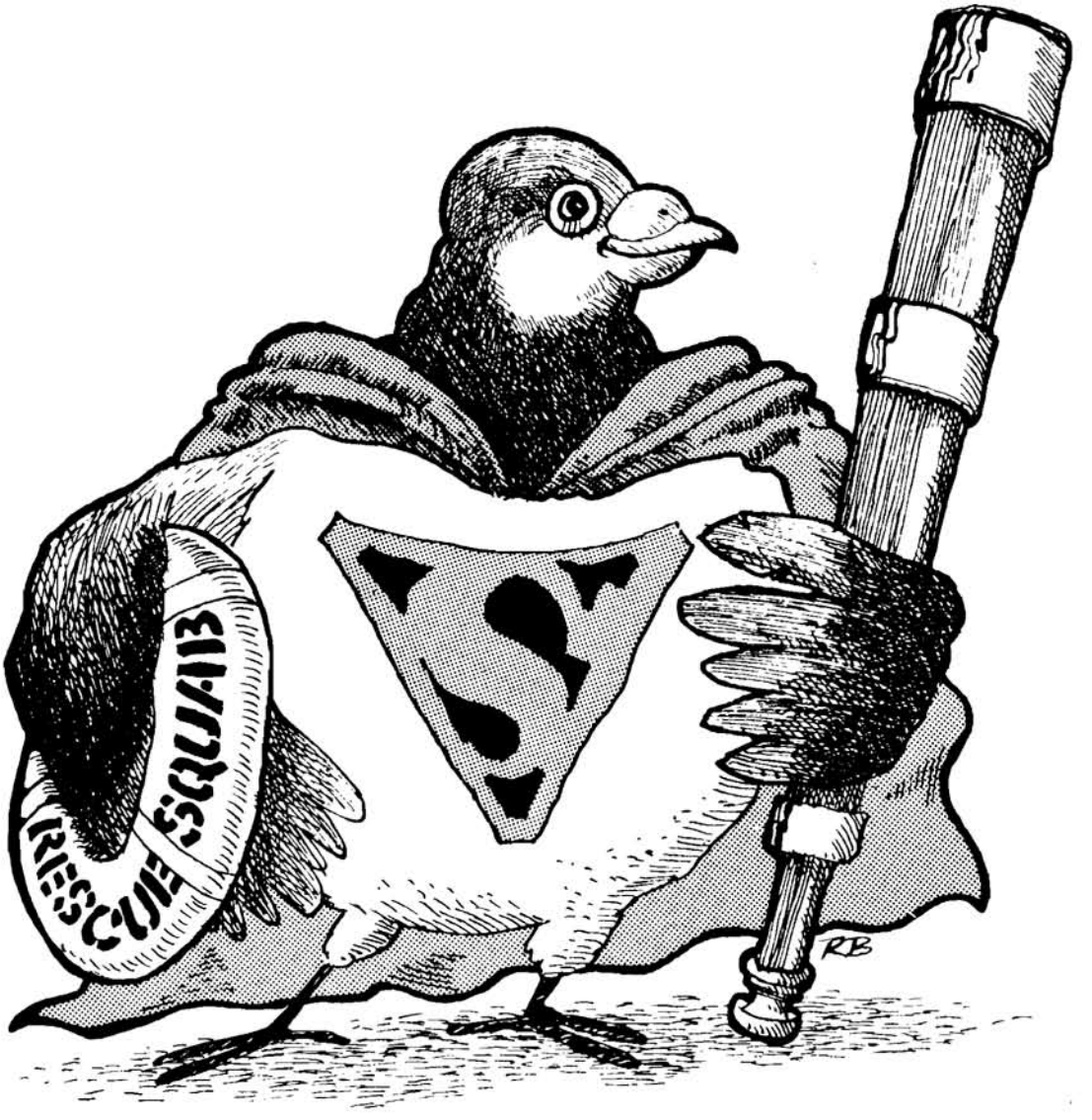
Proceedings
of the Marine Safety Council

Vol. 38, No. 9
December 1981



By Robert Barkin—The Washington Post

U.S. Department of Transportation
U.S. Coast Guard

CG-129

Proceedings
of the Marine Safety Council

Published monthly by the Commandant, USCG, in the interest of safety at sea under the auspices of the Marine Safety Council. Special permission for republication, either in whole or in part, with the exception of copyrighted articles or artwork, is not required provided credit is given to the Proceedings of the Marine Safety Council. The views expressed are those of the authors and do not represent official Coast Guard policy. All inquiries and requests for subscriptions should be addressed to Commandant (G-CMC), U.S. Coast Guard, Washington, DC 20593; (202) 426-1477. Please include mailing label when sending in a change of address. The Office of the Secretary of Transportation has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this agency. Use of funds for printing this publication has been approved by the Director of the Office of Management and Budget through May 31, 1984.

DIST. (SDL No. 114)
A: acde(2); fghklmntuv(1)
B: n(50); c(16); e(5); f(4); gj(3); r(2); bkiq(1)
C: eglmp(1)
D: adgklm(1)
E: mn(1)
F: abcdehjkloqst(1)
List TCG-06

When you have finished reading this issue, please pass it on.

Contents

features

departments

cover

Specially trained pigeons can greatly increase the Coast Guard's chances of finding people lost at sea. These pigeons, which are attached to search and rescue team helicopters, have learned to signal the crew when they see orange, red, or yellow objects (read: life preservers and other survival equipment) on the surface of the water. "Sea Hunt: A Bird's-eye View" begins on page 232. Cover drawing courtesy of The Washington Post

Maritime Sidelights

New Marine Lifting Equipment Code Published by LR

The first comprehensive code covering all lifting appliances intended for marine applications has been published by Lloyd's Register of Shipping.

Entitled "Code for Lifting Appliances in a Marine Environment," the new code, claim LR officials, is the first design standard in its field providing requirements for a range of lifting appliances such as ships' cranes and derricks, offshore and floating cranes, launch and recovery systems for diving operations, lifts, ramps, and mechanical lift docks.

The chapter dealing with offshore cranes and submersible launching and recovery systems, LR states, fulfills a need in the offshore industry for guidance on environmental factors affecting such equipment. This is also the first time that the society's certification requirements have been established for floating cranes, mechanical lift docks, and shipboard lifts and ramps.

The code contains procedures for meeting both the requirements of national governments for the certification of ships' cargo gear and the requirements, where applicable, for the classification of marine lifting equipment.

Coinciding with the issue of the code, Lloyd's Register has introduced new class notations covering lifting equipment of all kinds installed on ships. In the case of specialized vessels such as floating cranes, offshore crane barges, and diving support ships building to LR class, the lifting equipment will automatically be included in the classification of the vessel starting in December 1981. In addition, optional class notations have been introduced for shipboard cranes, derricks, passenger and vehicle lifts, and ramps installed on board LR-classed ships.

The new code, which supersedes the existing "Code of Practice for the Construction and Survey of Ships' Cargo Handling Gear," is available from Lloyd's Register's Printing House, Garrett House, Manor Royal, Crawley, England, or from LR's local offices.

(Reprinted from the October 1, 1981, issue of Maritime Reporter and Engineering News)

New Radiotelephone Handbook for Mariners Published

A new handbook to aid boatmen, fishermen, and other mariners in the proper use of marine radiotelephones has been published by the Radio Technical Commission for Marine Services (RTCM).

The booklet, entitled "Marine Radiotelephone Users Handbook," was produced with the new marine radiotelephone owner in mind, although it contains valuable reference information for all marine radio users. It was researched and written by a special task force representing radiotelephone manufacturers, the Federal Communications Commission (FCC), the Coast Guard and other marine-related Government agencies, the U.S. Power Squadrons and U.S. Coast Guard Auxiliary, the marine radio services of AT&T, boating writers, and professional shipmasters.

Included in its 104 pages are sections on radiotelephone licenses and how they are obtained, installation, selecting and using the correct channels for VHF/FM, single sideband radios for long-range communications, routine and emergency operating procedures with sample scenarios for ordinary and distress calls, and procedures for placing a call through the telephone company to or from a vessel underway.

An appendix includes listings of all FCC field offices, a map of U.S. Coast Guard radio stations ashore, a listing of all stations broadcasting continuous weather forecasts, and the locations, addresses and frequencies of all VHF/FM and medium/high frequency public coast stations (marine operators).

The new handbook is offered at a single copy price of $5.00. Single copies are available from most marine electronics and boating equipment dealers. Quantity discounts are available to dealers for resale or for group purchases by educational organizations from RTCM, c/o FCC, P.O. Box 19087, Washington, DC 20036; (202) 296-6610.

NVCs on New Inland Rules Ready

The new Navigation and Vessel Inspection Circulars announced in last month's Proceedings are now available. Order numbers for these NVCs, which provide exercises on the new Inland Navigation Rules for license renewals, are as follows:

NVC 11-81 Renewal of Deck Officers' Licenses
NVC 12-81 Operators' and Motorboat Operators' Licenses

Orders should be addressed to: Commandant (G-MP-4), U.S. Coast Guard, Washington, DC 20593. ‡

The Marine Safety Council
wishes you all
a happy holiday season.

The following items of general interest were published between September 22, 1981, and October 22, 1981:

Final rules: CGD 2-81-01 Safety Zone Upper Mississippi River, Mile 633.7 to 636.7, October 1, 1981. CGD 79-171 Establishment of Special Anchorage Area Muskegon Lake East, Muskegon, Michigan, October 1, 1981. CGD 3-80-4A Anchorage Regulations, New London Harbor, Connecticut, October 1, 1981. CGD 3-80-5A Special Anchorage Area, Manhasset Bay, New York, October 1, 1981. CGD 81-024 Drawbridge Operation Regulations, Bayou Plaquemine Brule, Louisiana, October 1, 1981. CGD 5-80-20R, Drawbridge Operation Regulations, Cambridge Harbor, Maryland, October 1, 1981. CGD 3-81-16-R Safety Zone: Arthur Kill, New York, October 22, 1981.

