

**LNG AND LPG: CG-478 UPDATE
OPERATION PHYSICIAN**



PROCEEDINGS

OF THE MARINE SAFETY COUNCIL

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cover

To many of the victims of disaster at sea, this is a welcomed view. In a new Coast Guard air-sea rescue program, physicians of the U.S. Public Health Service learn through first-hand experience that dangling beneath a roaring helicopter can be traumatic for some patients. Story begins on page 86.

maritime sidelights

CG ISSUES WARNING AGAINST UNAUTHORIZED LIFERAFT SERVICING

The Coast Guard is urging both foreign and U.S. vessel operators, ship masters and port agents to select proper servicing facilities for their inflatable liferafts.

Coast Guard officials have received several reports of improperly serviced rafts that would have malfunctioned in an emergency. The problems usually were traced to servicing by firms that are not trained or authorized by the raft manufacturers to perform the required maintenance.

Servicing of rafts ashore should be limited to facilities and depots recommended by the raft manufacturer because different types of rafts require different replacement parts and packing procedures. Unless rafts are overhauled and recertified by authorized firms, mistakes in packing can occur. Manufacturers waive responsibility for the operation of their rafts unless they are serviced by authorized stations.

Facilities designated as "U.S. Coast Guard Approved" are not necessarily qualified to work on all types of liferafts. Such approvals apply to servicing specific raft designs. Therefore, those sending rafts ashore for servicing should check the manufacturer's list of qualified facilities. In the case of U.S. flag inspected vessels, rafts must be serviced at Coast Guard approved facilities.

1981 OIL SPILL CONFERENCE

The seventh biennial Conference on the Prevention, Behavior, Control and Cleanup of Oil Spills will be held on March 2-5, 1981, at the Atlanta Hilton, Atlanta,

Georgia. More than 1,500 delegates and exhibitors from all over the world are expected to attend. Sponsors of the international conference are the American Petroleum Institute, the U.S. Environmental Protection Agency, and the U.S. Coast Guard.

Technical, scientific, and socio-economic-legal papers for presentation at the conference are invited. The 115 papers selected will be chosen from abstracts submitted by June 2, 1980. These abstracts must be in English, 200 to 250 words, and information being reported on must not be already described in any other open technical or scientific publication. Authors will be notified of selection by July 28, 1980.

The conference will stress spill prevention, development of new techniques for use in inland, coastal, deepwater and Arctic oil spill control operations, and spill liability and damage assessment. Papers are particularly sought in clean-up operations, cooperatives, training techniques, monitoring, new prevention and control techniques, new equipment developments, case histories of specific spills, oil transfer practices, offshore platform operations, deepwater port operations, dispersants, fate and effects of oil, natural resource damage assessment, and national and international socio-economic-legal aspects.

Submit abstracts **no later than June 2, 1980 to:**

CDR Ted Leigh (G-DMT/54)
U.S. Coast Guard Headquarters
Washington, DC 20593
(202) 426-2700

CONFERENCE ON CONTROL OF HAZ MAT SPILLS

This year's Conference and Exhibition on Control of Hazardous Material Spills is being held May 13-15, 1980 at the Galt House Hotel, Louisville, Kentucky. The conference is sponsored by the U.S. Environmental Protection Agency, U.S. Coast Guard, and Vanderbilt University.

The conference will feature a discussion panel comprised of

special guests who will discuss issues and progress in the area of hazardous chemical emergencies. Also, a comprehensive show consisting of approximately 50 exhibitors will feature the latest advances in both equipment and services. A film festival will complement the conference by illustrating the many aspects of hazardous materials spills presented at the technical sessions and exhibition. Altogether, more than 100 technical papers, exhibits, films and feature programs will be presented.

For additional information, write or call:

Hazardous Materials Conference
Coordinator
Center for Environmental Quality
Management
Box 6067, Station B
Nashville, TN 37235
(615) 322-2331

NEWS ON HYPOTHERMIA DEATHS

Victims of exposure or cold water drowning should be thoroughly warmed before being declared dead, claimed medical experts at a recent International Conference on Hypothermia.

Cold puts these victims into a "metabolic icebox" in which body processes are slowed down. "Because of this slow down, there is a better chance that victims can survive drastic drops in their internal body temperature. We are finding, in particular, that cold water drowning victims submerged for up to 30 minutes have been revived without brain damage," explained Neil W. Ross, conference chairman and marine recreation specialist with the University of Rhode Island Sea Grant Marine Advisory Service.

Ross and over 200 people from five nations gathered at URI recently for the first meeting held to examine what is currently known about hypothermia and its treatment. Meeting sponsors included URI, the American National Red Cross, the Sea Grant Program, the U.S. Coast Guard, and the Undersea Medical Society.

Continued on next page.....

MARITIME SIDELIGHTS.....

Hypothermia is the internal cooling of the body caused by exposure to cold air or water. Lowering of this temperature to the 70's can result in death. Hypothermia has caused deaths for centuries and almost everyone has at one time suffered from at least a mild case. Recognition of hypothermia as a leading cause in cold water drownings, and as a contributor to deaths among the elderly and children, has recently received national attention.

"Current research into hypothermia, particularly into its role in cold water drownings, has pointed out that many of the former rules about treatment of hypothermic victims need to be changed. This conference began the development of standardized treatment techniques based on these new discoveries of the body's reaction to cold," Ross said.

The conference produced some general guidelines for the public to follow in recognizing and treating hypothermia. To determine how hypothermic a victim is, experts recommend relying upon observations of the victim's behavior, and the administration of simple tests. Thermometers are not reliable because those in use only measure down to 94 degrees and reflect surface body temperature rather than the critical internal body temperature.

Mild hypothermia victims with internal body temperatures above 90 degrees F. will still be able to think clearly despite feeling extremely cold or shivering violently.

If the victim is stumbling, appears drunk and cannot answer simple questions or count backwards, it is likely that profound hypothermia has set in and the body core has cooled below 90 degrees F.

For mild hypothermia victims, the recommended treatment is to insulate the victims from the cold. A warm drink, while not adding greatly to increasing the internal body temperature, can still make the victim begin to feel warmer while the body is recovering.

In severe hypothermia, victims are unable to defend themselves from the cold and someone else must take charge. The person

should be insulated or moved out of the cold environment and gentle heating, such as trunk to trunk body rewarming or hot water bottles, can be applied to stop further cooling. "You can bring on heart attacks if the victim is excessively jarred so great care should be taken in transporting or moving the victim," Ross explained.

Treatment should not be stopped once a victim begins to "feel warm." Since skin temperatures rise more quickly than internal temperatures, the victim will start feeling better before the elevation of the core temperature. It is essential, therefore, to keep the victim under observation to ensure that the internal warming has happened.

If a victim is unconscious, the breathing passage should be checked to see that it is clear, and the victim's pulse should be taken. Many conference participants believe that cardiopulmonary resuscitation (CPR) should be applied only if there is no sign of a pulse. "In light of the fact that the body is in a metabolic icebox state where body processes are slowed but not stopped, the question of whether CPR is appropriate needs to be resolved in the immediate future," Ross stated.

Additional information about hypothermia and its treatment can be obtained by writing for either the technical conference proceedings or for a hypothermia handbook. Both will be available later this year from the URI Marine Advisory Service, Narragansett Bay Campus, Narragansett, RI 02882.

