# Proceedings

## of the Marine Safety Council


United States
Coast Guard

June 1984

# Proceedings
of the Marine Safety Council

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## Cover

*"Think Before You Drink; Be a Responsible Boat Operator" is the slogan of this year's National Safe Boating Week, June 3 - 9. Alcohol is one of the subjects covered in the article "Under the Influences," beginning on page 168.*

# Asbestos: Clarification and Update

The article on asbestos in the March 1984 issue of the *Proceedings* contained a reference to a "Coast Guard-recommended standard" for permissible exposure to asbestos. The standard mentioned was the one adopted by the Occupational Safety and Health Administration: that employees be exposed to levels no greater than 2.0 asbestos fibers per cubic centimeter, averaged over an eight-hour workday. The Coast Guard recommended that standard in its Navigation and Vessel Inspection Circular on asbestos, No. 5-80, directed at merchant vessels, deepwater ports, and outer continental shelf facilities.

The Coast Guard's standards for its own operations are even more restrictive. Working environments are to expose personnel to a concentration no greater than 0.5 fiber per cubic centimeter. In the near future, this will be reduced to 0.1 fiber. (For living environments on both its own and merchant vessels, the Coast Guard recommends that exposure levels not exceed 0.1 fiber per cubic centimeter.)

Because of growing concern about asbestos disease associated with lower-level exposure, OSHA intends to make its standard more restrictive. A recent attempt by OSHA to issue an emergency temporary standard of 0.5 fiber per cubic centimeter was struck down by the Fifth Circuit Court of Appeals. This decision was based not on the lower exposure limit, but on procedure, i.e., OSHA's use of the emergency temporary standard procedure rather than the normal notice-and-comment rulemaking procedure. As this issue was going to press, OSHA had solicited comments on a proposed rule and had scheduled public hearings to begin June 19. Among the questions to be discussed were whether the revised standard should be 0.5 or 0.2 fiber per cubic centimeter and, if the higher level was adopted, what provisions of the regulation might need to be applied at a lower exposure level.

The Coast Guard will revise its NVIC to reflect the new OSHA standard. ‡

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# Caution Urged in the Use of Venturi-type Blowers

The explosion and subsequent sinking of the SS AMERICAN EAGLE in the Gulf of Mexico on February 26, 1984, has alerted the Coast Guard to a possible hazard involving the use of steam with portable venturi-type blower or exhaust units in the blower mode. Three crew members lost their lives as a result of the explosion in that casualty, which is still under study by a Coast Guard Marine Board of Investigation.

The hazards of introducing steam into a non-gas-free atmosphere are well-known and are described in the International Safety Guide for Tankers and Terminals (ISGOTT). If a blower of the venturi type is used to gas-free a tank, the device must be grounded, as steam can produce mist clouds which may be electrostatically charged. Adding to the Coast Guard's concern is the possibility that a plastic sleeve attached to the venturi-type blower may increase the potential for static charge release.

Although no conclusions have been reached regarding the SS AMERICAN EAGLE incident, the Coast Guard feels that it should warn the maritime community to exercise extreme caution in using portable venturi-type blowers or exhaust units in the blower mode, especially when using steam to ventilate tanks that have not been gas-freed.

The Coast Guard plans to investigate this potential problem further. When investigation and possible testing of these devices are completed, a further recommendation regarding use of this equipment on tank vessels will be formulated. ‡

*Right: The model involved in the incident*

# MARPOL 73/78

*Last fall marked the entry into force of an important international treaty and the first of its annexes.*

The International Convention for the Prevention of Pollution from Ships, 1973, as modified by its Protocol of 1978 (MARPOL 73/78) entered into force on October 2, 1983. The combined instrument is generally regarded as the most important international treaty ever adopted in the struggle against pollution of the seas.

For signatory countries, MARPOL 73/78 supersedes a convention adopted in 1954 and updated by the International Maritime Organization several times since then. The 1954 convention was concerned only with the prevention of oil pollution arising from routine shipping operations, such as the cleaning of cargo tanks. MARPOL 73/78, on the other hand, not only strengthens regulations dealing with operational pollution but also introduces measures to mitigate the effects of oil pollution resulting from tanker accidents and addresses pollution by other substances.

The first of the five technical annexes to the Convention deals with oil pollution. Annex I entered into force along with the Convention last October. Its provisions can be divided into two groups, those directed at preventing operational oil pollution and those directed at preventing accidental oil pollution.

## Operational Oil Pollution

Among the new measures intended to prevent operational oil pollution are the following:

- All new oil tankers of 20,000 deadweight tons and above built since 1979 must have sufficient segregated ballast tanks to operate safely on ballast voyages without using cargo tanks for ballasting. This prevents the mixture of water and residues of the oil cargo and thereby eliminates the problem of dirty ballast disposal.

- New crude oil tankers of 20,000 deadweight tons or more must be fitted with a crude oil washing system. This is a system in which the walls of cargo tanks are cleaned of oil sediments by jets using crude oil rather than sea water. Although a final rinse is usually carried out using water, the proportion of oil in the resultant mixture of oil and water is greatly reduced. For existing tankers this is accepted as an alternative to the segregation of ballast tanks.

- The total amount of oil which can be discharged from a new tanker during the ballast voyage is 1/30,000 of the previous cargo. This is half the amount allowed by the 1954 convention, the 1/15,000 of the previous cargo which will continue to be allowed for existing tankers. Cargo-related discharges from tankers are completely banned within 50 miles of land. Discharge of oil from all ships is prohibited in certain "special areas." Initially, these include the Mediterranean, Black, and Baltic Seas, but other areas where the ecology is endangered may be included at a later date.

- Contracting parties to the Convention must provide facilities for the reception of oily wastes.

- Oil tankers must be fitted with special anti-pollution equipment such as slop tanks, oil-discharge monitoring and control systems, and oil-water separating equipment. Non-tankers must be fitted with equipment to control the discharge of wastes from machinery-space bilges.

- Strict inspection, documentation, and control procedures will be followed.

## Accidental Oil Pollution

Measures aimed at preventing pollution from accidents include the following:

- Segregated ballast tanks on new tankers must be protectively located: this means that they must be positioned in such a way that they will give maximum protection to the cargo tanks in the event of a collision or grounding.

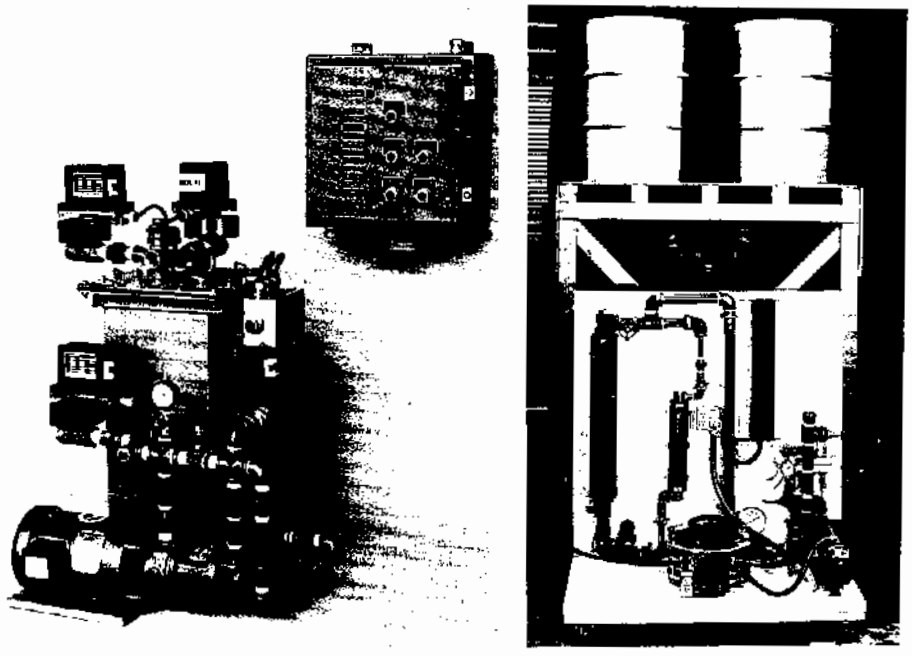
- The size of cargo tanks is limited: normally center tanks are limited to 30,000 cubic meters and wing tanks to 15,000 cubic meters. As a result, the amount of oil which can enter the sea following damage to a tank is limited.

- New subdivision and stability requirements have been introduced to ensure that tankers can survive assumed damage to a degree which is specified on the basis of the ship's length.

The requirements of Annex I were considerably strengthened in the Protocol of 1978. This was adopted at a special conference called by the International Maritime Organization to consider new measures for tanker safety and pollution prevention. At that time there was very little prospect of the 1973 parent Convention's entering into force within the foreseeable future, mainly because of technical problems connected with Annex II of the convention, which is concerned with the prevention of pollution from noxious liquid substances carried in bulk. Delegates to the 1978 conference therefore decided to adopt a Protocol which, in effect, absorbed the parent Convention, improved Annex I, and allowed contracting parties to defer implementation of Annex II for three years after entry into force of the Protocol.

Annex II is scheduled to enter into force on October 3, 1986. It contains detailed requirements for the control of more than 250 different substances carried in bulk. They are divided into four categories according to the hazard they present to marine resources, human health, or amenities. Discharge criteria vary according to the degree of environmental hazard, but all Category "A" residues must be discharged into reception facilities.

