PROCEEDINGS
OF THE MARINE SAFETY COUNCIL

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November 1979

Haz Mat Transportation Regs--An Overview

FOIL Update

PFD'S: Help for Those Who Help Themselves

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

CG-129

PROCEEDINGS
OF THE MARINE SAFETY COUNCIL

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A student at the Field Oil Laboratory Operator School, located at the Coast Guard Reserve Training Center in Yorktown, Virginia, learns to use the fluorescence spectroscopy method to identify the source of oil spills. Article begins on page 194.

maritime sidelights

NIOSH INFORMS SCOTT UNIT USERS OF STOP-SALES REVOCATION

The National Institute for Occupational Safety and Health (NIOSH) has lifted an earlier stop sales request on the Scott Air Pak II/IIA and Presur-Pak II/IIA self-contained breathing apparatus.

NIOSH rescinded the stop sales request on August 21, after Scott agreed to correct problems in units now in use, and to make necessary modifications on future respirators.

A NIOSH survey of units in the field, initiated last April after the deaths of three Lubbock, Texas firefighters who were wearing Scott respirators, found that at least 10 percent of the units examined had ruptured or punctured diaphragms.

According to the notice to users, Scott has redesigned the regulator outlet port in the respirators to prevent overpressurization from blocked airflow while the bypass valve is open. In addition, the firm has adopted a thicker, more resilient diaphragm, and has designed new specifications for the diaphragm retaining ring to eliminate sharp edges that could puncture the membrane, NIOSH reported.

Diaphragms and retaining rings on all units will be "carefully inspected during production by Scott quality assurance personnel," NIOSH informed users. The institute added that the modifications in new and existing units, if "made by experienced, authorized persons in accordance with the manufacturers instructions," will ensure that the respirators "will operate safely."

Owners of the respirators, which carry the identifications 900000-00, 900014-00, 900002-00, 900015-00, 900006, and 900007, should contact their Scott distributor or Scott Aviation to have the modifications made, NIOSH advised. The toll-free telephone number to contact is (800) 828-1577.

Reprinted from the *Occupational Safety & Health Reporter*, No. 0095-3237/79

MEDICAL COURSES AND LIFEBOATMAN COURSE OFFERED FOR MARINERS

The California Maritime Academy is offering two medical courses for mariners and a Coast Guard approved Lifeboatman course during the month of November. "Emergency Medical Training for Seagoing Personnel -No. 616" will be presented November 5-9 and includes information on treatment of hemhorrhage, shock, specific wounds and injuries, and burns; suturing, I.V. therapy, and bandaging; and cardiopulmonary resuscitation (official CPR card awarded).

"Emergency Medical Training for Seagoing Personnel - No. 617" will be presented the following week, November 12-16. This class will cover medical emergencies; diseases involving parasites and other infectious organisms; dental, cardiovascular, respiratory, gastrointestinal, and genitourinary medical emergencies; poisonous sea life, veneral disease; shipboard sanitation; drug use and abuse; and the ship's medicine chest and medical supplies.

Lifeboatman Certification will be offered November 26-30. The U.S. Coast Guard will administer the final exam at the end of the course, and all students which successfully complete the examination and meet the requirements for sea time and eligibility standards will be awarded their Lifeboatman certificate. The minimum sea service is only three months for all departments--deck, engine, and steward.

All the above courses will be held at the Academy in Vallejo, California. For further information call (707) 644-5601 or write to the California Maritime Academy, Adult Education Department, P.O. Box 1392, Vallejo, CA 94590.

ASBESTOS APPEAL

Irving J. Selikoff, renowned researcher of asbestos-related diseases (see Sept. 1979 *Proceedings*, "Asbestos Dust Inhalation") recently appealed to an audience of federal health professionals to intensify government programs for early detection and treatment of occupational diseases resulting from inhalation of asbestos fibers or other hazardous materials. Dr. Selikoff is the director of the Environmental Sciences Laboratory, Mt. Sinai School of Medicine, City University of New York. On September 18, he spoke to representatives of the Department of Health, Education and Welfare, the Consumer Product Safety Commission, and the Public Health Services, chiding these and other agencies for their delay in recognizing and protecting workers exposed to hazardous chemicals.

Data indicating the dangers of asbestos dust was available in the early 1900's, but the first government asbestos standards were published by NIOSH in 1972. Apparently, asbestos control still has a long way to go. Dr. Selikoff cited a recent study of a Baltimore shipyard which showed that 85 percent of 285 workers tested had lung abnormalities. Serious respiratory ailments, including cancer, take 15 to 20 years after exposure to develop, but it has been found that they may result from an exposure time of only one month! In emphasizing the prevalence of asbestos-related disease and, therefore, the importance of its detection and treatment, the doctor remarked that "The immensity of this problem is unknown in public health."

As we go to press, the Tanker Safety and Pollution Prevention (TSPP) package, CGD 77-057(a),

Continued on next page.....

77-058(b)(c)(d) and 77-063, is almost ready for publication. At this writing, the package is being reviewed by the Secretary of Transportation before forwarding it back to the Commandant of the Coast Guard for signature. Final rules will be published on CGD 77-057(a) and CGD 77-063 with interim final rules published on CGD 77-058(b)(c)(d). The purpose of the interim rules is to allow further public comment on this particular part of the package.

Although there are no Coast Guard public hearings or meetings scheduled in late October or November at this time, the House of Representatives Merchant Marine and Fisheries Committee's Coast Guard and Navigation Subcommittee was scheduled to hold hearings on H.R. 1741, legislation to require double hulls. This bill, also known as the Studds bill, was introduced earlier this year by Massachusetts Democrat Gerry E. Studds. The hearings were originally scheduled for October 23, 1979 to be chaired by Representative Mario Biaggi (D-NY), chairman of the Coast Guard and Navigation Subcommittee. They have been cancelled and, at this time, it is not known if they are to be rescheduled.

The Puget Sound regulatory package now has a scheduled date for the final rules. If everything goes according to plan the final rules should be out in August of 1980.

There have been no significant new projects introduced during the last month and the publishing load has been light, in order for the Federal Register to make changes and send the new Code of Federal Regulations to the printer. As can be seen by the Keynotes, there is a great deal of regulatory material scheduled to be published before the end of the year.

Any questions regarding regulatory dockets or companies and individuals wishing to speak at public hearings should notify Captain P. J. Danahy **at our new address:** (G-CMC/TP24), U.S. Coast Guard Headquarters, 2100 Second St. SW, Washington, DC 20590; (202)426-1477.

* * *

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

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

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

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

REVISION OF ELECTRICAL REGULATIONS
CGD 74-125

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

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

An initial NPRM was published on June 27, 1977 (42 FR 32700). A supplemental NPRM will be issued late in 1979.

STANDARDS FOR NEW SELF-PROPELLED VESSELS CARRYING BULK LIQUEFIED GASES
CGD 74-289

These regulations adopt the Intergovernmental Maritime Consultative Organization (IMCO) Resolution, the Code for Construction and Equipment of Ships Carrying Liquefied Gas in Bulk.

The increased use of liquefied gases for energy sources has produced a dramatic increase in the manufacture and use of vessels designed for the cargo. Due to the unusual and unique nazards associated with liquefied gases, these vessels must be addressed in regulations specially tailored to their unique situation.

The final rule was published May 3, 1979 (44 FR 25986). Copies of this rule and its supporting documents may be obtained by writing or calling the Marine Safety Council at the address/telephone number given at the beginning of the Keynotes section.

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

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

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

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

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

Anyone wishing to obtain copies of the rulemaking may do so by

Continued on next page.....

contacting Capt. P. J. Danahy, Marine Safety Council **at our new address** (telephone number has not changed) which is given at the beginning of the Keynotes section.

POLLUTION PREVENTION, VESSELS AND OIL TRANSFER REGULATIONS CGD 75-124a

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

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

The NPRM was published on June 27, 1977 (42 FR 32670). A supplemental NPRM was published October 27, 1977 (42 FR 56625). As stated in the August issue, the draft of the final rule is under its legal review prior to publication.

