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Cover

Fish--and other resources in the world's oceans--can be very important to the economy of a country. Jurisdiction over ocean space can be a contentious issue. Concern over expanding claims to coastal waters led to the calling of an international conference on law of the sea. The resulting convention is described in an article beginning on page 192. Photo, by Nina Loewinger, courtesy of NOAA

Coast Guard Evaluates Non-approved Firefighting Nozzles

The Coast Guard's Office of Research and Development recently conducted a study of firefighting nozzles used on merchant vessels. The Office of Merchant Marine Safety had received questions on the acceptability of firefighting nozzles not approved by the Coast Guard for regulated vessels. The Coast Guard felt that the inquiries had merit, since nozzle designs had improved significantly in recent years, and decided to research the subject.

Coast Guard regulations governing nozzles can be found in Part 162.027 of Title 46 of the Code of Federal Regulations. There are three fundamental requirements: nozzles must be able to pass debris (debris of 3/8" diameter in the case of 1½" nozzles, debris of ½" diameter in the case of 2½" nozzles), they must be adaptable to a low-velocity fog head, and they must be made of bronze.

The nozzles which were being proposed for acceptance had typically been designed for use on shoreside facilities by professional firefighters. They had multi-flow and multi-pattern settings, had not been designed for use with an applicator, had smaller-diameter tip openings, and, in some cases, were made of molded plastic.

The research consisted of two phases. The first phase involved surveying Coast Guard Marine Inspectors, who routinely check merchant vessels' firefighting systems. The Inspectors were asked whether the regulations could be improved and whether the proposed nozzles would perform adequately in a shipboard environment. The second phase of research involved collecting content samples from merchant vessel fire mains to measure the amount of debris that had collected and the size of the particles.

The Marine Inspectors were of the opinion that, in view of the debris typically found in fire mains, the regulations should not be changed to allow smaller tip openings. Although the nozzles proposed for acceptance had flush settings, the Inspectors felt that merchant seamen did not have adequate training to use these more sophisticated nozzles properly. The Inspectors also felt that a fog applicator was essential in fighting shipboard fires. The fog applicator serves two purposes: it affords cooling protection to firefighters working in close proximity to a fire, and it allows firefighters to direct spray onto fires around bulkheads, through slightly opened watertight doors, or over coamings without their being exposed to direct contact with the flames. In addressing the material construction issue, the Inspectors felt that nozzles should be sturdy in construction and have as few moving parts as possible. They were concerned that light-alloy or chrome-plated nozzles would not stand up to the stresses of a marine environment. Furthermore, experience has shown that in hot climates plastics often crack and in cold climates they become very brittle. The Inspectors were unanimous in their opinion that brass, bronze, or non-ferrous materials resistive to the salt-water environment were essential for nozzle construction.

Debris samples were collected from 12 merchant vessels. The quantity of debris was less than researchers had been led to expect, given the Marine Inspectors' observations; however, all fire mains had been flushed within the two weeks prior to sampling. Even so, debris was found that exceeded the 3/8" and ½" diameter provided for in the requirements of 46 CFR 162.027. This debris could have fouled approved nozzles, let alone the proposed nozzles with their smaller tips openings.

On the basis of these findings, the Coast Guard has determined that allowing alternative nozzle types would reduce ships' firefighting readiness. It has decided not to change the regulations.

Copies of the report "Evaluation of Requirements for Commercial Nozzles on Merchant Vessels" can be obtained from the National Technical Information Service, Springfield, Virginia 22161. The accession number is AD-A137728. ‡

Ship and Equipment Design

How well are mariners' requirements taken into account when ships are designed and fitted out? On the premise that feedback from professionals could forestall future problems, a London-based organization solicited the views of its seafaring members.

London's Nautical Institute recently circulated a questionnaire on problems related to ship and equipment design. The consensus of those responding was that ways could be found to improve the quality of design. Most of the improvements suggested call not for the outlay of great sums of money but simply for awareness—for greater sensitivity to operator requirements on the part of those responsible for ordering, designing, classifying, and building ships.

One recurrent theme that emerged in the responses to the questionnaire was the feeling that design staffs lacked an appreciation for the fact that ships have to operate day and night in all conditions of weather and climate and under varied conditions of heel and trim. Tradition, too, was a villain—many respondents felt that tradition was to blame for ships' having to go to sea with equipment and systems quite unsuited to smaller crews. In many cases, the siting of controls for hatches, pumps, lifeboats, and winches clearly reflected an absence of practical assessment at the design stage. Layout of deck equipment and piping caused difficulties in terms of maintenance. Finally, habitability and storage facilities and arrangements for mooring and towing on many ships left much to be desired.

The results of the Institute's survey were abstracted and published in *Seaways--The Journal of the Nautical Institute.* They will be reproduced here in a 10-part series. Although some of the items discussed are covered by regulation for U.S. ships, many are not. Readers are encouraged to write in about other problems they have experienced or to suggest alternative remedies to those recommended by the Institute.

Part I–Vessels at Sea

Compiled by E. J. Riley from responses to the Nautical Institute questionnaire

1. Bow Design

Problem: One vessel whose bow was a bulb 8.6 meters long had serious problems when docking.

Remedy: Avoid bulbous bows.

2. Drainage

Problem: Scuppers and discharges are often inadequate. Pipes clog frequently and are awk-

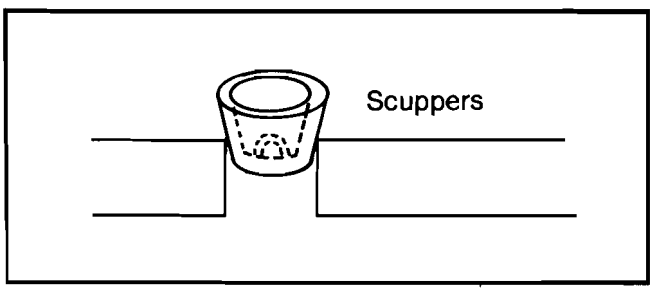
ward to maintain. Discharges cause a great deal of spray when sited too high and are sometimes badly sited with respect to pilot ladders and light ship and cargo lighter operations. Hatch-cover leak-catchment channels are inadequate, and water trapped in the channels during opening spills over the cargo. On some ships, seas wash over the fo'c's'le and foredeck in heavy weather. During heavy pitching the flexing of the bulwarks has been too extensive, resulting in inward bending and causing water to be shipped and the bulwarks to be bent outward by the excess of water on deck.

Remedy: Wash plates, bulwarks, breakwaters, and freeing ports should be examined during model tests. Spurling pipes should be fitted with movable steel sealing plates. Scuppers and discharges should be positioned to provide efficient drainage from all decks for all the many angles of trim experienced. Adequate freeing capacity should be provided, and stepped discharge/openings on deck should be avoided, as these cause flooding when the ship rolls. Drains for showers and washrooms should be sited in all four corners. All drainage pipes with bends should be fitted with spigots adjacent to the bends to enable cleaning out of any debris blocking the pipes. Strainers should be fitted at the entrances to all scupper pipes to assist with preventing blocked pipes.

Scuppers

Problem: Using wood plugs and cementing scuppers is labor-intensive and outdated. Scuppers treated in this way are frequently blocked or choked with rubbish.

Remedy: Deck scuppers should be provided with rubber plugs which will seat against any irregularities.



Rubber plugs are recommended for deck scuppers.

3. Fan Rooms

Problem: Fan rooms sited in or adjacent to accommodation spaces give rise to excessive vibration and noise in those spaces and are frequently inaccessible for maintenance.

Remedy: Fan rooms should be sited away from accommodation spaces and the bridge. Where this is not possible they must be sound-proofed. Fan rooms should be designed to give ready access to motors and dampers.

4. Foredeck Blackout

Problem: At night, the officer of the watch often lacks the complete darkness he needs on the foredeck to see the configuration of navigation lights of approaching vessels.

Remedy: Ships must be provided with deadlights or suitable blackout arrangements on the bridge-front bulkhead.

5. Galley

Problem: Storeroom capacity is often insufficient in relation to the size of the crew. Securing methods for pots, pans, stores, and provisions are often inadequate in heavy weather. Cooking smells frequently permeate ships.

Remedy: Galley design should be improved. A galley facing aft with doors to the deck and extraction remote from the main intake to the air conditioning is preferable.

6. Habitability

Problem: Doors and cupboards sometimes open in response to vibration and ship movements. Living conditions may be less than ideal.

Remedy: Attention should be paid to detail at all stages of design. This includes providing, at the minimum, proper fixtures and fittings, fixed chairs which are the right height for tables, and adequate recreational facilities. *(See also Noise and Vibration, Ventilation)*

7. Hatches/Holds

Problem: The area between coamings collects water and rubbish. It is extremely difficult to clean and maintain these areas because of the narrowness of the space and the design of the coamings/girders.

Remedy: These areas would be better incorporated into the hatches with access to the holds via mast houses or, better, underdeck passageways.

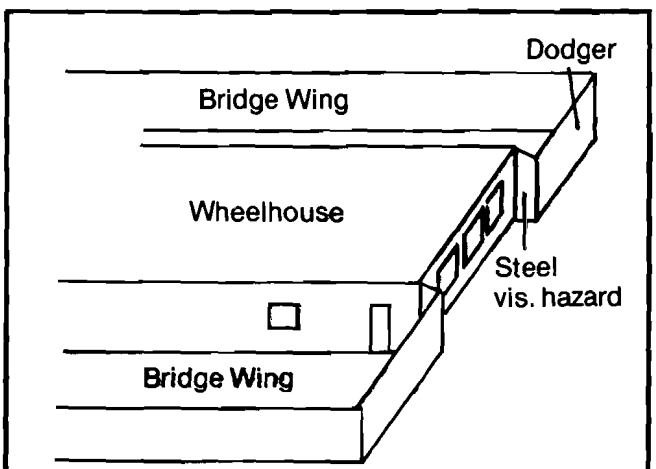
8. Ladders/Companionways

Problem: Ladders and companionways are frequently sited without due appreciation for their pattern of use when a ship is in service.