DOT AND CHEMTREC JOIN FORCES ON HAZ MAT EMERGENCIES

The Chemical Transportation Emergency Center (CHEMTREC) and the Department of Transportation have agreed to combine efforts to handle emergencies involving the transportation of hazardous materials. The arrangement is designed to facilitate the reporting of, and response to, such incidents.

Under the agreement, CHEMTREC will promptly notify the Coast Guard's National Response

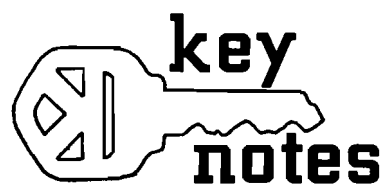
Center (NRC) when it receives information about significant incidents involving hazardous materials. NRC, in turn, will promptly inform CHEMTREC of any incident or emergency requiring information or advice available through CHEMTREC.

In announcing the agreement, Secretary of Transportation Neil Goldschmidt said the agreement "will form an unusual public-private team to provide a reporting system and data center that will be of unique value to local officials in coping with accidental chemical emergencies."

CHEMTREC, set up and run by the Chemical Manufacturers Association, is designed to provide immediate information to carriers and public safety officials facing a chemical transportation emergency. The service, which began operation in 1971, has handled more than 13,500 such emergencies—about 85 percent of those involved rail or truck transportation.

The NRC was established to receive notification of accidental spills of oil and certain hazardous substances. It also receives calls on other hazardous materials and pollution incidents.

(Reprinted from the American Waterways Operators, Inc. "Weekly Letter" of March 22, 1980, Volume XXXVII, No. 12.)



Aside from temporary documents, such as safety and security zones, there were few Coast Guard regulations published in the Federal Register during March. Three final rules were published. These were: CGD 79-066, COLREGS Demarcation Line, Boston Harbor (6 March 1980 Federal

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Register); CGD 73-243, Cargo Information Cards (17 March 1980); and CGD 77-103, Great Lakes Navigation Safety Regulations (24 March 1980). There were also four proposed rules published during this period. These were: CGD 75-59, Compatibility of Bulk Liquid and Liquefied Gas on Vessels (17 March 1980); CGD 79-137, Start in Gear Protection Devices (24 March 1980); CGD 80-21, Heptane Ignition Test for Hand Red Flares (3 April 1980); and CGD 80-21A, Equipment Requirements for Boat Operators (3 April 1980). One supplementary rule was published, CGD 76-086A, on Combination Fire Hose Nozzles. This was published on 31 March 1980.

A supplemental notice and a notice of a seminar were published on the subject of Tanker Construction Standards. The supplemental notice, CGD 75-083 and 75-083A, served to notify the public that the tank barge construction regulations under the same docket number would be postponed until an independent study could be completed by the National Academy of Sciences. The seminar notice concerned a 30 May 1980 seminar to be held in room 7132, 1111 Constitution Ave. NW, Internal Revenue Service Building, Washington, DC from 9 a.m. to 5 p.m. This seminar is in relation to the Tanker Safety and Pollution Prevention (TSPP) regulations published as Part V of the 19 November 1979 Federal Register.

A notice was published on 3 April 1980, CGD 80-30, which solicited for applicants for both the Chemical Transportation Advisory Committee (CTAC) and the Rules of the Road Advisory Committee (RORAC). Interested applicants should write to the Marine Safety Council at the address listed below.

Any questions regarding regulatory dockets or companies and individuals wishing to speak at public hearings should notify Capt. P. J. Danahy (G-CMC/24), U.S. Coast Guard Headquarters, 2100 Second St. SW, Washington, DC 20593; (202)426-1477.

* * *

QUALIFICATIONS OF THE PERSON IN CHARGE OF OIL TRANSFER OPERATIONS, TANKERMAN REQUIREMENTS CGD 74-44, 74-44a

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

It 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.

As stated in the last issue, these projects have been withdrawn (44 FR 25243). New notices of proposed rulemaking (NPRM's) which were anticipated in June have been delayed and are now scheduled for publication in April of this year under new Coast Guard docket numbers 79-116 and 79-116a.

REVISION OF ELECTRICAL REGULATIONS CGD 74-125

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

This revision is occurring 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 NPRM was published on 27 June, 1977 (42 FR 32700). A supplemental NPRM was published as CGD 74-125A on 3 March, 1980 (Part VII).

NEW TANK BARGE CONSTRUCTION CGD 75-083 UPGRADE OF EXISTING TANK BARGE CONSTRUCTION CGD 75-083a

This action is comprised of two regulatory projects centered on tank barge construction standards. These projects were the result of a Presidential initiative of 17 March 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. Regulatory documents for both will be published at the same time and joint public hearings have been held.

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, was published as part VI of the 14 June 1979 Federal Register (44 FR 34440 and 44 FR 34443, respectively).

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

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

A Supplementary Notice was published as Part III of the 13 March 1980 Federal Register (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. As part of the study a two day workshop will be held on 15 and 16 April 1980. The study will be completed by the end of January 1981. The Coast Guard will defer any further rulemaking on these proposals until completion of the study and the dates in the proposals of 14 June 1979 are no

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longer valid. If the Coast Guard should pursue further action on these proposals, a new time table will have to be developed.

Anyone wishing to obtain copies of the rulemaking may do so by contacting Capt. P. J. Danahy, 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 would 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 27 June 1977 (42 FR 32670) and a supplemental NPRM was published 27 October 1977 (42 FR 56625). Due to substantive changes in the regulation, a new NPRM is scheduled for April 1980.

The following three regulations, CGD 77-057, CGD 77-058(b)(c)(d), and CGD 77-063, make up the Tanker Safety and Pollution Prevention (TSPP) Regulations. Public hearings have been held on the package, comments were requested and 541 have been received. A notice of delay in publishing the final regulations was published in the 7 June 1979 Federal Register (43 FR 32713). Final rules have been published and appeared in the 19 November 1979 Federal Register (44 FR 66500). Currently a tanker seminar on construction standards has been scheduled for 30 May 1980 from 9 a.m. to 5 p.m. in room 7132, 1111 Constitution Ave. NW, Internal Revenue Service Building, Washington, DC. This notice appeared in the 3 April 1980

Federal Register and further information can be received by writing Mr. Joseph Angelo, U.S. Coast Guard (G-MMT-1/13), Washington, DC 20593.

INERT GAS SYSTEM CGD 77-057

This regulation would require certain oil tankers of 20,000 dead-weight tons and over to be fitted with inert gas systems.

As part of the President's initiatives to reduce marine pollution, this regulation will reduce the possibility of in-tank explosions which have been the cause of some pollution incidents.

The Inflationary Impact Statement for this regulation was completed in May 1977. An NPRM was published 12 February 1979 (44 FR 8984). Hearings were held 21 March 1979 in Washington, DC and 28 March 1979 in San Francisco, CA; 136 comments were received, have been evaluated, and the final rule has been published.

SEGREGATED BALLAST AND TANK CLEANING REGULATIONS GCD 77-058(b), (c) and (d)

This four-part regulation was initiated when President Carter directed the Secretary of Transportation to issue new rules for oil tanker standards, which were to include segregated ballast on all tankers and double bottoms on all new tankers which call at American ports. The provisions of these proposed regulations have been changed by the February 1978 Intergovernmental Maritime Consultative Organization (IMCO) Conference to include Crude Oil Washing (COW) and Clean Ballast Tanks (CBT).

