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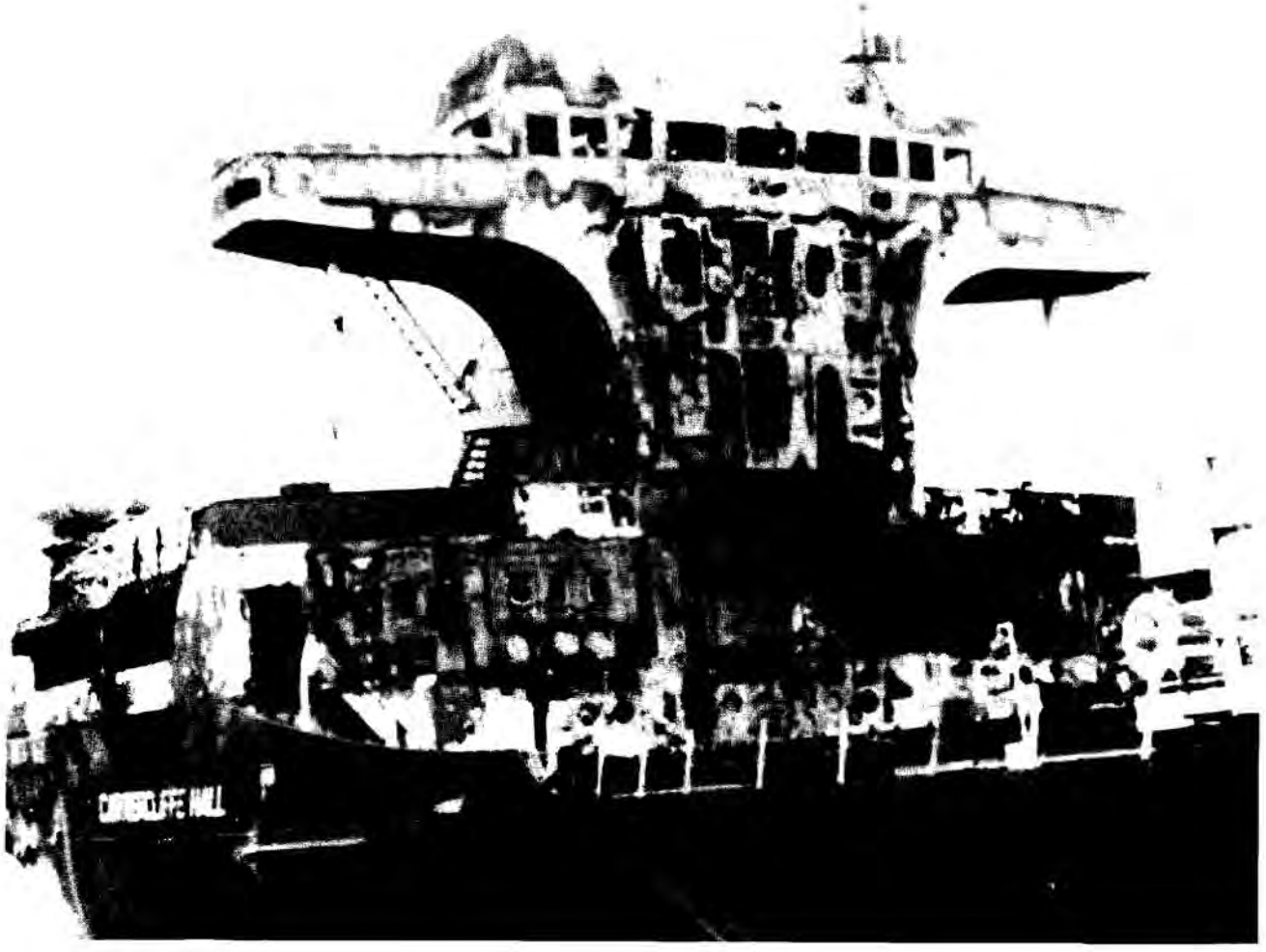

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Proceedings

of the Marine Safety Council

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Please pass this magazine along when you have finished reading it.

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The deckhouse of the M/V CARTIERCLIFFE HALL was gutted by a fire which resulted in the loss of seven lives. Fires on board ship can be especially perilous. Structural/technological safeguards can go a long way toward minimizing the danger, but humans must do their part, as well. CAPT H. F. Norton, Jr., discusses both factors in "Fire at Sea—a Casualty Visited," beginning on page 60.

Maritime Sidelights

Letter from the Editor

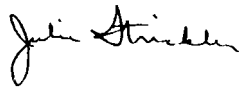
I would like to extend my thanks for all the letters and phone calls received in response to my "dandle" question (page 3 of the January/February 1981 issue). The fact that so many people not only went to the trouble of looking up the word but also passed along their findings to me seems to indicate that you enjoyed the poem. I hope so.

Once again I would like to say that all contributions from readers are appreciated. While most of the articles I receive are Coast Guard-authored, I welcome articles from private individuals and companies. Please, too, write and tell me which features/departments you enjoy and what types of articles you would like to see in the Proceedings. If any of you has safety tips to pass along to other mariners, please send those in, too.

Marine safety is, after all, this publication's reason for existence. If you have knowledge or experiences to share, I hereby offer you a forum.

I'm looking forward to hearing from you.

Sincerely,



Julie Strickler
Editor

The editor of the Proceedings of the Marine Safety Council (and the Marine Safety Council in general) can be reached at U.S. Coast Guard (G-CMC), 2100 Second St. SW, Washington, DC 20593; (202) 426-1477.

New SOLAS Protocol to Take Effect

The 1978 Protocol to the Safety of Life at Sea convention (SOLAS) will enter into force on May 1, 1981. This protocol, which in essence amends SOLAS 74, is a major advance in maritime safety. While the protocol was developed at the 1978 Conference on Tanker Safety and Pollution, it will have a far-reaching effect on all vessels to which SOLAS applies. The basic provisions of the protocol were mandated by the 1978 Port and Tanker Safety Act, and these provisions have been incorporated in Coast Guard regulations.

Navigation and Vessel Inspection Circular 1-81, dated February 18, 1981, provides a detailed account of how the protocol and its counterpart, the Protocol of 1978 relating to the International Convention for the Prevention of Pollution from Ships, 1973, were developed and the specific measures, both technical and administrative, that the Coast Guard is taking to implement the protocols. This NAVIC may be obtained by writing to: U.S. Coast Guard (GMP-4), 2100 Second St. SW, Washington, DC 20593.

Coast Guard Studying its Roles and Missions

The House Appropriations Committee has directed the Coast Guard to review its roles and missions. The committee report notes that since the last review was completed in 1962, "the character of Coast Guard activities has changed considerably because of the termination of the ocean station program, newly defined responsibilities in marine environmental protection, expanded fisheries law enforcement activities, and greater responsibilities on the outer continental shelf." The added responsibilities are "straining the ability of the Coast Guard to properly support all of the service's mission requirements." Rather than simply adding more money and personnel to continue to perform the expanding responsibilities, the committee decided that a comprehensive review was warranted. This review will ultimately distinguish those activities which the Coast Guard is currently performing (a) which might be eliminated as no longer useful or justified, (b) which might better be accomplished by new or existing private sector organizations, public authorities, local or State governments, or other agencies of the Federal government, and (c) which are being, or should be, performed by the Federal government and can most effectively be accomplished by the Coast Guard.

User Fees Bill Sent to Congress

Secretary of Transportation Drew Lewis transmitted to Congress on March 18 a proposed bill which would give him authority to establish fees for certain Coast Guard services.

The proposed legislation would authorize the Secretary to collect fees for Coast Guard services which are presently provided at little or no charge, such as commercial vessel inspections, documentations, and crew licensing. Other Coast Guard services involved are aids to navigation, search and rescue assistance, icebreaking, and water pollution monitoring and cleanup. The cost of providing such services currently makes up a significant portion of the Coast Guard budget.

The bill would require that certain vessels, mainly recreational boats, other undocumented vessels, and documented pleasure and fishing vessels, not be used on the navigable waters of the United States unless they show evidence of payment of a waterways user fee by displaying a waterways user decal. Waterways user fees will vary according to such criteria as vessel size.

U.S. documented commercial vessels other than those referred to above and foreign vessels would pay Customs a special tonnage user fee upon each entry into a U.S. port. Additionally, fees would be charged for direct services ren-

dered to the maritime industry such as inspection, licensing, certification, documentation, and admeasurement.

With passage of the bill, charges to be phased in over the next five years would recoup approximately $ 500 million per year from beneficiaries of Coast Guard services by the end of fiscal year 1986. The bill would provide for recoupment of $ 100 million in fiscal year 1982 and graduate upward at the rate of an additional $ 100 million annually until reaching the $ 500 million mark in 1986.

Auxiliary Offers Boating Courses

The Coast Guard Auxiliary, the all-volunteer, civilian arm of the Coast Guard, would like to remind the public that it offers various boating courses. Interested persons should check with the Director of Auxiliary in their Coast Guard Districts to see when the following courses will be offered:

Boating Skills and Seamanship - Six to thirteen lessons. The first six lessons are the nucleus of the course and cover boat handling, boating laws, rules of the road, aids to navigation, safe boating techniques, and sailor's terminology. Lessons seven through thirteen are optional and may cover such subjects as charts and compass, marine engines, marlinspike seamanship, introduction to sailing, weather, marine radiotelephone, and locks and dams.

Sailing and Seamanship - Seven to thirteen lessons. Parallels the Boating Skills and Seamanship course but is tailored especially for sailors. Seven-lesson core with six optional lessons which may be offered at conclusion of course.

Basic Boating - Compact three-lesson course covering seamanship, aids to navigation, rules of the road, knots, and safety techniques.

Skipper's Outboard Special - An excellent one-lesson starter course to give the novice or occasional boater an understanding of safety devices, boating equipment, and potentially hazardous situations.

Introduction to Sailing - One-lesson course covering basics of handling sailboats (also offered as a Boating Skills and Seamanship lesson).

Young People's Boating Course - One-lesson course for 10- to 15-year-olds, featuring pupil participation in demonstrations.

First Aid for the Boatman - One-lesson course developed in cooperation with the American National Red Cross.

Boating safety programs may also be arranged with the Auxiliary for presentation before civic groups, clubs, and government or industrial organizations.

Exemption Authority Delegated to District Commander

On March 9, 1981, a final rule went into effect delegating to the Commander of the Seventeenth Coast Guard District the authority to issue permits to exempt specific cargo-carrying vessels from certain federal laws and regulations. This power was originally delegated in Public Law 94-406 (enacted on September 10, 1976) to the Secretary of the Department in which the Coast Guard was operating. That law authorized him or her to issue permits exempting specific cargo-carrying vessels operating in the State of Alaska from all or part of the requirements of 46 U.S.C. 88, 391, 391a, and 404, which concern vessel inspections, manning, and load lines. The exemptions effectively involve a small group of vessels, 300 gross tons or less, which provide the only supply link to remote villages in Alaska. Coast Guard enforcement of the aforementioned laws was making the operation of these vessels economically infeasible, thereby threatening the life of the villages. The exemption legislation basically allows whatever relaxation of the standards is deemed necessary to allow the vessels performing this service to continue operation yet not present an immediate threat to safety.

Maneuverability Studied in Puget Sound

In January 1981 the Coast Guard conducted tests with a supertanker in the Straits of Juan de Fuca to find out whether or not it was possible to control large ships if the engines or rudder were out of action. Involved in the tests were a 188,000-dwt tank vessel, ballasted down to simulate a loaded tank vessel, and three tugboats furnished by Foss Launch and Tug Co. under contract to the Coast Guard. The tests were sponsored by the Maritime Administration, the American Institute of Merchant Shipping, and the U.S. Coast Guard. Simulations of various casualties were conducted over a four-day period. These included but were not limited to: (1) power failure (main engine), (2) rudder failure at 15 degrees, (3) rudder failure at 35 degrees, all at various speeds. The technical results are being readied by Hydronautics, Inc.

The tests were set up to provide input on proposed rules for Puget Sound tank vessel operations. That rulemaking project dates back to March 1978, when sections of the Washington State Tanker Law were declared unconstitutional by the U.S. Supreme Court and the Secretary of Transportation issued an Interim Navigation Rule reinstating a 125,000-dwt tanker size limit. Since then various maneuverability trials and public hearings have been held. A review of the comments received indicated that additional research was necessary to substantiate portions of the proposed rules, and the just-completed study was set up accordingly.