Remedy: All ladders on board (or, at least, all ladders within certain groups, i.e., inside accommodation spaces or on deck) should have the same angle of slope, depth, pitch of step, and general design.

(a) Outside the accommodation spaces, ladders between decks should be fitted fore and aft as far inboard as practicable to avoid difficulties when the ship rolls. Where this is impracticable and ladders must be placed athwartships, they should be as far from the ship's side as possible with inboard-facing slopes as they descend from each deck. Proper and effective screening should be provided for all ladders near the ship's side to prevent personnel from slipping overboard.

(b) Inside the accommodation spaces, companionways should be sited so that they provide the quickest access possible from cabins to working areas (provided this layout is compatible with fire protection considerations). Where doors are sited at the foot/head of ladders, sufficient space should be provided for personnel to stand in safety, especially when the ship is pitching and rolling heavily. Doors should open inward, not outward into the alleyway.



NOTE Design of Bridge Front — Wheelhouse set back. Steel construction joining gap, causing a needless visibility hazard.

The side projections in this design limit the arc of visibility.

9. Elevators

Problem: When elevators are positioned with the door to close from aft forward, the trim of the vessel can frequently cause doors to fail to close properly, thus isolating the elevator, particularly during cargo work.

Remedy: The elevator should be designed to operate irrespective of trim or heel.

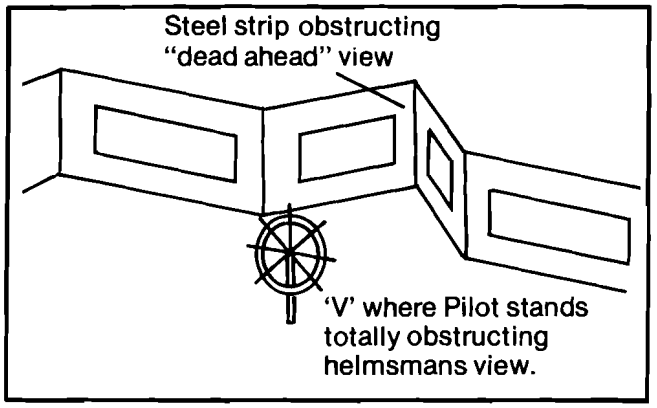
10. Noise and Vibration

Problem: Cabins are often located above compressors and adjacent to generators, fans, control rooms, winches, and winch controls and are thus subject to excessive vibration. Vibration is frequently accentuated in the upper decks of accommodation spaces aft. Vibration may cause regular damage to sensitive navigational instruments such as radar and echo sounders. Vibrating door hooks cause severe noise irritation and are prone to vibrate free. The noise level on bridge decks from fans and funnel vibrations is often dangerously high, making it difficult to communicate by telephone or VHF and making it impossible to listen for the sound of bell buoys or foghorns or the statutory sound signals of vessels in fog.

Remedy: This subject is adequately covered by International Maritime Organization Code of Practice Resolution A 468 (XII). Levels of noise and vibration should not exceed 60dB(A) in accommodation spaces, and limits on noise and vibration should be set forth in writing and should be a condition of acceptance of the ship. The problem of vibrating door hooks can be eliminated by providing adequate rubber lining on the securing mechanism.

11. Roll and Pitch

Problem: Personnel can be rolled out of bunks in heavy weather conditions if bunks are laid out in a fore-and-aft direction. Also, serious



Bridge layouts can obstruct the helmsman's view.

accidents have occurred when a ship has hit a heavy sea and thrown people off balance without anything to get hold of. Bridge wing doors are frequently unsatisfactory.

Remedy: A day bed/settee at right angles to the bunk should be provided for every crew member, and handrails should be provided in accommodation spaces and along all bridge consoles. Non-slip surfaces should be used throughout the ship and means provided to enable crew members to move safely about the ship in heavy weather. Void-space alleyways are a good idea. Bridge-wing doors need to be secure against vibration, weather, and rolling forces. These doors are in constant use and need to be substantial, with securing devices at waist level.

12. Spray and Corrosion

Problem: The flat "cow catcher" around the bow of Ro-Ros hits the water solidly and also lifts it when a vessel is pitching. In other ships, a tendency on the part of designers to reduce camber and sheer has resulted in wet decks and heavy corrosion.

13. Ventilation

Problem: Vent pipes are frequently sited where they are subject to heavy weather or where they allow fumes to enter the accommodation spaces.

Remedy: Care should be taken in the design and siting of vent pipes to minimize these effects.

14. Visibility and Bridge Design

Although this subject was not part of the survey, many respondents complained of bad visibility. It should be obvious to anybody designing a ship that the navigating officer should have the best possible visibility at all times. Examples were given of dangerous blind arcs caused by placement of containers, deck equipment, cranes, derricks, and masts. Certain bridge-front designs also caused operating difficulties. A projected "V" in the bridge front invariably attracted the pilot and left the helmsman with no reference point on which to steady the ship's head because the pilot was "in the way."

15. Weathertight Doors

Problem: Many storerooms on both the port and starboard side are accessible only from the outside of the ship. When on the weather side, these are extremely difficult and sometimes dangerous to enter. Gaining access to mast houses, cranes, and machinery spaces may prove similarly difficult.

Remedy: Where possible, outside access should be from aft on the weather deck. Inside access to storerooms is desirable. Equipment sensitive to weather and spray should be provided with substantial protective coverings. Individual cleats on weather doors are freqently not maintained, so that the springs lose their ability to hold the cleats in the open position. Handwheel-operated doors are preferable for spaces in regular use.

16. Wheelhouse

The bridge front, in exceptional conditons, is exposed to heavy salt spray. Breaking waves can make cleaning operations hazardous and, on occasion, can break windows. Serious accidents have occurred when waves have broken windows and put all electric control equipment out of action.

Remedy: Safe access should be provided along the bridge front for cleaning of the windows. Heavy-duty washing and wiping equipment should be provided. Special care must be taken to ensure that the main console and equipment are adequately protected from the effects of wave action. ‡

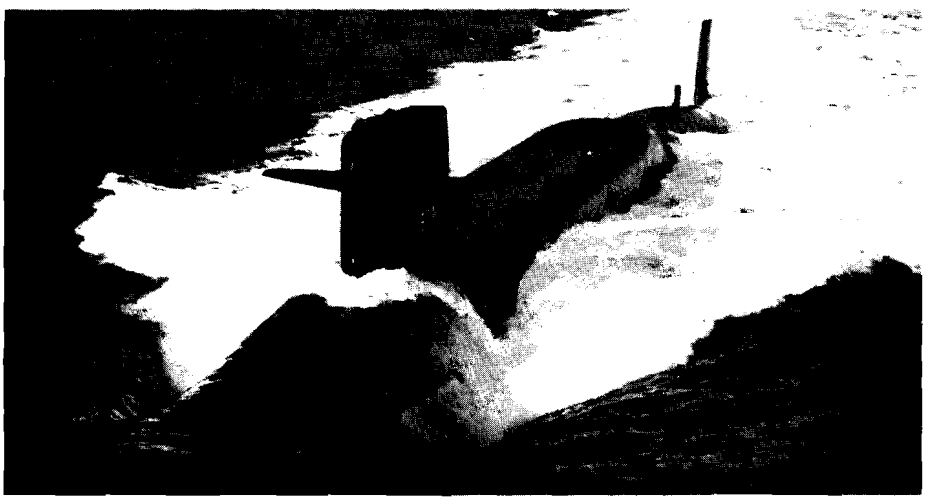
Law of the Sea:

The 1982 U.N. Convention

This convention, although rejected by the United States and not yet ratified by enough countries to enter into force, is a document of significance to those who navigate the seas.

by CDR John Shkor
Attorney, Office of Chief Counsel

Most mariners are already aware that the United States decided not to sign the United Nations Convention on the Law of the Sea after it was completed in 1982. The United States supported, and continues to support, the principle of a legal order facilitating peaceful, international use of the oceans. It found some of the provisions of the Convention to be so unacceptable, however, that it chose to reject the entire document. President Reagan laid to rest any concern over the course the United States would follow in the wake of this rejection. In his Oceans Policy Statement of March 10, 1983, he announced the United States' willingness to act in a manner consistent with the Convention in regard to its provisions regarding traditional uses of the oceans.



Undue restriction of the freedom of military vessels to operate continuously submerged would weaken defense systems. (Official U.S. Navy photo)

The purpose of this article is to explain the Convention's provisions on traditional uses as well as the provisions the United States found unacceptable.