The NPRM was published 16 May 1977 (42 FR 24868). As a result of the IMCO Tanker and Pollution Prevention Conference of February 1978, a new NPRM was issued on 12 February 1979 (44 FR 8984). Public hearings were then held in March in Washington, DC and San Francisco, CA; 265 comments were received on the docket, and were analyzed and the final rules were

formulated. These rules appeared in the Federal Register of 19 November 1979.

STEERING GEAR DESIGN STANDARDS TO PROVIDE REDUNDANCY CGD 77-063

As part of the President's initiatives to reduce pollution, this regulation is needed to help reduce the possibility of a marine collision due to a loss of steering.

An NPRM was published 16 May 1977 (42 FR 24869). As a result of the IMCO Tanker Safety and Pollution Prevention Conference of February 1978, a new NPRM was issued on 12 February 1979 (44 FR 8984). Public hearings were held on the docket and 138 comments have been received and analyzed and the final rules have been published.

CONSTRUCTION AND EQUIPMENT EXISTING SELF-PROPELLED VESSELS CARRYING BULK LIQUEFIED GASES CGD 77-069

These regulations would amend the current ones to include the substantive requirements of the "Code for Existing Ships Carrying Liquefied Gases in Bulk," adopted by the Intergovernmental Maritime Consultative Organization (IMCO). The use of liquefied gas has increased, as have the problems associated with it. Due to 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 ANPRM on these regulations is anticipated in December 1980.

LICENSING OF PILOTS CGD 77-084

This regulation takes into account the problems caused by increased ship size and unusual maneuvering characteristics. The proposal would require recency of service for each route upon which a pilot is authorized to serve, licensing with tonnage limitations

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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. An NPRM is expected in April 1980.

REVISION OF 46 CFR 157.20-5 DIVISION INTO THREE WATCH REGULATION CGD 78-037

This revision would have required an adjustment in vessel manning requirements, to bring them in line with current legislation. It would 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 will not be published, as the docket has been withdrawn.

TANK VESSEL OPERATIONS REGULATIONS, 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 14 March 1978 prohibiting entry of oil tankers in excess of 125,000 deadweight tons in Puget Sound; this appeared in the Federal Register of 23 March 1978 (43 FR 12257). An NPRM was published 27 March 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 11 and 12 June in Seattle, Washington, 13 June in Mt. Vernon, Washington, and 14 June 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 21 June 1979 (44 FR 36174). This extension was effective 1 July and will be in effect until the Coast Guard prints notice of its cancellation. 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 July 1980.

EIGHT-HOUR DAY VOLUNTARY OVERTIME CGD 78-146

This docket is a review of the Eight Hour Day, Voluntary Overtime regulation in 46 CFR 157.20-10, which states that no licensed officer should be required to be on duty more than eight hours per day except in extraordinary circumstances. Existing regulations, however, do not address overtime or consider any possible "fatigue factor." Recent Coast Guard studies have shown that this factor has a profound effect on reaction time and judgement, therefore the regulatory project has been withdrawn.

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 legislation. It will provide more comprehensive protection for personnel employed in vessels and installations in the oil trade. The work plan received by the Marine Safety Council (MSC) in early July calls for an NPRM in March 1980.

SHIPBOARD NOISE ABATEMENT STANDARDS CGD 79-134

These standards will establish acceptable sound levels for each of the various vessel compartments based on the latest technology. The standards will differentiate acceptable sound levels for both

existing vessels and new vessels, acceptable methods of compliance, and will establish a hearing conservation program.

During the development of these standards, the U.S. Naval Ocean Systems Center (NOSC), San Diego, California was contracted by the Coast Guard to evaluate sound levels aboard several U.S. merchant vessels, to study the data obtained, and then to define the extent of the noise problem. Based on this data and other information available, they were asked to recommend a set of noise levels to be used in the control and/or elimination of the shipboard noise problem for the proposed standards.

This study has been completed. Copies are available through the National Technical Information Service (NTIS), Springfield, Virginia 22161; request NOSC technical documents numbers 243, 254, 257, 267 and 405.

PERSONNEL AND MANNING STANDARDS FOR FOREIGN VESSELS CGD 79-081

This regulation, deemed necessary to reduce the probability of oil spills, would establish minimum manning levels for foreign tank vessels operating in U.S. navigable waters. It would also establish procedures for the verification of training, qualification and watch-keeping standards. As we go to press, an NPRM is pending.

PERSONNEL SAFETY AND HEALTH REQUIREMENTS FOR INDUSTRIAL VESSELS CGD 80-15

Similar to 79-077, this regulation covers the vessels engaged in exploration, supply and support on the Outer Continental Shelf (OCS). Mandated by pending OCS legislation, this project covers the growing fleet of vessels which perform the variety of industrial functions involved in the exploration and development of offshore resources. The regulations, designed to provide a more comprehensive personnel protection, are scheduled

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CG-478

LNG and LPG — Views and Practices, Policy and Safety

By

Doctor Alan L. Schneider
Lieutenant Gary L. Gregory
Lieutenant John S. Sedlak

The following article consists of excerpts from the Coast Guard publication "Liquefied Natural Gas and Liquefied Petroleum Gas, Views and Practices, Policy and Safety" (CG-478), which was recently revised to present current U.S. Coast Guard views, practices and policies for the transportation by water of Liquefied Natural Gas (LNG) and Liquefied Petroleum Gas (LPG). This publication answers a number of questions frequently asked by those interested in water transportation of these important bulk cargoes. It covers the properties and hazards of LNG and LPG, LNG and LPG carriers, operational controls and facilities, and personnel training and qualifications, and includes a question and answer section and recommendations for selected readings in the event a more thorough and technical knowledge of LNG and LPG is desired.

CG-478 will be reviewed periodically and revised editions will be published as necessary to assure that the information is current. Comments and recommendations are solicited and should be sent to the Chief, Cargo and Hazardous Materials Division (G-MHM/TP14), U.S. Coast Guard Headquarters, Washington, DC 20593. Single copies of this publication are available to the public free of charge from the same address.

Of all the chemicals being shipped in United States waters today probably none has captured the attention of a large portion of the American public as much as Liquefied Natural Gas (LNG) and Liquefied Petroleum Gas (LPG). Yet LNG and LPG are only two of the many bulk hazardous commodities transported by water, and many other commodities exhibit as great or even greater hazards. There is nothing exotic about the chemicals making up LNG and LPG--they are the lower molecular weight portions of the hydrocarbon spectrum, just as fuel oil is part of the higher molecular weight portion. Part of the problem may be that LNG, and to a lesser extent, LPG, are relatively new to the American public. Generally speaking, the hazards of LNG and LPG are not well understood by the public, nor are these hazards usually put into perspective with the hazards from other, more common dangerous materials such as gasoline.

Public concern is understandable--and commendable. The Coast Guard, however, has had many years of experience with hazardous cargoes. Supported by extensive research, the Coast Guard has developed a group of regulations covering vessel design and operations, shoreside facility design and operations, and

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LNG AND LPG.....

personnel training and qualifications. CG-478 provides an understanding of the Coast Guard's role in hazardous materials transportation in general and LNG and LPG transportation in particular, and thus may help to allay public concern.

HISTORY

Although both LNG and LPG have been produced for many years, large-scale importation into the United States is a recent factor in American energy supply. With the depletion of continental United States petroleum reserves, and the need for LNG and LPG markets by overseas producers, there is a place for both LNG and LPG in the United States. Both LNG and LPG represent energy that is often wasted, energy that must be utilized in an energy-short world.