New Golden Gate Directory Published

The Marine Exchange of the San Francisco Bay Region announces publication of the sixth edition of the "Golden Gate Atlas and World Trade Directory." This 106-page reference on Northern California's trade and shipping resources includes a cross-indexed listing of over 70 companies and the more than 500 steamship lines they represent, as well as detailed information and maps on each port area showing capabilities, facilities, and street and highway access. All Bay ship anchorages are shown and defined. Ocean routes to and from the Golden Gate to major ports of the world are listed, indicating the liner services available.

The Atlas is available for $ 4.95, postage included, from the Marine Exchange, 303 World Trade Center, San Francisco, California 94111. ↓

The following were published between February 20, 1981, and March 30, 1981:

Final rules: CGD 80-148 Great Lakes Pilotage Rates, March 26, 1981. CGD 76-170 Casualty Reporting Requirements (interim rule correction), March 30, 1981. CGD 77-087 New York Vessel Traffic Service (Clarification of Effective Date), March 30, 1981.

Proposed rules: CGD 77-081 Oceanographic Research Vessels (extension of comment period), March 9, 1981.

Notices: CGD 81-015 Study of Roles and Missions for the Coast Guard, March 5, 1981. CGD 79-077 (OCS Safety) International Association of Drilling Contractors (meeting notice), March 5, 1981; amended March 18, 1981. CGD 81-018 Towing Safety Advisory Committee; Notice of Establishment, March 16, 1981. CGD 81-022 Marine Safety Council Staff; Notice of Change of Location, March 30, 1981.

Any questions regarding regulatory dockets should be directed to Commander A. D. Utara (G-CMC), U.S. Coast Guard Headquarters, 2100 Second St. SW, Washington, DC 20593; (202) 426-1477.

* * *

Revision of Electrical Regulations CGD 74-125(A)

This regulation will constitute a general revision and updating of the electrical regulations to conform with the latest technology. It will include steering requirements for vessels other than tank vessels.

This revision is necessary because industrial standards for electrical engineering have changed in the past few years and the regulations must be brought up to date to reflect current industry practices.

An initial notice of proposed rulemaking (NPRM) was published on June 27, 1977 (42 FR 32700). A supplemental NPRM was published as CGD 74-125A on March 3, 1980 (Part VII).

New Tank Barge Construction CGD 75-083 Upgrade of Existing Tank Barge Construction CGD 75-083a

This action comprises two regulatory projects centered on tank barge construction standards. These projects were the result of a Presidential initiative of March 17, 1977, directing a study of the tank barge pollution problem. One project will address new barge construction, while the other will pertain to existing barges. Joint public hearings were held, and regulatory documents for both will be published at the same time.

In July 1977 the Coast Guard began a reexamination of the tank barge construction standards. It was determined that new construction would be treated separately from existing barges. An advance notice of proposed rulemaking (ANPRM) was then issued to gather additional data and assess impacts related to existing barges.

The new NPRM on tank barge construction, withdrawing the prior NPRM, and the ANPRM for existing tank barges were published as part VI of the Federal Register of June 14, 1979 (44 FR 34440 and 44 FR 34443, respectively).

Public hearings on the dockets were held as follows: August 2, 1979, Washington, DC; August 15, 1979, Seattle, Washington; August 23, 1979, New Orleans, Louisiana; September 5, 1979, Washington, DC; and September 7, 1979, St. Louis, Missouri. The comments made at the hearings have been incorporated in the docket.

On Thursday, November 8, 1979, a Federal Register notice extended the comment period on the project. This extension was based on the continued public interest and ran to December 1, 1979.

A Supplementary Notice was published as Part III of the Federal Register of March 13, 1980 (44 FR 16438). This notice informs the public of a deferment in the rulemaking process for these dockets. The comments received have raised significant questions concerning these proposals. It was decided that the entire tank barge pollution problem warranted a carefully considered study by a recognized independent body. The National Academy of Sciences/National Research Council will conduct the study. Part of the study, a two-day workshop, took place April 15 and 16, 1980. The study will be completed by the end of April 1981. The Coast Guard will defer any further rulemaking on these proposals until completion of the study, and the dates in the proposals of June 14, 1979, are no longer valid. If the Coast Guard should pursue further action on these proposals, a new timetable will have to be developed.

Anyone wishing to obtain copies of the rulemaking may do so by contacting Commander A. D. Utara, Marine Safety Council (address is given in the introduction to the Keynotes section).

Pollution Prevention, Vessels and Oil Transfer Regulations CGD 75-124a

This regulation will reduce accidental or intentional discharge of oil or oily wastes during vessel operations.

The basis of this regulation is threefold. First, there is the need to reduce the number and incidence of oil spills. Second, this regulation will help to clarify the existing rules. Finally, this regulation covers the additional requirement for oil-water separators under the 1973 International Convention for the Prevention of Pollution from Ships.

An NPRM was published on June 27, 1977 (42 FR 32670), and a supplemental NPRM was published on October 27, 1977 (42 FR 56625). Because of substantive changes in the regulation, there is currently no scheduled publication date for the final rule.

Construction and Equipment
Existing Self-propelled
Vessels Carrying Bulk
Liquefied Gases
CGD 77-069

These regulations will amend the current ones to include the substantive requirements of the "Code for Existing Ships Carrying Liquefied Gases in Bulk" adopted by the Inter-Governmental Maritime Consultative Organization (IMCO). The use of liquefied gas has increased, as have the problems associated with it. Because of its unique properties and the dangers associated with them, new regulations are being drafted. The environmental impact statement and regulatory analysis were completed in February 1979, and an NPRM on these regulations is anticipated in April 1981.

Licensing of Pilots
CGD 77-084

This regulation takes into account the problems caused by increased ship size and unusual maneuvering characteristics. The proposal will require recency of service for each route upon which a pilot is authorized to serve, licensing with tonnage limitations commensurate with pilot experience, and consideration of ship-handling simulator training for pilots of very large vessels. A regulatory analysis and work plan were completed in October 1978. The NPRM was published on November 28, 1980 (45 FR 79258), and corrected on December 8, 1980 (45 FR 80843). The following public hearings have been held in 1981: January 14 in Cleveland, Ohio, January 27 in Washington, DC, February 3 in New Orleans, Louisiana, and February 10 in San Francisco, California. Substantial revisions to the proposed regulations are presently being considered.

Revision of 46 CFR 157.20-5
Division into Three Watch
Regulation
CGD 78-037

This revision will require an adjustment in vessel manning requirements to bring them into line with current legislation. It will change the requirements which identify personnel who must be used on the three watches and personnel who may be employed in a day working status. An NPRM formerly scheduled to be published on this docket in January 1980 has been deferred pending legislative action in Congress.

Tank Vessel Operations--
Puget Sound
CGD 78-041

This regulation governs the operation of tank vessels in the Puget Sound area. It was initiated to reduce the possibility of environmental harm resulting from oil spills in Puget Sound. This is to be accomplished by governing the operation of tankers and reducing the risk of collision or grounding.

Former Secretary of Transportation Brock Adams signed a 180-day interim rule on March 14, 1978, prohibiting entry of oil tankers in excess of 125,000 deadweight tons in Puget Sound; this appeared in the Federal Register of March 23, 1978 (43 FR 12257). An ANPRM was published on March 27, 1978 (43 FR 12840). An extension of the interim rule was published in the Federal Register in order to allow the Coast Guard adequate time to complete this rulemaking.

The public hearings scheduled for June 11 and 12 in Seattle, Washington, June 13 in Mt. Vernon, Washington, and June 14 in Port Angeles, Washington, have been completed, and all the comments received have been entered in the docket files for consideration. The extension of the interim navigation rule was published on June 21, 1979 (44 FR 36174). This extension became effective July 1 and will be in effect until the Coast Guard prints notice of its cancellation. A supplemental NPRM was published on July 21, 1980 (45 FR 48827). Copies of documents or the transcripts of the hearings may be obtained by writing to the Marine Safety Council. A final rule on the docket is currently expected in December 1981.

Personnel Job Safety
Requirements for Fixed
Installations on the
Outer Continental Shelf
CGD 79-077

This regulation is concerned with the health and safety requirements for installations engaged in oil field exploration and development. This action was mandated by pending Outer Continental Shelf (OCS) legislation. It will provide more comprehensive protection for personnel employed in vessels and installations in the oil trade.

Qualifications of the
Person in Charge of
Oil Transfer Operations,
Tankerman Requirements
CGD 79-116 and 79-116A

These regulations will redefine and establish qualifying criteria for the certifying of individuals engaged in the carriage and transfer of dangerous cargoes in bulk.

In has been found that most pollution incidents are the result of personnel error; consequently, the minimum qualifications of persons involved in handling polluting substances should be specified.

New NPRMs have been approved by the Secretary of Transportation and were published on December 18, 1980 (45 FR 83268 and 83290). The following public hearings have been held in 1981: January 21 in St. Louis, Missouri, February 4 in New Orleans, Louisiana, February 18 in Long Beach, California, February 25 in Washington, DC, and April 1 in Washington, DC. Substantial revisions to the proposed regulations are presently being considered.

Shipboard Noise
Abatement Standards
CGD 79-134

These standards will establish a maximum daily noise exposure for shipboard personnel and industrial personnel on outer continental shelf facilities. The standards will not restrict sound levels in specific compartments but only require that the personnel exposure during a 24-hour period not exceed a certain limit. An exception to this would be the specification of a

maximum sound level in berthing spaces of 75dB(A), as envisioned. The limits would be more stringent for units contracted after 1988.

Development of this proposal has been aided by a Coast Guard-contracted study performed by the U.S. Naval Ocean Systems Center (NOSC), San Diego, California. The study evaluated sound levels aboard several U.S. merchant vessels along with other available information and made recommendations on standards to control and/or eliminate the noise hazard. Copies of the study are available through the National Technical Information Service (NTIS), Springfield, Virginia 22161; NOSC technical documents numbers 243, 254, 257, and 267 and technical report number 405 should be requested.

An NPRM is scheduled for May 1981.

Personnel and Manning Standards for Foreign Vessels CGD 79-081(B)

This regulation, deemed necessary to reduce the probability of oil spills, will establish minimum manning levels for foreign tank vessels operating in U.S. navigable waters. It will also establish procedures for the verification of training, qualification, and watchkeeping standards. An NPRM was published in the Federal Register on November 17, 1980 (45 FR 75712).

* * *

A complete listing of all Coast Guard proposed regulations, both "significant" and "non-significant," appeared in the Monday, August 25, 1980 Federal Register (45 FR 56538).

THERE ARE NO PUBLIC HEARINGS SCHEDULED FOR MAY.

Actions of the Marine Safety Council

March 4 Meeting

Helicopter Facilities on Inspected Vessels

Industry had requested guidance concerning vessel construction standards relating to the safe operation of helicopters on vessels. Although industry interest is high and there is some history of casualties, the consensus was that, given the present regulatory climate, the need is not sufficient to justify promulgation of a regulation. The proposed regulation was therefore withdrawn.

No regulatory projects are scheduled for the April meeting. ‡

Global Distress and Safety System Being Developed

During the 1970s a number of proposals evolved to enhance distress and safety radio communications. These stemmed from recent advances in electronics technology, increased use of "user-operated" voice radio equipment instead of manual Morse telegraphy, and refinements in the basic concepts of search and rescue. In 1978 the Inter-Governmental Maritime Consultative Organization's (IMCO) Sub-Committee on Radiocommunications began discussions on an overall systems approach to the numerous individual proposals. In 1979 a special working group was formed within the Sub-Committee to recommend a program for a future distress and safety system. Captain Gordon Hempton, USCG (retired), formerly the Coast Guard's Chief of Communications, was chosen as chairman of the working group.

Earlier this year the first major milestone of the working group's effort was realized at the 42nd session of IMCO's Maritime Safety Committee when the Requirements of the Future Global Maritime Distress and Safety Systems were approved.

The future system will use automatic alerting by means of terrestrial and satellite communications and satellite-based Emergency Position Indicating Radio Beacons (EPIRBs). Distress communications will be conducted by voice or by narrow-band, direct-printing radioteletype equipment. Other elements of the future system include methods to establish the geographical position of the vessel in distress, methods to identify the vessel or its survivors, and methods of coordinating Search and Rescue (SAR) communications and on-scene communications. Also planned to be integrated into the future system are preventive measures such as collecting, sorting, and disseminating information and taking actions which will reduce the number of distress incidents. The target date for implementation of the future system is 1990.