Interim final rule: CGD 77-028 Anchorage Grounds, Mississippi River Below Baton Rouge, Louisiana, Including South and Southwest Passes, October 8, 1981.

Notices of proposed rulemaking (NPRMs): CGD 5-81-08-R Drawbridge Operation Regulations, Wrightsville Beach, North Carolina, October 1, 1981. CGD 81-061 Drawbridge Operation Regulations, Amite River, Louisiana, October 5, 1981. CGD 81-061 Drawbridge Operation Regulations, North Landing River (AIWW), Virginia; U.S. Government Bridge at Chesapeake, October 8, 1981.

Advance notice of proposed rulemaking (ANPRM): CGD 80-093 Prince William Sound Vessel Traffic Service, Loran-C position Transmitting System (LPTS), October 19, 1981.

Notices: CGD 81-077 Ship Structure Committee, Notice of Meeting, September 28, 1981. CGD 81-074 Port Access Route, Notice of Study Results, October 5, 1981. CGD 81-075 Port Access Route, Notice of Study Results, October 8, 1981. CGD 78-041 Tank Vessel Operations, Puget Sound, Washington, Notice of Availability of Studies, October 19, 1981.

Emergency rule: CGD 5-81-07 Marine Event: Yorktown Bicentennial Celebration, York River, Yorktown and Gloucester Point, Virginia, October 13, 1981.

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

* * *

Casualty Reporting Requirements CGD 76-170 and 170a

Revisions may be forthcoming in casualty reporting requirements.

Requirements were changed in an interim final rule published in the Federal Register on November 24, 1980. Under the new rule, casualties have to be reported if they result in property damage amounting to $25,000 or more (under the old rule, this figure was $10,000). Occurrences which adversely affect a vessel's fitnesss for service (fire, flooding, damage to safety apparatus, etc.) are also to be reported. Steering or propulsion casualties have been made separate reporting incidents. Diving casualties have been made reportable incidents. Some intentional groundings, on the other hand, no longer need to be reported.

On October 8, 1981, the Coast Guard published confirmation of the effective date of this rule (January 1, 1981) and a notice of intent in the Federal Register. Many comments have been received about the interim final rule, bringing to light such problems as possible duplication resulting from the reporting requirements of the Occupational Safety and Health Administration. Development of a proposal for revision is now under consideration. Comments should be submitted to the Marine Safety Council at the address shown above. For further information about this rule, contact CAPT D. A. Frankenhauser, Planning and Special Projects Staff (G-MP), U.S. Coast Guard Headquarters, Washington, DC 20593.

Life Floats and Buoyant Apparatus Requirements for Painters and Float Free Links CGD 79-167

When a vessel sinks or capsizes, the life floats and other buoyant apparatus sometimes drift away, rendering themselves useless to the victims. Cases have been recorded where loss of life could have been prevented if the life floats had stayed near the ship.

An NPRM on this subject was published in the Federal Register on October 8, 1981. The proposed rule would require the buoyant apparatus to be attached to the ship by sea painters, or tethers, at least 30 meters (100 feet) long. In addition, the sea painters would have to be equipped with a detachable "float free" link which would free the painter and keep the floats from submerging, should the vessel sink in water deeper than the length of the sea painter.

Comments about this proposed rule should be submitted to the Marine Safety Council (address shown above) before January 6, 1982.

Ocean Thermal Energy Conversion Regulatory Project CGD 80-161

Electricity from seawater? That is now possible with an alternative energy-producing technique called Ocean Thermal Energy Conservation (OTEC). OTEC makes use of the difference in temperature between hot and cold seawater in tropical zones to produce electricity and other useful byproducts, such as ammonia and fresh water. The system works by passing surface seawater, heated by the sun, over tubes containing a fluid with a low boiling point (ammonia, for example). Once boiling, this fluid powers a turbine, producing electricity. Cold seawater from deeper seas is then pumped over the fluid to condense it, and it is ready

to be used again. The OTEC operation can be run from a ship or a land-based plant and provides a pollution-free source of power.

On August 3, 1980, former President Carter signed the Ocean Thermal Energy Conservation Act to provide a regulatory scheme for OTEC. The Coast Guard will regulate OTEC in the following areas: prevention and cleanup of any accidental pollution caused by OTEC, prevention of any marine accidents during the construction and operation of OTEC facilities, and documentation and safety standards in construction of OTEC plants.

An NPRM on OTEC was published in the Federal Register on October 5, 1981. For further information, contact Frank A. Martin, Jr., Pollution Liability Funds Management Staff (G-WF), U.S. Coast Guard Headquarters, Washington, DC 20593.

* * *

The October meeting of the Marine Safety Council was held at the end of the month. An account of the actions taken was not ready by press time and will thus appear in the January issue of the Proceedings.

Since we have discontinued the policy of repeating our reports on pending rulemaking projects in each issue of the Proceedings, we have decided to provide a year-end update of the Coast Guard's "significant" regulatory projects in this, the final issue of the year. Briefly, a significant regulation is one which does one or more of the following: generates substantial public interest or controversy, has a major impact on another Federal agency or a state or local government entity , has a substantial impact on a major transportation safety problem, involves a policy change, or involves standards or requirements substantially different from those recognized internationally.

The Department of Transportation published its Semi-Annual List of Regulations on October 1, 1981, as Part III of that day's Federal Register. This list includes brief descriptions of all regulatory projects under development by agencies of the Department. The Coast Guard's projects begin on page 48431 of the agenda.

The following is a list of regulatory projects previously published in the Proceedings. The column on the right shows what action is expected to be taken next on the project, according to the agenda of October 1.

Docket No.	Title	Action
CGD 74-125	Revision of Electrical Regulations	Final rule, December 1981
CGD 75-083 and 75-083a	New Tank Barge Construction and Upgrade of Existing Tank Barge Construction	Notice of Intended Future Action, 1981
CGD 75-124a	Pollution Prevention, Vessels and Oil Transfer	NPRM, indefinite
CGD 77-069	Construction and Equipment Existing Self-Propelled Vessels Carrying Bulk Liquefied Gases	NPRM, December 1981
CGD 77-084	Licensing of Pilots	Supplemental NPRM, January 1982
CGD 78-037	Revision of 46 CFR 157.20-5 Division into Three Watch Regulation	Withdrawn
CGD 78-041	Tank Vessel Operations—Puget Sound	Supplemental NPRM, indefinite
CGD 79-077	Personnel Job Safety Requirements for Fixed Installations on the Outer Continental Shelf	NPRM, August 1982
CGD 79-116 and 79-116a	Qualifications of the Person in Charge of Oil Transfer Operations, Tankerman Requirements	Final rule, October 1982
CGD 79-134	Shipboard Noise Abatement Standards	NPRM, 1981
CGD 79-081b	Personnel and Manning Standards for Foreign Vessels	Final rule, February 1982
CGD 80-159	Damage Stability and Flooding Protection for Great Lakes Dry Cargo Vessels	NPRM, August 1982

When the Public Speaks, the Coast Guard Listens

by Bruce P. Novak
Deputy Executive Secretary
Marine Safety Council

I would like to share some thoughts with you about the public's role in the rulemaking process. In the last two articles I wrote for the Proceedings (in the July and September/October 1981 issues), I discussed some of the reform efforts that the Coast Guard has been making to improve its regulatory process. The word "process" is perhaps misleading here. The emphasis on procedural changes and additional analyses may leave you with the impression that reforms are directed at the regulatory process itself. This is not true; rather, they are directed at the end result of that process. The aim of any changes made is not to improve the process but to improve the final product. In the Coast Guard's case, that means producing a regulation which achieves a socially desirable goal with a minimum of expense. While that may sound like a simple and reasonable task, the difficulty of trying to pin down and balance costs and benefits makes it a very complicated one. That is where you come in. Additional analyses are pointless if we do not get the necessary input from you, the public.

Public comments are one of the most important methods we have for getting in touch with and tapping the experience of the people who will be directly affected by our regulations. The Coast Guard makes use of many sources of information, of course. Sometimes we contract a study. Sometimes we examine the statistical data that can be distilled from mountains of accident investigations and reports. In many cases, though, public comment provides us with the bulk of information used to evaluate the desirability of a regulation. The publishing of an advance notice of proposed rulemaking (ANPRM) is specifically intended to take advantage of the public's desire to become involved in the rulemaking process. The major problem we have had with ANPRMs has been that many people seem to think that the Coast Guard has already decided on a particular type of rulemaking activity. Actually, what we are doing is testing the waters. Usually, the function of the ANPRM is to determine whether or not a rulemaking project should really be undertaken. We determine this by studying the public's thoughts on the merits of some general regulatory move the Coast Guard is evaluating. If the public response shows that rulemaking is not advisable, no further action will be taken. It might be that comments suggest some other method of accomplishing the regulatory goal or call attention to a trend that will change the Coast Guard's whole direction of thought on an issue. For example, public comments may show that changing trade patterns will eliminate a certain problem without any governmental intervention. If that is so, we will take no further action. If the comments support some form of regulation, though, we will develop more specific proposals and issue a notice of proposed rulemaking (NPRM).

The NPRM is a more formal document than the ANPRM. In an NPRM we are no longer on a fishing expedition but are proposing a specific regulation. Unless public comment changes our mind, this is how the final rule will look. While the NPRM represents a serious regulatory proposal, it is not set in concrete. This is a point that cannot be stressed too strongly. I have heard it said time and again at public hearings that the Coast Guard had made up its mind and that none of the comments made at the hearings would change things. That is not true. In my ten years with the Coast Guard I have seen a number of regulations effectively finished off at public hearings. Other proposals have been too big to kill quickly but, as a result of strong objections, have suffered a lingering death in either the "hold" bin or the lower left-hand drawer. Still others have been modified so that they were but mere shadows of their former selves. I'm not saying that we change every regulation to which there is opposition—on the contrary. If you remember my last article, I pointed out that there is bound to be some opposition to virtually everything we propose. What we do is make an attempt to balance the objections to any rule against the support for it. In other words, we try to justify the costs, be they monetary or social, against the benefits. In those cases where the costs are clearly excessive, we make some type of adjustment, within legislative limits.