The Coast Guard began studying LNG in the late 1960's and soon thereafter expanded these studies to include LPG. At the same time, the transport of bulk chemicals in large portable containers and portable tanks emerged as a problem requiring an increased effort both domestically and internationally. Recognizing this problem, the Coast Guard asked the Inter-governmental Maritime Consultative Organization (IMCO) to study this form of transport.

Based on Coast Guard leadership in the classification of hazardous substances and the development of its related construction program, IMCO, on October 12, 1971, adopted a code for the construction and equipment of bulk chemical carriers which was similar to U.S. national regulations. This was followed by the IMCO Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk, adopted internationally on November 12, 1975. Additional international agreements promoting marine safety, including the Tanker Safety and Pollution Prevention Convention and the Standards for Training, Certification and Watchkeeping for Seafarers, 1978, were developed in later years.

IMCO's work provided the foundation for a set of U.S. regulations applicable to liquefied gases. This regulatory effort, plus that of the Research and Development Program, has resulted in an understanding of the properties and hazards of LNG and LPG, and strict standards regulating vessel design and construction, vessel operational controls and shoreside facilities, and ship and shore personnel training and qualifications. Once a large quantity of either cargo is released, there is not much that can be done to mitigate the effects of a spill. This fact underlies the philosophy of the Coast Guard's LNG and LPG regulations: *large-scale cargo releases must be prevented.*

LNG AND LPG PROPERTIES AND HAZARDS

As with all hazardous materials, a good understanding of the properties and behavior of LNG and LPG is necessary to assure that design, construction, and operation of vessels and facilities are adequate to protect lives, property, and the environment during water transportation. Although these are two of the more hazardous cargoes, they are not unique nor are they the most hazardous.

A number of aspects of LNG and LPG behavior have been studied, including land spills, water spills, vapor clouds, rollover, reactivity, and the effects of very cold temperatures. In addition, much relevant knowledge has been gained from years of experience in the transportation of these and other liquefied flammable gases. Their primary hazard is flammability, although other hazards have been identified and investigated.

The components of LNG and LPG are known to be stable and not subject to violent chemical reactions in the absence of oxygen. The primary concern is with the behavior of large releases resulting from major accidents such as high energy ship collisions. Both LNG and LPG are transported in bulk as liquids to reduce the required container volume. In practice, LNG is carried at low temperature near atmospheric pressure in the marine mode; LPG is usually carried in bulk at low temperatures in ships and at high pressures in barges.

Safety in the transportation of all hazardous materials begins with a thorough understanding of the properties and behavior of the materials involved and an analysis of the risks involved in each step of the transportation system to determine the proper preventive measures. For both LNG and LPG, a sizable body of knowledge exists to ensure that containment systems on vessels and facilities present minimal danger under normal operating conditions. The primary preventive measures are good vessel design, stringent operational controls, and proper personnel training.

CARRIER DESIGN AND CONSTRUCTION

The Coast Guard is responsible for the safety of all U.S. flag liquefied gas ships world wide and all foreign flag liquefied gas ships while in U.S. waters. The statutory authority for the regulation of liquefied gas ships is the United States Code, specifically the Port and Tanker Safety Act of 1978 (46 USC 391a). This responsibility has led to the development of standards for ship design, construction, alteration, repair, maintenance, and operation.

The bulk shipment of LNG and LPG presents potentially significant hazards; the extreme flammability and the very low temperatures present major problems in ensuring that these cargoes are transported safely. This necessarily means that the cargo must not escape from the tank. Ship design regulations are intended to prevent any cargo release whenever possible, and to minimize the quantity released when prevention is not possible. Also, tank failures during normal operations are to be prevented. This has led to development of tank designs that have built-in redundancy; tanks that will leak before they fail, that is, in which any crack due to normal operations will give ample warning before catastrophic failure; or tanks that, through conservative design, can be shown not to fail in ordinary service. Many types of cargo systems are acceptable as long as the level of safety is at or above the existing required level. This equivalent level of safety concept is followed throughout the vessel design regulations. Since it is not

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possible to design a ship capable of withstanding the most serious collisions and groundings without some damage to the cargo containment system, operational controls such as restricting other vessels from approaching an LNG or LPG carrier in inland waters serve to prevent a major collision.

Before any U.S. flag vessel operates anywhere in the world, it must undergo a certification procedure to ensure that it meets all applicable design and construction requirements. Both U.S. and foreign flag vessels must meet essentially the same requirements for the cargo containment portion of the vessel. U.S. flag vessels are reviewed by the Coast Guard for compliance in such areas external to the cargo containment system as the design and construction of propulsion and steering equipment, auxiliary systems, accommodations arrangements, lifesaving equipment, and electrical systems, as mandated in 46 CFR 30-40. Foreign flag vessels are required to meet similar requirements which are found in the Safety of Life at Sea (SOLAS) Convention. Both a review of the ship's plans and a complete inspection are needed before a U.S. flag vessel is certificated and allowed to carry

"... LNG and LPG are only two of the many bulk hazardous commodities transported by water, and many other commodities exhibit as great or even greater hazards."

cargo. Thereafter, biennial inspections are required to maintain a valid Certificate of Inspection. For foreign flag vessels, a Letter of Compliance (LOC) is required. Biennial examination of foreign flag vessels is necessary for the renewal of an LOC. Additionally, expiration of a vessel's IMCO Certificate of Fitness, changes of vessel ownership, or changes of vessel registry invalidate the Letter of Compliance; the latter two circumstances must be reported to the Coast Guard. Although they do not automatically result in invalidation of the LOC, damage, repairs, or modifications to the cargo containment system must also be reported to the Coast Guard.

The basic regulatory requirements for the design, construction, and testing of liquefied gas ships are contained in 46 CFR 154; additional requirements are found in various other subchapters under 46 CFR addressing marine safety. The Coast Guard regulations parallel the recommendations of the IMCO Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk, except that they are more stringent concerning allowable stress levels, crack arresting steels, lower ambient temperatures, and cargo temperature/pressure controls. For both U.S. and foreign flag carriers, the Coast Guard is concerned with the design and arrangement of cargo tanks and cargo piping and vent systems; the arrangement and adequacy of installed fire extinguishing systems and equipment, and structural fire protection; safety systems designed to give warning of leaks or other disorders which could result in a casualty;

compatibility of the cargo with materials of construction; hull steel; cargo pressure and temperature control; segregation of the cargo spaces from the machinery working spaces and accommodation spaces; and the suitability of electrical equipment installed in hazardous areas.

In addition, IMCO has developed standards for existing liquefied gas carriers. The Coast Guard intends to implement elements of the IMCO Existing Ships Code that exceed current United States requirements, and has established a task group to draft the regulations. This intent has been published as an Advance Notice of Proposed Rulemaking entitled "Construction and Equipment of Existing Self-Propelled Vessels Carrying Bulk Liquefied Gases," Federal Register, Volume 42, Number 126, 30 June 1977.

FACILITIES AND OPERATIONAL CONTROLS

The Coast Guard has statutory authority to regulate and control port safety and security related matters. Presently, all bulk liquid and bulk liquefied gas facilities are regulated under the provisions of 33 CFR 126. These regulations, originally written in the 1960's, are being rewritten to reflect the vast changes in chemical transportation technology. The Coast Guard's Waterfront Facilities Task Force is revising, expanding, and developing Coast Guard waterfront facility regulations. Among these new regulations are comprehensive LNG facility rules; LPG facility rules will follow later. These rules were published as an Advance Notice of Proposed Rulemaking in August 1978. It is anticipated that final regulations will be published in 1980.