Annexes III, IV, and V, dealing with prevention of pollution from chemicals in packaged form, sewage, and garbage, respectively, are option-



*(Left) This typical oil-water separator processes four gallons of bilge water per minute. (Right) In this test rig for oil-water separators, one barrel holds water and the other oil. They feed into the separator, and the resulting fluid is then tested for its oil content.*

Copies of the International Maritime Organization's "Regulations for the Prevention of Pollution by Oil" can be ordered for £5.50 each from the IMO Secretariat, Publications Section, 4 Albert Embankment, London SE1 7SR, England. The sales number is 525.82.19E.

al. Countries ratifying the Convention do not have to adopt these Annexes. Consequently, the three Annexes have not yet met the requirements for entry into force, i.e., been ratified by 15 countries representing at least 50 percent of the world's merchant tonnage. The U.S. is among the countries that have yet to ratify Annexes III, IV, and V, although the U.S. Coast Guard is examining them.

Although it took ten years for MARPOL 73/78 to enter into force, the treaty has already had a considerable impact, especially on tanker design. The fact that the Convention had been adopted meant that most shipowners ordered tankers built to MARPOL requirements, since by doing so they would avoid the necessity of carrying out an expensive conversion at a later date. The most stringent requirements of the Convention apply to "new tankers." These are defined by calendar dates rather than the time of the Convention's entry into force.* In practice this procedure has meant that most ships ordered since December 1975 have incorporated the requirements of MARPOL 1973 and that tankers ordered since June 1979 have been constructed to meet the requirements of MARPOL 73/78.

## What MARPOL Means for U.S. Mariners

The U.S. Coast Guard is the agency responsible for implementing and enforcing the requirements of MARPOL 73/78 in the United States. Most of the requirements pertaining exclusively to tankers (such as segregated ballast tank requirements) had already been incorporated into U.S. Coast Guard regulations under the Port and Tanker Safety Act of 1978. An exception was the new requirement for a cargo-oil-discharge monitoring and control system. The Oil Pollution Prevention Regulations can be found in Parts 151, 155, and 157 of Title 33 of the Code of Federal Regulations.

New ships were required to be completely fitted with MARPOL 73/78-required pollution prevention equipment by October 2, 1983. Existing ships will have until October 2, 1986. Design and testing specifications for pollution prevention equipment are set forth in Part 162.050 of Title 46 of the Code of Federal Regulations. The regulations call for plans to be reviewed to ensure compliance with the Marine Engineering Regulations (Piping and Electrical) and laboratory tests to be done on prototype devices to see that they keep oil concentrations to the acceptable level. Lists of Coast Guard-approved pollution abatement equipment are maintained by the Merchant Vessel Inspection Division and can be obtained by writing to Commandant (G-MVI-3), U.S. Coast Guard, Washington, DC 20593.

U.S. oceangoing ships of 400 gross tons and above are required to be equipped with oil-water separating equipment for the treatment of machinery-space oily bilge water and an oil residue (bilge slop) tank. The specific equipment requirements depend on the size of the ship and whether or not the ship ballasts its fuel oil tanks. Oceangoing ships of less than 400 gross tons are not required to be equipped with oil-water separating equipment or an oil residue (bilge slop) tank. Retention on board of all oily mixtures for discharge to a reception facility is an acceptable alternative for these ships. If the operator wishes to discharge overboard, a vessel in this size range must be fitted with the equipment required on larger ships.

In accordance with Section 311 (b)(3) of the Federal Water Pollution Control Act the "sheen test" will be applied to discharges from machinery-space bilges and fuel oil tanks which occur within three nautical miles of land. Discharges which occur within 12 nautical miles of land are permitted only when the oil content of the discharges is 15 parts per million (ppm) or less. Discharges of oily mixtures which occur beyond 12 nautical miles from land are required to have an oil content of less than 100 ppm.

As for enforcement, the regulations call for the Coast Guard to inspect vessels to see that they are carrying installed oil-water separating equipment, an International Oil Pollution Prevention Certificate, and a MARPOL Oil Record Book as well as to see that operational discharge of oil is being held to an acceptable concentration level. This applies to both foreign and U.S.-flag ships.

*This article was adapted from an article appearing in* IMO News, *Number 4, 1983, and the paper "Shipyard Standards for Pollution Abatement Equipment" by LTjg D. S. Delikat and Thomas Mackey, delivered at the Chesapeake Marine Engineering Symposium, Washington, DC, January 19, 1984.*

* "New" ships, as defined by MARPOL, are those for which a contract for building or major modification was placed after December 31, 1975, or, in the absence of a contract, the keel of which was laid after June 30, 1976, or which was delivered after December 31, 1979.

# Update: Navigation and Vessel Inspection Circulars

Between July 1983, when the last NVIC update was published, and the end of 1983, the Coast Guard published the following Navigation and Vessel Inspection Circulars:

| NVIC No. | Name of NVIC | Price |
|---|---|---|
| 6-83 | Admeasurement of Vessels in Accordance with the Rules of the International Convention on Tonnage Measurement of Ships, 1969 | $2.25 |
| 7-83 | Guidance for Issuing International Oil Pollution Prevention (IOPP) Certificates under the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78) | $3.75 |
| 8-83 | Guidance for Compliance with Annex I of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78) | $3.75 |
| 9-83 | Coast Guard Guidance Regarding Requirement for Charts and Publications | $1.00 |
| 10-83 | Stability Approval and the Issuance of Stability Letters | $1.00 |
| 11-83 | Regulations for very large 46 CFR Subchapter T passenger vessels | $1.25 |
| 12-83 | Intact Stability of Towing and Fishing Vessels; Research Results | $1.25 |
| 13-83 | Coast Guard Retention of Commercial Vessel Plan Review Case Files | $1.00 |

The following NVICs were cancelled during 1983, either because their purpose had been served or because they had been superseded by a new NVIC, as indicated below:

| | |
|---|---|
| 5-69 | Carriage of Flammable and Combustible Liquids in Portable Tanks |
| 3-74 | Implementation of the Regulations Concerning Licenses for Operation of Uninspected Towing Vessels (46 CFR, Subpart 10.16 and Sections 157.10-85, 157.30-45) |
| 1-77 | Unified Interpretations of the 1966 International Convention on Load Lines (Cancelled by NVIC No. 5-83) |
| 4-79 | Recommended Procedures for Using Smith & Wesson International Line Throwing Appliances |

| | |
|---|---|
| 7-79 | 1969 Amendments to the International Convention for the Prevention of Pollution of the Sea by Oil 1954; Operational Compliance with |
| 12-80 | National Fire Protection Association (NFPA) Standard No. 306, "Control of Gas Hazards on Vessels 1980" |
| 3-81 | Coast Guard Retention of Commercial Vessel Plans, Specifications and Related Correspondence (Cancelled by NVIC No. 13-83) |
| 13-81 | Recall of Smith & Wesson Line Thrower Rockets |

NVIC No. 0-84, an index of Navigation and Vessel Inspection Circulars in effect as of January 1, 1984, can be obtained free of charge by calling (202) 426-0173 or writing

Commandant (G-MP-4/1409)
U.S. Coast Guard
Washington, DC 20593
ATTN: NVICs

Requests for **back issues** of NVICs (1983 and earlier) should also be directed to that address. A check or money order payable in U.S. dollars to "Treasury of the United States" must be included with each request. Price information is included in NVIC No. 0-84.

**NVICs published in 1984** must be purchased, singly or by subscription, from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. **Note to subscribers:** the annual subscription fee, payable in advance, is now $21.00 ($26.25 for foreign addresses). Checks or money orders should be made payable to "Superintendent of Documents, Government Printing Office." VISA or MasterCard holders may charge their orders.

A list of 1984 NVICs issued to date will appear in the September issue of the *Proceedings*.

# The Hybrid PFD

*This personal flotation device, still in the development stages, can be adjusted to provide different levels of flotation for different wearers.*

**by John C. Bernhartsen**
**Chief, Education Coordination Branch**
**Boating Safety Division**

To many people, putting on a PFD is associated with the sinking of the TITANIC. It is the last thing they do before a ship goes down, while the band is already playing "Nearer My God to Thee." Most boating accidents happen without warning, however. There is no time for a band to play and no time for a boater to find a PFD and put it on.

The tragedy of boating fatalities is that about 75 percent could be avoided if people would simply use PFDs. Someone who survives the initial moments of an automobile accident has a very good chance of coming through it alive. On the water, though, accidents are very different. Although victims may be only a few feet from safety, cold, shock, and panic too often take their toll, and too many individuals who fall in disappear from view and are never seen again alive. Wearing a PFD can mean the difference between life and death.

There are many reasons why people don't wear PFDs: they are "bulky," they are "hot," they are "unattractive," they are "uncomfortable," they are not "macho." Besides, they interfere with getting a tan.

The Coast Guard has been aware of the public's reluctance to wear PFDs for a long time. In the early days, PFDs were indeed all the negative things they are often still perceived to be. Many changes have been made in PFDs over the last few years, however, and PFDs are now available in a great variety of sizes, styles, and models. There is a PFD to fit anyone's needs and tastes. Although no one has yet come up with a PFD which will allow tanning rays to penetrate, the other objections

*PFDs are available in a great variety of sizes and styles.*

have been largely resolved. Considering the many warnings that sunbathing will lead to skin cancer, whatever effect PFDs have in blocking the sun's rays should perhaps be seen as an added bonus.