I have yet to see a mechanism that rivals the public comment process in its effectiveness for getting across opposition to a regulation. The requirement that Government agencies make regulatory proposals known to the regulated public ensures that those who will be affected emerge to make their views known. From time to time the Coast Guard publishes a particularly controversial proposal. When this happens, we like to give the public an opportunity to speak to us in person, and it is then that we schedule one of the abovementioned public hearings. If the issues involved cover a wide geographical area, we attempt to hold hearings in several areas. Personally,

I find these hearings very helpful. I've never attended one where I didn't learn something interesting or meet some very involved and concerned people.

Surprisingly, though, hearings seldom bring new factual information to light. Most of what we hear is a repeat of information that has previously been submitted in written comments. Written comments are much easier to work with than oral testimony. They can be readily duplicated and sorted. This makes the job of determining the public's reaction relatively easy for the project manager. Oral testimony, on the other hand, is more difficult to deal with. Transcripts are outrageously expensive, so I try to avoid them. The hearings themselves are difficult. They are expensive and time-consuming, disrupt the normal flow of business in the office, and invariably give me a headache. Yet I believe in and support the policy of having public hearings whenever they are needed.

Considering all the drawbacks to hearings, why do I support them? Because I think they are well worth all the time, expense, and aggravation. They give those of us who have been sitting at a desk too long a chance to talk directly with those whom we regulate. I don't mean the company representatives who can often be found in the halls of Coast Guard Headquarters. We see them on a regular basis. I'm speaking of the small businessman or woman, the ordinary citizen, the person who, in most instances, cannot get to Washington. As I said before, we read your written comments, and they get just as much attention as remarks made at a hearing. There is some undefinable quality about a face-to-face contact, though, that adds intensity to the exchange. I've seen angry faces. I've seen faces of people scared to death—scared of what we are proposing and scared of speaking in front of hundreds of people. I've seen hate, too, on the faces of people who thought they had been singled out for the great Federal meat ax and blamed me for it. None of those faces gets mailed to me in flat white envelopes. And none of you ever sees my face in the dry, unvarying pages of the Federal Register or the faces of the project managers who have just spent six months to two years of their professional careers writing those proposals. Nor do you see the faces of the program directors who have just been on Capitol Hill trying to answer the questions of a Senator or Congressman who wants to know what is happening to one of his favorite projects.

Believe it or not, these are all dedicated people. No one wants to put you out of business, but no one wants two ships to collide, either, or a recreational boat to blow up a fueling dock because of faulty wiring or poor ventilation. As the agency that has to write the regulations implementing legislation and, in many cases, enforce those regulations, the Coast Guard is the last stop for many measures that will be touching the daily lives of people working and living all across America. It is our job to transform law and legislative history into meaningful and effective action. To do this we need input from you, the public. We need you to tell us what you think will work and what you think won't. We need the benefit of your experience. We need to see you and speak with you so that we never lose sight of the fact that our real job is not to add another page to the Federal Register. Our real job is to make your lives safer, cleaner, or better in some way.

And you need to see us. If you talk to us, you will see, as many people attending public hearings all over the country have, that we want to do the best job we can. Sure, we have a lot of factors to consider. If you read the September/October issue of the Proceedings, you might recall some of the questions that we struggle with on a daily basis. If you come to a hearing with an open mind and realize the thought that went into a proposal, I think you will have to admit that we try to be sensitive to your needs. As I said before, it is not unusual for the Coast Guard to change a proposal as a result of comments received, nor is it unusual for us to withdraw a proposal because we discover during the comment period that it was not such a good idea. Those of you who have had experience with other Government agencies may appreciate how important it is for an agency to admit at times that it is not perfect.

I would like to close this article with a couple of personal observations. When the editor talked me into doing this series, I planned on doing only three pieces. This is the last. I've enjoyed doing them, and I thank those of you who have commented on them for your thoughts. I would like to extend an invitation to all of you to write to me with any questions or comments you might have. I don't pretend to be a paragon of regulatory knowledge in Washington, but, where I can, I would like to explain the Coast Guard's regulatory policy and procedures. If you have enjoyed the articles, I'm glad. If not, blame me, not the Coast Guard, for the content was mine. ‡

Tanker Safety Film Wins Award

The film "Tanker Safety Depends on You," sponsored by the Coast Guard's Office of Merchant Marine Safety and produced by THIRTYFIVE-SIXTEEN, INC., has been awarded a CINE Golden Eagle by CINE, the Council on International Nontheatrical Events. CINE is a 24-year-old private, nonprofit organization which coordinates submission and selection of U.S.-made short, nontheatrical films for showing in festivals around the world. According to the citation, the film has been awarded the Golden Eagle "in token of its excellence" and has been selected "to represent the United States of America in international motion picture events abroad." CDR Larry Balok, who served as a technical advisor on the film, will accept the award on behalf of the Coast Guard at the Awards Presentation Ceremonies in December.

("Tanker Safety Depends on You" appeared in adapted form as the cover story of the November 1981 issue of the Proceedings.)

Sea Hunt:

A Bird's-eye View

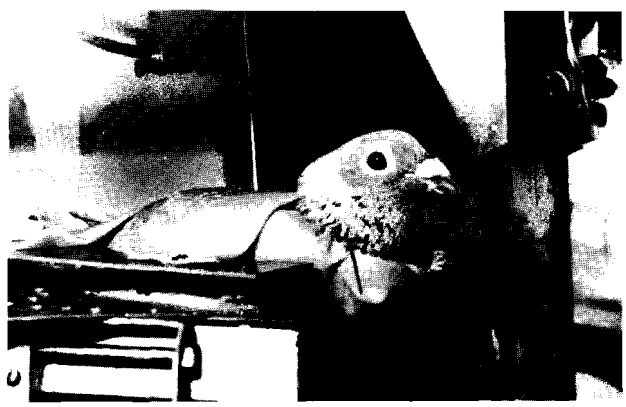
by Ensign James Candee, USCGR
Sensor Technology Branch
Office of Research and Development

You are five miles off the coast and the engine has quit on your boat. You are drifting with the current. Over the horizon, a Coast Guard helicopter appears, coming in your direction. Aboard the helicopter is an experienced six-member crew. Three are human, and three are Columba livia--pigeons--involved in Project Sea Hunt. All six are on this mission for the same reason: to find a small boat overdue from a fishing trip. You desperately want to get the helicopter crew's attention, so you wave a life vest over your head while one of your fellow passengers reaches for a flare gun and fires it into the air. You hope someone sees it. Aboard the aircraft the crew is busily flying the helicopter and searching the water below. The human crewmembers miss the small flare in the distance, but the pigeons do not. With their ability to view wide expanses of water at one time, the pigeons spot the target and trigger a mechanism alerting the crew to the presence and direction of something in the water.

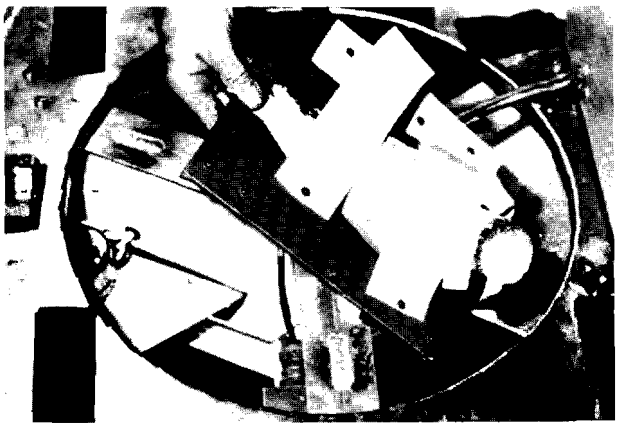
If you haven't yet guessed, Sea Hunt is a project which enlists pigeons to help Coast Guard helicopter search and rescue crews spot targets on the water. These birds have been trained to respond to the colors orange, red, and yellow, the recognized distress colors and the colors most likely to be found on a boat. During their training, they were rewarded with food whenever they recognized these colors and correctly responded to them. This form of training is called operant conditioning. (It differs from adversive conditioning in that it rewards desired behavior, rather than punishing undesired behavior.)

The Sea Hunt system was developed for the Coast Guard in 1976 by James V. Simmons of the Naval Ocean Systems Center in Hawaii. Pigeons were chosen over other birds because they are easily handled and are used to being in captivity. Pigeons have an advantage over human observers because their eyes enable them to search a wide area faster than a human can. In the Sea Hunt system, three pigeons are placed in a circular observation chamber which gives them a combined visual range of a full 360^{o}. The chamber is divided into three equal sections. The position of the pigeons in the chamber affords each a 200^{o} field of view, which means that the fields of view overlap on either side. This overlap makes it possible for the helicopter crew to know in which of six directions a target has been sighted: if just one bird responds, the target must be directly in front of that bird; if two birds respond, the target must be in their overlapping fields; etc. The birds identify a target by pecking at a response key. The information from the key is recorded on a strip recording chart, and the bird is rewarded with food when the pilot verifies the target.

Sea Hunt training flights were flown over the



The light-colored object in front of and above the pigeon holds the peck key, which the pigeon taps with its beak to alert the crew when it sees a target.