Under the authority of the Natural Gas Pipeline Safety Act, the Office of Pipeline Safety Regulation (OPSR) of the Materials Transportation Bureau has also prepared regulations for LNG facilities. In order to eliminate possible LNG water front facility regulation overlap and conflict, and to assist the owners and operators of LNG facilities subject to both Coast Guard and OPSR regulations, a Memorandum of Understanding was signed by the two agencies. Under the Memorandum of Understanding, the Coast Guard is responsible for establishing regulatory requirements for facility site selection as it relates to management

"Generally speaking, the hazards of LNG and LPG are not well understood by the public, nor . . . put into perspective with the hazards from other, more common dangerous materials such as gasoline."

of vessel traffic in and around the facility; fire prevention and fire protection equipment, systems and methods for use at a facility; facility security; and all other matters pertaining to the facility between the vessel and the last manifold (or valve) immediately before the receiving tank(s).

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LNG AND LPG.....

OPERATIONS PLANS

The local COTP establishes the need for special operating constraints for LNG and LPG vessels utilizing facilities in his area. He may require additional safety measures to be taken by the operators of LNG and LPG vessels and waterfront facilities as presented in local LNG/LPG Operations Plans.

In conjunction with the LNG/LPG Operations Plan, the COTP will develop an LNG/LPG Emergency Contingency Plan for the port area. The plan will provide for a coordinated approach to an LNG or an LPG emergency. Preplanning with the maritime industry and with other federal, state, and local agencies will result in a comprehensive response organization with a complement of materials, equipment, and training needed to deal with such emergencies.

"For both LNG and LPG, a sizable body of knowledge exists to ensure that containment systems on vessels and facilities present minimal danger under normal operating conditions."

To date, no serious marine mode LNG incidents have been reported by Coast Guard Captains of the Port. Casualties from LPG incidents have been few. Furthermore, there has been no environmental damage from the release of LNG or LPG while being transported in the marine mode. Through the development of comprehensive waterfront facility regulations and operations plans, it is expected that this safety record will be maintained.

PERSONNEL TRAINING AND QUALIFICATIONS

The Coast Guard's traditional responsibility of protecting lives and property at sea and the recent additional responsibility for the protection of the environment include the establishment of qualifications for licensing and certification of merchant marine personnel serving aboard U.S. merchant vessels. The general areas of training include firefighting, cargo hazards, cargo handling systems, and procedures pertaining to the carriage of LNG.

Although the United States pioneered LNG and LPG technology, most shipping experience has been gained by foreign flag vessels on voyages not subject to Coast Guard jurisdiction. In the United States there has been a greater emphasis on crew training by formal schooling than by on-the-job training, as practiced in most cases by foreign flag crews. Nevertheless, the U.S. Coast Guard determined that standards for manning and personnel qualification for U.S. flag LNG and LPG vessels will be applied to foreign flag LNG and LPG vessels operating in U.S. waters.

Present personnel qualification standards require that the Master, Chief Mate, Chief Engineer, and First Assistant Engineer have satisfactorily completed a course of instruction in the carriage and transfer of

liquefied gases as well as firefighting. A company initiated letter indicating the completion of a flag administration approved training course will serve as evidence of this training. The qualification standards require that all officers and ratings with specific duties involving cargo and cargo equipment complete a course of instruction, or onboard training, reflecting the duties performed. All crew members must also have training or onboard instruction in the special hazards of LNG and LPG, and an awareness of the general safety features of the vessel.

Presently, for U.S. crewmen intending to serve on LNG vessels, courses of instruction at the Harry Lundeberg School of Seamanship, the Calhoun MEBA Engineering School, and the Marine Institute of Technology & Graduate Studies are accepted by the Coast Guard on an interim basis, pending the formalization of appropriate regulations.

Coast Guard Captains of the Port evaluate the certification and training received by officers and crews of foreign flag LNG and LPG vessels using the IMCO Conference on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, Regulation V/3 and Resolution 12, as a measure of equivalency to U.S. standards.

Coast Guard regulations regarding LNG and LPG facility personnel requirements are contained in 33 CFR Part 126. Definite training and qualification requirements are not given in these regulations. It is, however, specified that the "person in charge" of the shoreside transfer operation must be trained in, and capable of performing competently, the necessary operations related to the transfer of the specific cargo. While these requirements vary due to the differences in facility operations, basic training in cargo characteristics, safety measures, and firefighting are universally required.

At the present time, the draft "Tankerman" regulations are in the process of further revision and should be published as a Notice of Proposed Rulemaking by 1980, with a final rule published soon thereafter. New proposed regulations under the Natural Gas Pipeline Safety Act will include training and qualification standards for LNG and LPG facility personnel. Also, regulations are under development which will require certain training standards for all personnel working at facilities handling bulk liquefied gas cargoes.

"The primary preventive measures are good vessel design, stringent operational controls, and proper personnel training."

CONCLUSION

There must be no doubt that LNG and LPG are hazardous commodities, although not the most dangerous being shipped today. Their very low human toxicity alone makes them less dangerous than many

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commodities. It is because of the fire and explosion hazards that the Coast Guard and many others have performed extensive research studies on these materials. From these studies, some of which are continuing, the Coast Guard believes that the nature of both LNG and LPG presents an acceptable risk for transportation in maritime commerce. These fuels are essentially pollution free and are energy sources that heretofore were commonly wasted; an unjustified overemphasis on safety could deprive the United States of a very valuable energy source.

CG-478, "Liquefied Natural Gas and Liquefied Petroleum Gas, Views and Practices, Policy and Safety," is a presentation of the Coast Guard position toward LNG and LPG. Though hazardous, these two cargoes present acceptable risks to society when the precautions established by the Coast Guard are followed.

Doctor Alan L. Schneider

Dr. Alan L. Schneider earned his Doctorate in chemical engineering in 1973 from the Massachusetts Institute of Technology. He has been working as a chemical engineer since 1974 with the Cargo and Hazardous Materials Division, Technical Support Section of the Hazard Evaluation Branch at Coast Guard Headquarters. In this field, Dr. Schneider is concerned with liquefied natural gas, fire and explosion phenomena, and computer simulation of cargo releases.

Dr. Schneider frequently contributes to the *Proceedings*. His two most recent articles were "LNG Research Overview," which appeared in the March-April 1979 issue, and "Blame it on Combustion," published in the October 1979 issue.

About the Authors

Lieutenant Gary L. Gregory

Lieutenant Gregory, a graduate of the University of California at Davis, was commissioned as an Ensign in the Coast Guard in January 1971. He first served aboard the USCG cutter CHASE, out of Boston; then completed a tour at the Marine Safety Office, San Francisco before being assigned as Operations Officer aboard the cutter BIBB. After one year in the Eleventh District's Office of Merchant Marine Safety, Long Beach, California, he spent several months in port safety industry training at Baltimore. Lieutenant Gregory was assigned to Coast Guard Headquarters in July 1977, where his present duties involve safety-related aspects of the Coast Guard's Port Safety and Security program, particularly program policy guidance for Captains of the Port and Marine Safety Offices.