One of the most notable aspects of the future system is the conceptual change in emphasis from the present primarily short-to-medium range ship-to-ship alerting techniques to long-range ship-to-shore distress alerting techniques. The primary objective of the future system will be a shift from the SOS relay techniques presently employed to direct alerting of SAR forces by distressed vessels. As envisioned, the future system will not employ the presently used terrestrial 500 kHz distress system based on manual Morse telegraphy.

A preliminary transition plan is being developed by the Sub-Committee to permit an orderly transition from the present system to the future system. The plan will ensure that the new system will take over fully only after all of the essential elements of the future system are in place so that a high level of safety is maintained during the transition. The plan, as presently drafted, allows vessels to carry equipment designed for the future system before the system enters into force, provided that level of safety is maintained.

Remaining to be completed by the Sub-Committee are: the transition plan; a rewrite of Chapter IV of the 1974 Convention of Safety of Life at Sea regarding the carriage, operation, and maintenance of equipment; and the development of technical equipment specifications and requirements. ‡

Fire at Sea—

by Captain H. F. Norton, Jr.

Captain Norton is the Chief of the Marine Safety Division in the Ninth Coast Guard District, Cleveland, Ohio. The following article has been adapted from a paper he presented at the National Safety Congress in Chicago, Illinois, in October 1980.

I. INTRODUCTION

The ancient Greek philosopher Thucydides is reported to have said that a collision at sea can ruin your entire day. While this certainly is true, a fire at sea can be a much worse experience with the most dire of consequences. The victims of a shipboard fire have limited resources with which to battle a conflagration and a very limited means of escape. In recognition of these perils, specific measures have been adopted which are intended to minimize the exposure of personnel to the perils of a fire and to provide reasonable and practical means of combating the fires that do occur.

Most regulatory efforts to date have been directed toward the "hardware" aspect of fire safety. This is exemplified by fire equipment regulations and the development of passive systems such as structural fire protection standards. Fire safety standards vary according to vessel flag, size, type, and date of build. Although the U.S. Coast Guard has long believed in the merits of structural fire protection, there are a number of older vessels which were built prior to the enactment of the newer standards and which are allowed to sail under the "grandfather" clauses of the regulations. This is especially common on the Great Lakes because of the life expectancy of fresh-water vessels. Therefore, wide variations in structural fire protection exist.

"The victims of a shipboard fire have limited resources with which to battle a conflagration and a very limited means of escape."

The human factor of fire protection at sea has not been addressed with the same emphasis that the hardware aspect has. This is not solely a Coast Guard responsibility but is rightfully shared with shipowners, operators, and licensed officers. The recent International Conference on Training and Certification of Seafarers conducted by the Inter-Governmental Maritime Consultative Organization (IMCO) in 1978 recognized this by placing emphasis on the need to provide firefighting training courses. The development of the new Maritime Administration firefighting school in Toledo, Ohio, is an example of a response to this need.

The subject of this article is a tragic fire that occurred on board a Great Lakes bulk carrier and claimed seven lives. In this instance the vessel was of Canadian registry, and the fire occurred in U.S. navigable waters. The article is based on an analysis of the Coast Guard investigative report and the transcripts of the testimony from which the report was developed. The comments and opinions expressed are those of the author and do not necessarily reflect the official position of the U.S. Coast Guard. The Coast Guard referred to in the text is the U.S. Coast Guard.

II. VESSEL INFORMATION

The vessel involved in the fire, the M/V CARTIER-CLIFFE HALL, was built in Hamburg, Germany, in 1960 for service as an ocean ore carrier. In 1976 it was converted for use as a dry bulk carrier for Great Lakes service. After the conversion all accommodations and navigation spaces were located aft in a deckhouse five decks in height. The decks and deckhouse structure were steel. A steel bulkhead surrounded the machinery casing in way of the accommodations, and a steel bulkhead surrounded the galley. These steel internal bulkheads were intended to protect the accommodations from the higher fire risk areas of the engineroom and galley. In retrospect, the isolation of the engineroom from the accommodations worked in reverse and provided a measure of protection for the engineroom watch personnel during the fire.

Structural fire protection was not utilized within the accommodations, nor were the accommodations fitted with either a fire detection or sprinkler system. For the most part, the internal subdivision of the accommodations, including the joiner paneling and false drop ceiling, were of wood construction.

The cabins on the poop deck level were fitted with windows in lieu of the airports fitted in the ship's side on the spar deck level. The airports and windows were to play a vital role in the casualty.

In the forward end of the spar deck accommodations on the port side, one cabin, used in part as a workshop, was also used as a paint locker. The investigation revealed numerous cans of varying size in the ashes of that cabin. The ship was also fitted with two paint lockers protected by steel bulkheads, as

A Casualty Visited

well as fixed firefighting systems, one aft and one forward.

III. THE CASUALTY SCENARIO

At midwatch relief time on June 5, 1979, as the CARTIERCLIFFE HALL headed across Lake Superior bound for Port Cartier, Quebec, the deckhouse was quite suddenly and totally involved in conflagration. Seven crewmembers lost their lives, six during the fire and one later as the result of burns. The entire deckhouse structure was gutted.

IV. THE FIRE

At 3:50 a.m. the morning watch mechanical assistant reported a fire in his cabin on the spar deck level. The watchman called the pilothouse and warned of the fire. The wheelsman sounded the general alarm, but the construction of the alarm switch was non-maintaining, and he had to continue to hold the switch in the closed position in order for the alarm to continue to sound. The mate on watch stopped the engine and attempted to call the master. In a matter of seconds smoke billowed up from the stairway leading below, and the pilothouse had to be evacuated. No "mayday" had been sent.

"In a matter of seconds smoke billowed up from the stairway leading below, and the pilothouse had to be evacuated. No 'mayday' had been sent."

From that point on, the crewmembers, awakened by the warning and the general commotion, made various attempts to escape. A number of those sleeping on the spar deck level were turned back by the flames and smoke in the passageway and escaped through the airports in the ship's skin; they were then hauled to safety. Others were able to go through cabin windows; one hazarded the flames to get to the companionways. The two men on watch in the engineroom escaped through a door in the stack casing that led to the boat deck.

By 4:15 a.m. the deckhouse was ablaze in its entirety, and the survivors had assembled on the spar deck forward of the deckhouse. Firefighting was commenced, but fighting the fire at this stage proved to be futile, and at 5:05 a.m. the crew, fearful of a fuel bunker explosion, abandoned ship. Seventeen crewmembers boarded the lifeboat and were rescued at 5:40 a.m. by the freighter THOMAS W. LAMONT. The watchstanders from the engineroom escaped in an inflatable liferaft and were rescued by the freighter LOUIS B. DEMERAIS. Six crewmembers were missing.

The fire eventually burned itself out, and the CARTIERCLIFFE HALL was later towed to Thunder Bay, Ontario. A subsequent search located the bodies of the six missing persons. Investigation also revealed that the engineroom and fuel tanks did survive the fire with relatively minor damage. The accommodations spaces and navigation spaces, however, were completely destroyed.

V. FIRE COMMENTS

How, in this age of sophisticated technology, such a sudden and tragic fire could occur is a very valid question. What combination of events transpired that resulted in a rapid and thorough conflagration of the deckhouse? A review of Coast Guard casualty data in general will soon reveal the overwhelming presence of the human factor in most casualties, whether it be direct and obvious or more subtle. The human factor as well as the hardware factor was present in either causing or contributing to this fire.

The Coast Guard investigation did not pinpoint the cause of the fire. However, it can readily be noted that two legs of the fire triangle--oxygen and combustibles--were present in abundance, waiting for the third, heat, to create the tragedy. It was determined that the fire most probably began in the port forward section of the spar deck accommodations. Whether the actual spark was caused by careless smoking, spontaneous combustion in the workshop, or possibly an electrical malfunction is irrelevant to the purpose

"... two legs of the fire triangle—oxygen and combustibles—were present in abundance, waiting for the third, heat, to create the tragedy."

of this article. Consideration must also be given to factors that contributed to the casualty in either an aggravating or a mitigating manner. The following comments describe several factors, most of which were contributory to this particular casualty but some of which more properly apply to fires at sea in general.

A. Structural Fire Protection

The deckhouse of the CARTIERCLIFFE HALL was not constructed with structural fire protection in mind. Within the false ceiling of the accommodations, a good deal of heat and fire spread could have occurred before the actual discovery of the problem. The suddenness of the conflagration subsequent to discovery supports this opinion. Recognizing the value of structural fire protection is akin to rediscovering the wheel. The presence of structural fire protection provides the opportunity to contain the fire to a small enough area so that people can escape. It also can contain the fire so that the firefighting resources of the ship can effectively deal with the problem without becoming overwhelmed.

"Recognizing the value of structural fire protection is akin to rediscovering the wheel."

The Coast Guard recently published Navigation and Vessel Inspection Circular No. 6-80, dated April 2, 1980, a comprehensive guide that largely covers present knowledge of the subject.

B. Deckhouse Arrangement

The economics of present-day ship construction result in all accommodations being aft, sharing the deckhouse with the navigation spaces above. This creates a relatively high structure which also may become a chimney in the event of a fire below, thus exacerbating the problem. In this casualty, the fire on the lower deck level resulted in an almost immediate evacuation of the pilothouse. This occurred before the Master could be aroused, before a "mayday" could be sent, and before the general alarm had sounded for a lengthy period.

With all accommodations and navigation spaces aft, "all your eggs are in one basket." This type of construction makes it all the more important to protect the deckhouse so that the resources of communications, emergency equipment, clothing, etc., are not lost or rendered unreachable by a fire in the accommodations. Fortunately, in this instance the crew was able to reach and make use of the lifesaving equipment.

C. Fire Detection and/or Sprinkler Systems

The accommodations of the CARTIERCLIFFE HALL were fitted with neither fire detection nor sprinkler systems. Although the Coast Guard places emphasis on structural fire protection, a fire detection and/or sprinkler system could have provided early warning and/or control of the problem.

Recently the Coast Guard published Navigation and Vessel Inspection Circular No. 7-80, dated April 2, 1980, which encourages the use of household-type fire detection equipment. While certain smoke or fire detectors of this type may or may not be amenable to the stresses of the marine environment, they have the advantage of being an extremely small capital investment. In addition, on today's ships with their reduced manning levels, there are fewer human smoke and fire detectors on board. Electronic smoke or fire detectors could be most beneficial on some of the older U.S. Great Lakes vessels which have substantial amounts of wood in their structures.

Consideration should also be given to the fact that an individual's cabin, even though built of noncombustible materials, can support a smoldering fire in the bedding or furnishings. While the fire may not get out of control, the crewmember, if not warned, could easily be asphyxiated.

D. Engineroom Casing

The two-man engineroom watch was protected down below by the steel bulkhead surrounding the engineroom casing where it passed through the accommodations. As a result of this protection, the fire in the accommodations caused relatively minor damage to the machinery spaces.

The fire within the accommodations prevented the activation of the CO_2 system (which would have released CO_2 to the engineroom), as the controls for the remote release could not be reached. In a wry twist of fate, this may have saved the lives of the two watchstanders, who could have been asphyxiated had the CO_2 release been effected before they escaped.

E. The General Alarm

The general alarm bell in the pilothouse had to be held in the depressed position in order for the alarm bells to continue to sound. As the pilothouse was evacuated very soon after the discovery of the fire, the bells also ceased to sound at that time. A

". . . on today's ships with their reduced manning levels, there are fewer human smoke and fire detectors on board."

maintaining switch would have continued the sounding of the general alarm until the fire's progress interrupted it.

F. Airports and Windows

The airports on the CARTIERCLIFFE HALL were of large diameter. That being the case, six crewmembers scrambled to safety when their normal escape route was blocked by smoke and flames. In addition, four other members of the crew escaped by climbing through their cabin windows. It is not unreasonable to conclude that the casualty toll would have been much higher had the vessel not been fitted in this manner.

G. Vessel Escape Routes

The design arrangement of a ship should provide for two avenues of escape from the internal spaces. From the cabins of the CARTIERCLIFFE HALL the normal means of escape was to an interior passageway where one could go either left or right. The sudden conflagration precluded using this means of escape for most crewmembers, but fortunately ten of the crew made their way to safety through the unintended routes provided by the airports and windows.

The fire boundary of stairways and stairtowers should be maintained by doors between each deck level. These doors should not be hooked or chocked in the open position, nor should they be locked closed, since that creates a dead end.

H. Knowing a Ship

Knowledge of a ship, including its escape routes, is a matter of prime importance. The frequent crew changes that are characteristic of seafaring today dictate a continuing need to indoctrinate new crewmembers. This includes ensuring that new crewmembers have a working knowledge of the ship's lifesaving and firefighting equipment.