DESIGN AND APPROVAL REQUIREMENTS FOR OIL POLLUTION PREVENTION EQUIPMENT CGD 76-088a

These regulations set out specifications and procedures for approving oil-water separators, cargo monitors, bilge monitors and bilge alarms for use on merchant vessels. They are based upon international design and test specifications adopted by the International Maritime Consultative Organization (IMCO) as Resolution A-393X, and provide standards for equipment that is representative of the best technology presently available.

The final rule, published in the September 13, 1979 Federal Register (citation number not known as we go to press), requires that performance testing of prospective equipment must be done by one of the independent testing laboratories designated by the Commandant (G-MMT). The following laboratories have received authorization to commence testing:

Underwriters Laboratories
Tampa, Florida, USA

National Sanitation Foundation
Ann Arbor, Michigan, USA

University of New Castle
New Castle Upon Tyne, UK

OFFSHORE OIL POLLUTION FUND CGD 77-055

This document established procedural rules concerning administration and operation of the fund, including liability limits for certain facilities, financial responsibility factors, damage claim settlement procedures, et. al.

This regulation was passed to create procedures for prompt settlement of claims arising from damage caused by oil pollution.

The final rule of this docket was published March 19, 1979 (44 FR 16860).

The following three regulations, CGD 77-057, CGD 77-058(b)(c)(d), and CGD 77-063, make up the Tanker Safety and Pollution Prevention (TSPP) Regulations. Public hearings have been held on the package, comments were requested and 541 have been received. Final rules on this package are currently being written. A notice of delay in publishing the final regulations was published in the June 7, 1979 Federal Register (43 FR 32713). Final rules are anticipated in the fall of 1979.

INERT GAS SYSTEM CGD 77-057

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

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

The Inflationary Impact Statement for this regulation was completed in May 1977. An NPRM was published February 12, 1979 (44 FR 8984). Hearings were held March 21, 1979 in Washington, DC and March 28, 1979 in San Francisco, CA; 136 comments were received and have been evaluated. The final rule is currently being reviewed by the Office of the Secretary of Transportation and should be published by the time this issue is published.

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

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

The NPRM was published May 16, 1977 (42 FR 24868). As a result of the IMCO Tanker and Pollution Prevention Conference of February 1978, a new NPRM was issued on February 12, 1979 (44 FR 8984). Public hearings were then held in March in Washington, DC and San Francisco, CA; 265 comments were received on the docket, and were analyzed and the final rules were formulated. These rules should appear in the Federal Register by the time this month's *Proceedings* is published.

STEERING GEAR DESIGN STANDARDS TO PROVIDE REDUNDANCY CGD 77-063

As part of the President's initiatives to reduce pollution, this reg-

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Winter Survival Tips:

Winterizing the Home—Severe weather can result in serious emergencies. Storms can knock down power lines, shutting off not only lights but heating equipment that needs electricity to operate. And there may even be periods when it is difficult or impossible to get out of the house. Here are some things you can do to protect your home and stay comfortable:

- Insulate your house. Make it airtight to keep heat in and cold out. Caulk and weatherstrip doors and windows. Install storm windows or cover windows with plastic. Insulate walls and attics.
- Have some type of emergency heating equipment available so you can keep at least one room warm enough to be livable if your furnace is not operating. This could be a fireplace and plenty of wood, a small, well-vented wood or coal stove, or a camp stove. Be careful. Know how to use this emergency heating equipment safely to prevent fire or dangerous fumes.
- Keep water pipes from freezing. Wrap them in special pipe insulation, or in layers of newspaper, lapping the ends and covering them with plastic to keep out moisture. When it is extremely cold, letting the faucets drip a little may prevent freezing damage. Know where the main valve is located. As a last resort you may have to shut it off and drain all the pipes to keep them from bursting. If the pipes freeze despite your efforts, open faucets wide to allow for expansion of the frozen water, wrap the pipes with rags, and pour hot water over the rags.

Without Heat? Don't Panic—The problem may be something simple you can remedy yourself. If your furnace burns oil, make sure the fuel tank is not empty. Check the electric switch, fuse, or circuit breaker. If your furnace is gas-fired, check other gas appliances to make sure your main gas supply has not been cut off. Next check the pilot light. Then, if necessary, call the utility company in your area, your fuel oil dealer, or a company that specializes in heating work.

While you wait for help, do the following to maintain a minimal heat level:

- Use your alternate heat source.
- Close off those rooms that are not absolutely essential.
- Hang blankets over windows at night (let the sun shine in during the day). Stuff cracks around doors with rugs, newspapers, towels, etc.
- Prevent water pipes from bursting as explained earlier. Close the water inlet valve on the toilet and then flush to prevent freezing damage. Collect water for drinking and store in covered containers.

Keeping Warm in a Cold House—If your house is without heat for any reason, there are ways to preserve some of the existing heat and stay relatively comfortable:

- Dress warmly. Wool clothing against the skin is the warmest. Layers are more effective than a single heavy thickness. And layers can be removed as needed to prevent perspiring and subsequent chill.
- Wear a wool hat, especially when sleeping under emergency conditions. The body loses approximately 70 percent of its heat through the head.
- Use several lightweight blankets instead of one very heavy blanket.

What You Need to Have Handy—When a winter storm strikes or extra-cold weather lingers for long periods, certain items and information are indispensible. A home energy emergency kit should include:

- Phone numbers you can dial for help—your neighbors, the police, fire department, and other community service organizations.
- Emergency food and water supply, especially food that does not require refrigeration or cooking.
- Flashlight and extra batteries, and candles and matches.
- Extra medicine as may be required by family members.
- First aid supplies. The items may be bought separately at most drug stores, or first aid kits may be purchased from any Red Cross chapter. A Red Cross *Standard First Aid and Personal Safety* manual should be included.
- Extra blankets or sleeping bags.
- Fire-fighting equipment, such as an extinguisher, buckets of sand, a shovel, and an ax.

in response to

Sea Language Washes Ashore

Dear Sir:

I would be pleased if you would be good enough to forward the enclosed letter to Mr. Robert L. Scheina whose article, "Sea Language Washes Ashore," appeared in the August edition of the *Proceedings*.

We are in regular receipt of the *Proceedings* on this vessel and invariably find the contents of interest to us all. It was particularly refreshing however, on a lighter vein, to read Mr. Scheina's article. Even after spending over twenty years at sea myself I have to admit that I had no idea how much seafarers of the past had contributed to our language.

Yours faithfully,

R. W. WARWICK
Chief officer
RMS Queen Elizabeth
Cunard Line Ltd.
New York, NY

Gentlemen:

The article "Sea Language Washes Ashore" was very interesting and I found myself saying "I didn't realize that." There was a reference to the definition *booby hatch* on page 30 to which the current meaning has been lost. The first thing that came to my mind was the bird commonly known as the booby. These birds have a ritual where they do a lot of head bobbing and ducking. Perhaps the sight of seamen ducking to get through hatches inspired for term *booby hatch*.

Thanks for the entertaining article.

Very truly yours,

THOMAS E. MCNULTY, JR.
GPE Controls
Newark, DE

ulation is needed to help reduce the possibility of a marine collision due to a loss of steering.

An NPRM was published May 16, 1977 (42 FR 24869). As a result of the IMCO Tanker Safety and Pollution Prevention Conference of February 1978, a new NPRM was issued on February 12, 1979 (44 FR 8984). Public hearings were held on the docket and 138 comments have been received and analyzed. The final rules are being reviewed by the Office of the Secretary of Transportation and should appear by the time this magazine is published.

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

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

LICENSING OF PILOTS CGD 77-084

This regulation takes into account the problems caused by increased ship size and unusual maneuvering characteristics. The proposal would require recency of service for each route upon which a pilot is authorized to serve, licensing with tonnage limitations commensurate with pilot experience, and consideration of ship-handling simulator training for pilots of very large vessels. A regulatory analysis and work plan were completed in October 1978. An NPRM is expected in December 1979.

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

This revision would require an adjustment in vessel manning requirements, to bring them in line with current legislation. It would change the requirements which identify personnel who must be used on the three watches and personnel who may be employed in a day working status. An NPRM is scheduled to be published on this docket in January 1980.