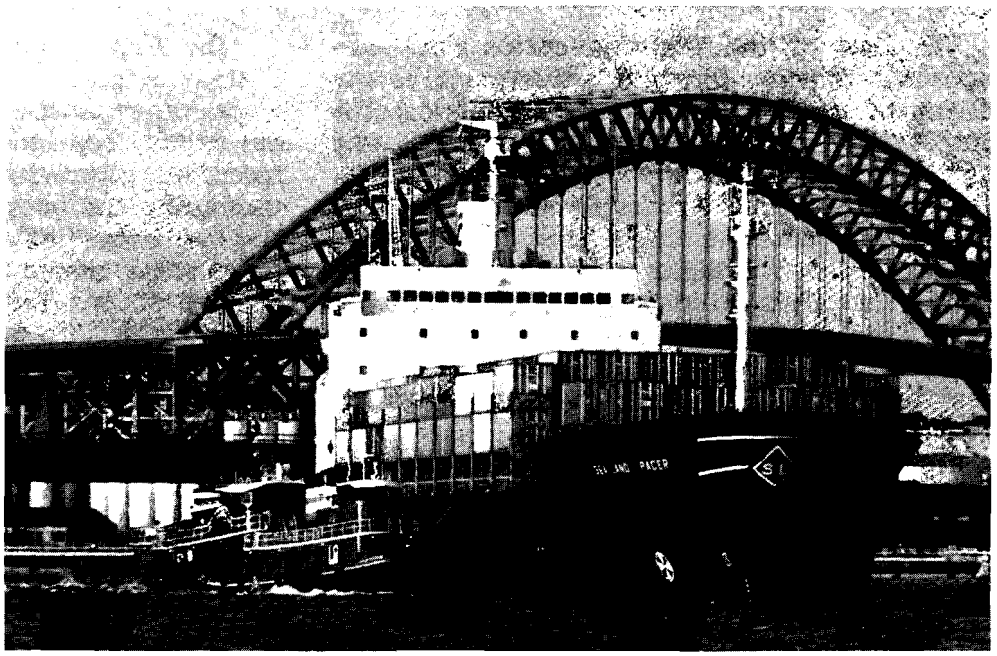
The History of the Convention

Traditionally, almost all of the world's oceans have been relatively free from regulation. This began to change in recent years as resources were discovered in the waters adjacent to coastal nations. Countries proceeded pell-mell with assertions of jurisdiction, some going so far as to claim 200 nautical miles of territorial sea (the traditional breadth, which the United States will continue to claim for its waters, had been three nautical miles.)

Concern over the expansion of territorial-sea claims led the United States and other nations to propose a conference on law of the sea. The goal of the conference was to develop an international convention which would stop the erosion of high seas freedoms and its potential interference with worldwide commercial and military navigation.

Unfortunately, this initiative was complicated when its scope was expanded to include resources in another area of the world's oceans--the deep seabed. New technologies promise to make available such deep-seabed resources as metal-rich nodules, and developing countries, many only recently having achieved independence, sought during negotiations to ensure that they would benefit from any operations undertaken. The concept that the deep seabed was the "common heritage of mankind" was born. The Convention that resulted was thus an amalgam of provisions pertaining to traditional uses of the ocean and provisions which would translate this "common heritage" concept into concrete terms.

When the Convention was completed in 1982, it was immediately signed by 117 nations. This did not bring the Convention into force, however. Ratification by 60 nations is required for that, and the Convention will enter into force only 12 months after the 60th country has ratified it. Ratification has proved to be a slow process, as nations must consider whether, on balance, the Convention is in their best interests. To date, only nine nations have ratified it. Whether another 51 will do so and bring the Convention into force is unclear.



The United States is by almost any measure the world's leading trading nation, and almost all of its trade, at least at some point, involves ocean transportation. In 1981, U.S. ocean-borne foreign trade totalled 760 million long tons and was valued at $315 billion dollars. U.S. companies operate more than 800 vessels of more than 60 million deadweight tons in worldwide commerce. Most of these vessels, particularly in the bulk trades, are operated under foreign flag. U.S.-flag lines carry a significant share of U.S. liner cargoes, and sophisticated, high-technology ships are enabling them to be competitive in the international marketplace.

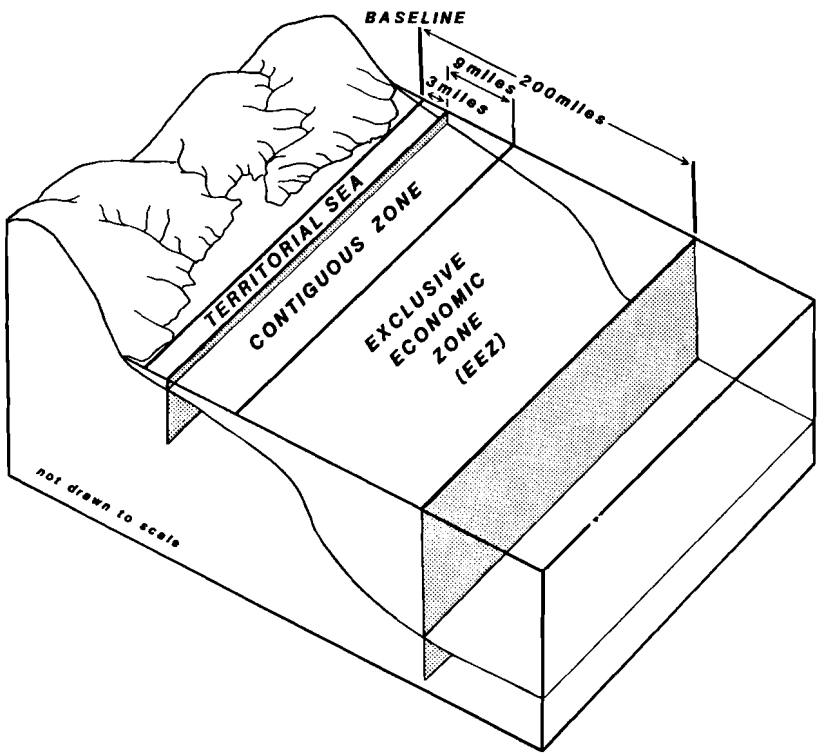
If the United States is to continue importing the goods it needs and exporting the goods it produces, safe, economical ocean transportation and freedom from unreasonable interference are a must. The Law of the Sea, which describes the rules that form the legal environment for use of the world's oceans, including its use by vessels carrying goods, is of singular importance for the United States. *(Photo courtesy of Sea-Land Service, Inc.)*

The Convention and its Provisions

The Law of the Sea Convention does two important things. First, it accommodates the desires of coastal States (i.e., countries) for control over coastal resources. Second, and more important from the mariner's viewpoint, it stops the seaward expansion of coastal State claims and preserves high seas freedoms of navigation and overflight to as great an extent as possible. This it does by limiting both the size of the various zones that can be claimed and the authority of the countries claiming them to regulate such activities as navigation within the zones.

The Convention establishes a comprehensive framework for the regulation of all ocean space. It is divided into 17 parts and 9 annexes and contains provisions governing, among other things, the limits of national jurisdiction over ocean space, access to the seas, navigation, protection of the marine environment, scientific research, exploitation of living and non-living resources, and seabed mining.

The Convention divides the ocean into the following zones, spelling out both the rights and the duties of coastal States and the international community in each of them:



This diagram shows the location of the baseline, territorial sea, contiguous zone, and exclusive economic zone with respect to the coastline.

Territorial Sea

The Convention, in Part II, accords every State the right to establish a territorial sea whose outer limit may extend seaward 12 nautical miles from the baseline. (Except where specified otherwise, the normal baseline for measuring the breadth of the territorial sea is the low-water line along the coast as marked on large-scale charts officially recognized by the coastal State.) The sovereignty of the coastal State extends to the waters of the territorial sea, the airspace above, and the seabed beneath. Within the territorial sea, however, the international community enjoys the right of innocent passage. Passage is considered innocent so long as it does not prejudice the peace and good order of the coastal State; the Convention lists 12 activities, such as the exercise of weapons and fishing, which are not considered innocent.

The right of innocent passage is subject to temporary suspension but only for the limited purpose of weapons tests. The right extends to surface ships, including warships, and is not contingent upon giving advance notice to the coastal State. Innocent passage does not include submerged transit by submarines or any form of overflight. On the other hand, vessels in innocent passage are not altogether free of regulation; the coastal State may adopt laws and regulations with respect to matters such as regulation of maritime traffic, protection of aids to navigation, conservation of living resources, environmental protection, and infringement of customs, fiscal, sanitary, and immigration laws. The coastal State may not, however, adopt regulations with respect to design, construction, manning, or equipment for vessels in innocent passage unless these simply reflect generally accepted international standards.

Contiguous Zone

The Convention continues the concept set out in the 1958 Geneva Convention on Territorial Sea and Contiguous Zone that there is a narrow zone beyond the territorial sea in which a coastal State may exercise jurisdiction for customs, fiscal, sanitary, and immigration purposes. The permissible breadth of the zone is increased under

the new Convention to 24 nautical miles from the territorial-sea baseline.

Straits

Delegates to the Third United Nations Conference on the Law of the Sea recognized that expanding the permissible breadth of the territorial sea to 12 nautical miles would result in more than 100 international straits' falling under the category "territorial sea" rather than "high seas." The concept of "transit passage" was developed to preserve longstanding navigation practices in such straits. Transit passage is navigation or overflight for the purpose of continuous and expeditious through transit. It includes submerged navigation by submarines and overflight by military and commercial aircraft.

Transit passage rights cannot be suspended by coastal States. Ships are obliged to refrain from the use of force against States bordering a strait and from activities not incident to transit, and they are obliged to comply with generally accepted international regulations on safety at sea and pollution prevention. Coastal States have limited authority with respect to merchant vessels engaged in transit passage. They may establish sea lanes and traffic separation schemes and require compliance with the regulations governing these, and they may promulgate laws implementing international regulations regarding oil and noxious substances.

Archipelagic Waters

The Convention gives to archipelagic nations much greater authority over the waters separating their islands. Such waters have heretofore been considered high seas. Part IV provides for the exercise of sovereignty by archipelagic nations over all waters within their island groups. Large ocean areas are involved, since the archipelagic State may draw its territorial-sea baselines from connecting points on its outermost islands. The waters embraced are termed "archipelagic waters," and territorial seas and exclusive economic zones *(see following paragraph)* may be established seaward of those baselines.

The international community retains two levels of navigational rights in archipelagic waters. There is a right to innocent passage through the archipelagic waters in general. In addition, archipelagic States are obliged to designate "archipelagic sealanes," or navigation corridors, within their waters. Such sealanes must be established wherever there is a recognized sea or air route. The international community's right to "archipelagic sealanes passage" in such corridors is broader than the innocent passage right, in that submerged submarine passage and overflight rights are included. It is also more secure, in that it may not be suspended by the archipelagic State. Archipelagic sealanes passage is essentially the same as transit passage in international straits.