"The design arrangement of a ship should provide for two avenues of escape from the internal spaces."

The engineroom watch of the CARTIERCLIFFE HALL was cut off from its normal avenue of escape during the fire. Fortunately the men knew the ship well enough to effect an escape through the stack casing onto the boat deck. This probably saved their lives.

I. Training, Drills, and Emergency Evolutions

Unfortunately crewmembers learn best how to handle themselves through participation in exactly what should be avoided, vessel casualties. As casualties should not be the norm, then, the training environment is most important. Crewmembers should be trained to know exactly what their responsibilities are in emergency situations. Today's characteristic reduced manning levels increase the importance of the roles of the individual crewmembers if for no other reason than there are fewer crewmembers to draw from.

"Negative human factors such as indifference and apathy and the biggest problem—complacency—can defeat the best of design and equipment features."

Emergency drills can be either meaningful evolutions or perfunctory performances. The latter accomplish nothing more than possible compliance with a regulatory requirement. The former can be an excellent training tool for all hands that will not only increase the proficiency of the crew in handling real problems but will point out shortcomings in the ship's organization as well. The value of emergency drills should correlate very positively with the effort that goes into them.

J. Good Seamanship

In the context intended here, good seamanship is closely akin to good housekeeping. This includes using spaces in a ship for their intended purpose, for example, keeping paint in a paint locker. It also includes reducing the hazards created by accumulations of trash and litter in rooms and service areas and the elimination of jury-rigged and unsafe electrical wiring. The list of possibilities is probably endless, but the matters addressed are well within the capabilities of the crew.

VI. CONCLUSIONS

The safe operation of a ship depends not only on the safeguards of design and equipage that technology has provided but must lean very heavily on the human factor as well. Negative human factors such as indifference and apathy and the biggest problem--complacency--can defeat the best of design and equipment features.

The best structural fire protection can be defeated and rendered hazardous through improper action on the part of the humans involved. The worst of non-fire-safe construction can be significantly improved by positive action on the part of the humans involved. The optimum can be achieved only where the hardware factor and the human factor complement one another.

The purpose of this "visit" to a particular casualty was educational. The author hopes that the article proves thought-provoking in a positive manner; if so, it has achieved its purpose. ⚓

A Look at the New Inland Navigation Rules

(Part 2 of a 5-part series)

This article is the second in a series discussing the major provisions of the new Inland Navigation Rules which will go into effect on December 24, 1981. The new Inland Rules follow the format and numbering system used in the 72 COLREGS. This article will cover Subpart II (Conduct of Vessels in Sight of One Another) and Subpart III (Conduct of Vessels in Restricted Visibility) of Part B (Steering and Sailing Rules). The next three issues of the Proceedings will take a look at Part C (Lights and Shapes), Part D (Sound and Light Signals), and Part E (Exemptions), as well as the five regulatory technical annexes.

PART B--Steering and Sailing Rules

This part sets forth standards for vessel behavior and rights of way to minimize vessel collisions. Subpart I (Conduct of Vessels in Any Condition of Visibility), containing Rules 4 through 10, was discussed in the last issue of the Proceedings. Our discussion continues now with Subpart II.

Subpart II. CONDUCT OF VESSELS IN SIGHT OF ONE ANOTHER

Rule 11. Application

This rule is the identical to Rule 11 of the 72 COLREGS and is consistent with the inland rules now in effect. The rules in this Subpart, which relate to sailing vessels, overtaking situations, head-on situations, crossing situations, action by a give-way vessel, action by a stand-on vessel, and responsibilities between vessels, apply only when vessels are in sight of one another—which means when each vessel can be observed visually from the other. These rules do not apply to vessels that are operating in restricted visi-

bility and are relying on radar or other electronic information.

Rule 12. Sailing vessels

This rule is identical to Rule 12 of the 72 COLREGS. It is patterned after the Inland Rule 17, Western Rivers Rule 17, and Great Lakes Rule 16 now in effect, but some changes have been made. Those rules were developed and enacted during the days of the square-rigged sailing vessel. Their provisions reflect the problems of maneuverability associated with that type of sailing vessel. The 72 COLREGS (and the new Inland Rules) reflect the needs of sailing vessels with fore-and-aft rigs, which are most common today, such as the schooner, ketch, and sloop.

This change brings the rules into closer conformance with yacht racing rules. The new rule says, in effect, if you are in doubt, assume you are the give-way vessel and keep out of the way.

Rule 13. Overtaking

This rule is identical to Rule 13 of the 72 COLREGS and is similar to the Inland Rule 24, Western Rivers Rule 22, and Great Lakes Rule 22 now in effect. It extends the applicability of the overtaking rules to all conditions of visibility. It recognizes the fact that the overtaking vessel should have less of a problem keeping clear and avoiding collision than the vessel being overtaken, even if the overtaken vessel has agreed to allow the maneuver.

Rule 14. Head-on situation

This rule is identical to Rule 14 of the 72 COLREGS. While it is similar to the inland rules presently in effect, the cumbersome language inadequately defining the meeting situation has been removed. Rule 14(c) states that if you are in doubt as to whether you are meeting or crossing you are to assume you are meeting and act accordingly. This change is intended to reduce the risk of collision. The rule requires each vessel to turn right, which should prevent or reduce collisions resulting from left-handed maneuvering.

Rule 15. Crossing situation

Rule 15(a) is identical to Rule 15(a) of the 72 COLREGS. It is consistent with the Inland Rules 19 and 22 now in effect, as well as comparable rules for the Western Rivers and Great Lakes. In all of our waters, the give-way vessel is to avoid crossing ahead of the other vessel, the stand-on vessel.

Rule 15(b) is not found in the 72 COLREGS and is a new rule. Western Rivers Pilot Rule 95.15 does include the concept of a precautionary rule for crossing vessels, but no such rule has thus far existed for the Great Lakes or inland waters. The new rule requires a vessel crossing a river to keep out of the way of a power-driven ascending or descending vessel on the Western Rivers, Great Lakes, or other waters specified by the Secretary of the Department in which the Coast Guard is operating. Unlike Rule 9(d), the rule is not limited to narrow channels, nor does it depend on the maneuverability of the ascending or descending vessel. This rule was added to the "Crossing situation" as an admonishment to vessels such as ferries or other craft proceeding in a course line more or less perpendicular to a channel of a river to keep clear of that channel if a power-driven vessel is ascending or descending.

Rule 16. Action by give-way vessel

Rule 16 is identical to Rule 16 of the 72 COLREGS and replaces the Inland Rule 23, Western Rivers Rule 21, and Great Lakes Rule 21 now in effect. The term "give-way" is considered a better description of the action to be taken than the presently used term "burdened."

Rule 17. Action by stand-on vessel

Rule 17 is identical to Rule 17 of the 72 COLREGS. The term "stand-on" is a more accurate reflection of the duties and rights of the vessel than the presently used term "privileged." This rule provides the stand-on vessel with much more flexibility in taking action to avoid collision than the Inland Rule 21, Western Rivers Rule 23, or Great Lakes Rule 20 currently in effect. Those rules require the privileged vessel to maintain course and speed until it becomes apparent "that collision can no longer be avoided by the action of the other vessel alone." At that point, the rules now in effect dictate that the privileged vessel take action to avert collision. This creates a serious problem and demands the impossible of the privileged vessel: it requires the privileged vessel to assess the possibility of avoiding collision in terms of the other vessel's capabilities, which of course, the privileged vessel has no way of accurately assessing. This situation is significantly worse now than when the rules were written, since two approaching vessels may have differences in speed capabilities of as much as five- or even eight-to-one.

A very slow stand-on vessel, for example, might be approached by a give-way vessel moving five times as fast as it is; this would be the case if a 3-knot tug with tow were approached by a container vessel moving at a speed of 15 knots. Under the rules currently in effect, the stand-on vessel is directed to hold course and speed until such time as the fast-moving container vessel (with its excellent turning capabilities) can no longer avert collision. Only when the vessels get that close (an in extremis situation) is the slow stand-on vessel entitled to take action to avert collision. At that point, no matter what the slow stand-on vessel with its poor turning capabilities attempts to do, collision is highly likely. The new rule permits the stand-on vessel to take earlier action to avoid collision "as soon as it becomes apparent" to her that the give-way vessel (the vessel that is required to keep out of the way) is not taking appropriate action.

The rule also cautions the stand-on vessel to not,if the circumstances of the case admit, alter course to port for a vessel on its own port side. Rule 17 does not relieve the give-way vessel of its obligation to

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keep out of the way.

Rule 18. Responsibilities between vessels

This rule is identical to Rule 18 of the 72 COLREGS, except that the 72 COLREGS Rule 18(d) has been deleted. The 72 COLREGS Rule 18(d) directs vessels to avoid impeding a vessel "constrained by her draft" but does not assign a right of way to the constrained vessel. Such a subjective rule might lead to abuses and result in a case where a vessel considering itself constrained by its draft claims a right of way to which it is not entitled, thereby creating a dangerous situation.

In the rules presently in effect, numerous vessels, such as those not under command or those operating under various working conditions, have a given or implied privilege. The new rule catalogues those privileges in one location. The preamble to the rule refers to other privileges and duties found in Rules 9 (Narrow Channels), 10 (Vessel Traffic Services), and 13 (Overtaking) that take precedence.

Paragraph (d) of this rule, which concerns seaplanes, is not included in any of the rules now in effect. It is identical to Rule 18(e) of the 72 COLREGS. The mariner, as well as the aviator, is reminded that for the purpose of these rules a seaplane is a vessel when it is on the water.

Subpart III. CONDUCT OF VESSELS IN RESTRICTED VISIBILITY

Rule 19. Conduct of vessels in restricted visibility

This rule is identical to Rule 19 of the 72 COLREGS. It contains a number of modifications to the rules now in effect on inland waters.

Rule 19(a) highlights the fact that restricted visibility rules apply not only when a vessel is in an area of restricted visibility, for example, a fog bank or smoke cloud, but also when it is near such an area. The key words are "not in sight of one another." When this phrase is considered together with Rules 34 and 35 (the rules dealing with sound signals), it is clear that maneuvering signals are not to be used when vessels are not in sight of one another.

Rule 19(b) replaces the Inland Rule 16, Western Rivers Rule 16, and Great Lakes Rule 15 currently in effect, which deal with moderate speed. The new rule states that a vessel shall proceed at a "safe speed" appropriate for the condition of visibility. The first three criteria for defining the term "safe speed" (as used in Rule 6) are visibility, traffic density, and ownship maneuverability. Should any one of these three conditions be other than ideal, the vessel's speed must be adjusted accordingly. As a practical matter, this can mean that in open waters, where traffic density is extremely light, full speed may be appropriate because, with no maneuvering restrictions, turning may be the best evasive maneuver. On the other hand, when traffic density increases or geographical constraints limit turning room, a severe speed reduction may be indicated.

The last sentence of Rule 19(b) is not found in existing inland rules. It says, in effect, that in restricted visibility power-driven vessels, no matter where they are operating, must be ready to maneuver immediately.

Rule 19(c) refers to Subpart I (Conduct for Vessels in Any Condition of Visibility) and requires that mariners be particularly mindful of existing conditions of restricted visibility when considering or establishing the following: proper look-out, safe speed, risk of collision, action to be taken to avoid collision, conduct in narrow channels, and conduct in vessel traffic service areas.

These new rules demand a more positive approach to the use of radar. Essentially, Rule 19(d) says that if you detect a vessel by radar you shall determine if a close-quarters situation or risk of collision is developing. This rule must be read in conjunction with Rule 7(b), which requires proper use of radar equipment.

If a close-quarters situation is developing, the mariner must take appropriate avoiding action in ample time. Rule 19(d)(i) requires that a port turn be avoided in the meeting and crossing situations where possible. It goes one step further in paragraph (d)(ii) and requires that a turn toward a vessel that is abeam or abaft the beam be avoided where possible. It might appear that these two provisions conflict with one another; however, close study makes it evident that a conflict does not exist. In the execution of this rule, the mariner must remember his duty under Rule 8(d), which provides that action taken to avoid collision be monitored until the other vessel is finally past and clear.

In Rule 19(e) the term "reduce her speed" more closely reflects the practice followed thus far on the Western Rivers and Great Lakes than the current Inland Rule provision that the vessel stop its engines. Under certain conditions, stopping engines could dangerously reduce steerageway and lead to increased risk of collision. The last sentence in paragraph (e) directs the vessel, if necessary, to take all its way off, which could include backing its engines, and then navigate only with extreme caution.