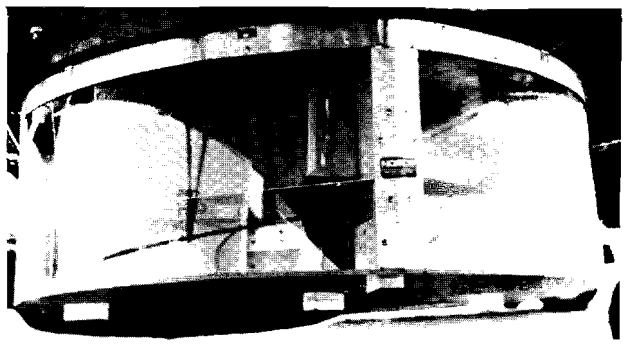
The pigeon is strapped securely into a "couch," which is then placed in the observation chamber. This frees the bird from the need to keep its balance and enables it to concentrate on looking for targets.

waters off of Oahu in 1976 and 1977. At first, the helicopters flew at a speed of 30 knots and an altitude of 30 meters. The birds adapted very quickly, however, and speed and altitude were increased until the aircraft was traveling at a speed of 90 knots and an altitude of 150 meters. After the training period, trials were flown so that the performance of the pigeons could be evaluated on a statistical basis against the performance of human crewmembers. Three things were recorded during the trials: whether the first sighting was made by the aircraft crew or the pigeons, the position of the target as seen from the helicopter, and how many passes over the target were made before the crew and the pigeons both detected the target. The humans or the pigeons scored if a detection was made on a single pass. The pigeons were rewarded with food if they detected a target which was verified by the observer recording the trial. The results of the trial were that the birds detected the target on the first pass in 80 of the 89 trials (for a 90 percent success rate), while the aircrew detected the target on the first pass in 34 of the 89 trials (for a 38 percent success rate).

Some interesting things happened while trials were being run. While on one pass, the pigeons began to make a series of what appeared to be false reports (responding where no targets had been placed). The aircrew investigated and found that the pigeons were reporting small red/orange flags that were atop a line of fishing floats. Another time the pigeons located an orange surfboard floating in the open water east of the island.

A recently developed simulator makes it possible to complete the training of the pigeons on the ground. A curved projection screen surrounds the pigeons, which are housed in a chamber. This screen simulates a pigeon's field of vision, which is much broader than a human's because a pigeon's eyes are located on the sides of its head. A film of the ocean surface is shown, and the chamber vibrates and turns as it would on a helicopter.

The Sea Hunt story has had its sad side as well. Three pigeons died in 1979 when the system was used for the first time in an actual mission. The mission

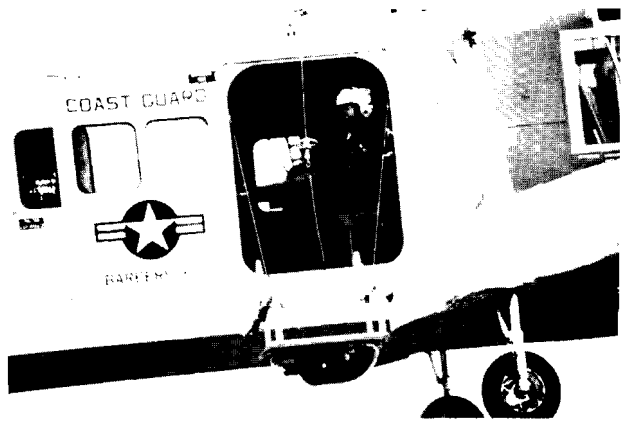


The chamber is divided into three equal sections. Visible in the photo above are the compartments which hold the two forward-facing pigeons. The third pigeon rides in back; a signal from that compartment lets the pilot know he has gone beyond a target. The third pigeon also serves as a backup—it may see a target the first two missed.

was a search for five men on a fishing trip who were missing off the coast of Maui. The helicopter carrying the pigeons was forced to make an emergency landing without power. The observation chamber carrying the birds was torn from the helicopter, and chamber and birds were lost. The human crewmembers survived uninjured.

Learning from this unfortunate incident, the Coast Guard modified the system so that the chamber rides outside the cabin door, below the helicopter. It is attached to the hoist so that it can be brought into the cabin quickly in the event of an emergency or if the hoist must be used.

Based on the results from the trials run in Hawaii, the Coast Guard's Office of Research and Development has decided to conduct a six-month evaluation of the Sea Hunt system. The evaluation is scheduled to start in January 1982 at Coast Guard Air Station San Francisco. After the tests have been completed, the results will be analyzed and the Coast Guard will decide whether pigeons should become permanent members of the Coast Guard helicopter search crews. ‡



Following the accidental death of three of the pigeons, the observation chamber was repositioned outside the cabin door.

Cold Water:

A Curse or a Blessing?

by J. C. Bernhartsen with Richard Schlenker

Accidents on the water can often lead to drowning. Drowning, in fact, is listed by the National Safety Council as the third most frequent cause of accidental death in the United States, exceeded only by falls and automobile accidents. Drowning is generally defined simply as death resulting from suffocation caused by water being drawn into the lungs. In cold water, however, a number of other factors are involved. The following article, describing some of the ways the human body reacts when it is submerged in cold water, has been adapted from "Cold Water Fatalities: An Overview of Physiological Responses," which appeared in Current: the Journal of Marine Education, Vol. 2, No. 2, Winter 1981.

Recent scientific investigation has shown that cold water is much like a double-edged sword: it can either contribute to the death of someone thrown into it and submerged for a long period of time, or it can save his life. The following descriptions of the body's physiological reactions to cold water may shed some light on this seemingly paradoxical role:

Caloric labyrinthitis. A typical victim of this phenomenon falls or dives into cold water and just disappears. His disappearance may be the result of the sudden injection of cold water into his ear canals; this can cause vertigo. The victim becomes completely disoriented and cannot determine which way is up. Instead of struggling to get to the surface, he may swim downwards until he can no longer hold his breath.

The hyperventilation reflex. Sudden exposure of the upper chest to cold water will trigger involuntary rapid breathing and increases in blood pressure, the pulse rate, and the metabolic rate. If the victim's head is under water when the reflex is triggered, the victim may not be able to hold his breath long enough to surface and may drown.

The mammalian diving reflex. The opposite of hyperventilation, this reflex makes it possible for otters, seals, whales, and other warm-blooded animals to spend long periods underwater. It reduces blood pressure, heart rate, metabolic rate, bloodflow to the extremities and the peripheral tissues, and respiration. Some authorities credit this reflex with making it possible to successfully resuscitate victims who have been submersed in cold water for as long as 48 minutes. Therefore, if a drowning victim has been in the water for less than one hour, he should not be declared dead until rewarmed. A number of people have been resuscitated without any apparent brain damage. Apparently, the colder the water and the younger the victim, the better the chances for successful resuscitation.

The attitude of the responders (first aid, emergency medical treatment, and emergency room people) is very important. Such cases must be considered rescues, not body recovery operations.

Pain. The skin is the largest of the body's sensory perceptors. Sudden immersion can be intensely painful, and some authorities believe that the sud-

den pain may cause shock and, possibly, heart attack.

Fatigue. Even strong swimmers tire rapidly in cold water and after just a few minutes are unable to help themselves. This phenomenon is not fully understood, but it is known that water becomes more viscous as it cools. This would mean that swimming in cold water requires additional effort. Another factor which must be taken into account is the body's tendency to conserve vital body heat by drastically reducing the blood flow to the extremities and the peripheral tissues. It has been speculated that the effort to overcome the body's defenses and supply the muscles with the blood required for their operation contributes to fatigue.

One of the most studied phenomena of cold-water accidents is the condition known as **hypothermia.** The human body is an electrochemical device which can function properly only within a very narrow temperature range centered on 37.6°C. A few degrees' increase, and a person has a fever. A few degrees' decrease, and he is hypothermic.

When the TITANIC went down, hundreds of people were found dead floating in their life jackets. The death certificates showed drowning, but the people were floating with their heads out of the water. They did not drown; they froze to death. They died from hypothermia.

Hypothermia is not always easy to spot. Generally, one of the first symptoms is violent shivering, which is an attempt by the body to create heat by exercise. Mental disorientation is another symptom: the victim may be forgetful or confused, exhibit personality changes, be unable to make decisions, or make the wrong decisions. Hypothermia victims tend to be clumsy and lose manual dexterity and coordination. As the hypothermia deepens, shivering gives way to muscle spasms, muscle rigidity, and loss of the use of arms and legs. In the most advanced stages the victim appears drunk or drugged, loses consciousness, and finally appears dead. Unless steps are taken to stop and reverse the hypothermia, the victim dies.

Levels of Hypothermia

°F	°C	
99.6	37.6	"Normal" rectal temperature
96.8	36	Increased metabolic rate in attempt to balance heat loss
95.0	35	Shivering maximum at this temperature
93.2	34	Patients usually responsive; blood pressure normal
91.4	33	Severe hypothermia below this temperature Pupils dilated; most shivering ceases
89.6	32	Consciousness clouded
87.8	31	Blood pressure difficult to obtain
86	30	Progressive loss of consciousness Increased muscular rigidity
85.2	29	Slow pulse and respiration
82.4	28	Cardiac arrhythmia develops; ventricular fibrillation may develop if heart irritated
80.6	27	Voluntary motion lost along with pupillary light reflex, deep tendon and skin reflexes—victims appear dead
78.8	26	Victims seldom conscious
77.0	25	Ventricular fibrillation may appear spontaneously
75.2	24	Pulmonary edema develops
71.6	22	Maximum risk of fibrillation
68.0	20	Heart standstill
64.4	18	Lowest accidental hypothermic patient with recovery
62.6	17	Iso-electric EEG
48.2	9	Lowest artificially-cooled hypothermic patient with recovery

And Yet Some Other Effects of Cold Water . . .

David S. Smith, a former Coast Guard Commander now working as a consultant on aquatic safety and hypothermia, points out some additional effects of immersion in cold water which might contribute to cold-water drownings:

Muscle function is rapidly reduced by cold water. Victims capsized in water cooler than 10°C quickly lose ability to grasp safety devices or flotation aids.

Canadian studies have shown that the ability to hold one's breath is markedly reduced in cold water. A diver plunging from a high pier or bridge who penetrates the colder water beneath warm surface layers may gasp and lose his breath because of the previously described hyperventilation reflex. In addition, since the amount of oxygen in the body is more rapidly metabolized in cold water, it is possible that he will simply run out of air while he is underwater and not be able to reach the surface before he is forced to breathe.

The body has mechanisms for coping with these temperature changes. If the body temperature goes up, a person sweats and breathes more rapidly; the skin becomes flushed because the blood vessels open to the surface of the skin to allow heat to escape. When a person becomes hypothermic, his skin will turn blue-gray and his lips blue because the body, in an effort to conserve body heat, restricts the blood vessels close to the surface of the skin. Breathing may be slow and shallow and speech slow and slurred.