Exclusive Economic Zones

The Convention, in Part V, accords coastal States the right to establish an "exclusive economic zone" (EEZ) seaward of the territorial sea and extending 200 nautical miles from the baseline. Within the zone the coastal State has exclusive sovereign rights with respect to natural resources and economic activities and jurisdiction over the establishment and use of artificial islands and installations or structures having economic purposes, marine scientific research, and protection of the marine environment. The international community retains the freedoms of navigation and overflight, the right to lay submarine cables and pipelines, and the right to other lawful uses.

The Continental Shelf

The Convention provides, in Part VI, that coastal States have exclusive sovereign rights to explore and exploit the natural resources of the seabed and subsoil of the continental shelf adjacent to them. The Convention permits coastal States to establish the seaward limit of their continental shelf as far out as 200 nautical miles or at the edge of the continental margin, whichever is farther seaward.

The High Seas

In Part VII, the Convention specifies that the freedom of the high seas includes, among other things, freedom of navigation, freedom of overflight, freedom to lay submarine cables and pipelines, freedom to construct artificial islands and other installations permitted under international law, freedom to fish (subject to certain other conditions), and freedom to conduct scientific research. These freedoms are to be exercised with due regard for the rights of other States. The high seas are reserved for peaceful purposes and, by the terms of the Convention, are not subject to the sovereignty

of any State.

For the most part, this section of the Convention simply incorporates the freedoms, rights, and duties traditionally observed on the high seas. It does reduce their scope somewhat, however. First, the area covered by the term "high seas" is smaller under the Convention. The high seas no longer begin where the territorial seas stop but, rather, are what is left after the territorial seas, exclusive economic zones, and archipelagic waters are excluded. Second, the Convention provides that the exercise of high seas freedoms must be consistent with pertinent Convention provisions. Of the freedoms listed in the preceding paragraph, only navigation and overflight freedoms are not subject to restrictions in other provisions. Third, the Convention contains provisions that would remove deep seabed mining from high seas freedoms.

The International Seabed Area

The Convention, in Part XI, establishes the international seabed area as that area of the seabed beyond national jurisdiction and commits this area to the "common heritage of mankind." The Convention provides for resource exploitation in the area to be regulated by an International Seabed Authority, which it establishes. Under a planned "parallel system" of exploration and exploitation, a subsidiary of the Authority, called the Enterprise, would function as an international mining entity in competition with the flag enterprises of individual nations. Private or governmental entities seeking licenses to mine the seabed would have to identify and conduct prospecting operations in two sites; one of these two sites would be allocated to the Enterprise.

International Standards

Readers of the *Proceedings* might be particularly interested in provisions of the Convention intended to promote compliance by vessels with generally accepted international standards. The Convention mentions such standards as being the only basis on which a coastal State may adopt laws regarding design, construction, manning, and equipment for foreign vessels in innocent passage. Similarly, ships engaged in transit passage are obliged to comply with generally accepted international practices and regulations aimed at promoting safety (these include the 72 COLREGS) and the prevention, reduction, and control of pollution. Flag States are obliged to ensure that their vessels observe international standards for construction, equipment, seaworthiness, manning, labor conditions, communications, navigation procedures, and pollution prevention.

U.S. Rejection of the Convention

President Reagan announced on July 1, 1982, that the United States would not sign the Law of the Sea Convention. The Administration felt that the Convention was flawed with respect to the provisions pertaining to the deep seabed. It concluded in its analysis that these provisions would inhibit, rather than encourage, deep seabed mining. Specifically, the Administration objected to the following points:

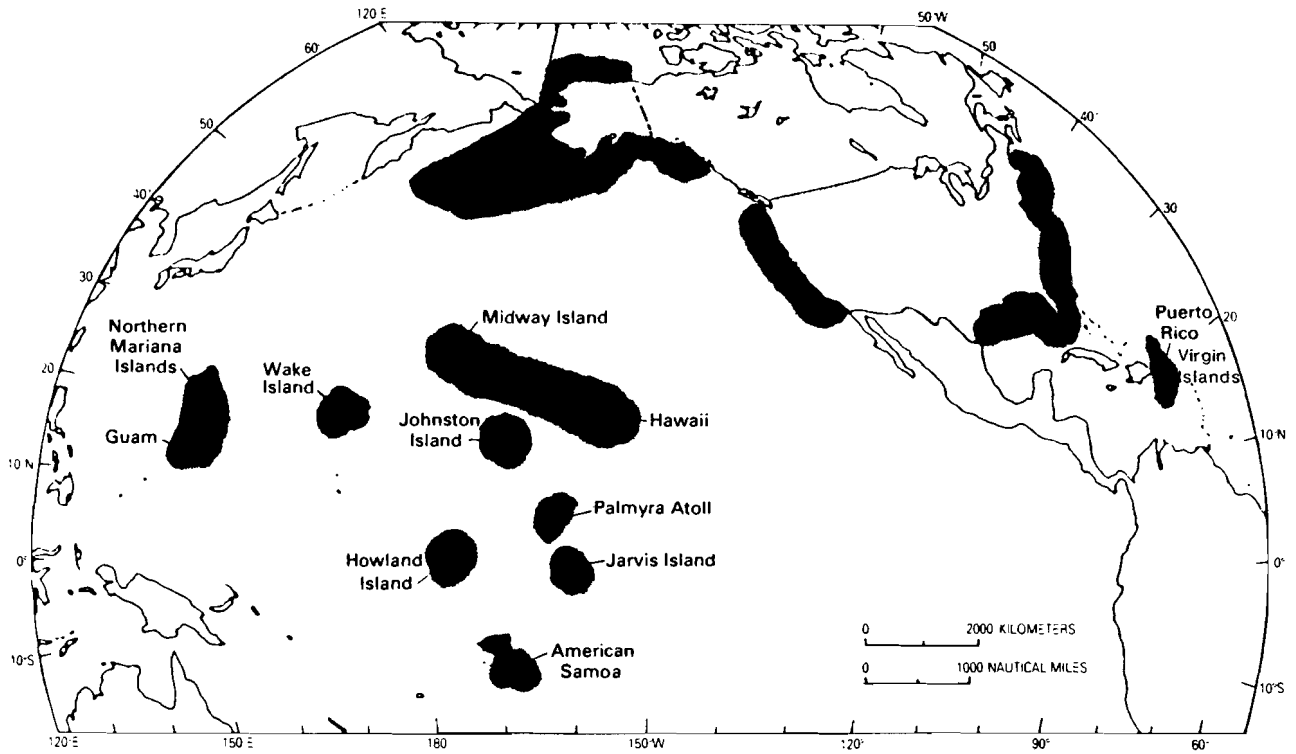
- provisions requiring the transfer of technology to the Enterprise,
- provisions allowing the rules governing the International Seabed Authority to be redefined in the future,
- provisions placing burdensome costs on private entities seeking to mine the seabed,
- failure to assure U.S. entities of national access to seabed resources, and
- failure to ensure that participating States would have a decision-making role with respect to the deep seabed provisions that fairly reflected their political and economic interests.

Subsequent Actions

As stated at the beginning of this article, the United States intends to act in accordance with the provisions of the Convention governing traditional uses of the ocean. These provisions reflect, in the main, customary international law or at least well-advanced developing international law and warrant observance by all nations.

The President spelled out U.S. policy in his statement of March 10, 1983:

"First, the United States is prepared to accept and act in accordance with the balance of interests relating to traditional uses of the oceans—such as navigation and overflight. In this respect, the United States will recognize the rights of other States in the waters off



The exclusive economic zone of the United States comprises the area contiguous to the territorial sea of the United States, the Commonwealth of Puerto Rico, the Commonwealth of the Northern Mariana Islands, and the U.S. overseas territories and possessions.

their coasts, as reflected in the Convention, so long as the rights and freedoms of the United States and others under international law are recognized by such coastal States.

"Second, the United States will exercise and assert its navigation and overflight rights and freedoms on a worldwide basis in a manner that is consistent with the balance of interests reflected in the Convention. The United States will not, however, acquiesce in unilateral acts of other States designed to restrict the rights and freedoms of the international community in navigation and overflight and other related high seas uses."

March 10 was also the day the United States established its exclusive economic zone. In the proclamation which accomplished this, the President reaffirmed the sovereign rights of the United States, to the extent permitted by international law, to the natural resources in this area. He also asserted U.S. jurisdiction over other activities for the economic exploitation and exploration of the EEZ, such as the production of energy from the water, currents, and winds, jurisdiction over the establishment and use of artificial islands and installations and structures having economic purposes, and jurisdiction over the protection and preservation of the marine environment. These elements are consistent with the Convention provisions on EEZs. The United States departed from the EEZ provisions of the Convention only in that it did not assert jurisdiction over marine scientific research conducted within the EEZ.

The Future of the Convention

It remains to be seen whether or not the Law of the Sea Convention will enter into force. More important, it remains to be seen whether the "balance of interests" with respect to traditional uses of the oceans will be maintained or, instead, whether coastal States will once again begin to push their claims beyond the accepted limits.