It should be noted that the substance of the Radar Annex to the 1960 International Regulations for Preventing Collisions at Sea has been included in this rule. The remainder of the annex has been incorporated in Rules 6, 7, and 8. Rule 6 deals with safe speed and factors to be considered in using radar, Rule 7 refers to radar in regard to the determination of risk of collision, and Rule 8 mentions the use of radar in taking action to avoid collision.

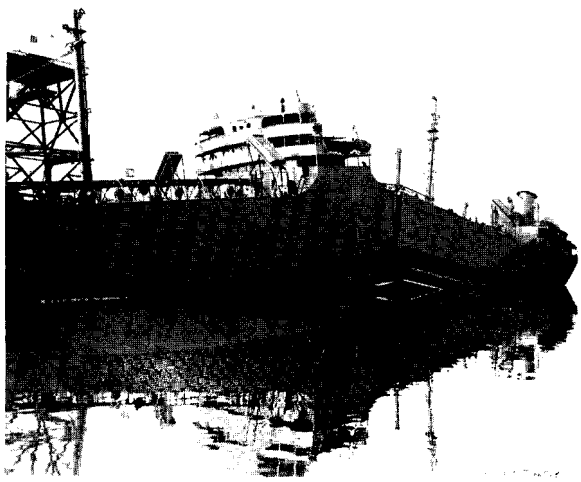
This concludes this issue's installment on the new Inland Navigation Rules. Next month's installment will begin with Part C, Lights and Shapes. As noted in the last issue, copies of the new Inland Navigational Rules Act are available for $ 1.50 from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402; (202) 783-3238 (specify P.L. 96-591, Stock Number 022-003-92759-0). A new edition of CG-169, Navigation Rules, International--Inland, will be published late this year and will also be sold through the Government Printing Office. ⚓

Ship Structure Committee

An Interagency Advisory Committee
Dedicated to Improving the Structure of Ships

Member Agencies:

United States Coast Guard
Naval Sea Systems Command
Military Sealift Command
Maritime Administration
United States Geological Survey
American Bureau of Shipping



It was 1943. The United States was at war. U.S. shipyards were delivering Liberty ships, Victory ships, and T-2 tankers in record time—just days, not months or years like today. But many of those ships were breaking in two before they ever completed their first voyage or had even been delivered. Congress demanded investigations. Accusations were made and refuted in the press that the quality of shipyard construction was at fault. Welding ship hull plates rather than riveting them was a new procedure for large ships and was suspected of playing a role in the failures. As a result, the Secretary of the Navy tasked a highly professional team of the country's best naval architects, welding engineers, and metallurgists with the job of determining the causes. The team found that a combination of locked-in welding stresses, poor metal ductility at low temperatures, and weld defects were the primary causes of the catastrophic failures. Riveted ships had never had these problems. Since so many unanswered questions remained about this new method of building large ships, the Secretary of the Treasury directed the Commandant of the Coast Guard to establish a committee to conduct research that would improve the design, construction, and materials of ships.

From that wartime beginning, the Ship Structure Committee was established. It began to develop a new understanding of welding processes, metallurgical factors affecting steel strength, and the new field of fracture analysis and control. Over the years its membership expanded to the current six member organizations and its field of endeavors broadened into other areas of marine structural research. Computer programs for predicting the structural response of a ship to waves, non-destructive inspection guidelines for determining weld quality, and design manuals for ship details taking into account such factors as fatigue, fracture toughness, and ease of construction are results of some projects. Vessels of all types have been instrumented to measure hull stresses, slamming pressures, and wave heights in order to verify the strength and adequacy of present ships and to develop more rational design limits for new ships.

Today the Ship Structure Committee has 24 ongoing research programs ranging from investigation of steels for improved weldability in ship construction to a worldwide survey of the current use of reinforced concrete in marine structures. All research projects result in publication of an SSC Report, of which there are now over 300. These reports are used by engineers and technicians working in the design and construction of structures ranging from nuclear power plants to bridges to ships. A program of providing small grants to graduate students at U.S. universities and colleges to encourage them to enter the field of naval architecture complements the other activities. The Committee also cosponsors, with the Society of Naval Architects and Marine Engineers, a triennial symposium on various aspects of marine structures. All of these efforts strengthen the U.S. maritime industry and improve the knowledge of our shipbuilders and designers.

The secret of success which has kept the Ship Structure Committee functioning for 35 years has been the budgetary and technical cooperation between the member organizations. Together they agree on the most important programs to be pursued. With technical expertise from the industry provided by the National Academy of Sciences, they pursue projects that will have the greatest application and broadest support. This has resulted in a cost-effective research and development program of which we can be proud.

For further information contact the Secretary, Ship Structure Committee, U.S. Coast Guard Headquarters (G-M/24), Washington, DC 20593. ‡

Safety from the Start:

Designing and Operating Fishing Vessels with an Eye to Minimizing Risks

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Washington, DC

DEPARTMENT OF TRANSPORTATION
COAST GUARD
DAILY
OPERATIONS HIGHLIGHTS

FISHING VESSEL - SINKING - ATLANTIC

On 9 February a vessel sank nine miles east of Hatteras Inlet. Two crewmembers were rescued by a passing fishing vessel which floated a line and two personal flotation devices to the first vessel. The master, who remained in the water 23 minutes, died as a result of immersion hypothermia. CASE CLOSED.

FISHING VESSEL - SINKING - BRISTOL BAY

Saturday morning this 93-foot fishing vessel, with five persons aboard, was reported listing and in immediate danger of capsizing 50 miles south of Cape Constantine. An HC-130 aircraft and an HH-3 helicopter from Coast Guard Air Station KODIAK were dispatched to the scene but were unable to conduct a visual search due to zero visibility in fog. Early Sunday morning a second U.S. fishing vessel sighted a flare, and a Soviet fish-processing vessel located and recovered a liferaft with four survivors on board nearby. The survivors, who had been adrift for 17 hours after their vessel sank, were wearing survival suits. The master of the vessel reportedly suffered an apparent heart attack while abandoning his vessel and was last seen drifting away from the vessel with no survival gear. ACTIVE SEARCH SUSPENDED PENDING FURTHER DEVELOPMENTS.

FISHING VESSEL - SINKING - PACIFIC

On 1 December a vessel was reported sinking on VHF/FM in the vicinity of San Clemente Island. An extensive search was mounted by Navy and Coast Guard units. Two hours later an EPIRB signal was detected by a Coast Guard helicopter and three persons were rescued from the craft. CASE CLOSED.

The authors of the following article predict that the U.S. fishing fleet will increase in size and efficiency as fish become an ever more important source of protein. The increased risk to vessels and personnel, they point out, can be reduced by linking vessel and equipment design improvements to safety, training, and education. The article has been adapted from the paper Life Safety Approach to Fishing Vessel Design and Operation, presented by the authors before the Society of Naval Architects and Marine Engineers at its spring meeting in Coronado, California, June 4 - 6, 1980. The views expressed are those of the authors and do not necessarily reflect the official position of the U.S. Coast Guard.

It may be argued that the introduction and utilization of a newer and more sophisticated fishing vessel fleet will reduce the risk faced by personnel on board. Advances in ship design and construction can carry over from one segment of the marine industry to another. It must be recognized, however, that while advances in shipbuilding techniques have been paralleled by advances in technology which permit increased efficiency in the locating and harvesting of fish, such advances have resulted in increased risk exposure by reducing previously accepted margins of safety. Increases in equipment capability, better communications, and weather reporting permit fishermen to go farther, stay longer, and operate in rougher weather. This increases the potential for disaster. Without changes—other than improvements in technology—, the risk will continue to increase. A review of statistics will indicate that the fisherman is at a greater risk even though vessels and equipment have improved.

The risk presented by increased exposure brought about by technological advancement can be compensated for only in part by the machine. The temptation to stress the machine to its limits is natural in a competitive arena. The attendant risk to personnel resulting from more frequent stressing of the human machine is little understood and has not been thoroughly examined in relation to the marine industry. Vessel and equipment design improvements specifically directed at safety and training and education can play a vital role in reducing risk to both vessel and personnel.

Training in this context is the continued maintenance of the skills necessary to handle and operate a vessel and its related gear under the broadest range of conditions. Education is a broad-based effort necessary to permit judgment and insight to be brought to bear on a problem. The problem can range from development of navigational skills or how to react in a particular situation to deciding on the type and characteristics of the next vessel to be purchased.

Design, training, and education are the key to reducing risk and maximizing productivity.

ORDERLY METHOD OF ANALYSIS

This article is intended to suggest an approach which can be used during vessel design and operation. The function of the vessel is of paramount importance, but its design and operation must also maximize personnel's chances of survival. Vessel safety and personnel safety are inextricably linked. Examination shows that casualties befalling the vessel and its personnel fall into the following general categories: collision, rammings, and groundings; flooding, foundering, and capsizing; fire and explosion; and structural failure. Any of these events, if carried to its extreme, could require personnel to leave the vessel or cause the vessel to sink without giving personnel sufficient time to leave, thereby putting the personnel at a high risk of not surviving. The solution is to reduce the incidence of such such events and the problems that result if they do occur. A suggested method of achieving this reduction is to view the safety problem in six phases:

AVOIDANCE
MINIMIZATION OF INCIDENT
ABANDONMENT
SURVIVAL
DETECTION
RETRIEVAL.

The life cycle of a vessel generally falls into two categories: design and operations. Examining all events in a vessel life cycle against each of the six phases shown above and taking appropriate action can result in achieving the goal of reducing risk.

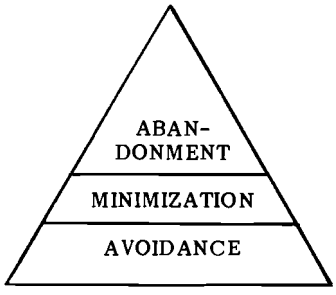
The first three phases are where thorough foreplanning can pay the greatest dividend.

The AVOIDANCE of disaster part of the vessel safety equation affects the largest portion of a vessel life cycle. It begins with design and carries over into daily vessel operation. The designer and owner must consider the need for and advantage of specific design features which can have a direct impact on safety for the life of the vessel. AVOIDANCE also relates to operational considerations. The art of seamanship then becomes a key factor in vessel and crew safety. The traditional nautical skills, knowledge of the vessel and its limitations, and the peculiarities of the area of operation are paramount. It is while the vessel is fulfilling its function, essentially, that AVOIDANCE is practiced; the master, through skill and judgment, avoids circumstances which lead to or place the vessel in extremis.

MINIMIZATION, on the other hand, represents the largest block of time, aside from fulfillment of vessel function, where actions are taken to minimize the consequence of any event so that the vessel may be returned to a more normal condition. Much can be done at the design stage to minimize the effects of an accident, fire, and bad weather. During or following a casualty there is much that can be done by the crew and master to reduce or resolve the problem. Traditional damage control techniques and seamanship again become the means. Knowledge of these techniques, the use of emergency equipment, and the limits of the vessel are essential.

ABANDONMENT is a relatively infrequent occurrence. It is the rare sailor that has experienced abandonment of a vessel, although there are those in the fishing fleet who have survived three sinkings.

In graphic form the relative importance of these phases may be shown as follows:



The exact relationship of these may be debated; however, general proportions are felt to be accurate.

The following areas of vessel design have a direct impact on these three phases: subdivision, stability, marine engineering, fire protection, lifesaving equipment, function-related items, cargo-handling gear, navigation and communication equipment, maintainablity, and reliability. This carries over into operation of the vessel as well.

After abandonment, the three remaining phases must be accounted for in order to improve assurance of safe return of personnel. While these are vital elements, they do not constitute a condition over which the individual has as much control before the fact. Proper equipment and training in the use of that equipment are two areas which can be controlled.

Proper lifesaving gear will go far toward reducing loss, should the preventive measures outlined above prove to be insufficient. No vessel can be designed to be risk-free. Provision of lifesaving equipment is therefore prudent and necessary. It must be addressed in the design stage as well as in the operational stage. Vessel design must include a proper location for such equipment so that it can be put into service easily and safely. Adequate space should be provided to ensure proper use and encourage drills and training. During operation there should be normal drill and training periods to develop skill in use of the equipment. Shoreside training programs can aid in this area, but they cannot replace "hands on" experience in how to use the equipment on a fisherman's own vessel.

Selection of equipment should be made with an eye to maximizing chances of success in the last three phases: SURVIVAL, DETECTION, AND RETRIEVAL.

A number of factors play a role in determining how the concept of vessel and personnel safety will be treated during the design stage: vessel function, economics, owner/operator preference, classification societies, federal or governmental regulations, and applicable international treaties.