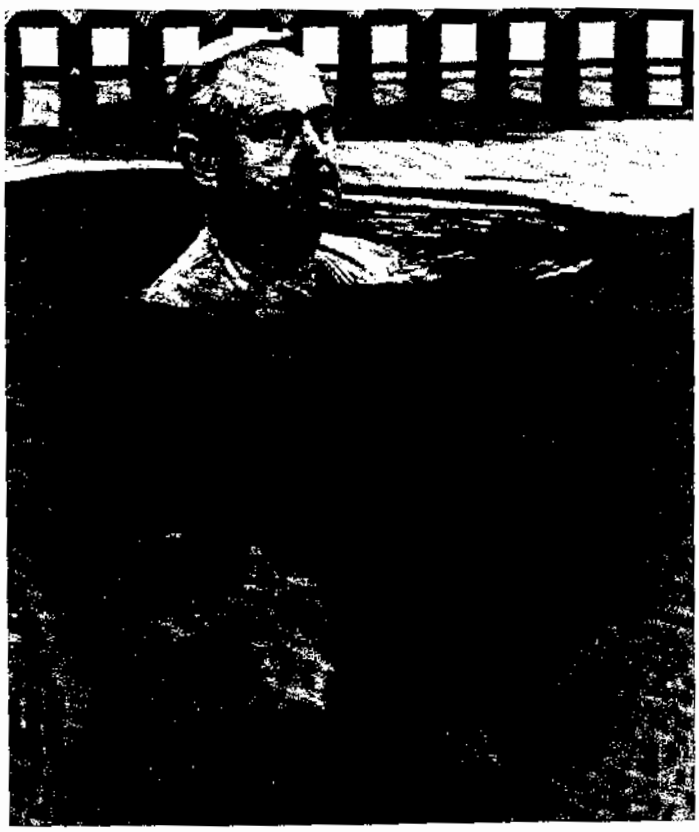
The Coast Guard recognizes that people are different and have different needs. The word "personal" in the term "personal flotation device" means what it says. A PFD must meet the needs of the individual wearing it. No standard PFD, no standard amount of flotation, will serve everyone equally well. Because of displacement, most people weigh only seven to nine pounds in the water; however, there are a few that weigh twice as much. The same PFD may float two individuals entirely differently.

To ensure that the great majority of people have adequate flotation in their PFDs, the Coast Guard has stipulated that Type III PFDs (the easy-to-wear type often tailored to meet the requirements of individual water sports) have a minimum of 15.5 pounds of inherent flotation. Some other types of PFDs have more.

Although 9 pounds of inherent flotation would be enough for most people, it would be inadequate for the individual who requires 12 to 15 pounds. What type of PFD would serve both wearers but not be too cumbersome for the smaller person? This is a question that has concerned the Coast Guard and PFD manufacturers for years. The latest attempt to supply the boating public with acceptable flotation devices is the "hybrid" PFD. The hybrid PFD has a certain amount of inherent flotation which the wearer can significantly increase by inflating one or more air chambers. Hybrid PFDs are still experimental, and none have yet been certified, but initial indications are promising.

The concept of a hybrid PFD has been under study for some time, and the National Boating Safety Advisory Council has been following its development. The Council's chairman, A. Newell Garden, the chairman of a special study group, Al Simon, and other members of the

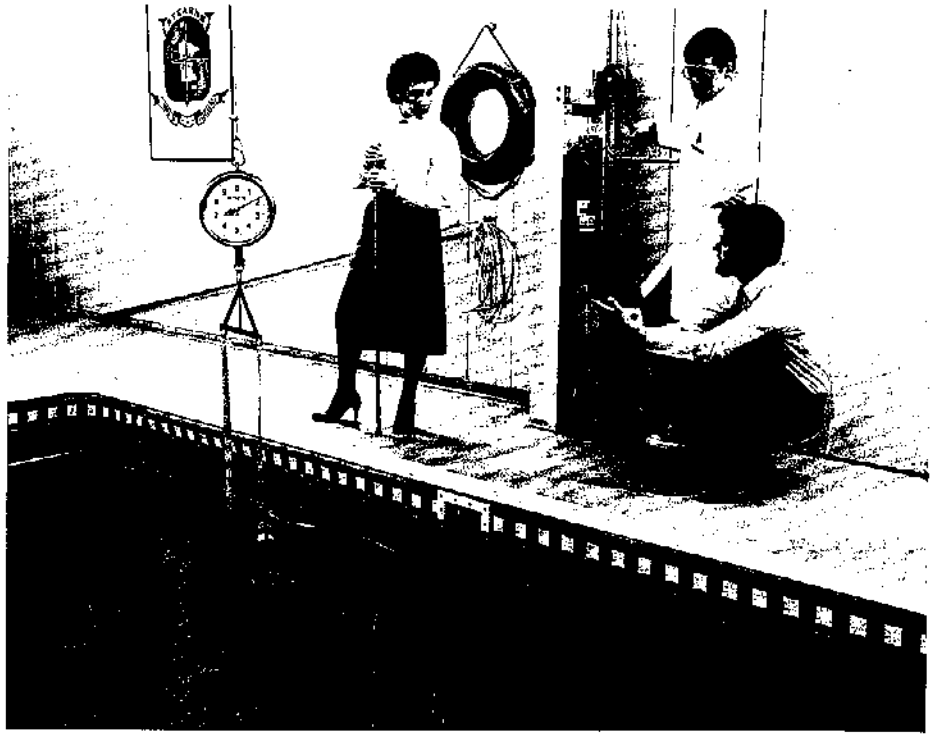
*Five pounds of inherent flotation in this hybrid PFD provide study committee chairman Al Simon with sufficient buoyancy until the supplemental air chamber is inflated. A conventional life preserver might have 16 pounds of inherent buoyancy.*



*Each puff of air added five pounds of additional buoyancy until the hybrid PFD was fully inflated. With 22 pounds of support provided by the combined inherent buoyancy and the air, the jacket now supports Al Simon so that his head and neck are fully out of the water.*

group recently completed an investigation of hybrid PFDs. The study group recommended that the Council approve the concept under the following conditions:

- The device should be considered Coast Guard-approved equipment only when worn.
- The wearer should be able to inflate at least one air chamber simply by blowing into it.
- The device should not be required to turn a person face up in the water.
- The device should have a minimum of five pounds' inherent buoyancy.
- When inflated, the device should have a minimum total buoyancy of 22 pounds.
- Because of the special nature of the device, an owner's manual should accompany each device sold.



*Personal flotation varies with an individual's body density. Here, Sam Wehr (kneeling) of the Coast Guard's Survival Systems Branch and Karla Evert of Stearns Manufacturing Co. measure buoyancy requirements for a test subject. The man in the water requires nearly 12 pounds of lift to float at this level. After figures for a variety of different subjects were obtained, each subject was studied in the pool wearing vests with different amounts of flotation material.*

With these provisions, the Council voted unanimously that the Coast Guard should proceed with a proposed rulemaking for the device. The Coast Guard is doing so, under the docket number CGD 78-174. A notice of proposed rulemaking is tentatively scheduled for publication in the Federal Register sometime in the next few months.

The Coast Guard project manager for this rulemaking, Samuel Wehr, cautions that the hybrid PFD has several disadvantages. One of them is obvious: the device simply has less inherent buoyancy than a conventional device. Also, since there is always a possibility that such a device will develop a leak, it will have to be checked regularly. The potential for damage to the air chambers requires that the device be given special handling; it cannot be treated as cavalierly as conventional devices. Wehr feels that most of these concerns would be allayed by the conditions under which the device would be approved. On the advice of the National Boating Safety Advisory Council, the Coast Guard will consider the hybrid PFD as meeting carriage requirements for Coast Guard-approved equipment only if it is being worn. This may sound restrictive, but Wehr says that it is the only way now known which will ensure that manufacturers design hybrid PFDs that are comfortable to wear. Improved comfort, and its counterpart, the improved likelihood that boaters will wear PFDs, would be the Coast Guard's main purpose for approving such devices.

Standards for the hybrid PFD have not yet been finalized and will not be finalized before the final rulemaking is complete. What this means is that the hybrid PFD will probably not appear on store shelves for some time.

While success in reducing boating fatalities will continue to depend on individual boaters, hybrid PFDs will present boaters with yet another comfortable device, one readily adaptable to different body types.