TANK VESSEL OPERATIONS REGULATIONS, PUGET SOUND CGD 78-041

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

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

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

EIGHT-HOUR DAY VOLUNTARY OVERTIME CGD 78-146

This docket is a review of the Eight Hour Day, Voluntary Overtime regulation in 46 CFR 157.20-10, which states that no licensed officer should be required to be on duty more than eight hours per day except in extraordinary circumstances. Existing regulations, however, do not address overtime or consider any possible "fatigue factor." Recent Coast Guard studies have shown that this factor has a profound effect on reaction time and judgement, therefore the regulation is currently being reviewed. An ANPRM is expected in late December 1979.

PERSONNEL JOB SAFETY REQUIREMENTS FOR FIXED INSTALLATIONS ON THE OUTER CONTINENTAL SHELF CGD 79-077

This regulation is concerned with the health and safety requirements for installations and vessels engaged in oil field exploration and development. This action was mandated by pending Outer Continental Shelf legislation. It will provide more comprehensive protection for personnel employed in vessels and installations in the oil trade. the work plan received by the Marine Safety Council (MSC) in early July calls for an NPRM in January 1980.

PERSONNEL AND MANNING STANDARDS FOR FOREIGN VESSELS CGD 79-081

This regulation, deemed necessary to reduce the probability of oil spills, would establish minimum manning levels for foreign tank vessels operating in U.S. navigable waters. It would also establish procedures for the verification of training, qualification and watchkeeping standards. An NPRM is expected on the docket in late December 1979.

A complete listing of all Coast Guard regulations, both "significant" and "non-significant," appeared in the Monday, August 27, 1979 Federal Register (44 FR 50140).

Regulations for the Transportation of Hazardous Materials by Vessel--An Overview

By Lieutenant Kevin J. Eldridge
Cargo and Hazardous Materials Division
U.S. Coast Guard Headquarters, Washington, DC

The opinions or assertions contained herein are the private ones of the writer and are not to be construed as official or reflecting the views of the Commandant or the Coast Guard at large.

Presented at the 87th National Meeting of the American Institute of Chemical Engineers
August 20-23, 1979, Boston, Massachusetts

INTRODUCTION

Title 49 of the Code of Federal Regulations defines a hazardous material as "a substance or material which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety and property when transported in commerce and which has been so designated." In short, a hazardous material is a product which could, if accidentally released, cause damage to people, property or the environment. Just about every chemical produced and transported in the United States satisfies this definition and is thus subject to regulation. Determining what are the applicable regulations can sometimes be a more difficult job than complying with them. This presentation should provide the reader with a good feel for the waterborne regulations, both domestic and international, and an understanding of where they come from and the knowledge of how industry may influence a new or even present regulation.

When one who is in the business of transporting hazardous materials thinks of the waterborne regulations, thoughts of the United States Coast Guard are not far behind. The Coast Guard has officially been involved with hazardous materials as far back as 1852 when the Steamship Inspection Act was passed. The primary purpose of this act was to ensure that hazardous materials were stowed well away from the boilers on passenger vessels. The Coast Guard initially found itself on the enforcement end of the spectrum, but today finds its efforts divided between writing regulations and enforcing them. A series of legislative acts highlighted by the Magnuson Act of 1950, the Ports and Waterways Safety Act of 1972, the Transportation Safety Act of 1974 and the Toxic Substance Control Act of 1977 necessitated this shift of emphasis. (See Table I for a detailed synopsis of the history of the regulations.)

The Coast Guard is directly concerned with: (1) the design, construction, operation and manning of vessels; (2) the safe operation of waterfront facilities; (3) the prevention of pollution along our shores and in our navigable waters; (4) the occupational safety of personnel on the vessel; and (5) the satisfaction of the ever growing emergency response needs. These concerns are directly reflected in the Coast Guard's regulatory and enforcement activities.

U.S. REGULATIONS

An orderly discussion of the present regulations on hazardous materials transportation requires one to differentiate between bulk and break bulk. Bulk refers to the transportation of hazardous materials which are loaded or carried on board a vessel without the benefit of containers or labels, and received and handled by the vessel carrier without mark or count. Break bulk

Continued on next page.....

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(or packaged commodities as they are commonly referred to) are packages of hazardous materials that are handled individually, palletized, or unitized for purposes of transportation. Note that although industry commonly refers to portable tanks as bulk liquid transportation, for regulatory purposes they are considered packages.

Currently, the Coast Guard is the authority that issues regulations on the waterborne movement of bulk hazardous materials. These regulations are published in Title 46 of the Code of Federal Regulations. On the other hand, the Materials Transportation Bureau of the Department of Transportation promulgates regulations for packaged hazardous materials for all modes of transport. The MTB accomplishes this through coordination of the efforts of the Department's four modal agencies; U.S. Coast Guard, Federal Highway Administration, Federal Railroad Administration and Federal Aviation Administration. In addition to assisting MTB in the development of the regulations, these modal agencies are charged with enforcing the regulations for their respective modes of transportation.

Previous to the Transportation Safety Act of 1974, each mode had its own set of hazardous materials regulations. This autonomy led to a duplication of effort and an overlap of authority which quite frequently served to hinder intermodal transportation. Efforts to facilitate domestic trade resulted in the reorganization of Title 49 of the Code of Federal Regulations. The regulations of each mode were incorporated into Title 49 in April 1976 with a special emphasis on eliminating much of the redundancy and conflicting requirements. These consolidated regulations were directed towards the shipper and carrier and stressed classifying, describing, packaging, labeling and marking shipments of packaged hazardous materials. The focus of regulatory responsibility was clearly placed upon the person or persons who initially identify and classify the material under Title 49 and ultimately select the packaging and prepare the packaging for eventual tender to the carrier.

Continued on next page.....

TABLE I
History of Legislation Affecting
the Transportation of Hazardous Materials by Water (ref. 9)

Steamboat Inspection Act	1852	Rules for carriage of highly combustible and explosive materials. Passenger steamboats only.
16 Statute 440	1871	Applied Steamboat Act to all steamboats.
Refuse Act	1899	Prevented refuse discharge into navigable waters of the U.S.
Espionage Act	1917	Under the cases of war, threat of war, insurrection or risk of invasion gave the Coast Guard the right to supervise reloading and restowing of cargo, control ship movements, and the right to inspect vessels (domestic & foreign).
Tank Vessel Act	1936	Tank vessels carrying dangerous cargoes in bulk made subject to inspection, licensing, and operating requirements.
Dangerous Cargo Act	1940	First act to specifically name the Coast Guard dangerous cargoes now regulated applicable to vessels and to shippers involved in transporting, stowing, storing, handling explosives or other dangerous cargo.
Magnuson Act	1950	Amended Espionage Act, allowed action without declaration of a national emergency. Executive Order 101.73 gave Coast Guard standing authority to implement on a continuous basis.
Federal Hazardous Substances Act	1960	Defined what is hazardous. Specified the tests to be made for regulatory purposes. Required HEW to name "hazardous substances" (never done).
Oil Pollution Act	1961	Implemented the International Convention for the Prevention of Pollution of the Sea by Oil.
Federal Water Quality Improvement Act	1970	Prohibited the release of hazardous polluting substances which were to be defined by EPA.
Ports and Waterways Safety Act	1972	Broadened pollution prevention role of 1936 Tanker Act. Corraled Coast Guard authority under one law.
Federal Water Pollution Control Act	1972	Abolished FWQI Act and initiated "hazardous substance" definition.
Transportation Safety Act	1977	Centralized regulatory for packaged hazardous materials within the Department of Transportation. Hazardous materials defined as anything Secretary finds as hazardous.
Toxic Substances Control Act	1977	Regulate/protect human health/environment by requiring testing and use restrictions on certain chemical substances.

REGS OVERVIEW.....

Title 49 is constantly being amended and updated to accommodate current packaging technology and standard field practice. Its actual use can sometimes be confusing, however, the modal agencies are always willing to help. The Department of Transportation sponsors a course entitled "Safety Training Course for Shippers and Transporters of Hazardous Materials". It is held at the Transportation Safety Institute in Oklahoma City periodically throughout the year to train people in the use of Title 49. There are also many industry sponsored courses held across the country for the same purpose. Title 49 has proved itself a working, flexible document and remains the source document for domestic transportation of packaged hazardous materials.