If the present level of freedom of navigation is to be maintained, the provisions of the Convention regarding navigation as well as those provisions limiting coastal State jurisdiction must be respected. The United States has demonstrated its commitment to preserving freedom of navigation by signalling its willingness to act in accordance with the non-mining provisions of the Convention. ↕

Keynotes

The Coast Guard published the following items in the Federal Register between April 19, 1984, and June 19, 1984:

Final rules:

CGD 83-049	Requirements for Safety Approval of Cargo Containers (published April 19)
CGD 81-080	Ports and Waterways Safety, Offshore Traffic Separation Schemes; Galveston Bay; correction (April 19)
CGD 83-067a	Dangerous Cargoes; Carriage of Solid Hazardous Materials in Bulk; final rule repromulgating Part 148 of Title 46 of the Code of Federal Regulations under the Hazardous Materials Transportation Act of 1974 (April 20)
CGD 82-025	Drawbridge Operation Regulations; Navigable Waterways of the United States; reorganization of Part 117 of Title 33 of the Code of Federal Regulations to consolidate drawbridge operation requirements and organize the bridges listed into a more usable format (April 24)
CGD7 83-04	Drawbridge Operation Regulations; Banana River, Florida (April 26)
CGD11 84-34	Special Local Regulations; Golden Gate to Spruce Goose Race, California (April 26)
CGD13 84-01	Drawbridge Operation Regulations; Lake Washington Ship Canal, Washington (April 26)
CGD 84-029	Safety and Security Zones; list of temporary special local regulations issued and temporary safety and security zones established between December 10, 1983, and March 31, 1984 (April 26)
CGD 83-067b	Updates of References to 46 U.S.C. in 46 CFR Subchapter J (April 27)
CGD11 84-46	Special Local Regulations; U.S. Olympic Sailing Trials; Long Beach Harbor and San Pedro Bay, California (April 27)
CGD 78-151	Inland Waterways Navigation Regulations; Connecting Waters From Lake Huron to Lake Erie (April 30)
COTP Baltimore Reg. 84-02	Safety Zone Regulations; Chesapeake Bay, Severn River, Annapolis, Maryland (May 3)
COTP Wilmington Reg. 84-02	Safety Zone Regulations; Trent River, New Bern, North Carolina (May 3)
CGD 78-151	Inland Waterways Navigation Regulations; Connecting Waters From Lake Huron to Lake Erie; correction (May 4)
CGD7 84-15	Drawbridge Operation Regulations; Garrison Channel, Florida; revocation of regulations for Garrison Channel drawbridge (May 10)

CGD7 84-16	Drawbridge Operation Regulations; Dead River, Florida; revocation of regulations for Seaboard System Railroad Drawbridge (May 10)
CGD7-83-21	Drawbridge Operation Regulations; Savannah River, Georgia (May 10)
CGD1-83-4R	Boston Harbor, Boston, Massachusetts; Safety Zone Regulations (May 10)
CGD 5-T84-03	Special Local Regulations; Norfolk Harborfest, Virginia (May 10)
CGD 82-073	Visual Distress Signal Equipment Requirements; correction (May 17)
CGD 76-088b	Tank Vessels Carrying Oil in Bulk; Cargo Monitors; correction (May 17)
COTP San Frsco Reg. 84-01	Safety Zone Regulations; San Francisco Bay (May 17)
COTP Honolulu Reg. 84-01	Safety Zone Regulations; Pearl Harbor, Hawaii (May 17)
COTP Baltimore Reg. 84-04	Safety Zone Regulations; Chesapeake Bay, College Creek, Annapolis, Maryland, Vicinity of U.S. Naval Academy (May 17)
COTP Baltimore Reg. 84-05	Safety Zone Regulations; Potomac River, Washington, DC, Vicinity of Arlington Memorial Bridge (May 17)
COTP Memphis Reg. 84-01	Safety Zone Regulations; Mississippi River Mile 734 to Mile 737 (May 24)
COTP New Orleans Reg. 84-06	Safety Zone Regulations; Japan Week Fireworks Display on the Mississippi River in New Orleans (May 24)
CGD 83-008	Guide Clearances for Bridges Across Navigable Waters of the United States; adoption of advisory clearances for bridges proposed for construction (May 25)
CGD 5-T84-05	Special Local Regulations; Marine Event; Elizabeth River Independence Day Celebration, Virginia (June 1)
CGD2 84-01	Special Local Regulations; Cape Girardeau Riverfest '84, Cape Girardeau, Missouri (June 1)
CGD3-84-18	Regatta; Harvard-Yale Regatta, Thames River; Connecticut (June 1)
CGD 09-84-01	Special Local Regulations; Eastern Divisionals, Niagara River (June 4)
CGD11 84-12	Special Local Regulations; Sunshine Marina Boat Drags, Colorado River (June 4)
CGD 11-84-48	Special Local Regulations; U.S. Olympic Sailing Trials, Long Beach Harbor, California; correction (June 4)
CCGD12 84-04	Special Local Regulations; Western States Championships, San Joaquin River, Stockton, California (June 4)
CGD11 84-44	Marine Event; Lake Havasu Water Ski Show, Lake Havasu City, Arizona (June 5)
COTP Jacksonville Reg. 84-24	Safety Zone Regulation; Atlantic Ocean, Jacksonville Beach, Florida (June 5)

CGD3-84-04	Safety Zone; New York, Arthur Kill (June 7)
COTP San Frsco Reg. 83-04	Safety Zone Regulations; San Francisco Bay (June 7)
CCGD 7-84-09	Regulated Navigation Area; Tampa Bay, Florida (June 7)
CGD 84-020	Documentation of Vessels; amending of definition of "United States" to include American Samoa (June 7)
CGD2 84-05	Special Local Regulations; Portsmouth Sternwheel Regatta, Portsmouth, Ohio (June 14)
CGD1-83-3R	Enlargement of Special Anchorage Area Salem Harbor, Marblehead, Massachusetts (June 15)

Notices of proposed rulemaking (NPRMs):

CGD3 83-059	Drawbridge Operation Regulations; Lake Champlain (Missisquoi Bay), Vermont (April 19)
CGD 3-84-18	Regatta; Harvard-Yale Regatta, Thames River (April 26)
CGD 11-84-01	Establishment of Safety Zones Around Structures and Artificial Islands on the Outer Continental Shelf (OCS) and the Navigable Waters of the U.S.; waters off Southern California (April 27)
CGD11 84-45	Special Local Regulations; Pre-Olympic and Olympic Marine Events in Southern California (April 27)
CGD 83-028	Inland Navigation Rules; Implementing Rules; supplemental notice of proposed rulemaking on extension of Western Rivers provisions of the Inland Navigation Rules to the Tennessee-Tombigbee Waterway and several rivers (May 3)
CGD3-84-17	Regatta; Night in Venice, Great Egg Harbor Bay, Ocean City, New Jersey (May 3)
CGD 84-024	Intervals for Drydocking and Tailshaft Examination on Inspected Vessels; advance notice of proposed rulemaking (May 4)
COTP LA Reg. 84-01	Safety Zone; Ports of Los Angeles and Long Beach and San Pedro Bay, California (May 4)
COTP Wilmington Reg. 84-01	Safety Zone Regulations; Upper Cape Fear River, North Carolina (May 4)
CGD7 84-18	Drawbridge Operation Regulations; Clearwater Pass, Florida (May 10)
CGD 1-84-5	Drawbridge Operation Regulations; Acushnet River, Massachusetts (May 10)
CGD13 83-12	Regulated Navigation Area, Puget Sound, Washington; supplemental notice of proposed rulemaking (May 10)
CGD3-84-20	Regatta; Connecticut River Raft Race (May 10)
CGD7 84-17	Drawbridge Operation Regulations; AIWW Florida (May 17)

CGD 08-84-01	Drawbridge Operation Regulations; Bayou Plaquemine, Louisiana (May 17)
CGD2 84-03	Drawbridge Operation Regulations; Missouri River, Kansas and Missouri (May 17)
CGD13 84-05	Drawbridge Operation Regulations; Snake River, Automated Railroad Bridge at Pasco, Washington (May 17)
CGD13 84-06	Drawbridge Operation Regulations; Columbia and Snake Rivers in the Vicinity of Pasco, Washington (May 17)
CGD 7-83-30	Regulated Navigation Area; King's Bay, Georgia (May 17)
CGD 84-027	Documentation of Vessels; advance notice of proposed rulemaking (May 17)
CGD3-84-24	Regatta; 1984 Cape May Classic, Grant Beach and North Cape May, Pennsylvania (May 22)
COTP Baltimore Reg. 84-06	Safety Zone; Annapolis Harbor, Maryland, Severn River, Vicinity of U.S. Naval Academy (May 24)
CGD3-84-25	Regatta; Air Brook Barnegat Bay Classic, Toms River, New Jersey (May 24)
CGD13 84-08	Regatta; Gold Cup Unlimited Hydroplane Race; Establishment of Controlled Navigation Area (May 24)
CGD3-84-23	Regatta; New Jersey Offshore Grand Prix (May 29)
CGD 83-071	Mobile Offshore Drilling Unit Operating Manual Requirements; advance notice of proposed rulemaking (June 1)
CGD 81-082	Unmanned Barges Carrying Certain Bulk Dangerous Cargoes; advance notice of proposed rulemaking (June 4)
CGD11 84-43	Marine Event; Lake Havasu Water Ski Show, Lake Havasu City, Arizona (June 4)
CGD12 84-03	Special Local Regulations; Sacramento Water Festival (June 4)
CGD3 84-30	Regatta; USAF "Thunderbirds" Air Show, New Jersey (June 4)
CGD 83-012	Certification, Safe Loading and Flotation Standards; extension of comment period (June 7)
CGD 78-035	Reception Facilities (June 19)

Notices:

CGD-84-031	National Boating Safety Advisory Council; notice of meeting (April 19)
CGD-84-032	National Boating Safety Advisory Council Subcommittee on Consumer Education; notice of meeting (April 19)
CGD 84-033	Rules of the Road Advisory Council; notice of renewal of charter (April 26)
CGD-84-035	Ship Structure Committee; notice of meeting (May 3)

CGD 84-036	U.S. Coast Guard Academy Advisory Committee; notice soliciting applications for appointment to membership (May 3)
CGD 84-038	Towing Safety Advisory Committee; notice of meeting (May 17)
CGD 84-041	Houston/Galveston Navigation Safety Advisory Committee, Offshore Waterway Management Subcommittee; notice of meeting (June 1)
CGD 84-042	Houston/Galveston Navigation Safety Advisory Committee, Inshore Waterway Management Subcommittee; notice of meeting (June 1)

Comments or requests for copies of rulemakings or notices should be directed to the Marine Safety Council at the following address:

Commandant (G-CMC)
U.S. Coast Guard
Washington, DC 20593
Tel.: (202) 426-1477

Comments may be delivered to the Marine Safety Council office, Room 2110 at Coast Guard Headquarters, 2100 Second Street, SW, Washington, DC, between the hours of 9:00 a.m. and 4:00 p.m. Monday through Friday. Comments will also be available for inspection or copying during those hours.