Hypothermia may be separated into two broad categories: chronic (slow-onset) hypothemia and acute (rapid-onset) hypothermia. Chronic hypothermia usually results from exposure to cold weather for a few hours to several days. It generally is caused by inadequate preparation and an overestimation of one's ability to withstand cold. Most chronic hypothermia cases develop in air temperatures of 0° to 10°C, frequently when victims get wet from perspiration, precipitation, or from splash and spray in water-related activities and fail to recognize the danger of being wet at such temperatures. The combination of wind and low temperatures is a potentially serious contributor to chronic hypothemia. Wind amplifies the effect of low temperatures, so that the combined effect (windchill) will be much greater than if there is no wind.

Acute or rapid-onset hypothermia is generally associated with immersion in cold water. Water can conduct heat more than 25 times faster than air. It is estimated that the average person, dressed in light clothing, when immersed in water 27°C or cooler will not be able to produce enough heat to offset the heat lost to the water. The colder the water, the faster the heat loss. Therefore, depending on water tempera-

Victims wearing PFDs can prevent heat loss by assuming the HELP position; groups of victims can conserve heat by huddling.

tures and other conditions, acute hypothermia may begin to develop in as little as 10 to 15 minutes or take several hours.

A person's physical characteristics also affect the time required for hypothermia to set in. The larger the person, the longer the cooling time. A fat person will cool more slowly than a thin person, and a tall, thin person will cool faster than a shorter, heavy one. Women, because they have a layer of subcutaneous fat, tend to cool more slowly than men of the same body size. However, since women are generally smaller than men, they usually cool faster. If a family were involved in a cold-water emergency, the children would be the first to succumb, the wife next, and the husband last, providing other factors were the same.

The victim's behavior in the water is an important determinant of how fast body heat is lost. A person wearing a personal flotation device (PFD) can reduce heat loss by remaining still in the water. The areas of greatest heat loss are the head, the neck, the sides, and the groin, because major blood vessels come close to the surface in these areas. Furthermore, these areas generally are not protected by layers of body fat. Heat loss can be reduced further by keeping the head out of the water, pulling the arms close to the sides, and lifting the legs to protect the groin—assuming the Heat Escape Lessening Posture (HELP). This position can reduce heat loss by nearly 50 percent. It must be pointed out that the HELP is possible only when a person is wearing a PFD, and then only with some PFDs. Many PFDs become too unstable when the full HELP position is assumed, and the victim will roll face down in the water. However, even a partial covering of the sides, neck, groin, and head will help reduce heat loss and extend survival time.*

*David Smith reports that it may also be possible for persons wearing waders, coveralls with layered clothing underneath, or a snowmobile suit to use HELP successfully. The trick to this form of flotation is to minimize movement and keep air trapped in the clothing or waders. This technique, however, cannot be depended on, especially by those who have not practiced HELP in advance, and a PFD is still the best bet.

A person not wearing a PFD must expend some energy swimming or treading water to stay afloat. This requires the use of muscles, which, in turn, require a flow of blood. When this blood, which has been cooled by being circulated through the muscles, returns to the core of the body, it will cool the body core, speeding the onset of hypothermia and reducing survival time.

Drownproofing, or floating face-down, is not recommended as a survival technique in cold water. This technique was developed for warm water. Resting with the head in the water increases the cooling rate by about 85 percent and reduces survival time in cold water to about one half that of even someone who expends his energy swimming.

Someone who is thrown into cold water should try to keep his body as much out of the water as possible. Since most boats will float, even when capsized or swamped, getting into or on top of the boat will increase one's chances of survival. Wearing several layers of clothing will help reduce heat loss in much the same way as a wet suit does.

A person in the water must make a decision whether to stay put and wait for rescue or swim for shore. Statistically, the person who stays with the boat and waits for rescue has a greater chance of survival. A person who elects to swim will rapidly use his energy and may become exhausted and drown before he reaches shore. Furthermore, distances on the water are very deceptive and are often greater than they appear. Currents and tides may work against the swimmer.

If a rescued victim has developed hypothermia, the first step in treating him should be to prevent further heat loss. This, of course, does not negate the need to

Drownproofing is not recommended for cold water. Persons without PFDs are advised to either do a slow breaststroke or tread water.

follow the normal ABCs of first aid: the victim must have a clear airway, be able to breathe, and have cardiac activity. Cardiopulmonary resuscitation (CPR) must always be administered if needed.

Many hypothermia victims have not reached the stage where CPR is needed, however. Rescuers in that case should concentrate on stopping heat loss. The victim must be brought to shelter and his wet clothing gently removed; his feeble heat energies must

Coast Guard Commander Wins Award for His Work with Near-drowning Victims

Commander Martin J. Nemiroff, a Public Health Service doctor with the Coast Guard, recently received the Sea Grant Award for his work proving that people submerged for long periods of time in near-drowning accidents can be successfully resuscitated.

Commander Nemiroff has been personally involved in the saving of 35 long-submersion victims (victims who have been in cold water for up to an hour). Lately, the doctor has been devoting much of his time to teaching others his lifesaving methods in the hope that many more victims can be given a second chance at life.

Commander Nemiroff's treatment is based on perseverance. As stated earlier, cold-water near-drowning victims may appear dead. Death, however, should be declared only if the victim fails to respond to resuscitation, and the commander can cite one case where resuscitation took as long as three hours. After being thought dead the entire time, the victims recover without suffering any brain damage whatsoever and are able to lead perfectly normal lives. This phenomenon can be attributed to the aforementioned mammalian diving reflex, which induces a condition similar to suspended animation or hibernation in the victim.

Victims of near-drowning should be given normal CPR vigorously and continuously. It should be administered on the way to the hospital and in the emergency room after the victim gets to the hospital. In addition, the victim's heart must be re-warmed. To accomplish this, Commander Nemiroff places a tube down the victim's throat attached to a respirator with pure oxygen which has been heated and humidified. (CPR is administered simultaneously.) Once the heart has reached a normal temperature, standard rescue measures for a victim of cardiac arrest (defibrillation, for example) can be administered, if necessary.

The key to successful resuscitation, it should be emphasized once again, is: DON'T GIVE UP!

The Sea Grant Association is an organization made up of academic institutions and other parties with an interest in the National Oceanic and Atmospheric Administration's Sea Grant Program. Under this program, the institutions conduct research and engage in educational activities on the wise development and use of the ocean and its resources. The Sea Grant Award is presented each year to an individual whose contribution to the field is seen as a major gain for mankind.

not be expended on warming and drying wet clothes. The victim should be wrapped in warm blankets, a sleeping bag, dry clothing, or whatever is available to protect him from losing heat. The administration of warm moist oxygen has been shown to effectively stop heat loss by bringing warmth directly to the core of the body. It is important to remember that a hypothermia victim is sensitive to rough handling and jostling. If the victim is not handled carefully, his cool heart can go into fibrillation. For the same reason, hypothermia victims should not be given anything to drink. Because of the cold, the muscles in the throat may not function properly, and a victim may inhale instead of swallowing.

The hypothermia victim may not realize that he or she is ill, because one of the first impediments of hypothermia is the inability to think clearly. It therefore becomes incumbent on friends and companions to watch for symptoms and take appropriate action when the symptoms develop.

The victim should be transported to a medical facility as soon as possible. It is important to realize that hypothermia often masks vital life signs. The eyes may be fixed and dilated; there may be no detectable pulse or respiration; the victim may be cyanotic (blue) and the skin cold and clammy to the touch. The victim may appear dead but still be alive. A number of people are alive and well today because their rescuers knew what to do. A hypothermia victim should be declared dead only by a physician, and then only after the victim has been rewarmed and has failed to respond.

In most cases, the phenomena associated with cold-water accidents are not separate and distinct. A drowning victim may be hypothermic, or a hypothermia victim may drown. An individual who has been exposed to cold for some time may develop a mild case of chronic hypothermia, which may be the initial step in a fall-overboard drowning case. The hyperventilation reflex triggered by the cold water may hasten the drowning process, but the mammalian diving reflex may make it possible to successfully resuscitate the victim.

For many years it has been thought that a victim who has been in the water for more than five minutes has suffered irreversible brain damage. Research and rescue cases have proved this to be wrong, especially when the accident takes place in cold water (below 21°C). Drowning and hypothermia victims who have been immersed for up to an hour, therefore, should be treated as rescues and not body recovery cases. Aggressive CPR and proper emergency room procedures have saved many people who just a few years ago would have been declared dead.

John C. Bernhartsen is Assistant Branch Chief and Education Specialist in the Coast Guard's Office of Boating Safety. He is the Chairman of the National Safety Council's Water Safety Committee and a member of its Public Safety Division. He is cofounder and trustee of the International Hypothermia Foundation. Richard Schlenker is on the science education faculty at the Maine Maritime Academy, Castine, Maine. He is a Lieutenant in the Coast Guard Reserve and is Commanding Officer of the Coast Guard Reserve Unit in Jonesport, Maine.

Navigation and Vessel Inspection Circulars

The effective Navigation and Vessel Inspection Circulars listed below can be obtained individually or by subscription, free of charge, by writing to Commandant (G-MP-4/14), U.S. Coast Guard Headquarters, Washington, DC 20593, or calling (202) 426-2163.