Ensuring the safe handling of hazardous materials, both bulk and break bulk at the waterfront facility, is also of prime concern to the Coast Guard. The Coast Guard issued waterfront facility regulations in Title 33 of the Code of Federal Regulations. Requirements relating to handling, storage, stowage and transfer of hazardous materials are addressed. 33 CFR also addresses pollution prevention. It implemented the Oil Pollution Act of 1961 and the International Convention for the Prevention of Pollution of the Sea by Oil of 1954.

Domestic regulation summary. When shipping hazardous materials via the water mode, three publications should be on hand: Titles 33, 46 and 49 of the Code of Federal Regulations. All are available through the local government printing office bookstore. Title 49 addresses portable tanks and other packaged hazardous materials; Title 46 governs bulk movements; and Title 33 relates to waterfront facility and pollution prevention regulations. Table II contains a detailed breakdown of applicable sections in each publication.

Continued on next page.....

TABLE II
Code of Federal Regulations Related to
Waterborne Transportation of Hazardous Materials

Title 33	
Part 124	Advance Notice of Vessels Carrying Especially Hazardous Materials (COPH)
Part 125-127	Waterfront Facilities; Security Zones
Part 151-159	Pollution Prevention
Part 160-164	Ports and Waterways Safety
Title 46	
Part 30-40	Tank Vessels—design, construction and operation. Provisions for carriage of certain flammable or combustible cargoes in bulk.
Part 64	Marine Portable Tanks—design, construction and operation. List of approved commodities.
Part 90-99	Cargo and Miscellaneous Vessels
Part 146	Military Explosives Aboard Commercial Vessels
Part 147	Ship's Stores and Supplies on Board Vessels.
Part 147A	Shipboard Fumigation (grain)
Part 148	Carriage of Solid Hazardous Materials in Bulk
Part 151	Unmanned Barges Carrying Certain Bulk Dangerous Cargoes
Part 153	Self-propelled Vessels Carrying Hazardous Liquids
Part 154	Self-propelled Vessels Carrying Bulk Liquefied Gases
Part 154A	Special Interim Regulations for Issuance of Letters of Compliance to Barges and Existing Liquefied Gas Vessels
Title 49	
Part 172	Hazardous Materials Table
Part 173	Shippers—general requirements for shipments and packaging
Part 174	Carriage by Rail
Part 175	Carriage by Aircraft
Part 176	Carriage by Vessel
Part 177	Carriage by Public Highway
Part 178	Shipping Container Specification
Part 179	Specifications for Tank Cars

Table III
Member Countries of IMCO and their Acceptance Dates (as of 31 May 1978) (Ref. 5)

Algeria	10/63	Kenya	8/73
Angola	6/77	Kuwait	7/60
Australia	2/52	Lebanon	5/66
Austria	4/75	Liberia	1/59
Bahamas	7/76	Libyan Arab Jamahiriya	2/70
Bahrian	9/76	Madagascar	3/61
Bangladesh	5/76	Malaysia	6/71
Barbados	1/70	Maldives	5/67
Belgium	8/51	Malta	6/66
Brazil	3/63	Mauritania	5/61
Bulgaria	4/60	Mexico	9/54
Burma	7/51	Morocco	7/62
Canada	9/48	Netherlands	3/49
Cape Verde	8/76	New Zealand	11/60
Chile	2/72	Nigeria	3/62
China	3/73	Norway	12/58
Colombia	11/74	Oman	1/74
Congo	9/75	Pakistan	11/58
Cuba	5/66	Panama	12/58
Cyprus	11/73	Papua New Guinea	5/76
Czechoslovakia	9/63	Peru	4/68
Democratic Kampuchea	1/61	Philippines	11/64
Denmark	6/59	Poland	3/60
Dominican Republic	8/53	Portugal	3/76
Ecuador	7/56	Qatar	5/77
Egypt	3/58	Republic of Korea	4/62
Equatorial Guinea	9/72	Romania	4/65
Ethiopia	7/75	Saudi Arabia	2/69
Finland	4/59	Senegal	11/60
France	4/52	Suerra Keibe	3/73
Gabon	4/76	Singapore	1/66
German Democratic Republic	9/73	Samalia	4/78
Germany, Federal Republic of	1/59	Spain	1/62
Ghana	7/59	Sri Lanka	4/72
Greece	12/58	Sudan	7/74
Guinea	12/75	Surinam	9/76
Guinea-Bissau	12/77	Sweden	4/59
Haiti	6/53	Switzerland	7/55
Honduras	8/54	Syrian Arab Republic	1/63
Hungary	6/70	Thailand	9/73
Iceland	11/60	Trinidad & Tobago	4/65
India	1/59	Tunisia	5/63
Indonesia	1/61	Turkey	3/58
Iran	1/58	U.S.S.R.	12/58
Iraq	8/73	U.K.	2/49
Ireland	2/51	United Republic of Cameroon	5/61
Israel	4/52	United Republic of Tanzania	1/74
Italy	1/57	U.S.A.	8/50
Ivory Coast	11/60	Uruguay	5/68
Jamaica	5/76	Venezuela	10/75
Japan	3/58	Yugoslavia	2/60
Jordon	11/73	Zaire	8/73
		Hong Kong (associate member)	6/67

INTERNATIONAL RECOMMENDATIONS/REGULATIONS

The majority of waterborne transportation is international in nature, the exceptions being Great Lakes and Mississippi River traffic. This fact requires importers and exporters of hazardous materials to be familiar with international regulations as well as U.S. regulations affecting marine transportation. Compliance with both is the only way to ensure uninterrupted international shipment.

The organization which is tasked with facilitating waterborne trade is the Intergovernmental Maritime Consultative Organization, IMCO. It is a specialized agency of the United Nations concerned with maritime affairs (see figures 1 and 2). In an effort to consolidate the diverse forms of international cooperation that has grown up over the years, IMCO has published recommendations on both bulk and break bulk transportation of hazardous materials. The key word to note is "recommendations". These recommendations are not mandatory. They can be, and have been adopted in whole or in part into domestic regulations of the IMCO member countries. As of 31 May 1978, there were 105 member countries, 27 nations from Africa, 20 from the Americas, 27 from Europe, 28 from Asia and three from Australasia (listing in Table III).

The U.S. Coast Guard respresents the United States on various IMCO subcommittees (see figure 3). The actual work is done at the subcommittee level. These subcommittees generate the recommendations that are submitted to the IMCO Maritime Safety Committee for approval and subsequent publication. These recommendations are constantly being amended.

Positions taken by the U.S. delegation are formulated from a number of sources. The Coast Guard Cargo and Hazardous Materials Division, located at Coast Guard Headquarters, Washington, D.C. has 25 chemists and chemical engineers who provide technical expertise. The Coast Guard periodically holds public meetings to solicit comment from industry and the public. These SOLAS (Safety of Life at Sea) Working Group meetings are announced in the Federal Register approximately 30 days in advance and in the past have been extremely well attended. The Chemical Transportation Advisory Committee is also consulted for technical material and advice. This standing advisory committee to the Coast Guard consists of not more than 40 members who are appointed for nominal terms of three years. Industry representatives comprise the majority of the membership. Representatives from academia and related interest groups make up the balance.

In addition to each country's delegation, IMCO receives proposals from the United Nations Committee of Experts on the Transport of Dangerous Goods (see figures 1 and 2). This group publishes its own recommendations for the transport of packaged hazardous materials by all modes. IMCO considers the U.N. recommendations that are applicable to the water mode for incorporation into the IMCO recommendations.

INTERNATIONAL TRANSPORTATION: BULK VERSUS BREAK BULK

Again, the bulk and break bulk distinction must be made. Generally speaking, if an exporter of bulk liquids is in compliance with U.S. regulations his goods should move throughout the world without much difficulty. This is the result of Coast Guard participation in the development of the IMCO bulk liquid recommendations and the subsequent influence of these recommendations on the development of U.S. regulations. To thoroughly understand the international transportation of bulk liquids, the interface of IMCO recommendations with U.S. regulations should be discussed in detail.