The excuses for not wearing a PFD continue to dwindle. ‡

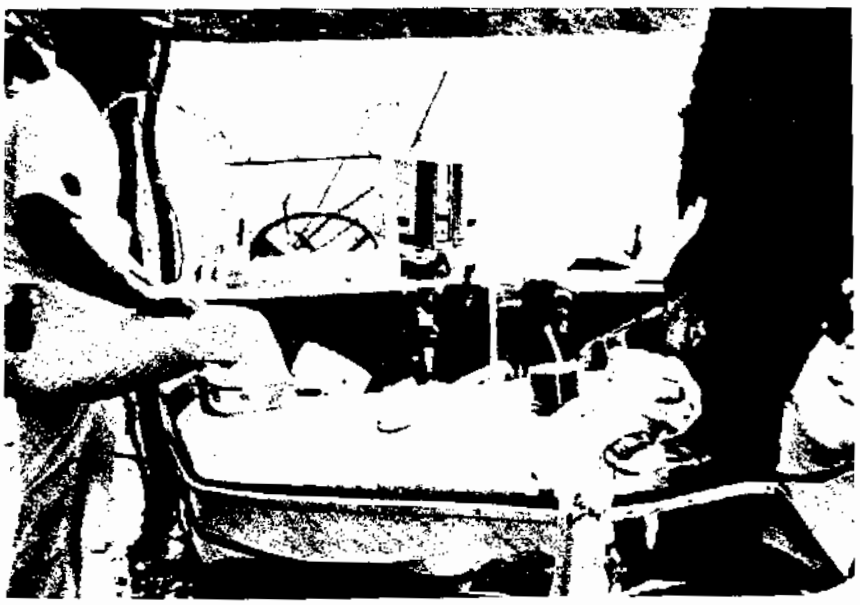
# Under the Influences

*How do you explain a normally prudent boat operator's running into an obstruction he's known about for years? How about two boats' colliding on a quiet lake where visibility is unlimited and their operators' then claiming they didn't see each other?*

**by John C. Bernhartsen**
**and LTjg Craig S. Thurber**
**Education Coordination Branch**
**Boating Safety Division**

Man was meant to stand on solid ground and have a steady horizon in front of his eyes; his sensors are attuned to those external references. Put him on a boat, and the pounding and vibration, the yaw, the pitch, the roll, confuse his body, upsetting the balance mechanism of his inner ear and giving conflicting signals to the motion analyzer in his brain stem. Add glare and noise, common conditions on the water, and you have a situation which produces considerable strain and fatigue. Make the boater's unsteady horizon even less steady by adding alcohol or, questions of legality aside, marijuana, and those seemingly inexplicable collisions suddenly begin to make sense.

The Coast Guard's Office of Boating Safety



*What, you may ask, is that object in the side of the boat that looks like a tree? It is a tree.*


*This merchant takes it for granted his customers will be drinking. He sells beer along with the fuel.*

*An accident like this one gives new meaning to the term "on the rocks."*


decided to undertake a research project on operator performance after determining that the causes of 90 percent of small-boat accidents were operator-related. We postulated that the reason boat operators committed errors was that they were subject to so many elements which induced stress. The combined effect of these elements or their "enhancement" by alcohol or marijuana made the strain on the operator that much greater.

The first area we studied was operator eye movements. This study was only a pilot and was limited in scope, but we did notice one thing: after a few hours, the operator tended more and more to look straight ahead, failing to react to lateral stimuli.

To test our hypothesis that combined stresses produced a magnified effect, we designed the second set of experiments so that boat operators would be performing a secondary task while engaged in the primary task of driving a boat. The operators were instructed to maintain a compass heading and RPM level and were told that lights would blink on and off in a detectable pattern. Whenever there was a change or an anomaly in the pattern, the operators were to press a button on the throttle handle. Our purpose was to measure their performance, their reaction to visual stimuli as affected by various factors.

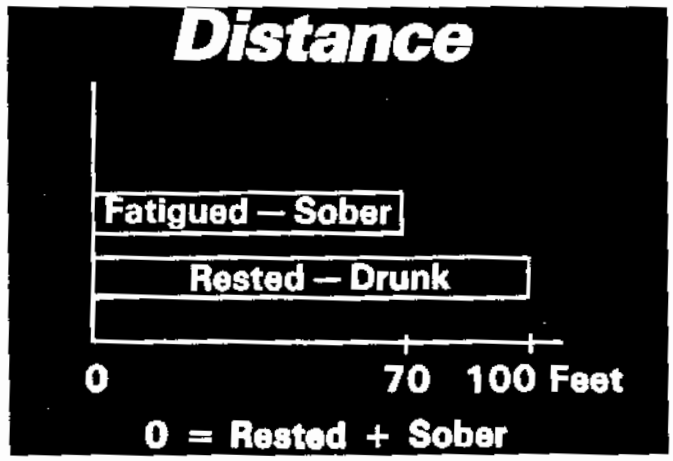
There is, of course, a vast difference between noting an anomaly/pressing a button and observing another boat, determining its course

**CHART FOR RESPONSIBLE PEOPLE WHO MAY OPERATE A BOAT WHILE DRINKING**

APPROXIMATE BLOOD ALCOHOL PERCENTAGE

| Drinks | Body Weight in Pounds | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 100 | 120 | 140 | 160 | 180 | 200 | 220 | 240 | |
| 1 | .04 | .03 | .03 | .02 | .02 | .02 | .02 | .02 | BE |
| 2 | .08 | .06 | .05 | .05 | .04 | .04 | .03 | .03 | CAREFUL |
| 3 | .11 | .09 | .08 | .07 | .06 | .06 | .05 | .05 | |
| 4 | .15 | .12 | .11 | .09 | .08 | .08 | .07 | .06 | OPERATION |
| 5 | .19 | .16 | .13 | .12 | .11 | .09 | .09 | .08 | IMPARED |
| 6 | .23 | .19 | .16 | .14 | .13 | .11 | .10 | .09 | |
| 7 | .26 | .22 | .19 | .16 | .15 | .13 | .12 | .11 | DO NOT |
| 8 | .30 | .25 | .21 | .19 | .17 | .15 | .14 | .13 | OPERATE |
| 9 | .34 | .28 | .24 | .21 | .19 | .17 | .15 | .14 | |
| 10 | .38 | .31 | .27 | .23 | .21 | .19 | .17 | .16 | |

Subtract .01% for each 40 minutes of drinking
One drink is 1¼ oz. of 80 proof liquor, 12 oz. of beer, or 4 oz. of table wine.




and speed, evaluating the probability of a collision, deciding on appropriate action, and executing this action. Neither this experiment nor the others were intended to be a precise simulation of boating activities. The experiments were devised only as tests to measure visual alertness and operator responses under real-world conditions.

We tested subjects in four conditions: sober and rested, sober but fatigued, drunk but rested, and drunk and fatigued. "Drunk" was defined as a blood alcohol content of .10%, as measured with a Breathalyzer. In later tests we added such factors, singly and in combination, as glare, noise, vibration, and heat. We recorded correct responses as well as missed signals and incorrect responses.

Using results from tests on sober, rested operators as a base line, we found that fatigue alone causes performance to deteriorate considerably. The stresses placed on the operator of a boat are so great that after only a few hours the operator's ability to perceive and react to outside stimuli is reduced nearly as much as if he or she were legally drunk. Add a little alcohol, and, of course, the reaction time is slowed even more.

A tired operator driving a boat at a speed of 30 mph would, on the average, travel 70 feet farther than a rested operator before he would start to react to a visual stimulus. Rested but with a blood alcohol content of .10%, the same operator, under the same conditions, would travel 100 feet before starting to take action. Alcohol increased missed responses considerably, and operators who were both drunk and fatigued had a missed response rate more than 10 times that recorded for sober, rested operators.

*Would sober inner tubers allow themselves to drift into water where boats were operating?*

The effects of alcohol are not limited to a slowed reaction time. There is also the worry that a boat operator who has imbibed will suffer from impaired judgment and a reduced ability to reason. Alcohol is a depressant, both neurologically and psychologically. Neurologically, it reduces the ability of a person to observe and react. Psychologically, it reduces socially learned restrictions on behavior and causes unpredictable and irresponsible actions.

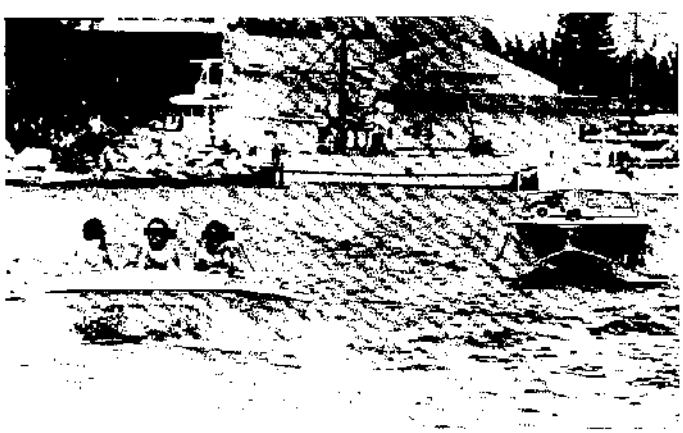
Alcohol has been found to

be an important contributor to all forms of accidents and violent death. Boating accidents are not exempt from this generalization. Some authorities claim that as many as 50 to 65 percent of boating deaths are alcohol-related.

Marijuana is another cause for concern. Although marijuana may initally appear to have a stimulating effect, it, like alcohol, is a depressant. It acts as a sedative to produce a reduced level of activity and, often, sleep. Among its effects are impairment of short-term memory, distortion of time distinction, and, among chronic users, impairment of long-term memory. More importantly for our area of interest, marijuana impairs driving skills by distorting a person's sense of speed and interfering with his ability to brake on time or even follow a course.

Marijuana, again like alcohol, produces psychological reactions. Users may develop abnormal levels of hostility and irritability and start experiencing mood swings, going from relaxed to furious. They may start to show signs of panic reaction, paranoia, or the "don't hassle me" or "everybody is against me" syndromes. Severe depression is also a possibility. If you were in a crossing situation, these are probably not the characteristics you would like to see in the operator of the approaching boat.

So where does all this lead? The bottom line is that the marine environment is harsh and demanding and is not tolerant of mistakes. To successfully cope in this environment, an individual must be in full possession of his faculties. There are enough stressful influences that the boat operator can do little about: the unsettling effect that being on the water has on his body's sensors, the fatigue, the glare, the noise, the heat or cold. He does not need to further impair his ability to drive a boat (and endanger his own life or those of others) by indulging himself in the use of alcohol or marijuana. ‡



*Intoxicated boaters are drawing increasing attention from police in Florida.*

## Boating While Intoxicated May Become Federal Offense

A bill recently approved by the House of Representatives authorizing Coast Guard appropriations for fiscal years 1985 and 1986 includes a provision establishing criminal and civil penalties for persons operating a vessel while intoxicated.