Lieutenant John S. Sedlak

Lieutenant Sedlak attended the U.S. Coast Guard Academy, graduating with a commission of Ensign in 1974. He served aboard the USCG cutter SHERMAN as an engineering student before receiving his present assignment at Headquarters, where he is an engineer on the Merchant Marine Technical Division staff. His primary duties include the administration of the Coast Guard's Letter of Compliance program for foreign flag liquefied gas carriers, plan review of these vessels, and approval of new concepts for liquefied gas containment system designs.

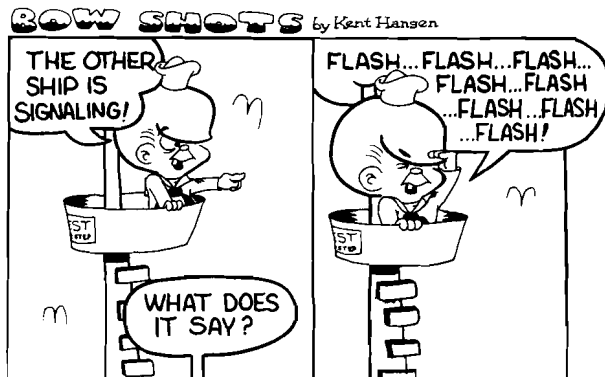
KEYNOTES.....

for an advanced notice of proposed rulemaking (ANPRM) in October 1980.

A complete listing of all Coast Guard proposed regulations, both "significant" and "non-significant," appeared in the Thursday, February 22, 1980 Federal Register (45 FR 13312).

THE COAST GUARD HAS NO PUBLIC HEARINGS SCHEDULED AT THIS TIME FOR APRIL OR MAY.

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OPERATION PHYSICIAN

By Photojournalist Jim McGranachan
Third Coast Guard District
Governors Island, New York

Doctors from the U.S. Public Health Service, Physicians Assistants and a variety of personnel from the United States Coast Guard are participating in a new program to further integrate their combined knowledge and skills. During 1978, the Coast Guard assisted in 2,295 medical evacuation cases in which Public Health Service doctors played an integral part in the decision to launch rescue operations. This caseload, along with the potential for disaster inherent in air-sea rescue operations, magnifies the intentions of the program designers.

On February 17, 1979, three U.S. Coast Guardsmen and a member of the Canadian Forces Rescue Service died when their helicopter crashed into 15-foot winter seas. They were attempting to evacuate an injured crewman aboard a Japanese fishing vessel, 180 miles southeast of Cape Cod, Massachusetts. This accident, which claimed four lives, is further evidence of the nature of the business. A rescue operation at sea is a reasonably risky venture at best.

Today, when the Coast Guard responds to the call for help, one of the Coast Guard Rescue Coordination Centers coast to coast, including Alaska and Hawaii, will assume coordination of the forces activated to conduct both land and air-sea rescues. When confronted with a medical emergency--often hundreds and sometimes thousands of miles at sea--the controllers who man these centers must rely on the medical advice of doctors from the Public Health Service when deciding if and how human resources should be committed to individual medical evacuation cases.

In June 1979, Coast Guard Headquarters issued instructions which stressed the necessity of good and meaningful communications between rescue coordinators and medical personnel during the course of medical emergencies at sea. The instruction noted that, "The U.S. Public Health Service has historically provided medical advice by radio to ships at sea. U.S. Public Health Service (USPHC) physicians have also provided advice to the Coast Guard

forces. Frequently, however, USPHS personnel are unfamiliar with Coast Guard Search and Rescue (SAR) operations and with Coast Guard aircraft and vessels."

In response to these instructions, Lieutenant Stephen J. Harvey, senior controller at the Coast Guard Atlantic Area Rescue Coordination Center, Governors Island, New York, has begun to implement an orientation program he helped to design. "The intention," says Harvey, "is to familiarize doctors of the U.S. Public Health Service with air-sea rescue techniques. The method is to physically expose these physicians to the hardships and inherent dangers of rescue operations at sea. The desired result is to maximize the ability of all involved personnel to weigh the risks to the lifesavers versus the needs of a victim."

Among the first medical personnel to participate in the new program were Dr. Catherine Fitzpatrick and Dr. Daniel Kim of the U.S. Public Health Service and

Continued on next page.....

OPERATION PHYSICIAN.....

Chief Warrant Officer Ray Leyko, a Coast Guard Physician's Assistant. The three medical officers were first introduced to the intricacies of helicopter operations during a thorough briefing at the Coast Guard Air Station, Brooklyn, New York. Lieutenant Harvey then escorted the medical group to Rockaway, New York, where they boarded the Coast Guard Cutter CAPE STRAIT for some "hands on" experience.

The idea seems to have accomplished a number of objectives. Dr. Fitzpatrick explained, "Because medical evacuations often seem to run so smoothly, we doctors tend to take for granted the sheer dynamics of getting a

helicopter to rendezvous with ships at sea. To evacuate patients from rolling heaving decks, often at night during the worst weather conditions, is indeed an impressive achievement. Having now shared in the experience of being lifted from the deck of a moving ship, I feel that I have greater insight, a more accurate basis from which to make operational medical recommendations."

This is exactly the reaction Lieutenant Harvey hoped to achieve when he organized the program. He noted, "The advantage of having physicians hoisted is that the rescue coordinators and the physicians will be able to communicate in the same language. There is nothing like doing a hoist yourself. Trying to main-

tain balance on the pitching deck of a ship, bouncing around in a dangling basket, hearing the roar of helicopter engines are all factors that a patient is exposed to during a medical evacuation. We do not want the physicians to become overcautious when considering the evacuation of a patient, but we do want the physicians to appreciate exactly what is involved in this type of operation."

As the CAPE STRAIT brought its medical passengers to a helicopter rendezvous at sea, its captain, Lieutenant Junior Grade Jeffery Huhn, acquainted his guests with his cutter. Besides receiving a taste of shipboard life,

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Lieutenant Stephen J. Harvey, senior coordinator at the U.S. Coast Guard Atlantic Area Rescue Coordination Center, Governors Island, New York, explains the intricacies of helicopter operations to Dr. Daniel Kim of the U.S. Public Health Service.



OPERATION PHYSICIAN.....

they talked in depth to members of the crew, learning about the problems and hazards they face during rescue operations.

A helicopter from Brooklyn Air Station met the CAPE STRAIT a few miles outside New York Harbor in the Atlantic Ocean. This gave the medical officers an opportunity to watch the harmony of an aircraft and a ship working closely together. More importantly, it gave them a chance to actually feel the sensations associated with being lifted from a moving ship and flying in a helicopter.

As were the others, Dr. Kim was enthusiastic about the experience. "This exercise made me aware of the forces set into motion when I make a recommendation to the Coast Guard for a medical evacuation," said Dr. Kim. "I can now visualize what actually happens out there. I have a better feel for what I am actually asking those young men to do."