7-56	Manned LSTs; Structural Reinforcement and Drydocking; Hull Inspection Requirements
10-60	Placards, Forms, and Instructions Required to be Posted Aboard Vessels; Alternate Materials and Methods
12-61	Inspection Procedures for Approved Inflatable Life Rafts Held in Storage
2-62	Watertight Bulkheads in All Inspected Vessels—Maintenance of Watertight Integrity
4-62	Renewal of Deck Officers' Licenses--Great Lakes
5-62	Renewal of Deck Officers' Licenses--Western Rivers
9-62	Liquefied Compressed Gas Cargo Hose
1-63	Notes on Inspection and Repair of Wooden Hulls
2-63	Guide for Inspection and Repair of Lifesaving Equipment
11-63	LSTs as Unmanned Barges; Structural Reinforcement and Drydocking; Hull Inspection Requirements
5-64 CH-1,2	Renewal of Ocean Operators' and Operators' Licenses
7-64	Renewal of Operators' Licenses—Great Lakes
8-64	Renewal of Operators' Licenses—Western Rivers
8-64A	Renewal of Operators' Licenses—Western Rivers
1-65	24.0' x 8.0' x 3.58' Steel Lifeboats with Removable Interiors, Oar-propelled (App. No. 160.035/398/0), Hand-propelled (App. No. 160.035/411/0), and Motor-propelled (App. No. 160.035/412/0), manufactured by Welin Davit & Boat, Perth Amboy, New Jersey, Replacement of Short Breast Plates
7-65 CH-1	Renewal of Deck Officers' Licenses
10-65	Stability Determination in Capsizing Cases Involving Uninspected Vessels
12-65	Alteration or Modification of Existing Cargo or Tank Vessels; Associated Safety Improvements
1-66	Requirements for Hull Structural Steel—Structural Continuity
3-66	Dual Tonnages; Application of
1-67	Stability Test—Preparations and Procedures
3-67	Alteration of Ship's Structure Which May Affect the Adequacy of Installed Safety Devices
4-67	Application of Incombustible Insulation Requirements and Identification of Approved Materials
8-67	Fixed Mud Ballast; Procedures and Standards for its Use
3-68	Tensile Fasteners
4-68	Protective Equipment Required for Firemen's Outfits
7-68	Notes on Inspection and Repair of Steel Hulls
8-68	Classification of Vessels as Self-propelled
1-69	Automated Main and Auxiliary Machinery
2-69	Submission of Reports for the Shipment and Discharge of Seamen Not Shipped or Discharged Before a Shipping Commissioner; Information Concerning
3-69	Z Nomograph Method of Calculating Available GM
4-69	Inclusion of Social Security Numbers on Certificates of Discharge and Discharges for Masters
5-69	Carriage of Flammable and Combustible Liquids in Portable Tanks
7-69 CH-1,2,3	Hydraulic Releases with Primary Lifesaving Equipment and Alternate Float-Free Arrangements
8-69	Impulse-Projected Rocket Type Line-Throwing Appliances
11-69	Statement of Claims for Specially Exempted Water-ballast Spaces in Tonnage Calculations
12-69	Special Examination in Lieu of Drydocking for Large Mobile Drilling Units
2-70	Acceptance of Pressure Vessels Used as Decompression Chambers or for Other Purposes Related to Diving
4-70	Powder Loads for Lyle Type Line Throwing Guns
6-70	Fixed Fire Extinguishing Systems for Use in Galley Ventilating Equipment
7-70	Marine Type Portable Fire Extinguishers
1-71	Repair of Boiler Safety Valves
2-71	Pipe Stress Analysis Calculations; Procedure for Submission of

4-71	Valves Employing Resilient Material
5-71	Index to 46 CFR Part 151 (Certain Bulk Dangerous Cargoes on Unmanned Tank Barges), Subchapter 0
6-71	Monitoring Carbon Monoxide (CO) in Ship's Cargo Spaces
3-72	Portable Radio Apparatus, Training in Use of
4-72	Definition of Paraffinic Hydrocarbon Commodities
6-72 CH-1	Guide to Fixed Fire-Fighting Equipment Aboard Merchant Vessels
1-73	Pilot Ladders Used Aboard Merchant Vessels
3-73	Intact Stability Criteria for Passenger and Cargo Ships under 100 Meters in Length
7-73	Main Propulsion Boiler Automation
8-73	Alternate Means of Determining the Weight of CO_2 in Fire Extinguishing Systems
9-73 CH-1	Implementation of the Pollution Prevention Regulations (33 CFR, Subchapter 0 and Amendments to 46 CFR, Subchapter D)
2-74	Change in Administration of Ships' Stores and Supplies of a Dangerous Nature
3-74	Implementation of the Regulations Concerning Licenses for Operation of Uninspected Towing Vessels (46 CFR, Subpart 10.16 and Sections 157.10-83, 157.10-85, 157.30-45)
4-74	Stability Information Required on Inspected and Uninspected U.S. Vessels Receiving a Load Line Certificate and Foreign Vessels Receiving Form B Load Line Certificates
6-74	Elimination of Unsafe Conditions on Board Tank Barges
7-74	Oil-water Separators; Acceptance of
1-75	Fire Safety Standards for Foreign Passenger Vessels
2-75	Alteration of Existing Rafts to Comply with Improved Inflation Standards
3-75	Bulk Grain Cargoes
2-76	Damage Stability Calculations for Tank Vessels
3-76	Stability of Fishing Vessels
1-77	Unified Interpretations of the 1966 International Convention on Load Lines
2-77	American Bureau of Shipping Acceptance of Structural Fire Protection Approval
3-77	Code of Safe Practice for Ships Carrying Timber Deck Cargoes
4-77	Shifting Weights or Counter Flooding During Emergency Situations
5-77	Inspection of Hydraulic Starting Systems for Lifeboats and Survival Capsules
1-78 CH-1	Automation of Offshore Supply Vessels of 100 Gross Tons or Over
2-78	Bulk Grain Cargo Regulations (46 CFR 31.10-33, 46 CFR 74.10-12, and 46 CFR 93.20)
3-78	Cross-Reference List Between the IMCO Chemical Code and 46 CFR, Part 153
4-78 CH-1	Inspection and Certification of Existing Mobile Offshore Drilling Units
2-79	Aluminum Bus Bars
3-79	Lifeboat Capacity on Foreign Flag Passenger Vessels
4-79	Recommended Procedures for Using Smith & Wesson International Line Throwing Appliances
5-79	Inerting and Tank Cleaning Procedures for Alkylene Oxide Containment Systems
6-79	Coast Guard Review of Merchant Vessel Plans and Specifications
7-79	1969 Amendments to the International Convention for the Prevention of Pollution of the Sea by Oil 1954; Operational Compliance with
8-79	Shipment and Discharge of Seamen
1-80	Inspection of Viking On-load Release Gear on Watercraft America Lifeboats
2-80	Poured Metal Socket Connections for Lifeboat Falls
3-80	Acceptance of Gel Coats and Composite Laminate Coatings Which Meet 46 CFR 177.10-5(a-1)
4-80	Installation of Retroreflective Material and PFD Lights on Lifesaving Equipment
5-80	Recommended Procedures for Control of Asbestos Hazard on Board Merchant Vessels, OCS Facilities and Deepwater Ports
6-80	Guide to Structural Fire Protection Aboard Merchant Vessels
7-80	Use of Fire Detection Systems Which Are Not Approved under 46 CFR 161.002
8-80	Fire Hazard of Polyurethane and Other Organic Foams
9-80	Servicing Requirements of Inflatable Liferafts
10-80 CH-1	Temporary Licenses and Certificates of Service for the Crews of Offshore Supply Vessels under P.L. 96-378
11-80	Structural Plan Review Guidelines for Aluminum Small Passenger Vessels
12-80	National Fire Protection Association (NFPA) Standard No. 306, "Control of Gas Hazards on Vessels 1980"
13-80	Breathing Apparatus for Tank Vessels
1-81	Guidance for Enforcement of the Requirements of the Port and Tanker Safety Act of 1978 (PTSA) Pertaining to SBT, CBT, COW, IGS, Steering Gear, and Navigation Equipment for Tank Vessels
2-81	Coast Guard Inspection Guidance Regarding Integrated Tug Barge Combinations
3-81	Coast Guard Retention of Commercial Vessel Plans, Specifications and Related Correspondence
4-81	Regulated Bulk Liquid Cargo Finding Aid
5-81	Literature Concerning Hazardous Cargoes
6-81	Lifeboat Weight Tests
7-81	Vessel Plan Review and Inspection by the American Bureau of Shipping
8-81	Initial and Subsequent Inspection of Uncertificated Existing Offshore Supply Vessels Under P.L. 96-378
9-81	Coast Guard Guidance Regarding Shipboard Helicopter Facilities

What Constitutes an Inert Atmosphere?

The following article was written by LCDR Winston S. Jones and Dr. Anthony L. Rowek of the Coast Guard's Cargo and Hazardous Materials Division to clarify the intent of requirements in Title 46 of the Code of Federal Regulations, Part 154 (46 CFR 154).

Anyone who has had cause to ask the question "What is the maximum permissible oxygen content of an inerted space on a ship carrying liquefied gases?" is probably aware that an explicit answer is not to be found in Title 46 of the Code of Federal Regulations, Part 154, the liquefied gas tanker regulations. Current technical literature reports that an atmosphere which has an oxygen concentration of eight percent or less by volume is incapable of supporting combustion. Therefore, the Coast Guard has defined an inert atmosphere as one in which the concentration of oxygen is eight percent or less by volume. This position was explained in the May 3, 1979, edition of the Federal Register (Vol. 44, No. 87, pages 25999 - 26000). The Coast Guard's Cargo and Hazardous Material Division (G-MHM) intends to incorporate this definition in 46 CFR 154.3 when that part of the Code of Federal Regulations is next updated.

Some confusion has arisen because 46 CFR 154.906 (a) specifies a separate standard for the maximum oxygen concentration in the inert gas produced by an inert gas generator. This rule requires the inert gas produced to have an oxygen concentration of five percent or less by volume. That value comes directly from section 9.5.1 of the Inter-Governmental Maritime Consultative Organization (IMCO) Gas Code. To repeat, an inerted space can have no more than eight percent oxygen, and an inert gas generator must produce a gas having no more than five percent oxygen. There is a reason for this difference. It is not possible to reduce the oxygen content in a space being inerted to less than eight percent unless the inert gas generator produces a gas with an oxygen concentration lower than eight percent.