* * *

Final rule:

Requirements for Safety Approval of Cargo Containers (CGD 83-049)

On April 19, 1984, the Coast Guard published in the Federal Register a final rule amending the Safety Approval of Cargo Container regulations. Its purpose was to make the regulations consistent with amendments to the International Convention for Safe Containers. The changes made will 1) require all gross weight markings on a container to be consistent with the safety approval plate, 2) increase the time period between required examinations, and 3) give owners the option (after the initial plating) of having their containers examined under a continuous program rather than periodically.

The rule became effective May 21.

Notice of proposed rulemaking (NPRM):

Reception Facilities (CGD 78-035)

The International Convention for the Prevention of Pollution from Ships, 1973, as modified by the 1978 Protocol relating thereto (MARPOL 73/78) limits the amount of waste that can be discharged at sea. It also requires reception facilities at ports and terminals to receive the materials vessel operators retain on board to comply with the Convention. In an NPRM published June 19, 1984, the Coast Guard solicited comments on regulations implementing the reception facility requirements of the Convention. The proposed regulations provide criteria for determining the adequacy of reception facilities and detail administrative procedures for granting Certificates of Adequacy.

Comments must be submitted to the Marine Safety Council (address in the paragraph in boldface type) by August 20, 1984.

Advance notices of proposed rulemaking (ANPRMs):

Intervals for Drydocking and Tailshaft Examination on Inspected Vessels (CGD 84-024)

As mentioned in the "Actions of the Marine Safety Council" section of the June issue, the Coast Guard is considering extending the intervals at which inspected vessels must be drydocked and their tailshafts examined. In an advance notice of proposed rulemaking published on May 4, 1984, it solicited comments from the public on what changes should be made in the requirements and what effect these changes would have.

Documentation of Vessels (CGD 84-027)

As was also noted in the June issue's "Actions of the Marine Safety Council," the Coast Guard has received reports that owners of documented vessels were unhappy with a

regulation requiring them to mark the vessels to show their hailing port. In CGD 84-027, an advance notice of proposed rulemaking published May 17, 1984, the Coast Guard solicited comments on whether it should continue to require such markings and what criteria should be used to determine the port to be marked as the hailing port.

Mobile Offshore Drilling Unit Operating Manual Requirements (CGD 83-071)

The Coast Guard is considering amending the regulations regarding operating manuals for mobile offshore drilling units. In an advance notice of proposed rulemaking published June 1, 1984, it solicited comments on what material needed to be clarified for operating personnel and what additional safety information should be included.

Unmanned Barges Carrying Certain Bulk Dangerous Cargoes (CGD 81-082)

In response to recommendations made by the Towing Safety Advisory Committee, the Coast Guard is considering making limited changes in the rules for barges carrying hazardous liquid cargoes in bulk. The changes would improve the handling of hazardous vapors displaced during cargo loading. Also included in a proposed rule would be the updating of references to definitions of hazardous materials and a recommendation by the National Transportation Safety Board that barges carry certificates of inhibition for those cargoes that require inhibition during shipment. A similar requirement already applies to tankships carrying inhibited cargoes.

The Coast Guard solicited comments on these changes in an advance notice of proposed rulemaking published June 4, 1984.

Actions of the Marine Safety Council

At its June meeting, the Marine Safety Council considered one item:

CGD 84-043 Marine Portable Tanks

The Coast Guard developed its specifications for portable tanks carried on ships in 1974, modeling them after the requirements of the International Maritime Organization (then the Inter-Governmental Maritime Consultative Organization). In 1981, the U.S. Department of Transportation's Office of Hazardous Materials Regulation developed a similar standard, using the same IMO requirements, applicable to all modes of transportation.

A proposal being considered by the Council would discontinue the policy of separate Coast Guard specifications for the marine portable tank by authorizing use of the DOT-specification tank in the marine trade. Existing Coast Guard-approved tanks would be covered by a grandfather clause.

The proposal has several advantages. It eliminates an almost duplicative standard and simplifies the regulatory structure. In addition, it allows the DOT-standard tank to be approved by third parties. This provision would ease workloads on Coast Guard personnel and speed the approval process.

A notice of proposed rulemaking was being readied for publication in the Federal Register as this issue went to press.

Isopropyl Alcohol: C_3H_8O or $(CH_3)_2CHOH$

Synonyms:	isopropanol 2-propanol "rubbing alcohol" dimethyl carbinol
Physical Properties	
boiling point:	82°C (180°F)
freezing point:	-86°C (-128°F)
vapor pressure at	
20°C (68°F):	32 mm Hg
30°C (86°F):	57 mm Hg
Threshold Limit Values (TLV)	
Time Weighted Average:	400 ppm; 980 mg/m3
Short Term Exposure Limit:	500 ppm; 1,225 mg/m3
Flammability Limits in Air	
lower flammability limit:	2% by vol.
upper flammability limit:	12.7% by vol.
Combustion Properties	
flash point (c.c.):	12°C (53°F)
flash point (TOC):	17°C(63°F)
autoignition temperature:	399°C (750°F)
Densities	
liquid (water = 1.0):	0.78
vapor (air = 1.0):	2.1
Identifiers	
U.N. Number:	1219
CHRIS Code:	IPA
Cargo Compatibility Group:	20 (Alcohols, Glycols)

For those of our readers who have been through the U.S. public school system, the odor of this issue's Chemical of the Month will evoke unpleasant memories of "shot" day. "Rubbing alcohol" is the name by which most people know the chemical. "Isopropyl alcohol" is its proper chemical name. "Isopropanol" is the name you might see on labels.

Isopropyl alcohol is an excellent solvent, inexpensive and free from the regulations which apply to ethyl alcohol. The characteristics which make it an excellent solvent in its own right also make it ideal for inclusion as the solvent ingredient in such consumer products as liniments, skin lotions, hair sprays, cosmetics, perfumes, oils, gums, and resins. Aerosol floor detergents, shoe polishes, insecticides, window cleaners, and automotive products also contain isopropyl alcohol as a solvent. Much of the isopropyl alcohol used each year goes into the production of other chemicals, primarily acetone. Its final major category of uses is the one alluded to in the first paragraph--medical. Isopropyl alcohol is used as an antiseptic and disinfectant for home, hospital, and industry. It is also contained in local anesthetics and bathing solutions for surgical sutures and dressings.

Isopropyl alcohol is produced commercially in one of two ways: 1) through treatment of propylene, an octane feedstock for gasoline, with sulfuric acid, or 2) through what is called direct hydration--using superheated steam and high pressure to bring about a catalytic reaction in propylene. The latter method is cheaper and less corrosive and is gradually replacing the former.

Reasonable care in the handling and use of isopropyl alcohol is necessary if its health hazards are to be avoided. Prolonged or repeated exposure to high concentrations of the chemical can cause depression of the nervous system and narcosis. If isopropyl alcohol is splashed in the eyes, they may be seriously irritated. Someone who swallows the chemical may exhibit such symptoms as difficulty breathing, nausea, vomiting, and headaches; more serious cases of ingestion result in coma and, sometimes, death. Replenishing the blood with vital substances has

been found to be effective in the treatment of severe cases of isopropyl alcohol poisoning.

Isopropyl alcohol is a flammable liquid. Like other flammable liquids, it produces vapors which, when mixed with air, are explosive. Proper handling is a must. If a fire does break out, several extinguishing agents are effective. Carbon dioxide or dry chemical is usually available in hand extinguishers. Water spray can also be used, but water in a straight hose stream should not, since it tends to scatter the liquid and spread the fire. Large spills or tank fires on board ships are best controlled with "alcohol-type" foam. Personnel fighting isopropyl alcohol fires should wear fire protection gear, including a self-contained breathing apparatus, leather boots, and a hard hat.

In cases of hazardous exposure to isopropyl alcohol, general principles of first aid apply. If the chemical is splashed in the eyes, they should be flushed out immediately. The victim should gently wash out his eyes under a faucet or shower head for at least 15 minutes; if neither of these is available, water can be poured from a clean container. If an individual has swallowed isopropyl alcohol and is still conscious, vomiting should be induced; syrup of ipecac or a finger down the throat will suffice for this purpose. A physician should be called immediately. A person showing symptoms of vapor inhalation should be removed from the contaminated area promptly. If breathing ceases, artificial respiration must be started and continued until the person resumes breathing or has been placed under the care of a physician.

For bulk shipment by tank barge or tankship, isopropyl alcohol is regulated by the U.S. Coast Guard as a Subchapter D cargo. The International Maritime Organization includes it in Chapter 7 of the IMO Chemical Code, i.e., chemicals to which the Code does not apply. For package shipment, the U.S. Department of Transportation considers isopropyl alcohol a Flammable liquid. IMO assigns isopropyl alcohol shipped in containers to Class 3.2 (the intermediate-flash-point group). The International Maritime Dangerous Goods (IMDG) Code entry for this chemical can be found on page 3100.

Richard Raksnis is a fourth-class Cadet at the Coast Guard Academy. He wrote this article under the direction of instructor LCDR Thomas J. Haas for a class on hazardous materials transportation. Technical assistance was provided by personnel in the Cargo and Hazards Branch at Coast Guard Headquarters. ↕

Chinese Delegation Visits Coast Guard Headquarters

Delegates from the Register of Shipping (ZC) of the People's Republic of China visited Coast Guard Headquarters on May 22, 1984. Their visit to the United States was an example of Chinese expansion into the international arena in an effort to become a major maritime nation.