When asked to summarize her thoughts about the orientation, Dr. Fitzpatrick observed, "A program like this counters the tendency for specialists to be isolated in their own areas. Participating on the open ocean in an air-sea rescue operation gave me a greater

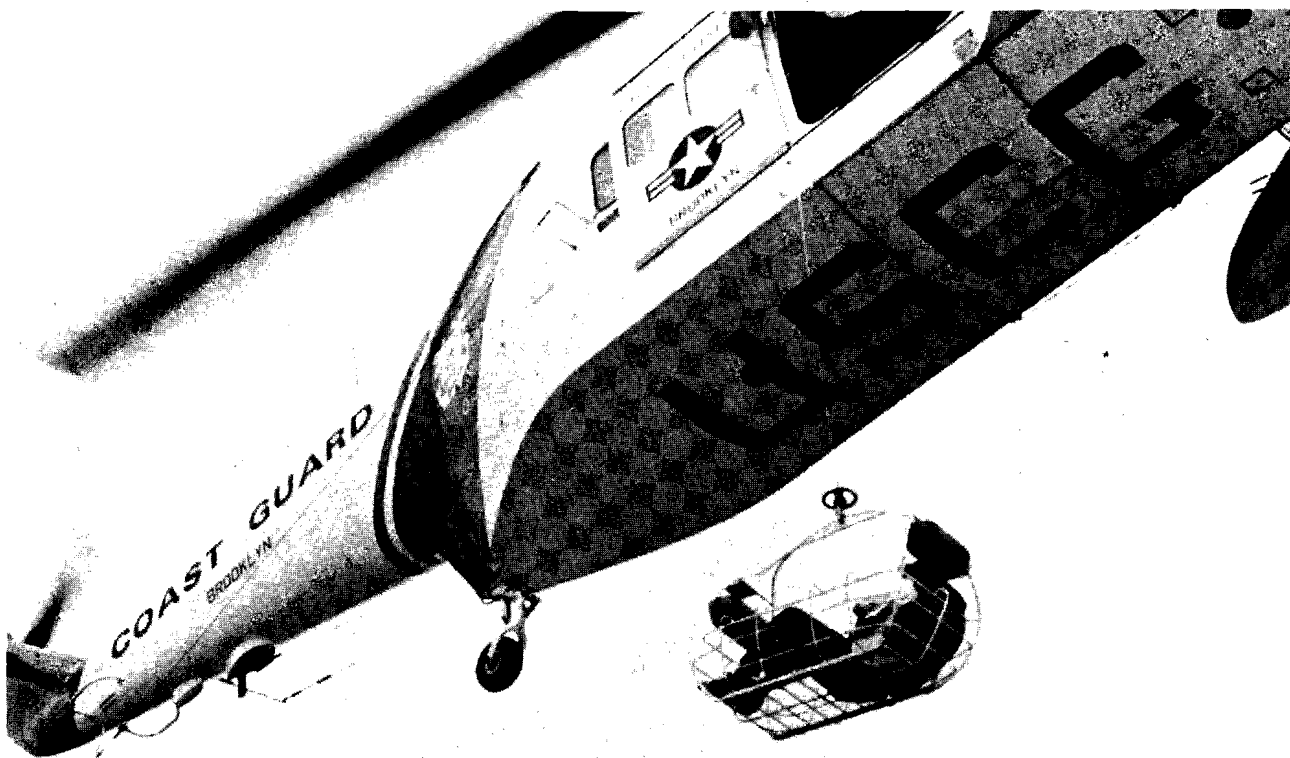
awareness of what can and can not be done on the open seas. The safety of many people can be involved when a medical evacuation is necessary. Thanks to this orientation program, I feel better equipped to make the proper decision when I am called to make an operational medical recommendation."

Dr. Fitzpatrick also commented on another aspect of the program which she appreciates.

"Working in the field with the Coast Guard," she said, "definitely left me with the feeling of being part of a proud lifesaving team."

(Reprinted from *On Scene*, the National Maritime SAR Review, issue No. 5/6-79).

Dr. Kim experiences first-hand the sensation of being hoisted from a moving ship to a Coast Guard helicopter. After participating in the new program, Dr. Kim and the other physicians felt better prepared to make operational medical recommendations associated with air-sea rescue operations, having learned of the methods and problems which might be encountered.



Lessons from Casualties

A mate on an uninspected towing vessel drowned after falling off the side of a tank barge while the vessel was moored at night on the Lower Mississippi River.

Preceding this accident, the tank barge had conducted crude oil offloading operations. At the time of unloading, a leak occurred at an elbow in the loading arm, which ran down the arm and dripped on the starboard (stern) deck of the tank barge inboard of the gunwale but outboard of the cargo header drip pan. A witness stated that throughout the transfer no more than one or two gallons of product leaked onto the deck. A granular

absorbent material was placed on the deck area involved in order to prevent water pollution.

After the barge was moored following offloading operations, the mate was walking on the starboard side of the tank barge toward the towboat. The only illumination on the barge was from a search light on the tug, which was aimed toward shore. A splash was heard by two workers on the other side of the barge. They ran to the spot where they could hear struggling in the water. The mate was not wearing a personal flotation device; attempts to rescue him were unsuccessful.

An investigation of the area where the mate was believed to have fallen overboard indicated that it was in the vicinity of the spilled oil. In addition, there were numerous deck fittings for mooring, steam coil deck bleed-off valves, and the loading and unloading header.

This casualty points out the importance for adequate deck illumination, the necessity to thoroughly clean up oil spilled on deck, and the need for a company policy requiring employees to wear lifesaving devices whenever working over or near the water.

Nautical Queries

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

DECK

(1) Which of the following are the only magnetic compass correctors that correct for both permanent and induced effects of magnetism?

- A. Quadrantal spheres
- B. Heeling magnets
- C. Athwartship magnets
- D. Fore - and - Aft magnets

REFERENCE: H.O. 226, Handbook of Magnetic Compass Adjustment

(2) The precession of the equinoxes occurs in a

- A. easterly direction.
- B. westerly direction.
- C. northerly direction.
- D. southerly direction.

REFERENCE: Bowditch

(3) The difference between local apparent time (LAT) and local mean time (LMT) is indicated by the

- A. equation of time.
- B. difference of longitude between the local and central meridian in time units.
- C. longitude in time units.
- D. zone description.

REFERENCE: Bowditch

(4) A claim for cargo damages may be held against the shipowner if such damage is the result of failure of the ship's officer to

- A. ensure the fitness and safety of cargo spaces.

- B. ensure adequate packaging of the cargo.
- C. prevent delays due to quarantine restrictions.
- D. correct all defects in the ship's construction.

REFERENCE: Marine Cargo Operations by Sauerbier

(5) The S.S. Long Trip is in the port of Singapore. Before the vessel is allowed to sail, the master must raise funds to pay for required stores. The master raises the money by securing a loan on the cargo. What legal term describes the method he used to secure the loan?

- A. Chattel mortgage
- B. Shipowner's liability
- C. Continuing obligation
- D. Hypothecation

REFERENCE: The Law of Seamen by Martin J. Norris

ENGINEER

(1) When the lower edge of the spiral begins to uncover the release port in a jerk pump, the

- A. pumping continues until the plunger travels its fill stroke.
- B. effective pumping stroke of the plunger ends.
- C. pressure drops slowly until the full stroke is attained.
- D. plunger rotates to the zero delivery position until the next stroke.

REFERENCE: Maleev

(2) The distillate pump of an evaporator rated at 12000 gpd should be rated at a minimum of

- A. 8.3 gpm.
- B. 50 gpm.
- C. 100 gpm.
- D. 150 gpm.

REFERENCE: Osbourne

(3) What does it mean if a submerged tube type evaporator operating at above atmospheric pressure requires constantly increasing coil pressure to maintain capacity?

- A. Heat transfer surfaces are being coated with scale.
- B. The brine density is not proper.
- C. Impure distillate is being produced.
- D. Vapor pressure is constantly increasing.

REFERENCE: Osbourne

(4) What statement is true concerning Halon 1211 fire extinguishing equipment?

- A. The agent is less effective than CO₂.
- B. Halon 1211 extinguishes the fire by smothering.
- C. The agent leaves no residue.
- D. All of the above.