Although neither the Marine Safety Manual (CG-495) nor the Tankship Hull Inspection Booklet (CG-840-S) specifically requires them to do so, boarding officers should check the oxygen content of hold spaces aboard liquefied gas tankers on which inerted hold spaces are required. Vessels which the Coast Guard approved on the basis of plan review are subject to a specific restriction in the Cargoes and Restrictions List if their hold spaces are required to be inerted. For those vessels holding an IMCO Certificate of Fitness, inerting requirements are found in Chapter 9 of the IMCO Gas Code. Sections 9.2 and 9.3 describe four different situations based on the cargo and the type of secondary barrier:

1. (9.2.1) Cargo containment system for flammable gases requiring full secondary barrier: hold space must be maintained inert.

2. (9.2.2) Cargo containment system for flammable gases requiring partial secondary barrier:

   a. Hold spaces must be maintained inert, or

   b. Except as limited by Chapter XVII of the Gas Code, hold spaces may be filled with dry air, provided the ship maintains a stored charge of inert gas sufficient to inert the largest hold space. Additionally, the leak detection system must be capable of detecting a leak rapidly enough for inertion to be effected before a dangerous condition can develop.

3. (9.2.3) Cargo containment system for nonflammable gases: hold spaces must be maintained with a suitable dry air or inert atmosphere.

4. (9.3) Independent tanks, type C (no secondary barrier): hold spaces must be maintained with a suitable dry or inert atmosphere.

There is one exception. Hold spaces for vessels carrying ethylene oxide must be inerted in all cases. The oxygen content of the inert gas supplied to the hold space must be no greater than 0.2 percent by volume. The IMCO Gas Code does not specify the required oxygen content of the atmosphere in the hold spaces surrounding ethylene oxide tanks, but the Coast Guard has recommended that IMCO adopt the requirement that the oxygen content of these hold spaces be maintained below two percent. ⚓

Lessons from Casualties

On a stormy evening late last winter the Coast Guard had to add the case of yet another uninspected offshore supply vessel to its casualty files. Unable to offload its supplies because of the sea conditions, the vessel was riding at anchor waiting for a break in the storm. The master sent out a call for help when the vessel began flooding. Although it was during the sequence of events following the distress call that the vessel actually sank, its fate had been sealed hours before at a Louisiana loading dock.

At the dock, the vessel, a small offshore supply boat, had taken on not only its deck cargo (approximately 14,500 pounds of assorted equipment for an offshore rig) but also a full load of water. Before any of the cargo had even been loaded, the loading supervisor noticed the cargo deck was awash by the stern; there were already two or three inches of water covering it. A member of the crew explained that this was because the vessel had taken on the full load of water. Loading proceeded (!).

The vessel left port and traveled without incident to its destination. Before the cargo could be offloaded, the weather deteriorated, and all transfer operations were suspended. The small supply vessel received permission to ride at anchor until conditions improved. It was then that the series of mishaps began which brought the casualty initiated at the loading dock to its close.

A cargo rope washed overboard and fouled one propeller; this did not put the vessel in immediate danger. During the next couple of hours the vessel started dragging anchor toward a platform, and a distress call was sent. The vessel was in no other danger, however, and help was on its way.

Help arrived in the form of a towboat. A towline, actually two mooring lines joined for a total length of 100 feet, was passed to the supply vessel, and rescue commenced. Five minutes later the towline parted. Using its one unfouled propeller, the supply vessel made way toward the towboat. The towline was made fast, and the tow resumed. During this time, though, some deck cargo shifted, and the vessel began to list. Shortly after towing resumed, the second line parted.

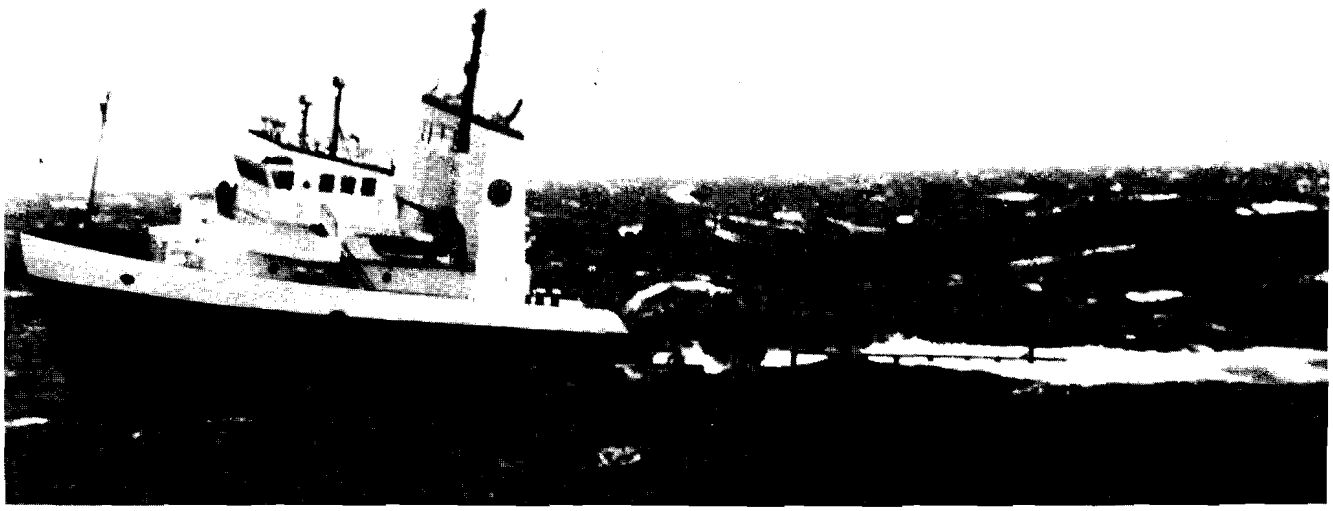
The rescuers reacted quickly. The master, at the wheel of the towboat, searched in vain for his tow. The deckhands retrieved the parted towline to avoid fouling the propellers. The mate used the vessel's spotlight and sighted the luckless supply vessel. A man without a life jacket was on the bow, only a foot or so of which was out of the water. Fog closed in, obscuring both the bow and the man.

Divers found one body in the cabin of the vessel, pinned down by a radio. A second body was found floating in the Gulf two weeks later. The body of the third person on board the vessel has yet to be found.

The preceding incident is typical of an all-too-common occurrence in the Gulf of Mexico. An uninspected vessel is bare-boat-chartered to be operated by a master holding no Coast Guard-issued license. As in this case, a stability letter, if it exists, is ignored or not understood.

The result: tragedy.

Since the time this particular casualty occurred, the Coast Guard, under authority of P.L. 96-378, has issued regulations regarding the licensing of crewmembers for offshore supply vessels. These regulations will ensure at least a minimum level of competence in the crews of this type of vessel and should reduce the number of future casualties. ⚓



Glycerine

$C_3H_5(OH)_3$ or

$HOCH_2CHOHCH_2OH$

synonyms:	glycerol 1,2,3-propanetriol
Physical Properties	
boiling point:	290°C (554°F)
freezing point:	18°C (64°F)
vapor pressure at 50°C (122°F):	0.0025 mm Hg
Threshold Limit Values (TLV)	
time weighted average (TWA):	10 mg/m^3
short term exposure limit (STEL):	none established
Combustion Properties	
flash point (open cup):	177°C (351°F)*
autoignition temperature:	370°C (698°F)
Densities	
liquid (water = 1.0):	1.26
vapor (air = 1.0):	negligible
Identifiers	
U.N. Number:	None
CHRIS Code:	GCR

* These values are for a 99% glycerine/1% water mixture

Glycerine is a chemical with wide-ranging uses. Nitroglycerine is a familiar product, but how many people know that glycerine is often used as a sweetener in toothpaste? All of us consume at least some glycerine every day. Most people consume about 100 grams of fat per day; about 10 of those grams are glycerine in its natural form, glycerides, which are present in such animal and vegetable fats as shortening and margarine. Glycerine is also a common additive in processed foods. It prevents the sugar from crystallizing in candy and icings, for instance, and it is the moisturizing agent which keeps syrup fluid. It is often used as a food preservative because of its sweet taste and clear, water-like appearance. Glycerine has the food value of a starch and is about 60 percent as sweet as sucrose, or common table sugar. The chemical is nontoxic for humans, and the grade used as a food additive has been designated "GRAS"—generally recognized as safe for human use—by the United States Department of Agriculture.

In addition to being *part* of many foods, glycerine also goes *around* many foods: because it does not present health hazards, it can be used as a softening agent in plastic wrap. Among the other products it goes into are gums and resins, tobacco, cellophane, drugs, toiletries, urethane foams, and explosives.

Glycerine was first discovered in 1779. It is a liquid chemical which rarely exists in the free state; rather, it is found in fats combined with other chemicals. Natural glycerine, or glycerides, can be separated out of fats and oils; this is called "fat splitting" and consists of adding water to the fats and oils to "split" them into fatty acids and glycerines. This type of glycerine is a byproduct of the soapmaking process. Glycerine can also be synthesized from propylene or refined sugar. Synthetic glycerine became a major factor in the market after 1949, and by 1965 about 60 percent of the total produced was synthetic. Naturally produced, or "crude," glycerine must be refined to whatever grade is required for a particular use. High levels of purity are necessary if the glycerine is to be used in foods, pharmaceuticals, or cosmetics.

Unfortunately, no chemical is without its hazards. Glycerine's major hazard is that it burns. However, the flash point is high (177°C, or 351°F, for a 99 percent solution commonly found on the commercial market), and the Coast Guard thus classifies glycerine as a Grade E combustible liquid when carried in bulk. Such fire-extinguishing agents as water fog, carbon dioxide, dry chemical, and alcohol foam are effective in fighting glycerine fires, whereas water streams may not be, since they cause frothing and splattering. Because glycerine is so viscous, it is usually heated to at least 38°C, 100°F (but no higher than 54°C, 130°F, or it discolors) before pumping. Hot glycerine can cause burns, just like any other hot liquid. When pure, glycerine is noncorrosive, so it can be shipped even in unlined steel tanks, although aluminum, stainless steel, and lined tanks are usually used. The vapor pressure of glycerine is so low that at ordinary temperatures only a limited amount vaporizes and enters the air. Glycerine mists (droplets) can form, however, during the manufacturing process or when the substance is being pumped into a ship. As stated earlier, glycerine is nontoxic, but the American Conference of Governmental Industrial Hygienists deems glycerine mist one of the "Nuisance Particulates" and recommends that the time-weighted average concentration to which a worker is exposed during a normal 8-hour-day, 40-hour work week not exceed 10 mg/m^3. Finally, spills of glycerine on the skin can cause minor irritation, so any affected area should be washed with water.

