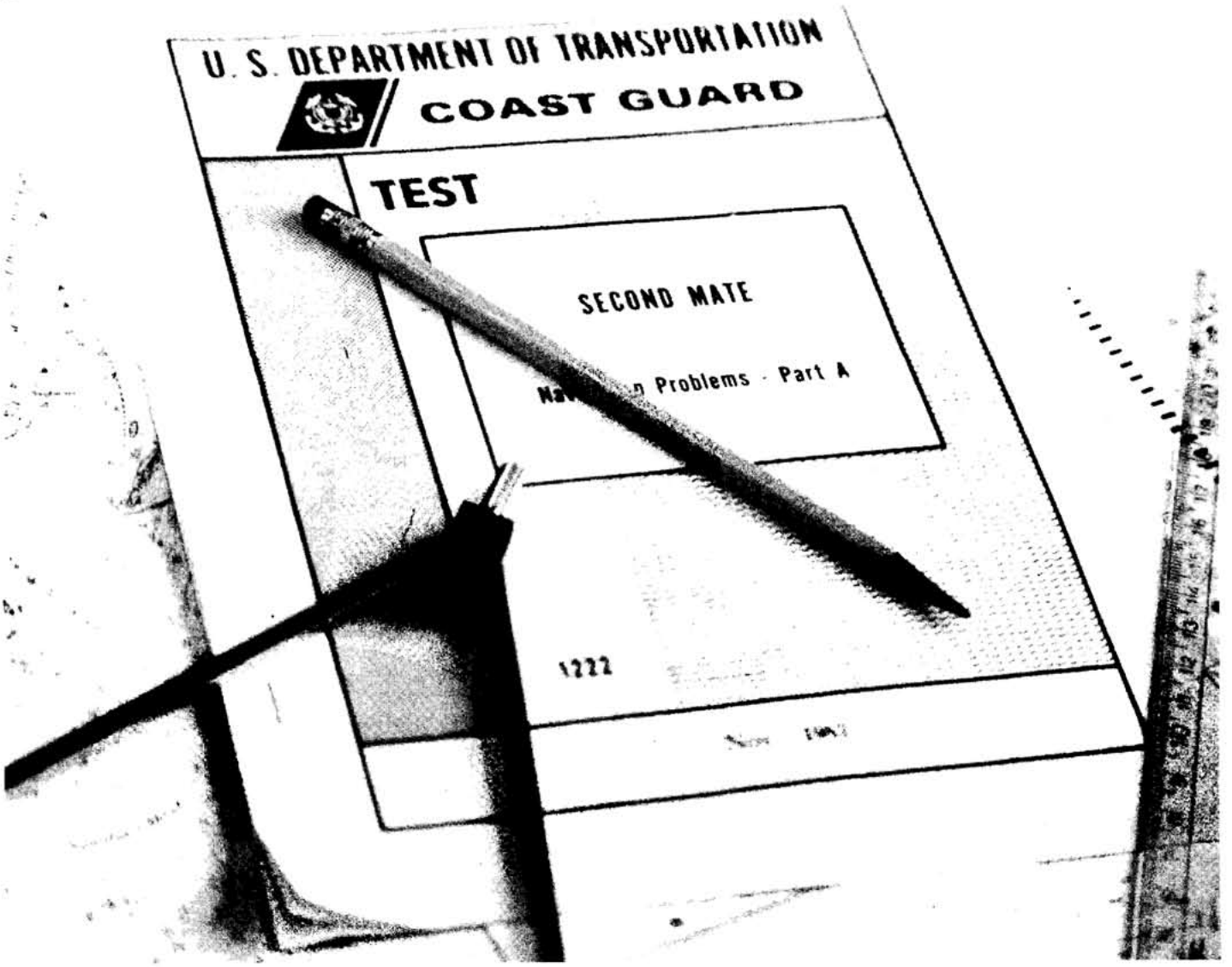
Proceedings

of the Marine Safety Council



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May 1984

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of the Marine Safety Council

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Contents

Features

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Cover

The professional examination no doubt looms large in the thoughts of applicants for licenses or certificates. In an article beginning on page 151, the Merchant Vessel Personnel Division explains how examination questions are developed and evaluated and how mariners can contribute to this process.