Present Federal law contains penalties for operating a vessel in a negligent or grossly negligent manner that endangers "the life, limb or property of a person." There is, however, no specific prohibition against a person's operating a vessel while intoxicated. H.R. 4841 would establish a criminal penalty of up to $1,000 or one year's imprisonment, or both, for such an offense. These sanctions are equivalent to those which may at present be imposed for gross negligence. A civil penalty of up to $1,000 would be established for cases not referred for criminal action.

Congress recognizes that primary responsibility for enforcing laws with respect to the operation of recreational vessels rests with state and local officials, not with the Coast Guard. This provision is intended merely to provide the Coast Guard with an additional law enforcement tool in the event that, during the course of its normal law enforcement activities, it becomes aware that a person operating a vessel is intoxicated.

The Coast Guard and Navigation Subcommittee of the House Merchant Marine and Fisheries Committee submitted a questionnaire to the state governments in connection with H.R. 4358, a forerunner to the provisions of H.R. 4841 dealing with alcohol abuse by vessel operators. Of the 31 states responding, 26 favored enactment of the legislation. All of those responding except Idaho reported that they had laws prohibiting persons who were intoxicated from operating vessels. Penalties ranged from a fine of $25 to a fine of $5,000 and one year in jail, depending on whether deaths or serious injuries were involved in a violation.

# Keynotes

The Coast Guard published the following items of general interest in the Federal Register between March 15, 1984, and April 13, 1984:

## Final rules:

| | |
|---|---|
| COTP New Orleans Reg. 84-03 | Safety Zone Regulations; Vicinity of the Mississippi Aerial River Transit (MART) Terminals in New Orleans (published March 15) |
| COTP Jcksnvlle Reg. 84-07 | Safety Zone Regulation; Atlantic Ocean, Jacksonville Beach, Florida (March 15) |
| COTP Jcksnvlle Reg. 84-06 | Safety Zone Regulation; Intracoastal Waterway, St. Augustine, Florida (March 19) |
| CGD3 83-060 | Drawbridge Operation Regulations; Nacote Creek, New Jersey (March 22) |
| CGD 78-180 | Special Requirements for Cargo Lightering Operations (March 26) |
| CGD11 84-17 | Special Local Regulations; Sunshine Marina Boat Drags, Riviera Marina, Riviera, Arizona (April 5) |
| COTP New Orleans Reg. 84-01 | Safety Zone Regulations; Lower Mississippi River, Vicinity of New Orleans (April 6) |
| COTP New Orleans Reg. 84-02 | Security Zone Regulations; 1984 Louisiana World Exposition in New Orleans (April 6) |
| CGD11 84-011 | Special Local Regulations: Newport to Ensenada Yacht Race, Newport Beach, California (April 12) |

## Notices of proposed rulemaking (NPRMs):

| | |
|---|---|
| CGD 1-84-1 | Drawbridge Operation Regulations; Danvers River, Massachusetts (March 15) |
| CGD3 83-067 | Drawbridge Operation Regulations; South River, New Jersey (March 15) |
| CGD7 84-05 | Drawbridge Operation Regulations; Savannah River, Georgia (March 19) |
| COTP San Frsco Reg. 83-04 | Safety Zone Regulations; San Francisco Bay (March 19) |
| CGD12-84-02 | Drawbridge Operation Regulations; Connection Slough, California (March 19) |
| CGD 83-013 | Carriage and Use of Liquefied or Nonliquefied Flammable Gas as Cooking Fuel on Vessels Carrying Passengers for Hire (March 22) |
| CGD 80-142 | COLREGS Demarcation Lines; Savannah River, Georgia, to Amelia Island, Florida; withdrawal of NPRM (March 22) |
| CGD3 84-06 | Drawbridge Operation Regulations; Christina River, Delaware (March 22) |

| | |
|---|---|
| CGD5-83-04 | Anchorage Ground; Hampton Roads, Virginia; advance notice of proposed rulemaking (March 22) |
| CGD5 83-08 | Anchorage Ground; Baltimore Harbor, Maryland (March 22) |
| CGD3-84-08 | Safety Zone Regulations; New York, New Jersey, Sandy Hook Channel, Raritan Bay, Arthur Kill (March 29) |
| CGD 81-80B | Shipping Safety Fairway Amendments, Gulf of Mexico; supplemental notice of proposed rulemaking (March 30) |
| CGD5-83-04 | Anchorage Ground; Hampton Roads, Virginia; correction (April 3) |
| CGD11 84-18 | Regatta; Sunshine Marina Boat Drags, Riviera Marina, Riviera, Arizona (April 6) |
| CGD 83-012 | Certification, Safe Loading and Flotation Standards (April 12) |
| CGD13 84-04 | Establishment of Special Local Regulations for the Harbor Fair Offshore Race in Seattle, Washington (April 12) |
| CGD3-84-14 | Regatta; United Way Trophy Race, Barnegat Bay, New Jersey (April 12) |

**Notices:**

| | |
|---|---|
| CGD 84-010 | Port Access Routes, Gulf of Mexico; notice of study (March 19) |
| CGD 84-012 | Rules of the Road Advisory Council; notice of meeting (March 19) |
| CGD 84-011 | Port Access Routes; Boston, Massachusetts; notice of study (March 22) |
| CGD 84-023 | Acceptance of Plan Review, Inspections and Examinations by the American Bureau of Shipping (ABS) on Behalf of the United States Coast Guard (March 29) |
| CGD 84-010 | Port Access Routes, Gulf of Mexico; notice of study; correction (April 12) |
| CGD 84-028 | The Recreational Boating Industry's Role in Consumer Education; request for public comment (April 12) |
| CGD 84-030 | Marine Sanitation Devices; notice of results of program review and availability of final review report (April 13) |

**Requests for copies of NPRMs should be directed to the Marine Safety Council at the following address:**

**Commandant (G-CMC)**
**U.S. Coast Guard**
**Washington, DC 20593**

**(Tel.: 202-426-1477)**

**The Marine Safety Council office, Room 2110 at Coast Guard Headquarters, 2100 Second Street, SW, Washington, DC, is open between the hours of 9:00 a.m. and 4:00 p.m. Monday through Friday. Comments are available for inspection or copying during those hours.**

**Final rule:**

**Special Requirements for Cargo Lightering Operations (CGD 78-180)**

This final rule established regulations for the lightering of oil and hazardous material

cargoes in bulk from one vessel to another in the marine environment surrounding the United States.

This rule requires vessels engaged in lightering to hold a Certificate of Inspection or, in the case of foreign vessels, a Certificate of Compliance or Tank Vessel Examination Letter. Such vessels must also be in compliance with MARPOL 73/78 (the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto). Pre-arrival notice of vessels to be lightered will have to be given in accordance with Part 156.215 of Title 33 of the Code of Federal Regulations, and certain incidents (fires, explosions, collisions, etc.) which pose a threat to the vessels involved will have to be reported. Finally, authority to establish lightering zones is delegated to Coast Guard District Commanders.

The cost of the regulations to the marine industry is expected to be minimal, limited to the cost of complying with the required-notice provisions. The regulations, published March 26, became effective April 26.

## Notices of proposed rulemaking (NPRMs):

### Use of Flammable Gas as Cooking Fuel (CGD 83-013)

These proposed rules, published March 22, 1984, would expand the choices of cooking fuels available to vessel owners.

Current ships' store regulations (Part 147 of Title 46 of the Code of Federal Regulations) prohibit the carriage of liquefied and nonliquefied gases as ships' stores items (items intended for use or consumption on board a vessel) on vessels carrying passengers for hire. The Coast Guard has received numerous requests that this prohibition be re-evaluated in regard to such substances as liquefied petroleum gas and compressed natural gas. Cited as reasons are advances in the technology of the systems, the adoption by the American Boat and Yacht Council (ABYC) of voluntary standards, and the cleanliness, convenience, and commercial availabilty of the fuels.

CGD 83-013 would remove the prohibition as it pertains to cooking appliances and would include standards for the design, installation, and testing of cooking appliances using these fuels and stowage of gas cylinders.

Certain ABYC standards would be incorporated by reference. They can be examined at most Coast Guard Marine Inspection and Marine Safety Offices or obtained from the American Boat and Yacht Council Inc., P.O. Box 806, Amityville, NY 11701.

### Certification, Safe Loading and Flotation Standards (CGD 83-012)

This NPRM, published in the Federal Register April 12, 1984, stems from a review of regulations governing construction standards for recreational boats. Miscellaneous amendments are being proposed to Parts 181 and 183 of Title 33 of the Code of Federal Regulations. Sections that have been determined to be no longer necessary or of limited value in improving boating safety would be revised or removed. Also, the table used to determine safe loading capacities and the amount of flotation material required for outboard-powered boats would be updated to bring it into line with the weights of the outboard motors currently being manufactured.