The Coast Guard regulates glycerine as a Subchapter D cargo, reflecting its minimal hazards. The Inter-Governmental Maritime Consultative Organization does not regulate this chemical.

ALAN SCHNEIDER, Sc.D., and CURTIS PAYNE, B.A.
HAZARD EVALUATION BRANCH
CARGO AND HAZARDOUS MATERIALS DIVISION

Chemical Queries

We began a Chemical of the Month series in last year's August/November issue. Your comments indicate that you have enjoyed these write-ups; we hope they have been of interest to you and that they have shed some light on the substances you might be handling on a day-to-day basis. It is now time to see how successful we've been and how well you've retained what you've read. Below is a list of the chemicals with the months they appeared in the Proceedings and a short quiz to test your memory.

			CHRIS	U.N. No.
Anhydrous ammonia	Aug/Nov	1980		
Chlorine	Dec	1980		
Sulfuric acid	Jan/Feb	1981		
Asphalt	Mar/Apr	1981		
Epichlorohydrin	May	1981		
Acrylonitrile	June	1981		
Carbon disulfide	July	1981		
Motor fuel anti-knock compounds containing lead alkyls	Aug	1981		
Sulfur	Sep/Oct	1981		
Trichloroethylene	Nov	1981		
Glycerine	Dec	1981		

Match the Chemical of the Month with its correct CHRIS Code(s) and U.N. Number(s) in the spaces provided to the right on the chart above. The CHRIS Codes and U.N. Numbers are:

1649	GCR	ASR	2023
SFA	1830	1093	CBB
TCL	ASP	1999	CLX
SXX	AMA	MFA	1350
1005	1017	EPC	1131
1710	2448	ARF	ACN

asphalt

1. "SC," "MC," and "RC" are descriptions for various grades of this commodity, which is used by the construction industry. It is carried in a heated state onboard barges. What is it?

H_2SO_4

2. This commodity has been indicted as a culprit in environmental pollution. Acid rain is essentially this chemical in its dilute form. Can you name it?

3. If this toxic substance were released into the atmosphere, you would recognize it from its pale greenish-yellow vapor and pungent, irritating odor. The U.S. Coast Guard does not allow this commodity to be shipped in bulk on tankships but does allow it to be shipped on unmanned barges. What is it?

Cl_2

4. This commodity has such a low autoignition temperature it can be ignited by steam pipes. Fires after cargo spills are likely, and materials heated by the fire, especially metals, can cause the vapors to reignite once the fire is extinguished. Can you name the chemical?

ACN

5. When a manufacturer of this chemical first applied for permission to transport it, his request was rejected. The reason was that the name he used was "vinyl cyanide," which, of course, was considered "too dangerous." What name is it usually known by?

NH_3

6. This commodity, which is liquefied for shipping, is caustic in both its vapor and liquid states. It exists naturally in the atmosphere of some of the other planets of the solar system. Here on earth, most of it is produced from natural gas, and much of it is used as fertilizer. Name it.

7. This chemical's commercial importance derives from its high reactivity, a property which makes it extremely effective in epoxies. Persons working around the chemical in its liquid form must take special care: leather articles are easily penetrated by it, cannot be decontaminated, and must be destroyed, and even rubber gear will gradually absorb the chemical and have to be discarded. What is it?

8. Every day your body absorbs varying amounts of this commodity, to your benefit. You may be putting it on your skin in the form of cosmetics. You may also be consuming it, since it is a natural part of many foods and has been added to many others. What is it?

9. While ingestion is usually not considered a major threat to those handling chemicals, many people accidentally swallow this "Chemical of the Month" while siphoning gasoline. Can you name it?

10. This commodity, capable of degreasing metals, was once thought to be safe. Recent evidence has shown that it is flammable and toxic. It has also been found to cause cancer in laboratory animals. What is it?

S

11. This chemical is used by industry in greater quantities than any other raw material. One of its major hazards is the danger of fires and explosions. When it burns, a toxic gas forms. Can you name it?

Answers to questions 1 - 11 on page 245

Annual Index Volume 38

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. Hygroscopic cargoes should be ventilated in cases when

A. the dew point of the outside air is greater than the dew point of the air in the hold.
B. a ship is going from a warm to a cold climate.
C. the dew point of the air in the hold is very low.
D. the outside dew point is $60^{o}F$ and the cargo temperature is $54^{o}F$.

REFERENCE: Sauerbier

2. The maximum length allowed between main transverse bulkheads on a vessel is referred to as the

A. floodable length.
B. factor of subdivision.
C. compartment standard.
D. permissible length.

REFERENCE: Ladage

3. Which of the following is an explosion hazard when exposed to flame?

A. Nitrous Oxide
B. Toluene
C. Formic Acid
D. Tallow

REFERENCE: CG 388

4. Which statement is true concerning combustible gas indicators?

A. One sample of air is adequate to test a tank.
B. They do not work properly where there is a lack of oxygen.
C. They will detect a lack of oxygen.
D. They are calibrated to read the percentage chance of explosion.

REFERENCE: Marton

5. When moored with a Mediterranean moor, a ship should be secured to the pier by having

A. a stern line and two quarter lines crossing under the stern.
B. all regular lines leading to the pier in opposition to the anchor.
C. a stern line, two bow lines, and two quarter lines leading aft to the pier.
D. two bow lines and two midship lines leading aft to the pier.

REFERENCE: Knights

ENGINEER

1. Cavitation erosion in the cooling water system of a diesel engine usually occurs at the pump impeller and on the waterside of the

A. fuel nozzle holders.
B. exhaust valve guides.
C. engine cylinder liners.
D. engine exhaust manifold.

REFERENCE: Stinson

2. One characteristic of a pulse-type turbocharging system is

A. high average exhaust manifold pressure.
B. greatly fluctuating inlet manifold pressure.
C. constant exhaust manifold pressure.
D. multiple exhaust pipes to the turbocharger.

REFERENCE: Stinson

3. What procedures should you use when fitting piston rings?

I. Check ring gap for sufficient clearance at the smallest part of the cylinder.
II. Remove any existing carbon from all piston ring grooves.

A. I only
B. II only
C. Both I and II
D. Neither I nor II

REFERENCE: NAVPERS ENG 3&2

4. Superheating of refrigerant takes place in which refrigeration system component?

A. Expansion valve
B. Evaporator
C. Drier
D. Receiver

REFERENCE: Althouse

5. The purpose of the six-way valve in an electro-hydraulic steering system is to

A. parallel rudder motion to the steering wheel.
B. take the pump off stroke when desired rudder angle is attained.
C. redirect hydraulic fluid flow when changing over pumps.
D. ensure positive contact between the Rapson slide and the rudder post.

REFERENCE: Naval Auxiliary Machinery

ANSWERS

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

ANSWERS TO CHEMICAL QUERIES

1. Asphalt
2. Sulfuric acid
3. Chlorine
4. Carbon disulfide
5. Acrylonitrile
6. Ammonia
7. Epichlorohydrin
8. Glycerine
9. Motor fuel anti-knock compounds containing lead alkyls
10. Trichloroethylene
11. Sulfur

INDEX TO COAST GUARD REGULATIONS

Many of the publications previously included in this list (under the title "MERCHANT MARINE SAFETY PUBLICATIONS") were unavailable because they were being revised or reprinted. These publications were reprints of selected subchapters of the Code of Federal Regulations (CFR). The Superintendent of Documents publishes the CFR in yearly updated form, and 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.

Safety-related publications not falling into the CFR-reprint category will henceforth be published periodically in a separate list.

Listed below are the Code of Federal Regulations (CFR) subchapters covering Coast Guard shipping regulations (Title 46, Chapter I of the CFR). 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.

Listed below are the Code of Federal Regulations (CFR) subchapters covering Coast Guard regulations on Navigation and Navigable Waters (Title 33, Chapter I of the CFR). Chapter I consists of a single volume containing 19 subchapters. Subchapters and/or parts of this chapter are not published individually; the entire volume must be ordered.

	Volume	Coast Guard Equivalent	Contents
1.	33 CFR Parts 1 to 199	None	Subchapter A—General. Parts 1 to 26.
		None	Subchapter B—Military Personnel. Parts 45 to 53.
		None	Subchapter C—Aids to Navigation. Parts 60 to 76.
		None	Subchapter D—Navigation Requirements for Certain Inland Waters. Parts 80 to 86.
		None	Subchapter DD—Implementation and Interpretation of the 72 COLREGS. Parts 87 and 88.
		None	Subchapter E—Navigation Requirements for the Great Lakes and St. Marys River. Parts 90 to 92.
		None	Subchapter F—Navigation Requirements for Western Rivers. Parts 95 and 96.
		None	Subchapter G—Regattas and Marine Parades. Part 100.
		None	Subchapter H—Routes for Passenger Vessels. Part 105.
		None	Subchapter I—Anchorages. Parts 109 and 110.
		None	Subchapter J—Bridges. Parts 114 to 118.
		None	Subchapter K—Security of Vessels. Part 122.
		None	Subchapter L—Waterfront Facilities: Security Zones and Regulated Navigation Areas. Parts 125 to 128.
		None	Subchapter M—Marine Oil Pollution Liability and Compensation. Parts 135 and 136.
		None	Subchapter N—Artificial Islands and Fixed Structures on the Outer Continental Shelf. Parts 140 to 147.
		None	Subchapter NN—Deepwater Ports. Parts 148 to 150.
		None	Subchapter O—Pollution. Parts 151 to 159.
		None	Subchapter P—Ports and Waterways Safety. Parts 160 to 165.
		M16752.2	Subchapter S—Boating Safety. Parts 173 to 183.

U.S. GOVERNMENT PRINTING OFFICE : 1981 O - 357-910