2 Fire-extinguishing Agents: Carbon Dioxide vs. Halon

Extinguishing the flames is only half the story when it comes to putting out fires on board vessels. With some extinguishing agents, vessel personnel must be protected from the agent as well as from the fire.

by Alan L. Schneider
Ship Design Branch
Marine Technical and
Hazardous Materials Division

For many years, the favored method of extinguishing fires in enclosed spaces (engine rooms, for example) has been to smother them. The enclosed space has been filled with a gas, carbon dioxide, which extinguishes the fire by depriving it of the oxygen it needs for combustion. Unfortunately, totally flooding a space with carbon dioxide will also deprive anyone in it of the oxygen he needs to live. To prevent vessel personnel from being asphyxiated, Coast Guard regulations require a minimum delay of 20 seconds between system activation and the release of the carbon dioxide. During these 20 seconds, a siren sounds, warning personnel to quickly evacuate the enclosed space.

In recent years, carbon dioxide's supremacy as an agent for fighting fires in enclosed spaces has been challenged by the development of Halons. The word Halons is short for "halogenated hydrocarbons," in other words, hydrocarbons containing one or more of the halogens--fluorine, chlorine, or bromine.

Halons have certain advantages over carbon dioxide. Less Halon than carbon dioxide, for example, would be needed to extinguish a fire of the same size. This is an important consideration on ships, with their weight and space limitations. In addition, there is some evidence that Halons can extinguish engine room fires more quickly than carbon dioxide can. The Halons used in firefighting systems are thought to be effective in breaking the chain reaction which is the mechanism that keeps fires going. Since the Halon extinguishes the fire by putting an end to this reaction rather than by filling the room and displacing the oxygen, as carbon dioxide does, lower concentrations can be used. Whereas carbon dioxide would require a concen-

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This article is the second in a series of intermittently appearing articles on workplace hazards. It was adapted from a paper delivered by the author at the Thirteenth Intersociety Conference on Environmental Systems, held in San Francisco July 11 - 13, 1983, and is printed here with the permission of the Society of Automotive Engineers, Inc., which released the paper in its SAE Technical Paper Series as a copyrighted publication.

tration of 28.5% to be effective, Halon 1301, which is typically used on board ships, will extinguish a fire at a concentration level of 6%. This could be vitally important in the case of accidental release. Since the Halon-air mixture would contain 94% air and only 6% Halon, personnel trapped in an enclosed space with it would not be asphyxiated.

Why, then, haven't Halons replaced carbon dioxide completely? One reason is financial considerations. Halon is typically more expensive than carbon dioxide. Another reason might be that Halon 1301, the Halon most commonly used for fire-extinguishing purposes, decomposes to form two toxic gases, hydrogen fluoride and hydrogen bromide, when it is exposed to heat. The American Conference of Governmental Industrial Hygienists has set recommended maximum exposure levels for these two gases. If personnel must be exposed to them, the concentration to which they are exposed should not exceed 3 parts per million (ppm), averaged over the eight-hour workday.

No data were available on how much hydrogen fluoride and hydrogen bromide were generated when Halon was released or how effective Halon 1301 was in extinguishing machinery-space fires when the Coast Guard began drafting safety regulations for Halon. To acquire the necessary data, the Coast Guard, with support from the marine firefighting industry, ran a series of tests in 1970 in the engine room of a full-scale ship at the U.S. Coast Guard Fire and Safety Test Detachment in Mobile, Alabama. The concentration of hydrogen fluoride measured following release of Halon 1301 varied from 0.1 to 230 ppm and the concentration of hydrogen bromide from 0.6 to 68 ppm. One of the factors responsible for the wide range of values recorded was the speed of discharge: the faster the discharge, the lower the concentration of toxic gases measured. Unfortunately, releasing Halon very rapidly endangers the people in its path, possibly knocking them down or causing the Halon to be injected under their skin. The concentrations in the upper range, on the other hand, are much too high for humans. The Coast Guard concluded in its study that personnel should be evacuated prior to release of Halon.

While Halon in its usual concentration of 6% will not cause asphyxiation, it is a chemical and personnel should not breathe it indiscriminately. The recommended exposure limit for Halon 1301 for cases of short-term exposure to a high concentration (in an emergency, for example) is 1,200 ppm. A 6% concentration translates to 60,000 ppm, well above the range deemed acceptable. In addition to concerns over the immediate effects of breathing Halon 1301, hydrogen fluoride, and hydrogen bromide, there are questions about the long-term effects, largely unknown, of exposure to these gases.

The Coast Guard published guidelines for the use of Halon in a Navigation and Vessel Inspection Circular (NVIC 6-72, Change 1, "Guide to Fixed Fire Fighting Equipment Aboard Merchant Vessels"). The Coast Guard recommends that the activation device for Halon systems be located outside the space outfitted with the system, so that the Halon can be released without exposing anyone to harmful gases. It also recommends a delay to permit evacuation.