The eight-person delegation, headed by Ding Qizhong, Director of ZC, was given a tour of Headquarters by Office of Merchant Marine Safety personnel. Rear Admiral Clyde T. Lusk, Chief of the Office, welcomed the delegation and gave it a brief overview of the Coast Guard's Commercial Vessel Safety (CVS) program. Delegation members saw a series of presentations covering aspects of the CVS program, from vessel inspection and plan review functions to casualty analyses and computer applications. They were particularly interested in the offshore structures program. The Chinese are actively working in offshore development and are aggressively seeking shipbuilding contracts. U.S.-flag mobile offshore drilling units are now being built in China.

During its visit to the United States, the delegation also met with members of the American Bureau of Shipping. The ABS demonstrated to the Chinese how ZC responsibilities were akin to those of the Coast Guard CVS program and the ABS. ↕

The Chinese delegates discuss marine safety with Rear Admiral Lusk.

Hidden Hazards

Given the variety and the volume of chemicals they transport each year, chemical carriers have a remarkably good safety record. Safety standards are strict and well-observed, and the number of casualties that occurs is small. Occasionally, however, an unsuspected characteristic of a chemical can cause a tragic accident.

Two crew members of a parcel chemical tanker recently lost their lives when they entered a cargo tank to inspect it. The tank had been discharged of its cargo, formic acid, and had been cleaned before the crew members entered it. What, then, caused them to die? The answer: poisoning by a hidden hazard of formic acid, carbon monoxide.

As a product, formic acid is relatively easy to handle--it requires no special temperature for shipping, for example. It does, however, present some readily apparent health hazards, even aside from the carbon monoxide danger. It is very corrosive to skin tissue and will cause severe burns on contact. Formic acid fumes, even low-concentration fumes, are extremely irritating, and inhalation of them may be quite painful. Inhalation of stronger fumes will result in nausea and vomiting, and strong concentrations may cause corrosion of the tissues of the respiratory system.

The Threshold Limit Value-Time Weighted Average set for formic acid by the American Conference of Governmental Industrial Hygienists is 5 parts per million (ppm). Employees who must be exposed to formic acid should be exposed to a concentration no greater than 5 ppm, averaged over their 8-hour workday. Since the chemical has good warning properties, employees will be able to detect its pungent and penetrating odor at concentrations well below the the 5 ppm concentration.

The hidden hazard, unfortunately, is not so easily detectable. The entry for formic acid in the International Chamber of Shipping's *Tanker Safety Guide (Chemicals)* shows that the chemical will decompose slowly during transport and storage. What is important to know about this decomposition is that it will result in the generation of carbon monoxide, a colorless, odorless, highly lethal gas.

While formic acid is completely soluble in water and thus easy to clean out of tanks, carbon monoxide does not share this characteristic. Even though a tank which has held formic acid may have been washed thoroughly (say, for two hours or so), its atmosphere may still be unsafe. It may still contain lethal concentrations of carbon monoxide.

The hemoglobin in red blood cells which transports oxygen from the lungs to the body's tissues and cells and returns carbon dioxide to the lungs is dangerously partial to carbon monoxide. Given a choice between absorbing oxygen and absorbing carbon monoxide, the hemoglobin will favor the carbon monoxide. Its affinity for carbon monoxide is, in fact, 200 times as great as its affinity for oxygen. The more carbon monoxide the hemoglobin absorbs, the greater the hemoglobin's resistance to absorbing oxygen will be. Eventually, the hemoglobin will refuse to absorb any oxygen, no matter how great a supply is available. A carbon monoxide concentration of as little as

0.5 to 1 percent by volume in air is sufficient to cause lethal poisoning in a period of 5 to 10 minutes.

What this means for vessel personnel is that cargo tanks which have held formic acid must be thoroughly ventilated in addition to being thoroughly washed.

The casualty described at the beginning of this article could have been avoided, had the following practices been observed:

- After a formic acid cargo tank has been washed, it should be ventilated with an amount of air equivalent to four to five times the cargo tank volume. This is a minimum standard.
- Before anyone enters the tank, the atmosphere must be carefully checked for the presence of carbon monoxide as well as that of formic acid.
- Also, the tank must be found to have a safe oxygen level (20 to 21 percent).

Neglecting to see to any of these factors may result in a false all-clear signal. Furthermore, any formic acid cargo tank which has been left empty for some time should always be checked carefully before anyone enters it, as new carbon monoxide may have developed since the last entry. If doubt about the tank persists, anyone entering the tank should don a self-contained breathing apparatus, checking carefully to see that it fits tightly. (Beards may be a worry in this respect.)

The shipping company involved in the casualty had just received the report of the deceased crew members' blood sample analysis when this article was written. The carbon monoxide levels in their blood were 81 and 68 percent, respectively. The level sufficient to kill a human being is 40 to 50 percent. In other words, while the carbon monoxide hazard of formic acid may have been "hidden" to the employees, its effects were not. ‡

Effects of carbon monoxide exposure

Atmospheric concentration (ppm)	Blood saturation* %	Principal symptoms
50	7	slight headache
100	12	moderate headache and dizziness
250	25	severe headache and dizziness
500	45	nausea, vomiting, possible collapse
1,000	60	coma
10,000	95	death

* Blood saturation is measured in % carboxyhemoglobin, the combination of carbon monoxide and hemoglobin that forms in the blood when carbon monoxide is inhaled.

Adapted with permission from "Medical Management of Chemical Exposures," © 1982 American Petroleum Institute

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 vessel not under command, underway but not making way, would show

A. two all-round red lights in a vertical line.
B. sidelights.
C. a sternlight.
D. all of the above.

REFERENCE: Commandant Instruction M16672.2, Rule 27

2. The tide that occurs along the East Coast of the United States and which is most common throughout the world is which of the following types?

A. Diurnal
B. Mixed
C. Semidiurnal
D. Quadrantal

REFERENCE: Bowditch, Vol. I, 1977

3. Before entering any compartment, you should see that its air contains at least what percent oxygen?

A. 14%
B. 18%
C. 21%
D. 24%

REFERENCE: Marton, Tanker Operations

4. The lowest temperature (^{o}F) at which a liquid will give off flammable vapors is referred to as its

A. fire point.
B. flash point.
C. lower explosive limit.
D. Threshold Limit Value.

REFERENCE: Page and Gardner, Petroleum Tankship Safety

5. Under the IALA-B buoyage system, a yellow buoy may mark

A. fishnet areas.
B. spoil grounds.
C. military exercise zones.
D. all of the above.

REFERENCE: U.S. Coast Guard brochure "Modifications: For a New Look in U.S. Aids to Navigation"

ENGINEER

1. If a radial piston hydraulic pump fails to deliver the rated fluid volume, the

A. fluid requires renewal.
B. thrust rings are pitted.
C. rotor bearings are worn.
D. suction passages are obstructed.

REFERENCE: Hicks, Pump Operation and Maintenance

2. Reduction gear bridge gage readings should be taken after

A. the journal is rotated to the point of minimum oil clearance.
B. all bearing caps and all bearing halves are removed.
C. the bearing shell is rotated so that the point of maximum bearing wear is directly at the bottom.
D. all of the above.

REFERENCE: Osbourne, Modern Marine Engineer's Manual, Vol. I

3. When a turbine-driven main feed pump must be run at shutoff or at 20 percent or less of its rated capacity, what prevents the pump from overheating?

A. Throttling of the steam supply valve
B. Throttling of the liquid discharge valve
C. A bypass or recirculating line led back to the pump suction
D. A bypass or recirculating line led back to the source of suction supply

REFERENCE: Hicks, Pump Operation and Maintenance

4. What does a wound-rotor induction motor have that a squirrel-cage motor does not?

A. Slip rings
B. End rings
C. A centrifugal switch
D. End plates

REFERENCE: Lister, Electric Circuits and Machines

5. Fire-detecting systems on merchant vessels may be arranged to sense

A. smoke.
B. rate of temperature rise.
C. ionized particles.
D. any of the above.

REFERENCE: Harrington, Marine Engineering

ANSWERS

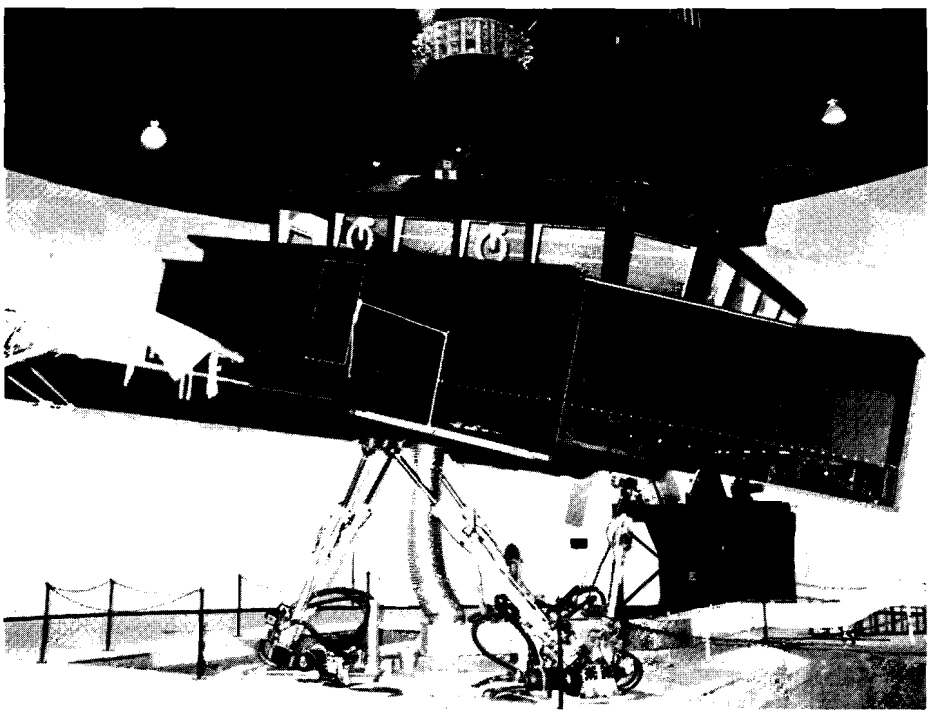
1.D;2.C;3.D;4.A;5.D
ENGINEER
1.A;2.C;3.B;4.B;5.D
DECK

If you have any questions about the Nautical Queries, please contact Commanding Officer, U.S. Coast Guard Institute (mvp), P.O. Substation 18, Oklahoma City, Oklahoma 73169; tel.: (405) 686-4417. ‡

Maritime Licensing, Certification, and Training

Simulators and their potential uses in the maritime industry are a topic of growing interest to the U.S. Coast Guard. One area being explored by the Coast Guard is the possibility of using simulator models of ports to determine aids-to-navigation and dredging requirements. The Coast Guard Academy is actively pursuing installation of its own bridge simulator, and the Cadets can look forward to using it for the type of training already available elsewhere in the United States and in other countries. Radar simulators promise to offer a fair, convenient means of testing the proficiency of candidates for license endorsements. The Coast Guard is also considering using simulators in place of written examinations to test knowledge of shiphandling, Rules of the Road, and seamanship. (Any projects involving training and proficiency testing of ship's officers will be evaluated in depth by the Coast Guard and the Maritime Administration before they are adopted for use.)

