessel. This information is valid only when approved by

A. the American Bureau of Shipping.
B. the Commandant of the U.S. Coast Guard.
C. U.S. Salvage.
D. Lloyd's of London.

REFERENCE: 46 CFR 93.10(a)(b)

3. The space containing carbon dioxide cylinders shall be properly ventilated and designed to prevent an ambient temperature in excess of

A. 75°F.
B. 100°F.
C. 130°F.
D. 165°F.

REFERENCE: 46 CFR 95.15-20

4. How often must cargo booms be weight-tested by the American Bureau of Shipping to reaffirm their safe working load?

A. Every four years
B. Every two years
C. Annually
D. At each drydocking

REFERENCE: 46 CFR 91.37 1(d)

5. You are proceeding at a slow speed with your starboard side near the right bank of a channel. If your vessel suddenly sheers toward the opposite bank, the best maneuver would be

A. full ahead, hard left rudder.
B. full ahead, hard right rudder.
C. full astern, hard left rudder.
D. full astern, hard right rudder.

REFERENCE: Knight's

ENGINEER

1. Upon dismantling a fuel-injection pump, you find the plunger scored and the barrel in good condition. You should

A. replace the plunger only.
B. turn the plunger in a lathe.
C. replace the plunger and barrel.
D. use fine grinding compound to smooth the scores.

REFERENCE: Maleev

2. The time between fuel injection and ignition in a diesel engine is known as

A. injection lag.
B. ignition lag.
C. detonation lag.
D. precombustion lag.

REFERENCE: Maleev

3. Oil oxidation as a result of excessively high lube oil temperature is harmful to a diesel engine because

A. oil foaming will always occur.
B. large quantities of oil are consumed.
C. lube oil viscosity is always decreased.
D. corrosive by-products are usually formed.

REFERENCE: Stinson

4. When used as a separator, a centrifugal purifier may lose its seal and cause

A. water contamination of the lube oil.
B. the purifier pump to lose suction.
C. water flow from the oil discharge.
D. oil flow from the water discharge.

REFERENCE: Osbourne 1

5. The main propulsion diesel keeps running after you try to shut it down. You should

A. stop the air supply.
B. engage the jacking gear.
C. secure the lube oil pump.
D. shut off the fuel at the day tank.

REFERENCE: Maleev

ANSWERS

DECK
1.A;2.B;3.C;4.A;5.B
ENGINEER
1.C;2.B;3.D;4.D;5.A

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