Some mariners have recently expressed an interest in using Halon 2402. Halon 2402 has an advantage over 1301 in that it remains a liquid after release, enabling the firefighter to direct a stream of the agent a greater distance than would be possible with 1301. However, since its toxicity is significantly greater than that of 1301 and since 1301 is effective in extinguishing fires, the Coast Guard has not approved 2402 for use on board ships. The same line of reasoning has kept the Coast Guard from approving the use of Halon 104 in total flooding situations or even in portable fire extinguishers. A fourth type of Halon, Halon 1211, is less toxic than Halon 104 but more toxic than Halon 1301; the Coast Guard permits its use but only in portable fire extinguishers and fixed systems for unmanned engine compartments in small uninspected vessels.

By considering all of the potential hazards connected with fire-extinguishing agents and drafting its regulations and recommendations accordingly, the Coast Guard tries to protect the marine worker from the negative effects of the agents. While the Coast Guard does not recommend removal and replacement of existing systems, anyone ordering a new system for a vessel should bear these same considerations in mind.

Alan L. Schneider is a fire protection engineer in the Ship Design Branch of the Coast Guard's Marine Technical and Hazardous Materials Division. An article by him on a related subject, "Dry Chemical," appeared in the Lessons from Casualties section of the February 1984 issue of the Proceedings.

Member Agencies:

United States Coast Guard
Naval Sea Systems Command
Maritime Administration
American Bureau of Shipping
Military Sealift Command
Minerals Management Service

Ship Structure Committee

An Interagency Advisory Committee
Dedicated to the Improvement of Marine Structures

Address Correspondence to:

Secretary, Ship Structure Committee
U.S. Coast Guard Headquarters, (G-M/TP 13)
Washington, D.C. 20593
(202) 426-2197

The Ship Structure Committee recently published six new technical reports:

SSC-314 Pressure Distribution on Models of the SL-7 Containership and Great Lakes Bulk Carrier S. J. CORT in Waves

This report presents data from various pressure taps on the two ship models. A future report will compare results obtained from computer calculations with model and full-scale test results.

SSC-315 Fatigue Considerations in View of Measured Load Spectra

This report discusses methods used in assessing the characteristics of fatigue crack propagation under load spectra typical of those experienced by ships at sea. The information was obtained from the SL-7 containership instrumentation program. Results of random loadings are compared with those of constant amplitude loadings.

SSC-316 Ship Structure Committee Long Range Research Plan

This report outlines the research which will need to be conducted between now and the year 2000 if the demands on the marine industry at that time are to be met.

SSC-318 Fatigue Characterization of Fabricated Ship Details for Design

This report describes a design procedure that should help eliminate cracks in ship details. It is an important part of the Ship Structure Committee's overall program to provide information on sound and economical details for ship structures.

SSC-320 A Study of Extreme Waves and Their Effects on Ship Structures

This report represents one of the technical community's earliest efforts to describe, quantify, catalogue, and assess the characteristics of extreme waves. Future reports in the area will focus on re-creating the various types of extreme waves in model tanks and evaluating ship design for ship response in such waves.

Ship Structure Committee Publications - A Special Bibliography

This index lists the reports published by the Ship Structure Committee from its beginnings in 1946 through 1981 and gives a brief description of each.

(Reports SSC-317 and SSC-319 will be published at a later date.)

These reports will be available from the Coast Guard free of charge until copies run out. After that, copies will be available from the National Technical Information Service, Springfield, Virginia, 22161. For copies of the reports or further information, contact LCDR David B. Anderson, Secretary, Ship Structure Committee, U.S. Coast Guard (G-MTH-4), Washington, DC 20593.

Have pump, will travel

High technology originally developed for space exploration now has direct application in the marine fire protection industry.