IMCO has published three sets of recommendations dealing with bulk liquid transportation: the IMCO Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (Bulk Chemicals Code); the IMCO Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (New Ships Gas Code); and the IMCO Code for Existing Ships Carrying Liquefied Gases in Bulk (Existing Ships Gas Code). The first two codes were implemented by the U.S., for the most part, in Title 46 of the Code of Federal Regulations, Parts 153 and 154. Since Parts 153 and 154 either meet or exceed the IMCO Bulk Chemicals Code and New Gas Ships Code, respectively, U.S. flag vessels in compliance move unencumbered internationally.

The Coast Guard is in the process of revising the U.S. regulations for "existing" gas carriers (46 CFR Parts 30-40 and Parts 90-109). These regulations will include existing regulations plus recommendations of the IMCO Existing Ships Gas Code that exceed current U.S. regualtions. The definition for an existing ship is a vessel which:

1. is constructed under a building contract awarded before November 1, 1978;

2. in the absence of a building contract, has the keel laid or is at similar stage of construction before January 1, 1977;

3. is delivered before July 1, 1980; or

4. has undergone a major conversion for which

   a. the building contract is awarded before November 1, 1976;

   b. in the absence of a building contract, conversion is begun before January 1, 1977, or

   c. conversion is completed before July 1, 1980.

The definition for a new ship parallels the existing ship definition but with construction or conversion beginning on or after the specified dates.

Continued on next page.....

REGS OVERVIEW.....

Foreign flag vessels transport a large share of the bulk hazardous materials moved to and from the U.S. These vessels are mandated by law to obtain a Letter of Compliance, LOC, from the U.S. Coast Guard to operate within U.S. waters. Procedures for obtaining a LOC for new or existing bulk liquid chemical carriers are located in 46 CFR Part 153; for new liquefied gas ships, the requirements are detailed in 46 Part 154; and for existing gas ships, the regulations of 46 CFR Part 154A pertain. A Letter of Compliance is issued by the Coast Guard once the foreign flag vessel is in compliance with the appropriate regulations and meets minimum safety requirements. This LOC allows the vessel to enter and transit U.S. waters for the purpose of transporting hazardous materials in bulk. The LOC must be renewed every two years and the vessel is subject to periodic Coast Guard inspection.

Hazardous bulk solids are regulated domestically in 46 CFR Part 148. IMCO has published the Code of Safe Practice for Solid Bulk Cargoes, but these recommendations do not specifically address hazardous cargoes. They speak to bulk cargoes in general. Work is underway, however, to include such a section in the present code. It will detail requirements such as stowage and segregation as well as list the hazardous cargoes that will be permitted for bulk carriage. This work is nearing completion, but the publication date cannot be predicted. The IMCO International Maritime Dangerous Goods Code, which is the set of recommendations for packaged hazardous materials,

Continued on next page.....

Table IV
Adoption of the International Maritime Dangerous Goods Code (as of 18 July 1978) (Ref. 8)

Country	Adoption being considered	Partially adopted	Fully adopted	Effective from
Algeria	Yes			
Argentina			Yes	
Australia			Yes	3/68
Bahamas			Yes	76
Belgium			Yes	5/66
Canada	Yes	Yes		
Chile		Yes		1/66
Denmark			Yes	2/72
Egypt	Yes			
Finland		Yes		
France			Yes	8/68
Germany Federal Republic of			Yes	4/72
Greece			Yes	
India	Yes			
Ireland			Yes	68
Israel			Yes	11/72
Italy			Yes	8/69
Japan	Yes	Yes		
Liberia	Yes			
Netherlands			Yes	1/74
New Zealand	Yes	Yes		
Norway			Yes	71
Pakistan			Yes	
Peru			Yes	1/70
Poland			Yes	1/74
Republic of Korea	Yes		Yes	1/74
Saudi Arabia			Yes	11/75
South Africa	Yes			
Spain	Yes	Yes		
Sweden			Yes	
Switzerland			Yes	2/73
USSR			Yes	1/69
United Kingdom			Yes	68
USA		Yes		7/76