In many instances, particularly where fishing vessels are concerned, national and international requirements are almost nonexistent. The degree of specification is left to the owner/operator. What is suggested here is an approach that owners and operators might adopt prior to contract. It is a check test which may be used to examine the specific needs of an owner while also recognizing the need for life safety considerations in vessel design. Function and life safety, if carefully planned and assessed, do not need to conflict or operate at cross purposes.

Until 1977 there were no internationally agreed upon design standards for fishing vessels. The convention produced that year at the International Conference on Safety of Fishing Vessels can serve as an excellent guide for design specifications. This convention focuses greater attention on the relationship between man and machine than do other safety conventions. Traditional conventions, such as SOLAS 74, speak primarily to hardware and ship construction. The tools and technology which could increase the safety level of fishing vessels do currently exist. What is needed is an education program to increase awareness of that fact and increased training in survival arts and skills.

ANALYSIS OF CASUALTIES

One need only examine the casualty statistics compiled by W. J. Ecker, Executive Officer of the Marine Safety Office in New Orleans, to realize the potential improvements that can be made to both vessel and personnel.

The casualties must be sorted into various categories if the influence of personnel, design, construction, etc. is to be determined. An oft-repeated statistic is that human error plays some part in approximately 85 percent of maritime casualties. With this in mind, the following has been extracted from Ecker's analysis:

- OPERATIONAL COLLISION—The single largest cause of operational collisions was personnel fault. Rules of the road violations were listed in almost half of the personnel fault situations.

- GROUNDINGS—The cause of the majority of groundings was personnel fault. The major subcategory of navigational error had to do with failure to ascertain the position of the vessel.

- FIRE/EXPLOSIONS—11.2 percent were attributed to improper safety precautions, carelessness, etc.

- FLOODINGS/FOUNDERINGS/CAPSIZINGS—17.6 percent were attributable to personnel.

- MATERIAL FAILURE—Personnel fault was responsible for 2.4 percent.

The areas which are personnel-intensive and critical to the safe operation of the vessel are those areas which contained the greatest number of casualties. The fact that such a substantial number of casualties involves such basic tenets of the sea as rules of the road and navigation suggests that there is a serious gap in the knowledge generally attributed to professional watermen.

In fiscal year 1978 fishing vessels accounted for only 16.6 percent of commercial vessel casualties but 47.5 percent of deaths for vessels involved in casualties and 35 percent of all deaths on commercial vessels. Casualties have increased by approximately 25 percent over the last four years, from about four casualties per 100 vessels to about five casualties per 100 vessels.

EDUCATION AND TRAINING

The goal of a fishing vessel designer should be to make a vessel seaworthy, efficient, and safe. To do this in a knowledgeable fashion, the owner/ purchaser/ operator should be aware of the options available, the benefits of advanced technology as well as its limitations.

This is truly part of the educational, as opposed to the training, aspect of a program. It is essential that naval architects, marine engineers, and other professionals who have an impact on vessel design present straightforward information on design and options. When such information affects potential vessel safety, it should be brought to the attention of owners. The increased costs for add-ons during construction are frequently insignificant when compared to add-ons after completion.

Design decisions made well before a vessel puts to sea can have a profound effect on the probablity of survival. Operators and fishermen need to know of options available which would enhance their safety as well as the prospects of commercial success.

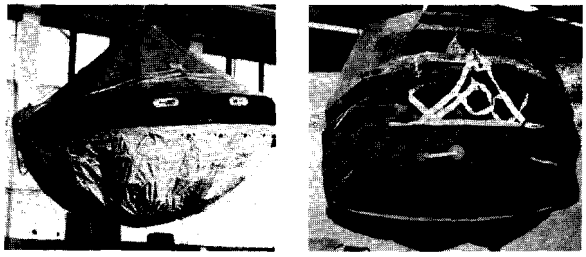
Many design questions need to be answered by the naval architectural community and disseminated to the fishing industry. The Society of Naval Architects and Marine Engineers (SNAME), to its credit, is active in this field and is pursuing three safety research projects: Seakeeping, Study of Feasibility of Development of a Roll Monitor/Alarm Device, and Icing Problems.

The U.S. Coast Guard has initiated a nationwide education program which will include both a voluntary pierside boarding program for uninspected and commercial vessels and the development and distribution of informative pamphlets. During the boarding the following will be reviewed:

lifesaving equipment
firefighting equipment
marine sanitation devices
vessel documentation/marking requirements
navigational lights and equipment
pollution prevention procedures
radio station license
installation and operator license
overall propulsion equipment condition
condition of accessible through-hull fittings
obvious safety hazards

No citations for violations will be issued at this dockside examination; rather, each deficiency, whether regulatory or general safety, will be pointed out to the vessel representative. When a vessel is determined to be in compliance with all existing federal regulations and substantially in safe condition, a decal will be offered to the owner/operator which he may display in a pilothouse window. This decal will immediately identify the conscientious fisherman and will aid the Coast Guard in deciding which vessels to board underway.

During the dockside courtesy boarding, the Coast Guard representative will also provide available handouts dealing with topics of interest and be available to answer any questions which may be troubling the fisherman.



Two types of improved life raft are the Givens Buoy, left, and the Switlik, right. The self-righting Givens' two stabiliziation chambers enable it to adjust its center of gravity to compensate for rough seas. The Switlik accomplishes this purpose by means of its Toroidal Stabilizing Device, a toroidal ballast bag divided into eight separate compartments.

In support of this voluntary examination program, the Office of Merchant Marine Safety at Coast Guard Headquarters has established a task group which is charged with identifying casualty scenarios from which others can learn. Articles will be written and offered to numerous trade publications for broad dissemination. Additionally, as new safety products and procedures are identified, handouts will be developed to aid in wide distribution and rapid industry acceptance.

There is no formal training program for fishing personnel in the United States. Personnel with professional maritime training may choose to pursue fishing as a career; the percentage who do this, however, is probably not great. As indicated above, the casualty data indicates a need for increased personnel training.

As the fishing industry grows, there will probably be an increase in the number of local and regional fishing associations. These types of organizations could establish voluntary education and training programs during off seasons to upgrade and augment knowledge gained through experience.

Several organizations around the country now are conducting survival courses which include basic personal survival techniques, use of emergency survival and detection enhancement gear, and actions to be taken to aid rescue forces when they arrive on scene. Most indicate that they can bring the training to the local area.

Another source of "hands on" examination of survival gear, including life rafts and their related emergency gear, is the raft service depots in most major ports. The rafts are inflated in the course of servicing, and a good understanding of how they work can be gained by a short exposure to this equipment. Individuals or fishing associations could make arrangements for such training visits.

The following is a suggested syllabus for a fishing vessel safety training program:

I. Operational Safety

A. Watertight Security
B. Use of Operational Gear
C. Deck Loading
D. Personal Safety

E. Cargo Segregation
F. Fuel and Liquid Tank Levels
G. Seamanship
I. Icing Precaution

II. Weather Familiarity

III. Navigation and Rules of the Road

A. Radar
B. Loran

IV. Communications

A. Types
B. Techniques

V. Lifesaving Equipment

A. Selection
B. Use
C. Maintenance

VI. Fire Prevention and Protection

A. Design Considerations Common to Vessels
B. Use Techniques
C. Maintenance

VII. Basic First Aid

FIRE SAFETY AND PERSONNEL SAFETY

Fire safety information can be useful in the building, construction, and outfitting of a fishing vessel. The points made below represent the collective experience of fire protection engineering personnel. The list is not meant to be exhaustive.

- Individual smoke detectors installed in quarters or berthing areas can improve one's chances against a fire.

- Fixed fire suppression systems for machinery spaces are currently available. They are effective and are of proven worth.

- Polyurethane foam installed as insulation in fish holds is extremely flammable when ignited. Sheet metal, wood, and commercial cements are designed to provide ignition protection. Care should be exercised when doing "hot work" in areas where this foam is used.

- HALON 1301, HALON 1211, and CO_2 portable extinguishers are very effective in fighting small closed engine compartment fires. For larger spaces where hand application can be used, HALON 1211 and dry chemical are very effective. Portable dry chemical extinguishers should be inverted and shaken periodically to protect against compaction.

- Fiberglass-reinforced plastic with fire-retardant resin provides a greater degree of fire safety for fishing vessels than those constructed of general purpose resin.

- Aluminum fishing vessels can be provided with structural fire protection in accordance with the provisions of SNAME T&R Bulletin 2-21. (Available from SNAME at One World Trade Center, Suite 1369, New York, NY 10048)

- One of the single biggest causes of fishing vessel fires is fuel-line rupture with subsequent ignition by hot manifold temperatures. Following closely as a cause of fires is inattention in the galley.

These are equipment- and design-related items that if incorporated in the design specification process can provide for a vessel with greater inherent fire safety.

The need for training in firefighting and fire reaction techniques is of paramount importance. Personnel should become familiar with extinguishing equipment and actions to be taken upon discovery of a fire. These can be planned and examined before a fire occurs so that when a fire breaks out the preliminary decisions have already been made. Training programs can be developed with fire equipment distributors or local fire school facilities to provide "hands on" training.

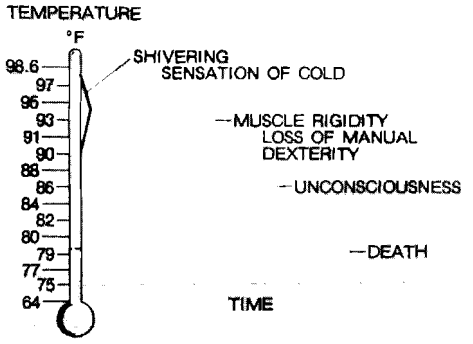
Fire safety information, coupled with training, can go a long way toward AVOIDANCE and MINIMIZATION of disaster.

Personnel safety problems related to the routine working environment can be addressed as they would in an industrial situation. The normal approaches suggest themselves—proper housekeeping, good maintenance, avoidance of fatigue, reduction of plant noise, clear walkways, proper rail heights, guards on moving machinery, etc. These are policies which can be instituted before the fact and should be maintained during normal operations.

Emergency safety can be addressed by providing lifesaving equipment and training. A good array of lifesaving equipment is available. The traditional life preserver and ring buoy come quickly to mind. Prudent fishermen have recently been outfitting themselves with gear which more than meets the required minimum. This has resulted in some very favorable results in the specific cases where emergencies arose.

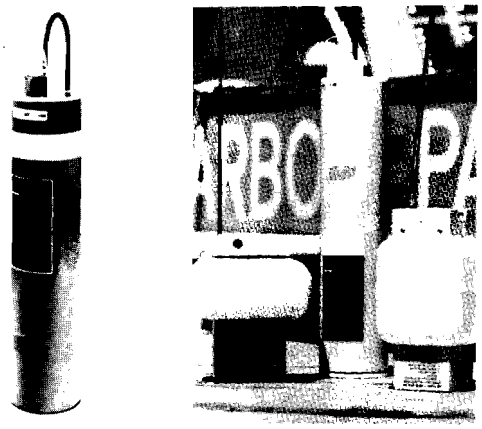
An exposure suit such as the one shown to the left can greatly increase a person's chances of survival. The suit, with its inflatable head support, will keep him both warm and afloat.

Three relatively recent developments have had a significant impact—exposure suits, Emergency Position Indicating Radio Beacons (EPIRBs), and life rafts with improved stability. All three of these have resulted in lives saved. All of these developments have stemmed from recognition of the need to reduce the risk of exposure. Drowning is a problem and will always need to be addressed, but exposure to cold water is equally disastrous. The rate of body heat loss depends on water temperature, the protective clothing worn, and the manner in which the survivor conducts himself. If exposure is severe, the body is unable to conserve or produce enough heat. The core temperature begins to fall, creating a condition known as "hypothermia." The following chart is a good depiction of the problem.



The new developments specifically address hypothermia protection. The exposure suit permits immersion in the sea for extended periods, up to 24 hours in freezing water, depending on the physical make-up and condition of the individual. It is estimated that exposure suits have saved 200 lives.

Shown below are two types of Emergency Position Indicating Radio Beacon (EPIRB). These waterproof, self-buoyant devices operate on the aircraft emergency frequency and can be used by rescue ships and aircraft to home in on persons in distress.



Use of an EPIRB results in a significant decrease in time for arrival on scene of rescue forces, thereby substantially reducing the exposure risk. The U.S. Coast Guard highly recommends EPIRBs because in many cases where EPIRBS were used, rescue craft were on scene in the time normally associated with being notified of the problem. The time lost searching is also avoided.