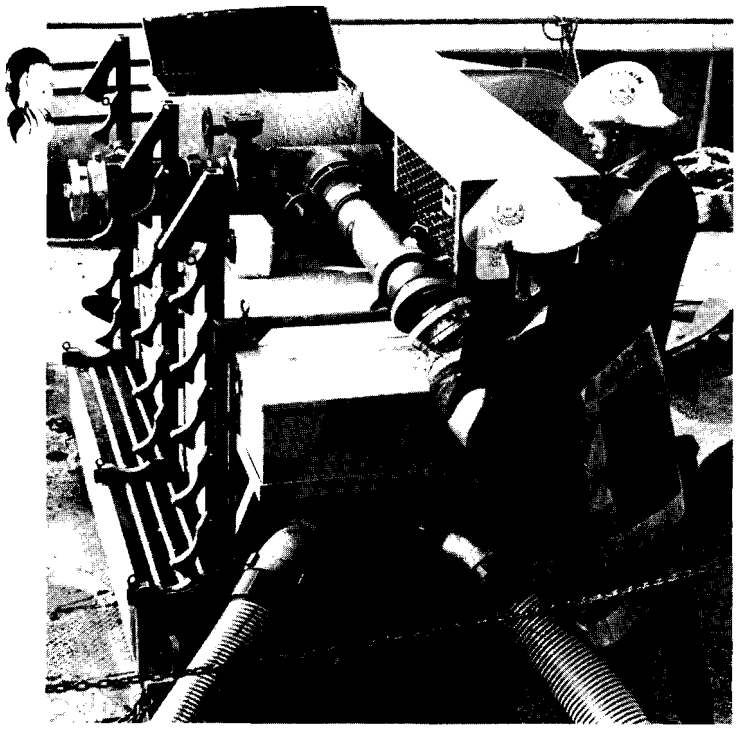
The link between outer space and a fire in a U.S. harbor is the technology used in a powerful, lightweight, compact fire pump known as the LFFM (or Lightweight Firefighting Module). This unit, with its self-contained fuel supply, can be easily moved to the scene of a fire and set up and operated by as few as two people.

The initiative for development of the portable module came from the Coast Guard in 1975. The Maritime Administration became interested in the pump because of its promise for improving inland and coastal harbor fire protection and joined the project in 1978. The module, which has now reached the public demonstration phase, was developed under joint government-industry contracts through the cooperative efforts of NASA, the Maritime Administration, and the U.S. Coast Guard and is being tested and evaluated at sites throughout the United States by the U.S. Navy. The Navy's test program has demonstrated the LFFM's portability and versatility as well as its potential in combating fires at sea, fires on vessels in port or in close-in coastal areas, and fires on land.

Firefighters direct the module's nozzle during a demonstration at Port Newark on board the U.S. Merchant Marine Academy's tugboat KINGS POINTER.

While the unit is not intended to replace fire pumpers in their normal range of operations, its features make it an attractive supplement to traditional firefighting equipment. It is also ideally suited for fighting fires in small, remote communities that may be unable to afford firefighting equipment and crews. The unit is designed to operate from a river bank, a dock, the deck of a barge or boat, or the bed of a light truck or trailer. It can be transported by truck, trailer, boat, or helicopter. The water source can be any open stretch of fresh water or saltwater or a high-capacity fire hydrant.

The applications of the portable fire pump are many. It can turn a patrol boat into a fireboat or a truck into a fire truck. In can be used to fight conventional fires (shipboard or harbor fires, fires on offshore platforms) or "specialty" fires. Late last year, for example, it was used in helping control an unusual fire in a pile of automobile tires (estimated at 7 to 10 million tires) covering 4½ acres near Winchester, Virginia. The module pumped water to the fire scene from ponds more than a thousand feet away. The module can also provide booster, vessel dewatering, or flood control pumps: in a recent exercise in San Francisco Bay, the unit pumped 4.5 million gallons of ballast water from a tanker ship in 47 hours. Finally, there is speculation that the module might be effective in oil spill cleanups.



Firefighters attach hoses to the module after it has been placed on board a tugboat.

Although the module has a gross weight of less than 1½ tons, it has a pumping capacity of 2,500 gallons per minute or better—matching the capacity of standard fire pumpers weighing 3 to 5 tons more.

The strong, lightweight materials and sophisticated equipment used in the module were adapted from those found in high-performance jet airplanes, rockets, and spacecraft in the U.S. aerospace program.

The high-capacity, two-stage, two-speed, direct-drive pump was spun off from the space technology originally developed for pumping fuel into rocket engines. The pump housing is made of aluminum. One of its two impellers (the inducer) is made of titanium, the other (main) impeller of stainless steel.