### Summer Olympics May Affect Port Activities

As this issue was going to press, COTP LA 84-01, "Safety Zone; Ports of Los Angeles and Long Beach and San Pedro Bay, California," was being readied for publication as an NPRM in the Federal Register. This rule would establish a Safety Zone in the Los Angeles-Long Beach harbor area during the 1984 Summer Olympic Games, including Olympic pre-game- and post-game-related activities that might generate port congestion and related port safety and security problems. The rule would be in effect from July 5, 1984, until August 21, 1984, and would cover the Ports of Los Angeles and Long Beach, San Pedro Bay, the Pilot Areas, and the Outer Anchorages. Within the Safety Zone, Captain of the Port Los Angeles-Long Beach could 1) restrict or prohibit the movement of vessels and cargo, the operation of certain waterfront facilities, and related maritime activities, 2) establish areas of limited or prohibited access, and 3) require additional security measures on certain vessels and for certain waterfront activities.

For further information, contact the Coast Guard Captain of the Port, Marine Safety Office Los Angeles-Long Beach, 165 N. Pico Avenue, Long Beach, CA 90802; tel.: (213) 590-2315.

## Notice:

### Marine Sanitation Devices (CGD 84-030)

A joint Environmental Protection Agency-Coast Guard review of existing federal marine sanitation device (MSD) regulations and six alternative MSD programs has now been completed. The results were summarized in the Federal Register on April 13, 1984.

Among the recommendations offered by the review panel were that the current MSD requirements be relaxed somewhat and that the program be modified to 1) provide some relief to owners of small vessels (65 feet or less) and 2) allow states to set up and enforce optional programs for vessel sewage discharge requirements based on Federal standards.

Copies of the report, "Priority Review of the Marine Sanitation Devices (MSD) Regulations (33 CFR Part 159)," can be obtained from the National Technical Information Service, Springfield, Virginia 22161. The basic report (No. PB 84-166339) costs $10. A separate document of supporting appendices (No. PB 84-166347) costs $29.50.

While CGD 84-030 was mistakenly identified in the Federal Register table of contents as a proposed rule, it is only a review, not an action to change the current MSD program. Any proposed regulatory changes will be announced in a future notice of proposed rulemaking.

## Actions of the Marine Safety Council

The Marine Safety Council discussed the following items at its April meeting:

### CGD 84-024 Intervals for Drydocking and Tailshaft Examinations

If the interval between drydockings for tailshaft examinations could be extended without diminishing vessel safety, it would result in significant savings to vessel operators and decrease the Coast Guard's work load. The Coast Guard plans to issue an advance notice of proposed rulemaking sometime in the next month or so seeking information from the public on the advisability of such a proposal.

### CGD 84-025 Safety Rules for Vessels Engaged in Chemical Waste Incineration at Sea

This proposal would incorporate the requirements of the International Maritime Organization's International Bulk Chemical Code into Coast Guard regulations for the purpose of regulating the operation of chemical-waste incineration ships. At present the Coast Guard is regulating these vessels on a case-by-case basis using standards from various places in Title 46 of the Federal Register as well as the IMO code. CGD 84-025 would consolidate the requirements and give the public an opportunity to comment on the rules.

A notice of proposed rulemaking is scheduled for publication in fall 1984.

### CGD 84-027 Vessel Documentation, Hailing Port Rule

Certain problems have come to the Coast Guard's attention regarding a regulation that entered into force on July 1, 1982, requiring vessels to show their hailing port. Two major objections have been noted: 1) MarAd must mark Norfolk as a hailing port for all vessels it owns, regardless of the vessel's actual home port or area of operation, and 2) vessel owners must use a hailing port which is recognized by the United States Post Office as a bona fide mailing address. Many ports are not so recognized.

One of the options the Coast Guard is considering is simply eliminating the requirement that a vessel be marked with a hailing port. A search has failed to turn up any legal requirement for vessels to be so marked other than the Coast Guard regulation which is the subject of this rulemaking project.

As this issue went to press, an advance NPRM had been scheduled for publication in the Federal Register this month. In it the Coast Guard planned to seek the public's reaction to this proposal and ask the public to propose other possible solutions.

### New Semiannual Agenda Out

A summary of Coast Guard rulemakings, reviews of regulations, and recently completed actions was published as part of the Department of Transportation's Semiannual Regulatory Agenda in the Federal Register on April 19, 1984. Copies can be obtained from Commandant (G-CMC), U.S. Coast Guard, Washington, DC 20593. ↕

# Maritime Sidelights

## Maine Maritime Academy Offers Graduate Studies Program

The Maine Maritime Academy, after five years of planning and research, is now initiating its Master's Degree Program.

The first academic courses, designed as a phase-in to the full program under the title Maritime Career Development Institute 1984, will run from June 4 through July 27.

The eight-week high-intensity institute is designed to give seagoing and shore personnel a thorough graduate-level grounding in basic business management concepts, principles, and techniques. The courses are specifically aimed at enhancing management careers in the maritime industry and are appropriate for those who have graduated from a maritime academy or non-business college.

The institute will consist of three elements: 1) courses in economics, human-resource management, and accounting similar to standard introductory-level MBA courses but oriented toward maritime transportation, 2) approximately 40 hours of skills development in report writing, speech communication, and computer technology, and 3) several short courses or seminars covering a wide spectrum of business management subjects specifically related to the maritime industry.

Successful completion of the program will lead to a Certificate of Graduate Studies in Maritime Management as well as nine graduate credit hours toward the Master of Science in Maritime Management.

Information about the institute and the degree program can be obtained from the Director of Graduate Admissions, Maine Maritime Academy, Castine, Maine 04420; tel. (207) 326-4311, ext. 211. ‡

## Three Technical Reasons for Going to Boston in July 1984:

- Over 30 experts from 17 countries will present their country's viewpoints on the status of welding research today and strategy for the late '80s at the International Congress on Welding Research. Also addressed will be specialized topics such as the research needs of specific industries, collaboration in welding research, technological forecasting, etc. The congress dates are July 13 - 14.
- The International Conference on Welding of Tubular Structures will be held July 16 - 17. Some 35 individual papers will be presented on the application, fabrication and inspection, static and dynamic response to loading conditions, design, and research of welding of tubular structures. Consideration will be given to welded tubular construction for offshore structures, large-span structures, towers, masts, and other tubular applications.
- The Annual Assembly of the International Institute of Welding will offer attendees the opportunity to participate in the work of the 16 Technical Commissions of the IIW. Over 600 engineers from at least 37 countries are expected. The Assembly will be held July 16 - 20.

For additional information on these three events, contact the American Council of the International Institute of Welding, P.O. Box 351040, Miami, Florida 33135; tel. (305) 443-9353. ‡

## Guide Aids in Selection of Restraint Systems

A guide for ship operators, designers, and others concerned with the selection of container and trailer restraint systems for use on board oceangoing vessels has been prepared under a Maritime Administration contract. The guide addresses the problem of securing containers and trailers on board ship with the goal of reducing loss and damage to equipment and cargo through a better understanding of the forces generated by ship's motion.

Copies of "A Guide to Selecting Shipboard Container and Trailer Restraint Systems" are available for $22 from the National Technical Information Service, Springfield, Virginia 22161. The Report No. is PB84-104405. ‡

## National Cargo Bureau Offers Revised Course on Stability

As reported in the October/November 1983 issue of the *Proceedings*, a new edition of the text *Stability and Trim for the Ship's Officer* by John LaDage and Lee Van Gemert was published in 1983. The National Cargo Bureau, Inc., has announced that it will be using that edition in a new version of its Self Study Course in Ship's Stability.

This course has been designed so that its completion will ensure that the student has mastered the basic principles and techniques of merchant ship stability calculations. In the years since 1965, when the course was first published, there have been significant changes in the stability requirements for grain vessels. The 1984 edition of the course has been revised to reflect these changes and to conform with the revised third edition of the LaDage-Van Gemert text.

The basic charge for the new course, which has been expanded from 11 to 14 assignments, is $175. This includes the text, the course, correcting services, and postage.

Interested persons should contact the National Cargo Bureau, Inc., Suite 2757, One World Trade Center, New York, New York 10048; tel.: (212) 432-1280. ‡

## Convention on Diagnostic Engineering Called

The Institution of Diagnostic Engineers has announced that it will hold its first annual convention at the City Conference Centre in London September 4 - 7, 1984. Details are available from the Institution's headquarters at 3 Wycliffe Street, Leicester LE1 5LR, England.

The Institution of Diagnostic Engineers has enrolled over 3,000 members since its founding in April 1981. The organization publishes a bimonthly 32-page newsletter of technical articles relating to defect recognition and diagnostic techniques. ‡

## New Show Set for Norfolk, Virginia

The 1st Annual Norfolk Naval & Commercial Marine Exhibition will be held at the Norfolk Scope, Norfolk, Virginia, September 11 - 13, 1984.

Applications for exhibit space are now being accepted from companies offering products and services in the Navy and commercial marine markets. The cost of the space is $9.00 per square foot.

For additional details, contact Industrial Presentations, Inc., P.O. Box 721948, Houston, Texas 77272; tel. (713) 879-8929. ‡

## Attention, Tugboat Operators:

The National Technical Information Service has published a new bibliography containing citations concerning maneuverability, motion studies, and accident analysis of tugboat-towed ships and barges. Over 130 citations are listed, 13 of which are new. To order, call (703) 487-4650 and ask for order number PB83-873372.

*(Reprinted from the* Weekly Letter *of the American Waterways Operators, Inc., Vol. XLI, No. 4)* ‡

## MarAd Regulations Update Available

The Maritime Administration has released an update of its "Index of Current Regulations of the Maritime Administration, Maritime Subsidy Board and National Shipping Authority." The 43-page publication has been revised as of January 1, 1984. It is provided as a reference for other government agencies and for those persons required to comply with the regulations.