REFERENCE: Marad Fire Fighting Manual

(5) What statement is true concerning Bunker C vapors?

- A. The vapor cannot be ignited by a spark unless the vapor is at its flash point.
- B. The vapor is nontoxic in all concentrations.
- C. The vapor cannot be ignited by a spark unless it is at its autoignition temperature.
- D. The vapor is heavier than air.

REFERENCE: CG-174

ANSWERS

Deck

1. B; 2. B; 3. A; 4. A; 5. D

Engineer

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

MERCHANT MARINE SAFETY PUBLICATIONS

The following publications may be obtained from the nearest marine safety office, marine inspection office or by writing: **Commandant (G-CMA/TP26), U.S. Coast Guard, Washington, DC 20593.** Because changes to the rules and regulations are made from time to time, these publications can be kept current between revisions only by referring to the Federal Register. (Official changes to all Coast Guard authored federal regulations are published as final rules in the Federal Register on Mondays or Thursdays.) Following the title of each publication in the table below are the dates of the most recent editions and changes, if any.

The Federal Register may be obtained by subscription (\$5 per month or \$50 per year) or by individual copy (75 cents each) from SupDocs, U.S. Government Printing Office, Washington, DC 20402.

CG No.

TITLE OF PUBLICATION

NOTE: This is a newly revised list; please check carefully for changes.

- CG-101-1 Specimen Examinations for Merchant Marine Deck Officers (2nd and 3rd Mate) (4-1-77).
 - CG-101-2 Specimen Examinations for Merchant Marine Deck Officers (Master and Chief Mate) (7-1-78).
 - CG-108 Rules and Regulations for Military Explosives and Hazardous Munitions (4-1-72). FR 7-21-72, 12-1-72, 6-18-75, 9-26-77.
 - CG-115 Marine Engineering Regulations (8-1-77). FR 9-26-77, 10-10-78, 11-16-78, 12-4-78, 3-12-79, 5-3-79.
 - CG-123 Rules and Regulations for Tank Vessels (8-1-77). Ch-1, 4-78. FR 1-3-77, 8-18-77, 9-12-77, 9-26-77, 9-29-77, 1-11-79, 3-12-79, 5-3-79, 6-14-79, 7-2-79, 11-19-79, 12-27-79, 1-31-80.
 - CG-169 Navigation Rules - International - Inland (5-1-77). FR 7-11-77, 7-14-77, 9-26-77, 10-12-77, 11-3-77, 12-6-77, 12-15-77, 3-16-78.
 - CG-169-1 Colregs Demarcation Lines (7-15-77).
 - CG-172 Rules of the Road - Great Lakes (7-1-72). FR 10-6-72, 11-4-72, 1-16-73, 1-29-73, 5-8-73, 3-29-74, 6-3-74, 11-27-74, 4-16-75, 4-28-75, 10-22-75, 2-5-76, 1-13-77, 11-3-77, 12-6-77.
 - CG-174 Manual for the Safe Handling of Flammable and Combustible Liquids and Other Hazardous Products (9-1-76).
 - CG-175 Manual for Lifeboatmen, Able Seamen, and Qualified Members of Engine Department (3-1-73).
 - CG-176 Load Line Regulations (2-1-71). FR 10-1-71, 5-10-73, 7-10-74, 10-14-75, 12-8-75, 1-8-76, 7-24-78.
 - CG-177 Yacht Admeasurement and Documentation (9-72).
 - CG-182-1 Specimen Examinations for Merchant Marine Engineers License (2nd and 3rd Assistant) (4-75).
 - CG-182-2 Specimen Examinations for Merchant Marine Engineer Licenses; First Assistant Engineer, Steam and Motor, any Horsepower (4-76).
 - CG-182-3 Specimen Examinations for Merchant Marine Engineer Licenses; Chief Engineer Steam and Motor, any Horsepower (4-76).
 - CG-184 Rules of the Road--Western Rivers (8-1-72). FR 9-12-72, 12-28-72, 3-8-74, 3-29-74, 6-3-74, 11-27-74, 4-16-75, 4-28-75, 10-22-75, 2-5-76, 3-1-76, 6-10-76, 7-11-77, 12-6-77, 12-15-77.
 - CG-190 Equipment Lists (8-1-77).
 - CG-191 Rules and Regulations for Licensing and Certifying of Merchant Marine Personnel (11-1-76). FR 3-3-77, 5-16-77, 8-8-77, 4-9-79, 12-6-79.
 - CG-227 Laws Governing Marine Inspection (7-1-75).
 - CG-239 Security of Vessels and Waterfront Facilities (5-1-74). FR 5-15-74, 5-24-74, 8-15-74, 9-5-74, 9-9-74, 12-3-74, 1-6-75, 1-29-75, 4-22-75, 7-2-75, 7-7-75, 7-24-75, 10-1-75, 10-8-75, 6-3-76, 9-27-76, 2-3-77, 3-31-77, 7-14-77, 7-28-77, 9-22-77, 9-26-77, 12-19-77, 1-6-78, 1-16-78, 3-2-78, 11-16-78, 1-22-79, 1-25-79, 2-12-79, 11-5-79, 12-10-79, 1-31-80.
 - CG-242 International Conventions & Conferences on Marine Safety (6-51).
 - CG-257 Rules and Regulations for Cargo and Miscellaneous Vessels (9-1-77). Ch-1, 3-17-78. FR 9-26-77, 9-29-77, 10-10-78, 1-11-79, 3-12-79, 5-3-79, 6-14-79, 7-2-79.
 - CG-258 Rules and Regulations for Uninspected Vessels (4-77). FR 9-26-77, 9-29-77, 6-14-79, 7-2-79, 12-17-79.
 - CG-259 Electrical Engineering Regulations (7-1-77). FR 9-26-77, 10-10-78, 11-16-78, 12-4-78.
 - CG-268 Rules and Regulations for Manning of Vessels (7-1-77). FR 11-19-79.
 - CG-293 Miscellaneous Electrical Equipment List (6-73).
 - CG-323 Rules and Regulations for Small Passenger Vessels (7-1-77). Ch-1 3-17-78. FR 9-26-77, 10-25-77, 12-15-77, 7-17-78, 3-12-79, 6-14-79, 7-2-79, 12-13-79.
 - CG-329 Fire Fighting Manual for Tank Vessels (1-1-74).
 - CG-388 Chemical Data Guide for Bulk Shipment by Water (1976).
 - CG-403 Great Lakes Pilotage Regulations (7-76).
 - CG-439 Bridge to Bridge Radiotelephone Communications (12-1-72). FR 12-28-72, 3-8-74, 5-5-75, 7-11-77.
 - CG-467 Specimen Examinations for Uninspected Towing Vessel Operators (10-1-74).
 - CG-474 When You Enter That Cargo Tank (3-76).
 - CG-478 Liquefied Natural Gas, Views and Practices, Policy and Safety (2-76).
 - CG-480 Oil Pollution Control for Tankermen (6-75).
 - CG-482 Benzene Safe Handling Practices (12-76).
 - CG-486 Shippers Guide to Hazardous Materials Regulations (Water Mode) (8-77).
 - CG-491 Safety for Small Passenger Vessels (8-77).
 - OLD CG-497, Rules and Regulations for Recreational Boating (12-78), now M 16752.2 (12-78) FR 7-19-79.
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**Under revision--CG-176 text can be found in Title 46 CFR Parts 41-69

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