The improved life raft also reduces exposure risk. The reduced risk of overturning, the greater chance of the raft's remaining close to the stricken vessel for easier boarding and location, and the improved chance of successful pickup by helicopter all aid in keeping survivors out of the sea. It is estimated that 80 people have sucessfully used these new rafts, eleven in February 1980.

CONCLUSIONS AND RECOMMENDATIONS

The casualty statistics for fishing vessels are increasing at an alarming rate.

The fishing vessel industry should increase its efforts to upgrade the safety of its vessels and their operation. Potential for loss of life can be significantly reduced by incorporation of safety-related design features into vessel designs and carriage of recently developed emergency equipment.

Carriage of exposure suits, EPIRBs, and improved life rafts is having a positive effect on lifesaving. The number of lives which had to be saved, however, together with the number of fatalities, points to the need for correction of the root cause—the vessel and its operation.

Education and training programs sponsored by local or regional fishing associations can have a positive impact on the overall safety of the fishing fleet.

The U.S. Coast Guard voluntary pierside boarding program should aid the industry education and training programs by pointing out and aiding in correction of problem areas.

If casualties continue to increase, there will be significant pressure for U.S. government intervention in fishing vessel design and operation.

SURVIVAL TRAINING SUBJECTS

The Annex to the International Convention on Standards of Training, Certification, and Watchkeeping for Seafarers, 1978, specifies that crewmembers

Demonstrate ability to:

1. don a life-jacket correctly, safely jump from a height into the water, board a survival craft from the water while wearing a life-jacket;
2. right an inverted life raft while wearing a life-jacket;
3. interpret the markings on survival craft with respect to the number of persons which they are permitted to carry;
4. make the correct commands required for launching and boarding the survival craft, clearing the ship, and handling and disembarking from the survival craft;
5. prepare and launch survival craft safely into the water and clear the ship's side quickly;

6. deal with injured persons both during and after abandonment;
7. row and steer, erect a mast, set the sails, manage a boat under sail, and steer a boat by compass;
8. use signalling equipment, including pyrotechnics;
9. use portable radio equipment for survival craft.

Possess knowledge of:

1. types of emergency situations which may occur, such as collisions, fires, foundering;
2. principles of survival, including:
   (a) value of training and drills;
   (b) need to be ready for any emergency;
   (c) actions to be taken when called to survival craft stations;
   (d) actions to be taken when required to abandon ship;
   (e) actions to be taken when in the water;
   (f) actions to be taken when aboard a survival craft;
   (g) main dangers to survivors;
3. special duties assigned to each crew member as indicated in the master list, including the differences between the signals calling all crew to survival craft and to fire stations;
4. types of lifesaving appliances normally carried on ships;
5. construction and outfitting of survival craft and individual items of their equipment;
6. particular characteristics and facilities of survival craft;
7. various types of devices needed for launching survival craft;
8. methods of launching survival craft into a rough sea;
9. action to be taken after leaving the ship;
10. handling survival craft in rough weather;
11. use of painter, sea anchor, and all other equipment;
12. apportionment of food and water in survival craft;
13. methods of helicopter rescue;
14. use of the first aid kit and resuscitation techniques;
15. radio devices carried in survival craft, inluding Emergency Position Indicating Radio Beacons;
16. effects of hypothermia and its prevention; use of protective covers and protective garments;
17. methods of starting and operating a survival craft engine and its accessories together with the use of fire extinguisher provided;
18. use of emergency boats and motor lifeboats for marshalling life rafts and rescue of survivors and persons in the sea;
19. beaching a survival craft. ⚓

Halon Firefighting Systems

The following article was written by Gregory Szczurek, Vice President, Consulting Division, Houston Marine Consultants, Inc., 1600 20th St., Kenner, Louisiana 70062. The article appeared in the March 1981 issue of the company's newsletter Hooked Up.

With advances in firefighting technology, mariners may be seeing new types of firefighting agents and equipment in shipboard use. One Coast Guard-approved agent that is now being added to the standard water, CO_2, and dry chemical devices found on vessels is Halon 1301.

Halon 1301 is stored as a pressurized liquid. When released, it changes to a colorless, odorless gas and is propelled to the fire by its storage pressure. It extinguishes the fire by chemically interrupting the combustion process. When properly used, it will extinguish the fire almost immediately.

Halon 1301 may be toxic when exposed to flames. If the fire is extinguished rapidly, the poisonous material produced is minimal. Dangerous levels of toxic material can build up, however, if the fire dies slowly.

As a result, Halon systems are installed primarily in places that can be evacuated by all personnel before the agent is discharged. A warning alarm must sound prior to activation of the system, and two separate actions must be performed before the compartment is flooded in order to prevent accidental discharge.

For Halon 1301 to be effective, all ventilation should be shut down to the space being flooded. Prior to re-entering the compartment, the area should be vented with fresh air. If it becomes necessary to go into an area where Halon 1301 is being used, the person should wear a breathing apparatus.

Halon 1301 is effective for combatting a number of different types of fire, including electrical and combustible liquid fires. Because it is non-conductive and does not leave a residue, it is recommended for use in control rooms and spaces with computers where sensitive electronic equipment might be damaged by other agents.

If you are on a vessel with a halogenated extinguishing system, be aware of its uses, limitations, hazards, and activating controls. It can save your life.

Do Alcohol and Water Really Mix?

In "Safety Muster," a feature of the magazine Inland Boating, an incident was recently related that is fairly common in water safety. A young man enjoying a summer outing became intoxicated and told his friends he was going to ride a plastic air mattress over a nearby low-head dam. Accompanied by joking from his companions, he placed a floatable cushion on his back and made his way into the river. Below the dam a young couple was canoeing.

The inebriated rafter went over the dam, was caught in the hydraulic, or vertical whirlpool at its base, and screamed for help. The canoeists paddled to his assistance. Unfortunately their canoe broke apart in the violent, powerful boil at the dam's base. Subsequently, all three perished. They became part of last year's tragic total of 6600 drownings.

Although alcohol is normally accepted in American recreational settings, very few of us really understand the dangerous grip that it can have on our minds and bodies, especially when we are suddenly and unexpectedly immersed in relatively cold water. Statisticians tell us that approximately 95 percent of the adult U.S. population either experiments with or uses alcohol regularly. It is also estimated that approximately 10 percent of the population can be classified as either practicing or potential alcoholics. The National Safety Council reports that alcohol contributes to a tremendous number of accidents each year, eventually costing the nation billions of dollars and hundreds of thousands of lives.

January 1981: a report to Congress from the National Institute of Alcohol Abuse and Alcoholism (NIAAA) indicates alcohol as a factor in 10 percent of all deaths in the United States. It is named as a factor in 68 percent of all drownings.

Does water kill people, or is water simply an implement? Should all drownings be listed as accidental?—or might 68 percent be better listed as alcoholic?

Although the use of alcohol as a social beverage is widespread in this country, relatively little has been done to study its effects in water-related accidents. Even before the January 1981 NIAAA study the little research done indicated that intoxication was a factor in as many as 50 percent of all water fatalities involving people over the age of 11. Studies in the few states such as South Carolina which require analysis of blood alcohol content supported this. At the time of death, 52 percent of their drowning victims were intoxicated.

Water safety expert Frank Pia has repeatedly appeared on ABC Television's "That's Incredible" to demonstrate the involuntary but normal actions of near-drowning non-swimmers. Mr. Pia has also studied the behavior of drunks at a large public beach on Long Island. He is proud of the number of saves made by lifeguards he supervises. Each year, however, three or four intoxicated persons drown because no one sees them enter the water and they give no sign of distress. They quietly and rapidly slip under the surface. Such drownings are usually discovered when another bather steps on the body.

Alcohol has four effects which are especially dangerous in water-related activities. These effects and the time it takes them to manifest themselves depend on many variables. Included are: the age of the drinker, his or her size, capacity, and experience, and the activities in which he or she is engaged. On the average, it is estimated that two or three drinks per hour, be they bottles of beer, glasses of wine, or highballs, affect average middle-aged American males in roughly the same way. The effects may be more pronounced on smaller, younger people or those not experienced or used to drinking. The effects are as follows:

a. One of the first things modified by alcohol is stability. Even though an inebriated boat operator may not be able to detect it, his balance is greatly lessened by as few as one or two drinks an hour. The primary causes of boating fatalities are falls overboard and capsizings among boats less than 16 feet long. Also many, if not most, people who drown do not intend to go into the water. Because of the fuel shortage, more people are becoming car-top boaters. Staying close to home, they go out in rafts or canoes or rowboats rather than larger powered vessels. In these small craft the impairment of stability is extremely dangerous. A 14-foot punt or easily tipped canoe is a poor place to experiment with balance. A lot of people do and get away with it—for a while.

b. The second thing alcohol affects is the integration of sensory input to the brain. After a person has consumed two or three drinks in the space of an hour, the brain loses its ability to take messages from various sense organs and combine them in a meaningful manner. This is especially important to someone operating a boat, who needs to to be able to rely on his or her vision, hearing, and sense of balance. Coast Guard studies show that even without alcohol the reaction time of the average boater often doubles after three hours' normal summer operation. This may mean that a boater will not be able to react to a person's falling over the bow of a 20-foot boat moving at 25 miles per hour until that person has been run

over. Add alcohol to the equation, and the boater may not even know the person is gone.

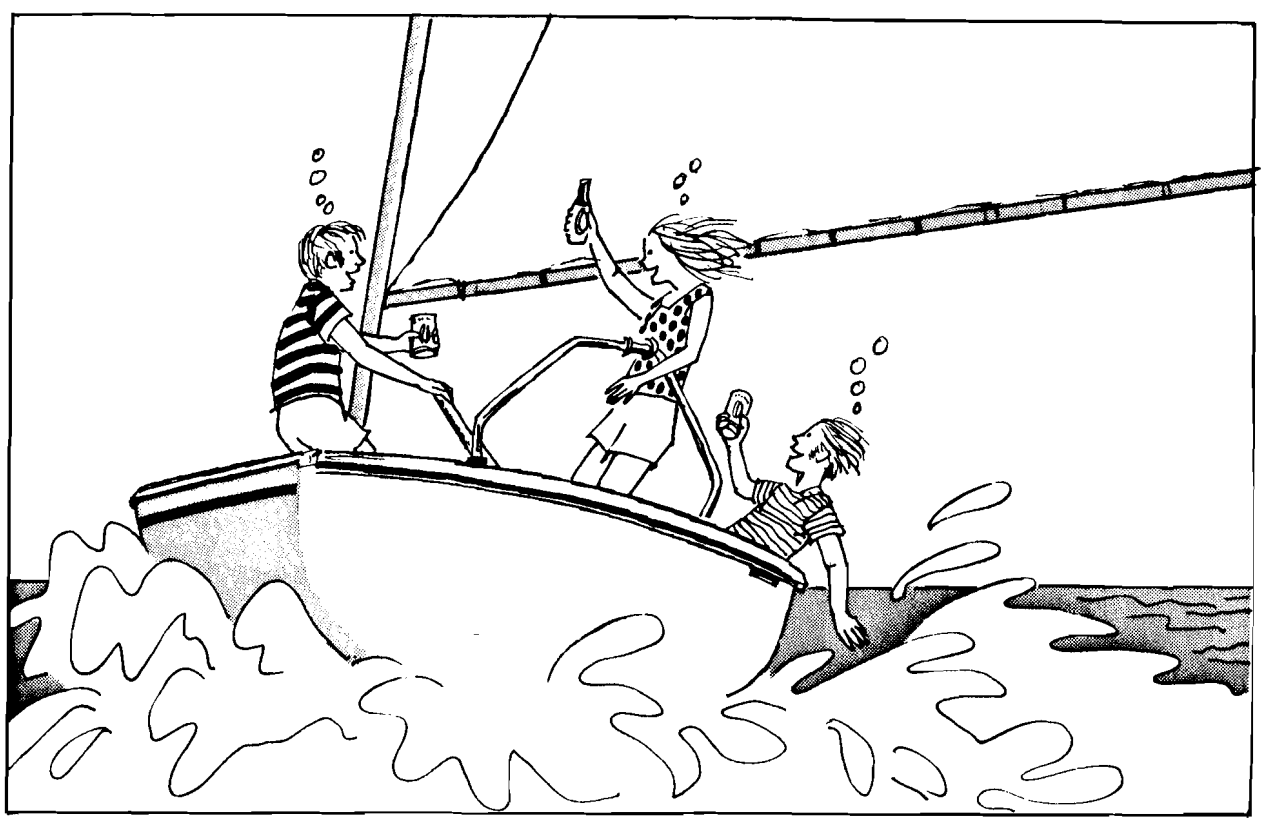
c. The third effect of alcohol is on vision. A person sees by making a number of eye fixations per second. These fixations are put together by the brain to form a clear picture of the person's surroundings. This mosaic of smaller pictures can be seriously interrupted by social drinking, however. The problem becomes worse in proportion to the percentage of alcohol in the blood. It has been estimated that the frontal vision of an inebriated person operating a boat at 35 mph after dark is reduced by as much as 75 percent. Peripheral vision may be totally lacking. The reason that many fire engines and other emergency apparatus are painted yellow or white rather than red is the fact that intoxicated persons are unable to see the primary colors red and green at night. This helps explain why drunk drivers have collisions at intersections or run into the rear ends of automobiles on highways. It should be borne in mind that red and green are the colors used for sidelights on watercraft.

d. Finally, alcohol reduces inhibitions in risk-taking situations. This affects young people especially. There is a nationwide rash of drownings among 18- and 19-year-old males every spring, normally around the time of high school graduation. The scenario goes something like this:

An occasion such as graduation calls for a beach party or celebration with a lakeside setting. In order to demonstrate their manhood, young men attempt difficult feats in the water. Alcohol interferes with muscular coordination as well as balance. Swimming, especially in the cold springtime waters of many lakes and streams, becomes much more difficult. Many of the show-offs in this situation do not make it back to shore. Similarly, in many boating and swimming accidents, would-be rescuers or fellow boat occupants are so tipsy themselves that they cannot effectively aid the victim.