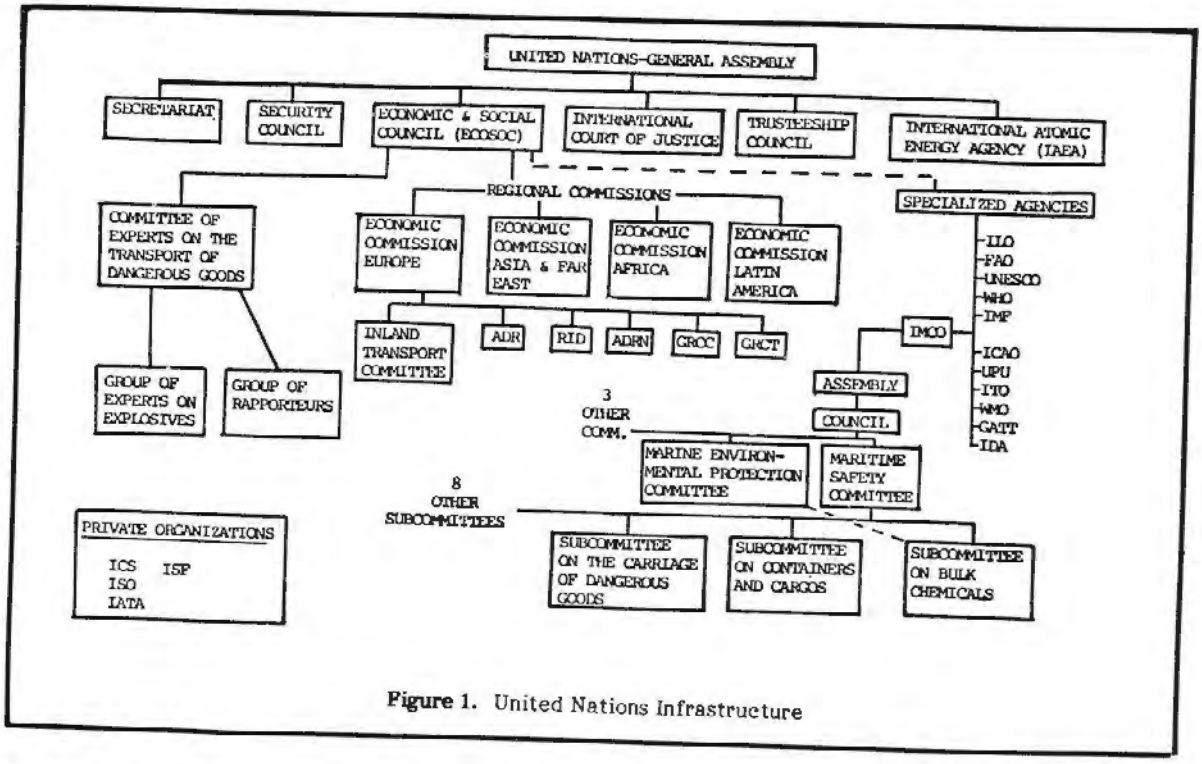

Figure 1. United Nations Infrastructure

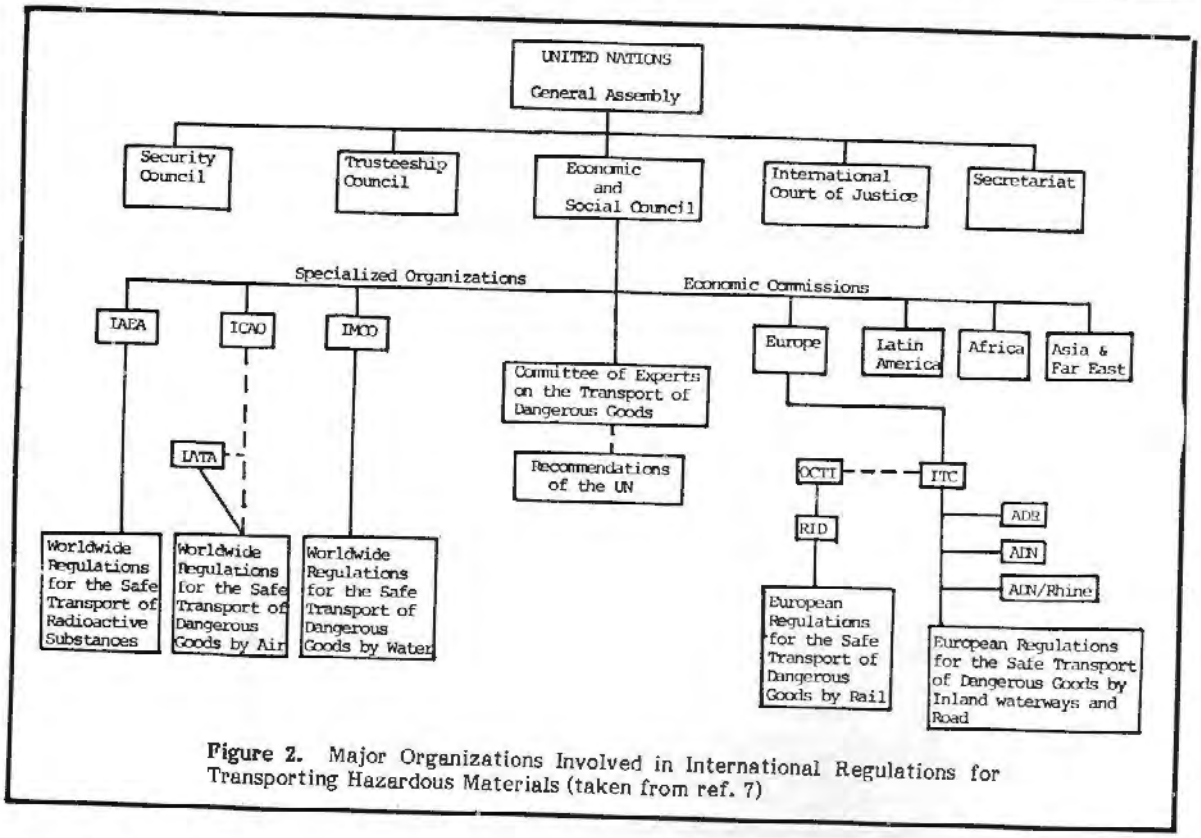

Figure 2. Major Organizations Involved in International Regulations for Transporting Hazardous Materials (taken from ref. 7)

does note, for a few commodities, that they are authorized for bulk carriage. Therefore, until publication of the hazardous bulk cargo recommendations is effected an exporter must consult the IMCO Dangerous Goods Code for international requirements and 46 CFR Part 148 for domestic details. It goes without saying that the exporter must be aware of any additional requirements imposed by the nation for which the shipment is destined.

A different approach has been taken in the case of packaged hazardous materials. Parts of the IMCO International Maritime Dangerous Goods Code have been directly incorporated into Title 49 of the Code of Federal Regulations. Other parts have been incorporated by reference. Exporters must be aware and comply with both Title 49 and the IMCO Dangerous Goods Code.

Paragraph 171.12 of Title 49 reads:

> (b) The requirements of §171.12 with respect to classification and labeling notwithstanding, a hazardous material (other than Class A or B explosives or radioactive materials) which is classed and labeled in accordance with the IMCO Code and being imported into or exported from the United States or passing through the United States in the course of being shipped between places outside the United States may be offered and accepted for transportation and transported within the United States if it is otherwise offered, accepted, and transported in accordance with this subchapter. When a material is transported within the United States by air, highway, or rail under an IMCO class, the entry on the shipping paper required by §172.202(a)(2) must include a class set forth in this subchapter that most appropriately corresponds to the IMCO class.

To explain further, a shipper may classify and label an export shipment in accordance with IMCO. The provision eliminates the need for double paperwork previously necessitated when a shipment arrived at a port of embarkation. This provision is an example of incorporation by reference.

A complication the exporter must also be aware of is that a shipment in compliance with Title 49 and the IMCO Dangerous Goods Code does not mean the country receiving the material will accept it. The exporter should check with his customer on the other end regarding his country's particular requirements. Table IV lists those countries that have partially or entirely adopted the IMCO Dangerous Goods Code.

CONCLUSION

The eventual goal of IMCO is to standardize a dangerous goods code for marine transportation worldwide. Philosophical differences, current practices and political, as well as economic constraints have made such a worldwide system impractical to date. Through the continued efforts of the IMCO member countries, however, the world is moving in a direction of cooperation and harmony.

Continued on next page.....

About the Author

Lieutenant Kevin J. Eldridge

A '74 graduate of the U.S. Coast Guard Academy, Lieutenant Eldridge spent two years at sea aboard the USCGC BUTTONWOOD in deck assignments. This was followed by two years at the University of Michigan where he obtained a bachelor of science degree and master of science degree, both in chemical engineering. He is presently pursuing a master's in business administration (off duty) at the University of Maryland. His current assignment is with the Cargo Systems Branch of the Cargo and Hazardous Materials Division at Coast Guard Headquarters. His duties are regulatory in nature and center around insuring the safe transportation of packaged hazardous materials by water. He is active in the American Institute of Chemical Engineers and is a member of Phi Lambda Upsilon.

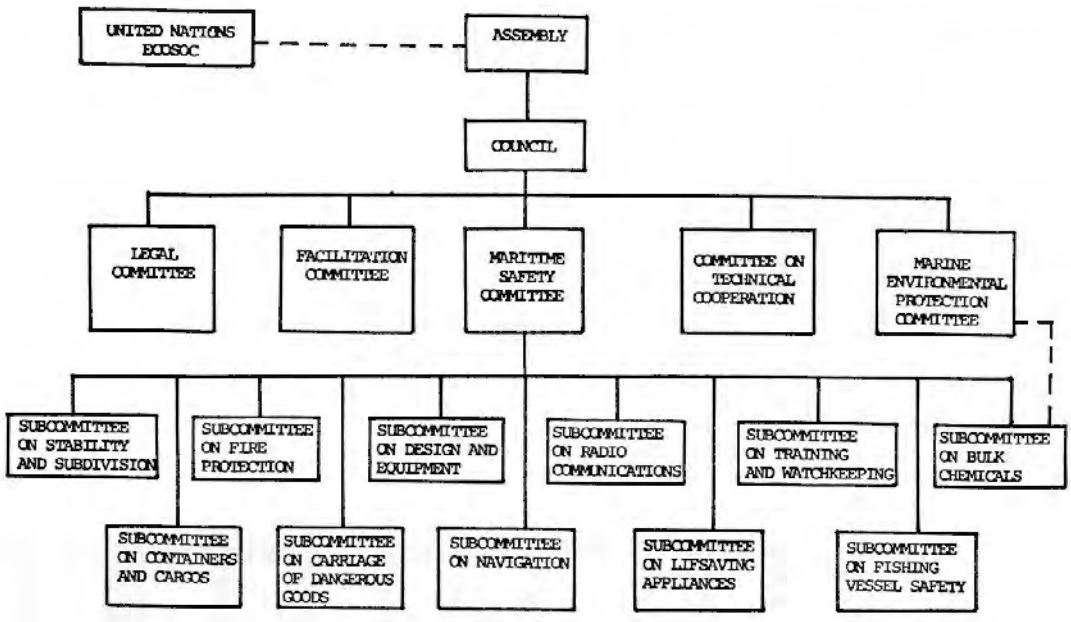

Figure 3. Intergovernmental Maritime Consultative Organization (IMCO)