In this article, we will focus on the value of simulators for training. Although the use of simulators for maritime training is finally gaining wide acceptance, some mari-



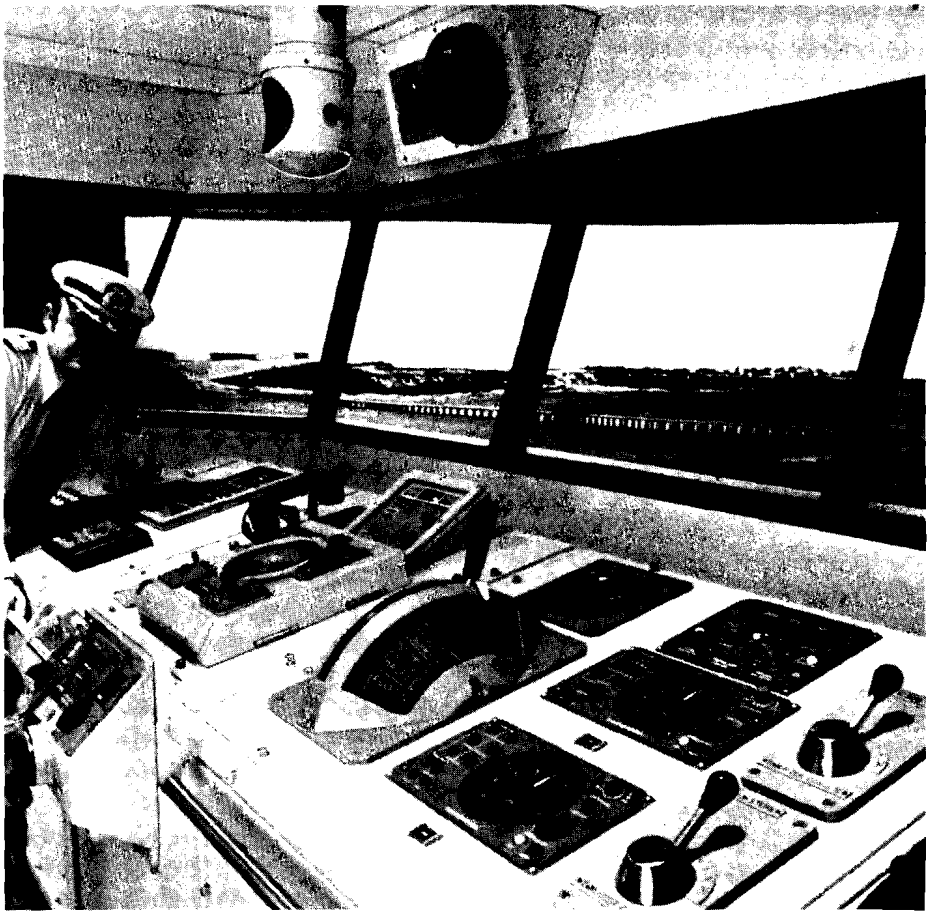
A full-bridge simulator at the International Organization of Masters, Mates and Pilots' Maritime Institute of Technology and Graduate Studies has a 360° screen. When nighttime scenes are projected, operators can see the lights of ships as they approach and then see the lights behind them once the ships have passed. This outside view shows the unit simulating motion.

ners remain skeptical about how well knowledge and experience gained on a simulator will transfer to the sea environment.

The value of simulator training varies according to your source of information. Most people who have been trained on bridge simulators say that it is a worthwhile experience, and common sense would indicate that this is the case. A simulator has the advantage of being programmable—as one instructor put it, "How long would a mariner have to serve at sea in order to see the same things modeled and learned on the simulator? A very long time." Others may consider simulator time simply equivalent to time at sea. In other words, a day of simulator training can equal either a day at sea or 30 days at sea, depending on which expert you talk to.

The time-equivalents approach is one way of determining how much a training course is worth. Another is to measure mariners' competency before and after training, then equate the newly learned tasks to sea time. For this approach to be valid, job tasks have to be analyzed for all officers so that schools can be sure the tasks for which they are training mariners relate directly to the real world.

The Coast Guard is taking both approaches into account as it develops a policy on granting credit toward licenses for simulator training. Any school interested in acquiring a simulator would understandably be concerned about the high initial and operating costs and would need to know that it would realize an adequate return on its investment. It is the Coast Guard's job to ensure that credit granted students reflects an accurate sea-time equivalent and that the training is valid in terms of tasks taught.



The "ship" operated by officers training on Marine Safety International's LaGuardia Airport shiphandling simulator is actually a three-camera, wide-angle television probe moving over a three-dimensional model of a harbor.

While a Coast Guard policy on credit toward licenses is not yet in place, the Coast Guard has proceeded with guidelines for evaluating training programs. These are meant to ensure uniformity in the treatment of the many organizations offering such courses. The guidelines for radar training courses have already been completed. (If adhered to by a training institution, these guidelines could also serve as an outline which would result in a course with all the elements necessary for successful training.) Similar guidelines for all training incorporating simulators are being readied in anticipation of increasing requests for Coast Guard approval. The guidelines will be standards, not absolutes by which a program will be judged acceptable or not acceptable.

As it develops its guidelines, the Coast Guard is analyzing all aspects of simulator training. The equipment selected is unquestionably important, but studies have shown that the most important element is the instructor. A detailed breakdown of course elements can be found in the publication "Simulators for Mariner Training and Licensing: Guidelines for Deck Officer Training Systems," issued by CAORF, the Computer Aided Operations Research

Facility. Any organization contemplating establishing a simulator training program is encouraged to order a copy of the report, order no. AD A128 898, from the National Technical Information Service, Springfield, Virginia 22161. The price, including postage and handling, is $10.

The following lists have been excerpted from the CAORF publication. They give a fair idea of what elements are important for bridge-simulator programs, simulator-based training in general, and instructor qualifications.

Simulator Design (Critical Characteristics)

Visual Scene
- Geographic Area
- Horizontal Field of View
- Vertical Field of View
- Time of Day
- Color Visual Scene
- Visual Scene Quality

Radar Presentation
Bridge Configuration
Ownship Characteristics and Dynamics
Exercise Control
Traffic Vessel Control
Training Assistance
Technology Availability

Training Program Structure (Critical Characteristics)

Skill Levels After Training
Skill Levels Prior to Training
Training Objectives
Training Techniques
- Knowledge of Requirements
- Positive Guidance
- Adaptive Training
- Post-problem Critique

Instructors Guide
Classroom Support Material
Simulator/Classroom Mix
Training Program Duration
Class Size
Scenario Design
Number of Scenarios
Stress
Overlearning

Instructor Qualifications

Mariner Credentials
Instructor Credentials
Subject Knowledge
Instructor Skills
Instructor Attitude
Student Rapport
Instructor Evaluation

At present there are only a handful of training facilities in the United States with full-bridge simulators. They include the following:

Maritime Institute of Technology and Graduate Studies
5700 Hammonds Ferry Road
Linthicum Heights, MD 21090

Marine Safety International
Marine Air Terminal, La-Guardia Airport
New York City, NY 11371

Eclectech Associates Division of Ship Analytics, Incorporated
North Stonington Professional Center
North Stonington, CT 06359

Maritime Training and Research Center
One Maritime Plaza
Toledo, Ohio 43604

Since the Coast Guard is still developing its guidelines, none of these schools can yet offer Coast Guard-approved simulator training.

The Coast Guard considers simulators valuable training aids and fully supports their use in helping mariners develop their professional skills. It will make every attempt to aid any school or organization wishing to develop a simulator training program. ‡

☆U.S. GPO: 1984-421-449/805

A bibliography on ship-handling simulator facilities and their use is available from the National Maritime Research Center (NMRC), the research facility of the Maritime Administration. The bibliography is priced as follows: for the United States, $15; for Canada, US$15 or the equivalent in Canadian dollars; for other countries, US$25 or, if paid in foreign-currency equivalent, $35. Checks should be made payable to "Seatrack for NMRC Study Center" and sent to the Study Center, National Maritime Research Center, Kings Point, New York 11024-1699 along with a request for NMRC-SB-1, Bibliography on Shiphandling Simulators.

Signing off . . .

Well, dear readers, it's time for this editor to move on. The issue you have just finished reading will be my last one; your next issue will be getting to you as soon as the new editor has a chance to get acclimated.

It's been a pleasure being the editor of the *Proceedings*. I have appreciated all of your comments, suggestions, and submissions, and I know my successor will as well. Please keep him or her in mind as you go about your business.