The foregoing is not intended to lessen anyone's enjoyment of aquatic activities. Its purpose is to increase people's awareness of the fact that mixing alcohol with water may result in accidents. The feeling that "getting bombed is my business, and I'll do it if I like" is doubly dangerous. Someone else frequently ends up trying to rescue people who take that attitude. Too often, as in our opening story, well-meaning rescuers die with the ignorant drunk. ‡

The preceding article was submitted by Commander David S. Smith, Boating Safety Division, Second Coast Guard District, 1430 Olive Street, St. Louis, Missouri 63103. Commander Smith will be leaving the Coast Guard July 1 to become a private consultant and organizer of seminars on aquatic safety and hypothermia. Readers are invited to contact him at 5163 Christy Lane, Imperial, Missouri 63052; (314) 464-3718.



Epichlorohydrin

synonyms:	Epi ECH chloromethyl (oxirane)
Physical Properties	
boiling point:	116°C (241°F)
freezing point:	-57.1°C (-70.8°F)
flash point:	88°F (closed cup)
autoignition temperature:	416°C (781°F)
vapor pressure:	17.25 mm Hg at 25°C (77°F)
Threshold Limit Values	
time weighted average:	2 ppm; 10 mg/m^3
short term exposure limit:	5 ppm; 20 mg/m^3
Flammability Limits in Air	
lower flammability limit:	3.8 %
upper flammability limit:	21.0 %
Densities	
liquid:	1.17 at 25°C (77°F) (water = 1)
vapor:	3.2 (air = 1)
Identifiers	
U.N. Number:	2023
CHRIS Code:	EPC

Epichlorohydrin was first discovered in 1854. Today large quantities of the chemical are made commercially. Propylene is used as a starting material .

The uses of epichlorohydrin are many. It acts as a solvent for natural and synthetic resins, gums, paints, varnishes, and lacquers. It is part of the manufacturing process for chemicals to be used as plasticizers, dyestuff, intermediates, and pharmaceuticals. It was used as a curing agent for a dental compound as far back as 1943 and is now a curing agent for propylene-based rubbers. Much of the epichlorohydrin used today goes into epoxy and phenoxy resins, of which it is the major raw material.

Epoxies have found use in an incredibly wide range of applications. This is due to their unique chemical and physical properties. They combine toughness, adhesion, chemical resistance, and superior electrical properties in one product.

For all the usefulness of the products made with epichlorohydrin, the chemical itself should be handled with caution. Epichlorohydrin is a poison; if ingested, it can be fatal. The liquid is corrosive and irritating to the skin. It can be absorbed through the skin during prolonged contact. While the irritation may not be noticed immediately, it might result in deep-seated pain with blistering several hours later. The vapor form of the chemical is a severe irritant to the eyes, nose, throat, and lungs. High concentrations can be fatal. A saturated atmosphere can contain 22,000 ppm at room temperature. The chemical does have an irritating chloroform-like odor, but anyone who can smell it is being over-exposed to it. It should be noted that epichlorohydrin is currently under investigation as a potential carcinogen.

Persons working around the liquid should wear splash-proof goggles or a full face mask. Rubber gloves, boots, and outer gear should be worn and should be washed if they come in contact with the liquid. Epichlorohydrin is slowly absorbed by rubber, and rubber gear showing signs of deterioration should be discarded. No leather articles should be used, as they are easily penetrated by epichlorohydrin, cannot be decontaminated, and must be destroyed. Polyvinyl-chloride (PVC) clothing is suitable only for temporary protection, as it is more readily penetrated than rubber. NIOSH-approved respiratory equipment should be readily available for use if needed. Three rules to observe are:

Keep the liquid off skin and clothing.
Maintain good ventilation.
Use breathing protection when required.

Epichlorohydrin is flammable. Since it has a flash point of 88°F (cc) and a lower flammability limit of 3.8 % in air, explosive mixtures can form at relatively low temperatures. Burning epichlorohydrin can produce toxic vapors and gases such as hydrogen chloride and deadly phosgene and carbon monoxide.

Epichlorohydrin is also highly reactive (which is one of the reasons for its commercial importance). It can react violently with acids, caustics, bases, reactive metals, and metal halides. Epichlorohydrin may polymerize spontaneously and violently, forming large, chain-like molecules.

Epichlorohydrin is regulated by the U.S. Coast Guard as a cargo of particular hazard (COPH). Its minimum carriage requirements are detailed in Subchapter O of Title 46 of the Code of Federal Regulations. The U.S. Department of Transportation classifies it as a flammable liquid and the Environmental Protection Agency as a Category C pollutant. The Inter-Governmental Maritime Consultative Organization (IMCO) details the minimum carriage requirements in Chapter 6 of the "Chemical Code" and considers it a Category B pollutant.

The assistance of Dow Chemical U.S.A. and the Shell Chemical Company for material used in the preparation of this article is gratefully acknowledged.

HAZARD EVALUATION BRANCH
CARGO AND HAZARDOUS MATERIALS DIVISION

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) Which statement is true concerning an "inverting type" sextant telescope?

A. It is also known as the "erect image" type.
B. It has one lens fewer than the erect type.
C. It absorbs more light than the erect type.
D. When only one telescope is provided with a sextant, it is usually of this type.

REFERENCE: Bowditch

(2) The total local magnetic effects which cause deviation of a vessel's compass can be broken down into a series of components which are referred to as

A. divisional parts.
B. coefficients.
C. fractional parts.
D. equations.

REFERENCE: Bowditch, Dutton 13th Edition

(3) A frontal thunderstorm is caused by

A. pronounced local heating.
B. wind being pushed up a mountain.
C. a warm air mass rising over a cold air mass.
D. an increased lapse rate caused by advection of warm surface air.

REFERENCE: Donn's 2nd Edition

(4) Weather conditions in the middle latitudes move generally

A. eastward.
B. westward.
C. northward.
D. southward.

REFERENCE: Donn's 2nd Edition

(5) A swift current occurring in a narrow passage connecting two large bodies of water which is produced by the continuously changing difference in height of tide at the two ends of the passage is called a(n)

A. hydraulic current.
B. rectilinear current.
C. rotary current.
D. harmonic current.

REFERENCE: Bowditch

ENGINEER

(6) Why is the ring belt of a piston for use in a diesel engine made smaller in diameter than the skirt?

A. To allow for greater expansion caused by a higher operating temperature
B. To seal the cylinder against leakage of combustion gases
C. To provide an additional surface for oil cooling
D. To provide additional strength for the crown and lower structure

REFERENCE: Stinson

(7) The volumetric efficiency of a reciprocating air compressor is the ratio of the

A. adiabatic work of compression to the indicated horsepower.
B. work of isothermal compression to the brake horsepower of the motor.
C. air indicated horsepower from indicator cards to the brake horsepower input.
D. actual intake air volume flow to the compressor displacement.

REFERENCE: Harrington

(8) A recirculating or bleed-off line is installed on a centrifugal pump in order to

A. establish a back pressure at the labyrinth seal to eliminate leakage.
B. equalize pressure on both sides of the suction valve disc.
C. prevent the pump from overheating when operating at shut-off.
D. decrease the net positive suction head.

REFERENCE: Karassik

(9) When the desired rudder angle is attained in a typical double ram electrohydraulic steering gear, the

A. ram relief valves bypass oil to curtail rudder movement.
B. six-way valve shifts to the neutral flow position.
C. steering pump electric motor is de-energized by the transfer switch.
D. follow-up gear takes the hydraulic pump off stroke.

REFERENCE: Principles of Naval Engineering

(10) When dealing with contaminated oil from a hermetic compressor that has had a burnout, you should

A. store the oil in a clean refrigerant drum.
B. use rubber gloves.
C. circulate the oil through a filter drier.
D. remove the oil with a portable charging cylinder.

REFERENCE: Althouse

ANSWERS

DECK
1.B;2.B;3.C;4.A;5.A
ENGINEER
6.A;7.D;8.C;9.D;10.B

MERCHANT MARINE SAFETY PUBLICATIONS

In previous issues this list has included publications that were unavailable because they were being revised or reprinted. These publications are reprints of selected subchapters of the Code of Federal Regulations (CFR). The Superintendent of Documents publishes the CFR in yearly updated form. The CFRs are thus the best source for those needing up-to-date information on Coast Guard regulations. The price and availability of any desired volume can be obtained by calling (202) 783-3238 or writing: Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

Publications previously appearing on this page which do not fall into the category described above will henceforth be listed separately. That list will be published periodically; it appears for the first time in this issue, on page 49.

Listed below are the Code of Federal Regulations (CFR) subchapters covering Coast Guard regulations (Title 46, Chapter I). Chapter I comprises nine volumes. A desired volume should be ordered by referring to the parts it contains; for example, if marine engineering regulations (Subchapter F) are needed, 46 CFR Parts 41 to 69 (the third volume) should be ordered. The numbers shown in the "Coast Guard Equivalent" column refer to previous reprints of selected subchapters. See the chart below.

	Volume	Coast Guard Equivalent	Contents
1.	46 CFR Parts 1 to 29	None	Subchapter A—Procedures Applicable to the Public. Parts 1 to 9.
		CG-191	Subchapter B—Merchant Marine Officers and Seamen. Parts 10 to 16.
		CG-258	Subchapter C—Uninspected Vessels. Parts 24 to 29.
2.	46 CFR Parts 30 to 40	CG-123	Subchapter D—Tank Vessels. Parts 30 to 40.
3.	46 CFR Parts 41 to 69	CG-176	Subchapter E—Load Lines. Parts 42 to 46.
		CG-115	Subchapter F—Marine Engineering. Parts 50 to 64.
		None	Subchapter G—Documentation and Measurement of Vessels. Parts 66 to 69.
4.	46 CFR Parts 70 to 89	None	Subchapter H—Passenger Vessels. Parts 70 to 89.
5.	46 CFR Parts 90 to 109	CG-257	Subchapter I—Cargo and Miscellaneous Vessels. Parts 90 to 106.
		None	Subchapter I-A—Mobile Offshore Drilling Units. Parts 107 to 109.
6.	46 CFR Parts 110 to 139	CG-259	Subchapter J—Electrical Engineering. Parts 110 to 139.
7.	46 CFR Parts 140 to 155	None	Subchapter N—Dangerous Cargoes. Parts 146 to 149.
		None	Subchapter O—Certain Bulk Dangerous Cargoes. Parts 150 to 154.
8.	46 CFR Parts 156 to 165	CG-268	Subchapter P—Manning of Vessels. Part 157
		None	Subchapter Q—Specifications. Parts 160 to 165.
9.	46 CFR Parts 166 to 199	None	Subchapter R—Nautical Schools. Parts 166 to 168.
		CG-323	Subchapter T—Small Passenger Vessels (Under 100 Gross Tons). Parts 175 to 187.
		None	Subchapter U—Oceanographic Vessels. Parts 188 to 196.
		None	Subchapter V—Marine Occupational Safety and Health Standards. Part 197.

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