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1. "Code of Federal Regulations, Title 49, Transportation," U.S. Government Printing Office, 1978
2. "Code of Federal Regulations, Title 46, Shipping," U.S. Government Printing Office, 1978
3. "Code of Federal Regulations, Title 33, Navigation and Navigable Waters," U.S. Government Printing Office, 1978
4. "Transport of Dangerous Goods, Recommendations prepared by the Committee of Experts on the Transport of Dangerous Goods," United Nations, 1977
5. "IMCO and its Activities," Intergovernmental Maritime Consultative Organization, London, 31 May 1978
6. "International Maritime Dangerous Goods Code," IMCO, as amended 1 July 1979
7. "Principle Organizations Involved in International Regulations for Transporting Hazardous Materials," Hazardous Materials Advisory Committee pamphlet, Washington, D.C.
8. Intergovernmental Maritime Consultative Organization, Carriage of Dangerous Goods Subcommittee circular CDG/circ. 24, 18 July 1978
9. U.S. Coast Guard Marine Safety School, Hazardous Chemicals Training Course class notes, August 1978

COAST GUARD FIELD OIL IDENTIFICATION SYSTEMS: UPDATE

By Lieutenant B. N. Balch
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The Coast Guard's enforcement of its federal water pollution control mandate (Federal Water Pollution Control Act as amended 33 USC 1321) requires that it have the capability to identify pollutants found in waters under its jurisdiction and to identify their sources. When the Coast Guard was assigned this task, many laboratory techniques were available and capable laboratory facilities existed which could identify individual pollutants and classify them as to specific generic type. There was, however, no standard analytical technique, or set of techniques, which had an accepted and established capability to identify an oil uniquely with its source and with sufficient accuracy that the results could withstand judicial review. Techniques and procedures were needed which Coast Guard operational units could use to rapidly identify the source of an oil spill with sufficient accuracy to be able to require corrective action by the suspected polluter or take other administrative action.

OIL IDENTIFICATION TECHNIQUES

Accordingly, the Coast Guard Research and Development Center (R&DC), Groton, Connecticut was tasked with the responsibility of developing analytical techniques and hardware to identify the sources of oil discharges in the marine environment. Every promising technique was evaluated for its ability to characterize oils. Four of the five most promising methods which were selected for development were infrared and fluorescence spectroscopy and gas and thin-layer chromatography. Other promising methods which were evaluated but not selected were ionization mass spectroscopy, emission spectroscopy and high pressure ionization mass spectroscopy.

Each selected technique was developed independently and optimized using R&DC oil library samples

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(over 675 different oils). The statistical reliability of the analytical results was enhanced by the multi-method approach, since totally independent instrumental methods of analysis were used. The following basic principles of each method are outlined to show their independence.

Infrared Spectroscopy

Infrared spectroscopy is fundamentally a measurement of the absorption of infrared radiation at frequencies corresponding to the vibration frequencies of the various molecules present in an oil sample. The phenomenon can be measured because molecules absorb radiation at the frequencies coinciding with their molecular vibrations, as long as a net change in electric dipole moment occurs. The energy absorption is measured with a spectrophometer which scans the infrared portion of the electromagnetic spectrum from 2.5-5.0 microns in wavelength (400-200 wavenumbers, in cm^{-1}), and detects the beam with a thermopile after it is passed through the oil sample. When a wavelength is reached at which energy is absorbed, a peak is recorded on a chart.

The chart recording is referred to as an infrared spectrum. For oil identification, the spectra of oil samples are compared at all wavenumbers with particular attention to the 900-650 cm^{-1} region, which is referred to as the "oil fingerprint region." Peaks in this region are characteristic of a given oil and are used to identify a spill source by matching the spectrum of the discharged oil to that of the source.

Fluorescence Spectroscopy

Fluorescence is the process by which certain molecules absorb ultraviolet radiation and re-emit visible radiation, generally at longer wavelengths (lower frequencies). This absorption process takes place within the electronic state (i.e., the electrons of the individual atoms which have combined to form a molecule). The electronic state of the molecule is excited during the absorption process causing electrons to exist temporarily in an unstable configuration. As the electronic structure of the molecule returns to its stable, original state, energy is released and detected as fluorescence. Fluorescence spectra are obtained with a fluorescence spectrophotometer which employs an energy source (usually a xenon arc). The radiation of the source is filtered by a diffraction grating so that nearly monochromatic light falls upon a sample of oil dissolved in cyclohexane. The light emitted from the sample enters a similar monochromator (the emission monochromatic) which is placed at 90 degrees to the excitation monochromator in order to reduce the effect of scattered light on the fluorescence signal. The emitted radiation passes through the second monochromator so that nearly monochromatic radiation strikes a sensitive photomultiplier detector.

Fluorescence spectroscopy is a highly sensitive and specific method for oil identification, since petroleum oils contain many fluorescent components (primarily aromatic hydrocarbons). Since petroleum oils are complex organic mixtures, the intensity and spectral distribution of the fluorescence will vary with the chemical composition of the oil. When fixed instrumental parameters are used with a given concentration of oil, an emission or excitation spectrum will be obtained which serves as a unique "fingerprint" of a given oil.

Gas-Liquid Chromatography

Gas chromatography, more properly known as gas-liquid chromatography, is a physical method for separating components of a mixture. It is based on the partition of molecular species between a high energy phase carried by an inert gas and a stationary liquid phase adsorbed on an inert solid substrate. The components of an oil are separated in the approximate order of their boiling points by passing the volatilized sample, in helium, through a chromatographic column. The column consists of a small diameter stainless steel tube filled with a high-surface-area, inert, solid substrate. The amounts of each component are plotted as functions of time (temperature) to produce a gas chromatographic spectrum or chromatogram.

The technique developed at the R&DC employs simultaneous analysis on two columns with two different detectors. The columns are heated at a uniform rate and the effluents detected by a flame ionization detector (FID) which is sensitive to virtually all oil components that come off the column, and a flame photometric detector (FPD) equipped with a narrow band-pass filter which permits detection of only the sulfur-containing compounds. The responses of both detectors are simultaneously traced onto a strip chart to produce a dual chromatogram. The identity of a spill sample is established when its chromatogram matches one of the suspect sample chromatograms.

Thin-layer Chromotography

Thin-layer chromatography (TLC) utilizes the principle that the components of a liquid solution can be separated by passing the solution over a solid substrate, since various components of the mixture migrate at different rates. A suitable inert solvent is used as a mobile phase, and an adsorbent stationary phase is coated onto a glass plate in a uniform thin layer. The separation of components depends on the different affinities of the components for both the mobile solvent and the stationary adsorbent. A spot of the solution is placed near one edge of the plate and propelled across the surface of the plate by capillary action of the developing solvent.

For oil identification by TLC, the oil sample is mixed with methanol to extract the aromatic fraction which fluoresces in a banded column pattern characteristic of each oil sample separated by TLC. The pattern is made visible by examination under ultraviolet light, which causes the oil extraction to fluoresce. Whereas fluorescence spectroscopy measures the fluorescence emitted by the entire sample as a function of wavelength, TLC shows the fluorescence color and intensity pattern of the separated components.

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PFD'S: Help for Those Who Help Themselves

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The opinions or assertions contained herein are the private ones of the writer and are not to be construed as official or reflecting the views of the Commandant or the Coast Guard at large.

How many times have you thought that the Personal Flotation Device (PFD) you were wearing was going to save your life if an accident occurred? In the following situations, taken from USCG casualty files, all of the individuals were wearing life preservers while working aboard barges and yet they all died following a mishap in which they fell into the water.

The first case occurred during a rainy summer night aboard a Mississippi River towboat while in the process of remaking a tow. At approximately two o'clock in the morning, the towboat's unlicensed mate proceeded across several barges to cast off some lines. In the process, he attempted to jump from a light barge to a loaded one, a vertical distance of about five and a half feet. He landed off balance and fell in the two-foot gap between the barges. The mate was wearing a life vest and the accident was witnessed by a fellow crew member. Even though rescue was prompt, the mate was dead upon recovery. The coroner's report stated that the man had struck his head on the side of a barge during the fall, thereby losing consciousness. While he was unconscious, the current swept him under the barge. In this instance, the life vest was of little help to the mate.

A second accident occurred on a clear cold winter night with an air temperature near freezing. A tug with a load of barges was approaching a set of locks on the river. A deck hand, wearing a life vest, was assigned to the lead outboard barge just prior to entering the locks. After a short period of time, being unable to raise the deckhand by walkie talkie and not seeing him forward on the barges, the Captain sent a second person to look for him on the tug. The Captain then began sweeping the water with his floodlights and

Continued on next page.....