Copies are available from the Office of Public Affairs, Maritime Administration, Room 7219, Department of Transportation, Washington, DC 20590. ‡

# Ethyl Alcohol: $C_2H_5OH$ or $CH_3CH_2OH$

| | |
|---|---|
| Synonyms: | ethanol<br>alcohol<br>grain alcohol<br>denatured alcohol<br>spirits<br>spirit of wine<br>methyl carbinol |
| **Physical Properties** | |
| boiling point: | 78°C (173°F) |
| freezing point: | -114°C (-173°F) |
| vapor pressure at | |
| 20°C (68°F): | 44 mm Hg |
| 25°C (77°F): | 50 mm Hg |
| 30°C (86°F): | 75 mm Hg |
| **Threshold Limit Values (TLV)** | |
| Time Weighted Average: | 1,000 ppm; 1,900 mg/m$^3$ |
| Short Term Exposure Limit: | not established |
| **Flammability Limits in Air** | |
| lower flammability limit: | 4.3% by vol. |
| upper flammability limit: | 19% by vol. |
| **Combustion Properties** | |
| flash point (TOC): | 18°C (65°F) |
| flash point (TCC): | 14°C (57°F) |
| autoignition temperature: | 423°C (793°F) |
| **Densities** | |
| liquid (water = 1.0): | 0.8 |
| vapor (air = 1.0): | 1.6 |
| **Identifiers** | |
| U.N. Number: | 1170 |
| CHRIS Code: | EAL |
| Cargo Compatibility Group: | 20 (Alcohols, Glycols) |

*All values in this table are for pure alcohol.*

Many words that begin with the letters "al" (albatross, algebra, and alkali, for example) are Arabic in origin. The "alcohol" in the name of this issue's Chemical of the Month is no exception. The Arabic "al-kohl" ("the" + "kohl") became the word used by Latins to refer to a powder used to tint the eyelids. By extension, it came to mean any powder obtained by sublimation and, by further extension, any quintessence. It is that sense of "alcohol" that is reflected in two of the chemical's synonyms, "spirits" and "spirit of wine."

When people today speak of "alcohol," they are most likely talking about the particular chemical type we will describe this month, ethyl alcohol. While ethyl alcohol is most immediately associated with alcoholic beverages, it is also a vital material in industry. This volatile, colorless liquid goes into the making of drugs, plastics, lacquers, polishes, perfumes, and cosmetics. It is also important for its use as a solvent, germicide, antifreeze, fuel, and intermediate in the production of organic chemicals.

The ethyl alcohol used in industry (often called "industrial ethanol") is usually divided into four classes: pure alcohol, specially denatured alcohol, completely denatured alcohol, or solvents. Pure ethyl alcohol, which accounts for a very small percentage of the alcohol used in industry, can be found in the list of ingredients for foods and medicines and is used by hospitals as a reagent and solvent. Denatured alcohol contains denaturant substances (such as methyl alcohol, benzene, acetone, or gasoline) that render it unfit as a beverage. Specially denatured alcohol, the most widely used form of ethyl alcohol, is used in the making of fragrance, personal care, pharmaceutical, and household products and vinegar. Completely denatured alcohol can be used in authorized formulations for any lawful purpose, subject only to such minimum government regulations as labeling requirements. Solvents, another highly denatured form, are usually packaged for wholesale and industrial use for such processes as extracting medicinal substances from plant and animal tissues.

Some of our readers may be familiar with the old-fashioned method of producing ethyl alcohol from potatoes: the starch is converted by enzymes into sugar, which, in turn, is con-

verted by yeast into alcohol and carbon dioxide. Sugar substances such as molasses are even more effective as starting materials, since they can be more directly converted to ethyl alcohol. Today this type of fermentation process has taken a back seat to a more commercially advantageous method of producing high-quality alcohol. This involves mixing pure ethylene with pure water at elevated pressure and with enough heat to cause the synthesis of a crude dilute alcohol. A separator then separates the alcohol from any unreacted ethylene, and the alcohol is sent through a series of distillation towers, where it is concentrated and purified.

Ethyl alcohol is a flammable liquid and, consequently, should be handled with care. It should not be allowed anywhere near sources of ignition, such as heat, sparks, or flames. Indoors, ethyl alcohol should be stored in a cool, well-ventilated area away from all possible sources of ignition. It should not be stored with perchlorates, peroxides, chromic acid, or nitric acid. Note: it is recommended that any tank which has previously contained ethyl alcohol be purged with steam or water; purging with air could result in the formation of flammable gases.

Ethyl alcohol spilled on a ship should be flushed with water. Workers involved in the cleanup should wear respirators and chemical safety goggles. Fires involving ethyl alcohol can be fought with dry chemical, alcohol foam, or carbon dioxide (the latter is suited primarily for small fires). Water spray may be effective in keeping fire-exposed material and containers near the fire cool.

Ethyl alcohol can be a health hazard if its vapors are inhaled in excessive amounts. However, proper ventilation and handling procedures reduce the likelihood of any such adverse health effects. Exposure beyond that found acceptable by the American Conference of Governmental Industrial Hygienists (a maximum exposure level of 1,000 parts per million, averaged over an eight-hour workday) can cause coughing, irritation of the eyes and nose, and possibly stupor or drowsiness. While concentrations of this magnitude are easily detectable and usually intolerable because of the intense odor, workers can become accustomed to the odor after a relatively short period of time.

Ethyl alcohol does not irritate the skin and is not absorbed through it, but in its undiluted form it can cause injury to the eyes. The eyes should be quickly irrigated with water (flushed out under a faucet or shower head for 15 minutes) if this occurs.

When swallowed, ethyl alcohol is oxidized completely by the body to form carbon dioxide and water. It thus differs from the methyl alcohol described last month in that it is not a cumulative poison. Repeated consumption of excessive amounts of ethyl alcohol will, however, over time, produce liver injury and possibly cirrhosis. The immediate effect of excessive intake of alcoholic beverages is intoxication, with its accompanying headache, drowsiness, nausea, etc. Alcohol affects people differently, depending on their body size, age, and drinking experience, how much food they have in their stomachs, and how fast they are drinking. Most of the states with prescribed levels for determining intoxication use a blood alcohol content of 0.10%; death will have occurred by the time a person's blood alcohol content has reached 0.60%. For a chart showing blood alcohol content by body weight and number of drinks and information on another type of health hazard, the deterioration of judgment and control that results from consumption of alcohol, see "Under the Influences," beginning on page 168.

For bulk shipment, ethyl alcohol is regulated by the U.S. Coast Guard as a Grade C flammable liquid in Subchapter D of the Code of Federal Regulations (Parts 30 - 40 of Title 46). The International Maritime Organization includes it in Chapter 7 of the IMO Chemical Code (chemicals to which the Code does not apply). For package shipment, ethyl alcohol is regulated by the U.S. Department of Transportation as a Flammable liquid, and containers are required to bear the Flammable liquid label. The International Maritime Dangerous Goods (IMDG) Code entries for ethyl alcohol can be found on pages 3074 and 3133-1. IMO classifies ethyl alcohol shipped in containers as an inflammable liquid and assigns it to Classes 3.2 (flash point of -18°C to 23°C) and 3.3 (flash point of 23°C to 61°C), depending on the strength of the solution.

*Denise L. Matthews is a second-class Cadet at the Coast Guard Academy. She wrote this article under the direction of instructor LCDR Thomos J. Haas for a class on hazardous materials transportation. Technical assistance was provided by personnel in the Cargo and Hazards Branch at Coast Guard Headquarters.* ‡

# Nautical Queries

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

DECK

1. Which of the following statements is true concerning the danger signal?

A. Vessels must be in sight of each other to use the signal.
B. Only the stand-on vessel can sound the danger signal.
C. Distress signals may be used in place of the danger signal.
D. The danger signal consists of four or more short blasts of the whistle.

REFERENCE: Commandant Instruction M16672.2, Rule 34 (d)

2. A petroleum liquid has a flash point of 85°F. This liquid is classed as a Grade

A. B flammable liquid.
B. C flammable liquid.
C. D combustible liquid.
D. E combustible liquid.

REFERENCE: Chemical Data Guide for Bulk Shipment by Water, CIM 16616.6

3. Which of the following is a characteristic preceding an approaching warm front?

A. Gusty winds
B. Steadily falling pressure
C. Decreasing relative humidity
D. All of the above

REFERENCE: Donn, Meteorology, 2nd Edition

4. A vessel's KG is determined by

A. dividing the total longitudinal moment summations by displacement.
B. dividing the total vertical moment summations by displacement.
C. multiplying the MT1 by the longitudinal moments.
D. subtracting LCF from LCB.

REFERENCE: LaDage, Stability and Trim for the Ship's Officer, 1983

5. The call-sign series ZVA-ZZZ has been assigned to

A. South Africa.
B. Poland.
C. Burma.
D. Brazil.

REFERENCE: H.O. 102 (Hydrographic Office Publication No. 102, International Code of Signals)

ENGINEER

1. The main function of wearing rings in a centrifugal pump is to

A. maintain radial alignment between the pump impeller and casing.
B. absorb all impeller shaft end thrust.
C. prevent water leakage to the atmosphere.
D. prevent wear of the pump casing and impeller.

REFERENCE: Hicks, Pump Operation and Maintenance

2. According to Coast Guard regulations, the minimum number of consecutive cranking cycles an emergency diesel generator's starting system must be capable of providing is

A. two.
B. three.
C. six.
D. eight.

REFERENCE: 46 CFR 112.50-3(f) and 112.50-5(a)

3. Values which can change continuously, such as temperature, pressure, or level, are called

A. binary values.
B. digital values.
C. bumpless values.
D. analog values.

REFERENCE: O'Higgins, Basic Instrumentation

4. Diesel-engine mufflers or silencers reduce the engine exhaust noise by

A. increasing the exhaust gas velocity.
B. diffusing exhaust vibrations through activated carbon baffles.
C. passing the exhaust through long head pipes.
D. reducing the exhaust gas velocity.

REFERENCE: Stinson, Diesel Engineering Handbook

5. Pigtail siphons protect Bourdon tube gauges from direct exposure to steam by

A. changing the steam's direction.
B. reducing the steam's velocity.
C. creating a water loop seal.
D. bleeding off a portion of the steam.

REFERENCE: O'Higgins, Basic Instrumentation

ANSWERS

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

ENGINEER

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

DECK

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

# Maritime Licensing, Certification, and Training

We receive many questions about study materials for the examinations for licenses and U.S. merchant mariners documents. The following is a list of suggested references for deck and engineering libraries. The list is not to be considered all-inclusive as regards sources from which examination questions may be drawn, and any authoritative, recognized publication similar to a text listed can substitute as an adequate study resource. The years shown in parentheses are those for the most recent editions published, although previous editions may also serve the candidate as a source of information.

Most of the books and publications listed can be obtained from a local nautical bookstore. Coast Guard publications, Navy publications, and copies of Federal regulations can be ordered from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. Specific resource lists for each license or certificate may be obtained from a local Regional Examination Center or from Commandant (G-MVP-3), U.S. Coast Guard, Washington, DC 20593. Questions or comments should be directed to G-MVP-3.

## Deck Licenses and Ratings

**American Merchant Seamans Manual.** F. M. Cornell and A. C. Hoffman. Edited by William B. Hayler. Centreville, Maryland: Cornell Maritime Press Inc. (1981)

**American Practical Navigator: Being an Epitome of Navigation.** Nathaniel Bowditch. Saint Clair Shores, Michigan: Scholarly Press Inc., or Defense Mapping Agency Hydrographic Center (1977)

**American Red Cross First Aid Manuals**

**Bridge to Bridge Radiotelephone Communications** (CG-439). U.S. Government Printing Office

**Cargo Containers.** Herman D. Tabak. Centreville, Maryland: Cornell Maritime Press Inc. (1970)

**Chapman Piloting, Seamanship and Small Boat Handling.** Charles F. Chapman and E. S. Maloney. New York: Hearst Books (1981)

**Chemical Data Guide for Bulk Shipment by Water** (CIM 16616.6). U.S. Government Printing Office

**United States Coast Pilots.** National Ocean Survey. U.S. Government Printing Office

**Code of Federal Regulations, Titles 33 and 46.** U.S. Government Printing Office

**Dictionary of Commodities Carried by Ship.** Pierre Garoche. Centreville, Maryland: Cornell Maritime Press Inc. (1952)

**H.O. 102 - International Code of Signals.** Defense Mapping Agency Hydrographic Office. U.S. Government Printing Office

**H.O. 214 - Tables of Computed Altitude and Azimuth.** Defense Mapping Agency Hydrographic Office. U.S. Government Printing Office

**H.O. 229 - Sight Reduction Tables.** Defense Mapping Agency Hydrographic Office. U.S. Government Printing Office

**Introduction to Steel Shipbuilding.** Elijah Baker. New York: McGraw-Hill Book Co. (1953)

**Knight's Modern Seamanship.** John V. Noel, Jr., and Frank E. Bassett. New York: Van Nostrand Reinhold Co. (1977)

**U.S. Coast Guard Light Lists.** U.S. Government Printing Office

**Marine Cargo Operations.** Charles L. Sauerbier. New York: Wiley, John, and Sons, Inc. (1956)

**Marine Fire Prevention, Firefighting and Fire Safety.** Maritime Administration

**Merchant Marine Officer's Handbook.** Edward A. Turpin and William A. MacEwen. Centreville, Maryland: Cornell Maritime Press Inc. (1965)

**Meteorology.** William L. Donn. New York: McGraw-Hill Book Co. (1975)

**Modifications: For a New Look in U.S. Aids to Navigation.** Commandant (G-NSR-1/14), U.S. Coast Guard, Washington, DC 20593

**Nautical Almanac.** U.S. Government Printing Office

**Navigation Rules: International—Inland** (COMDTINST M16672.2A). U.S. Government Printing Office

**Petroleum Tankship Safety.** R. C. Page and A. Ward Gardner. London, England: Maritime Press Ltd. (1971)

**Shipmaster's Handbook on Ship's Business.** Ben Martin. Centreville, Maryland: Cornell Maritime Press Inc. (1969)

**Stability and Trim for the Ship's Officer.** John H. LaDage and Lee Van Gemert. Edited by William E. George. Centreville, Maryland: Cornell Maritime Press Inc. (1983)

**Tanker Handbook for Deck Officers.** C. Baptist. New York: State Mutual Book and Periodical Service, Ltd. (1981)

**Tanker Operations, A Handbook for the Ship's Officer.** G. S. Marton. Centreville, Maryland: Cornell Maritime Press Inc. (1978)

**Tidal Current Tables.** National Ocean Survey. U.S. Government Printing Office

**Tide Tables.** National Ocean Survey. U.S. Government Printing Office

**Tugs, Towboats and Towing.** Edward M. Brady. Centreville, Maryland: Cornell Maritime Press Inc. (1967)

## Engineer Licenses and Ratings

**Basic Applied Fluid Power.** J. Oster. New York: McGraw-Hill Book Co. (1969)

**Basic Electricity, 5 volumes.** Nooger and Neville Van Valkenburgh. New York: Brolet Press (1977)

**Basic Electricity.** NAVPERS 10086-A. U.S. Government Printing Office

**Boilerman 1 & C.** NAVPERS 10536-D. U.S. Government Printing Office

**Centrifugal Pumps, Selection, Operation, and Maintenance.** Igor J. Karassik and Roy Carter. New York: McGraw-Hill Book Co. (1960)

**Code of Federal Regulations, Titles 33 and 46.** U.S. Government Printing Office

**Diesel Engine Operation and Maintenance.** Vladimir L. Maleev. New York: McGraw-Hill Book Co. (1954)

**Diesel Engineering Handbook.** K. W. Stinson. Business Journals, Inc., Stamford, Connecticut 06904 (1972)

**Diesel: Fundamentals Service and Repair.** Bill Toboldt. South Holland, Illinois: Goodheart-Willcox Co., Inc. (1980)

**Electric Circuits and Machines.** Eugene C. Lister. New York: McGraw-Hill Book Co. (1975)

**Electricity One-Seven.** Edited by Harry Mileaf. Rochelle Park, New Jersey: Hayden Book Co., Inc. (1976)

**Engineman 3 & 2.** NAVPERS 10541. U.S. Government Printing Office

**Fireman.** NAVPERS 10520-C. U.S. Government Printing Office

**Introduction to Marine Engineering.** Robert F. Latham. Annapolis, Maryland: Naval Institute Press (1958)

**Introduction to Steel Shipbuilding.** Elijah Baker. New York: McGraw-Hill Book Co. (1953)

**Lubrication.** Raymond C. Gunther. Philadelphia and New York: Chilton Book Company (1971)

**Workboat Engineer and Oiler.** Robert J. Ward. Houma, Louisiana: Marine Education Textbooks (1981)

**Machine Tool Metalworking.** John L. Feirer. New York: McGraw-Hill Book Co. (1973)

**Machinist's Mate 3 & 2.** NAVPERS 10524-C. U.S. Government Printing Office

**Marine Engineering.** Roy L. Harrington. Society of Naval Architects and Marine Engineers (1971)

**Marine Fire Prevention, Firefighting and Fire Safety.** Maritime Administration

**Modern Marine Engineer's Manual, Vol. 1.** Alan Osbourne and A. B. Nield. Centreville, Maryland: Cornell Maritime Press Inc. (1965)

**Modern Refrigeration and Air Conditioning.** A. D. Althouse, C. H. Turnquist, and A. F. Bracciano. South Holland, Illinois: Goodheart-Willcox Co., Inc. (1982)

**Modern Welding.** A. D. Althouse, C. H. Turnquist, and A. F. Bracciano. South Holland, Illinois: Goodheart-Willcox Co., Inc. (1982)

**Preventive Maintenance of Electrical Equipment.** Charles Hubert. New York: McGraw-Hill Book Co. (1969)

**Principles of Naval Engineering.** NAVPERS 10788-B. U.S. Government Printing Office

**Principles of Refrigeration.** Roy J. Dossat. New York: Wiley, John, and Sons, Inc. (1978)

**Procedure Handbook of Arc Welding.** 12th edition. Lincoln Electric Company, 22801 St. Clair Avenue, Cleveland, Ohio 44117 or bookstores

**Programmed Blueprint Reading.** Schriver L. Coover. New York: McGraw-Hill Book Co. (1975)

**Pump Handbook.** Igor J. Karassik, William C. Krutzch, Warren H. Fraser, and Joseph P. Messina. New York: McGraw-Hill Book Co. (1976)

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