PFD'S

eventually spotted the orange lifejacket, still fastened around the body of the deckhand. All attempts to revive the man were to no avail due to the massive skull fracture he had suffered. Later, the walkie talkie was found at a point where the deckhand apparently fell between barges. The decks were found to be dry and free of tripping hazards, while the vertical distance between the barges was noted to be approximately five feet. Again, no chance for the PFD to save a life.

The third accident occurred in the early fall during clear weather with an air temperature of 55 degrees F. (13 degrees C.). A group of barges was tied to a river bank remaking the tow. A deckhand wearing a work-type life vest attempted to jump from one barge to another, a drop of approximately six feet. Witnesses stated that he lost his balance upon landing and fell off the barge. His body was retrieved within 20 minutes, but attempts to revive him using artificial respiration were unsuccessful. It was noted that near his jumping point, a ladder was provided expressly for the purpose of descending between the barges. Had he taken the extra moments to go over and use it, his wife would not be a widow today.

In all of the above cases, there is a commonality that is more basic than the wearing or not wearing of lifejackets. It could be called the human factor, or more appropriately, carelessness--not using your head. A PFD is no doubt of great value and can be in the truest sense a "lifesaver," if given the proper circumstances. But just because it has been put on doesn't mean that "the force is with you." Safety requires the use of caution and common sense at all times.

Another significant item in each of the above casualty cases was the fact that none of the barges were actually underway. They were all stopped or moored and there was no apparent reason why any of the three individuals should have taken the aforementioned risks. Carelessness with one's life is the result of unthinking actions which can lead to tragic mishaps. Be aware that there is a good probability that injury and/or unconsciousness may occur from a fall between barges prior to entering the water. *Remember*, don't attempt that jump if there is the slightest doubt in your mind. Whether or not you use your PFD, for your own sake, use your head!

Remember--PFD's are designed to help you save your own life!

FOIL UPDATE

Using their library of known oils the Coast Guard R&D Center developed statistical probabilities for each analysis method selected.

The probability of accurately identifying an oil belonging to a general class of oils is:

Gas chromatography	0.857
Fluorescence spectroscopy	0.905
Infrared spectroscopy	0.875
Thin-layer chromatography	0.970

The probability of establishing a correct match or non-match between two oil samples is:

Gas chromatography	0.911
Fluorescence spectroscopy	0.911
Infrared spectroscopy	0.944
Thin-layer chromatography	0.629

FIELD OIL IDENTIFICATION LABORATORIES

The use of these four independent techniques in the matching of spilled oil to suspects is the major reason that the use of independent as well as the EPA labs is being discontinued. Most independent labs are set up to utilize one method of analysis. No single method has been established which is unequivocal in all cases. Additionally, most independent labs cannot take into consideration the effects of evaporation, dissolution, biodegradation, photooxydation and other elements of weathering of spilled oil to the degree that the Coast Guard system will.

The Coast Guard will have 10 Field Oil Identification Laboratories (FOILS) in operation by November 1979, located in Portland, Maine; St. Louis, Missouri; Philadelphia, Pennsylvania; New York, New York; New Orleans, Louisiana; Long Beach, California; San Francisco, California; Seattle, Washington; Honolulu, Hawaii; and Anchorage, Alaska. Upon completion of the project to establish thesa labs there will be 18 Coast Guard units with FOIL capabilities. FOIL analysis results are used for investigative purposes in locating sources of pollution and as supportive evidence for civil penalty proceedings.

Assistance to these Field Labs is provided by the Central Oil Identification Laboratory (COIL) presently colocated with the R&D Center in Groton, Connecticut. Cases requiring analysis beyond the FOIL capability, or when the only evidence in a case is the sample analysis, are processed by COIL utilizing all four techniques described earlier. Two backup methods are still under development; liquid chromatography and low temperature phosphorescense are also available at COIL.

The American Society for Testing and Materials (ASTM) has published consensus standards on the identification of waterborne oils using input based on the methods developed by the Coast Guard R&D Center for several of the standards. Standards have been published for the gas chromatography-dual detection method and the ultra-violet fluorescense spectroscopy method. The standard for the infrared spectrophotometry method is still being developed.

The FOIL system is at present used only for oil identification, but work is underway by the R&DC to adapt the system for use in identifying hazardous substances.

Nautical Queries

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

DECK

(1) What is the use of the quadrantal soft iron spheres located on each side of the magnetic compass binnacle?

A. To remove deviation on the intercardinal compass headings
B. To remove deviation on the cardinal compass headings; 0 degrees, 90 degrees, 180 degrees, 270 degrees
C. To remove heeling error
D. To compensate for induced magnetism in vertical soft iron

REFERENCE: Dutton

(2) A katabatic wind blows

A. up an incline due to surface heating.
B. in a circular pattern.
C. down an incline due to cooling of the air.
D. horizontally between a high and a low pressure area.

REFERENCE: Bowditch

(3) The perforated, elevated bottom of the chain locker which prevents the chains from touching the main locker bottom, and allows seepage water to flow to the drains is called a

A. cradle.
B. draft.
C. manger.
D. harping.

REFERENCE: Merchant Marine Officer's Handbook

(4) What document shows the minimum required crew a vessel must have to navigate from one port in the United States to another?

A. Register
B. Articles
C. Certificate of Inspection
D. Crew List

REFERENCE: Martin, Ben; Shipmaster's Handbook on Ship's Business

(5) The anchors should he dropped well out from the pier while at a Mediterranean moor to:

A. prevent damage to the stern caused by swinging against the pier in the approach.
B. permit the ship to maneuver in the stream while weighing anchors.
C. increase the anchor's reliability by providing a large catenary in the chain.
D. eliminate navigational hazard by allowing the chain to lie along the harbor bottom.

REFERENCE: Knights Modern Seamanship 13th 1960

ENGINEER

(1) The formation of a pit in a boiler tube is most likely to occur when

A. waterside deposits are present.
B. sludge is present.
C. the tube metal acts as an anode.
D. dissolved minerals are present.

REFERENCE: Principles of Naval Engineering

(2) In a diesel engine, blowby

A. increases exhaust back pressure.
B. increases liner and ring wear.
C. can only be detected by a compression check.
D. decreases fuel consumption.

REFERENCE: Stinson 11th Edition

(3) Dehydrating agents such as activated alumina and silica gel remove what substance(s) from refrigeration systems?

I. Moisture
II. Acid

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

REFERENCE: Nelson

(4) What instrument sensors must be fitted downstream of the blowers in an inert gas system?

A. Oxygen concentration indicator and permanent recorder
B. Pressure indicator and permanent recorder
C. Temperature indicator
D. All of the above

REFERENCE: 46 CFR 32.53-60

(5) The term $\frac{\text{PLAN}}{33000}$ is equal to the

A. BMEP
B. IHP
C. BHP
D. SHP

REFERENCE: Maleev

ANSWERS

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

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

MERCHANT MARINE SAFETY PUBLICATIONS

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

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

CG No.	TITLE OF PUBLICATION
CG-101-1	Specimen Examinations for Merchant Marine Deck Officers (2nd and 3rd Mate) (4-77).
CG-101-2	Specimen Examinations for Merchant Marine Deck Officers (Master and Chief Mate) (7-78).
CG-108	Rules and Regulations for Military Explosives and Hazardous Munitions (4-72).
CG-115	Marine Engineering Regulations (8-77).
CG-123	Rules and Regulations for Tank Vessels (8-77). Ch-1, 4-78.
CG-169	Navigation Rules - International - Inland (5-77).
CG-169-1	Colregs Demarcation Lines (7-77).
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CG-227	Laws Governing Marine Inspection (7-75).
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CG-518	Marine Investigating Officer's Regulation Handbook (2-78).
CG-526	Utilizing the Packaged Hazardous Materials Regulations, 49 CFR (5-78).
Safety of Life at Sea: Convention, with Regulations, London, June 17, 1960.	
Specifications for Merchant Vessel Equipment (Subparts of Chapter Q, 46 CFR, parts 160 to 164.	

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