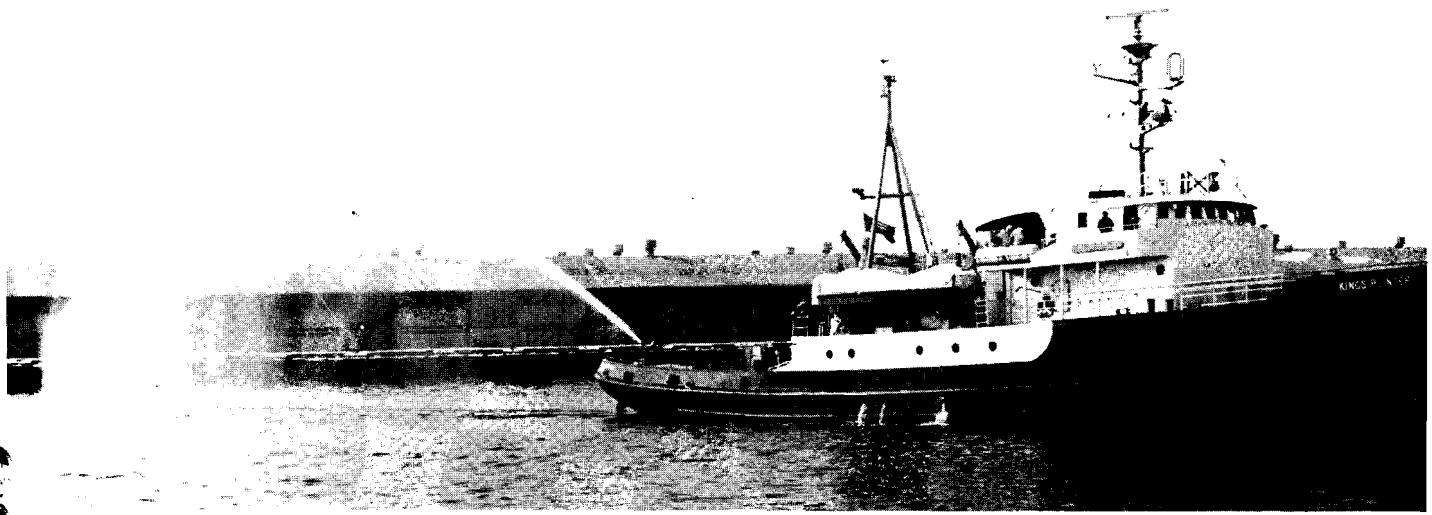
The pump is powered by a 370-horsepower Allison gas turbine engine, slightly modified from a type used in helicopters. It burns either diesel or jet fuel and can operate at maximum flow for four hours without refueling.

The pump operates at pressures of 150 to 250 pounds per square inch, has suction lifts in excess of 20 feet above the sea (or other water supply level), and has an automatic controller.

The module was publicly demonstrated January 24, 1984, at Port Newark, New Jersey. The objective of this demonstration was not only to show how space technology could be applied to everyday problems, but also to emphasize that the system is now available for everyday use.

Additional demonstrations are planned to acquaint groups of firefighters with the operation of the experimental unit. Testing and evaluation will also continue as the Navy, over the next decade, phases in even more powerful portable units.

Additional details on the portable fire pump are available from program manager Carl Sobremisana, Office of Port and Intermodal Development, Maritime Administration, 400 7th Street, SW, Washington, DC 20590; tel.: (202) 426-4357. ⚓



The module's pump incorporates technology developed for pumping fuel into rocket engines.

1983 Merchant Marine Personnel Statistics

Merchant Marine Officer Licenses Issued

Deck

	Issues	Endorsements	Failures	Renewals
Master, Any Gross Tons, Oceans	157	28	86	812
Master, Limited Tonnage	9	10	4	22
Master, Great Lakes	2	7	0	80
Master, Coastwise	7	1	4	15
Master, Uninspected Vessels	154	67	61	237
Master, Fishing Vessels	20	7	8	97
Master, Ferry Vessels or MODUs*	92	6	41	30
Master, Freight and Towing Vessels	388	123	191	189
Master, Mineral and Oil Vessels	385	145	241	189
Chief Mate, Any Gross Tons, Oceans	180	32	135	176
Chief Mate, Limited Tonnage	50	17	14	10
Second Mate, Any Gross Tons, Oceans	270	18	206	257
Third Mate, Any Gross Tons, Oceans	594	19	345	382
Mate, Uninspected Vessels	46	13	29	45
Mate, Fishing Vessels	1	0	1	8
Mate, Ferry Vessels or MODUs	22	0	10	1
Mate, Freight and Towing Vessels	154	28	131	26
Mate, Mineral and Oil Vessels	139	32	108	21
First Class Pilot	184	613	126	1,348
Second Class Pilot	4	1	0	0
Operator, Uninspected Towing Vessels	721	183	665	6,885
Second Class Operator, Uninspected Towing Vessels	176	30	201	21

* MODU - Mobile Offshore Drilling Unit

Engineer

	Issues	Endorsements	Failures	Renewals
Chief Engineer, Motor	49	97	72	106
First Assistant, Motor	43	56	28	39
Second Assistant, Motor	104	86	84	84
Third Assistant, Motor	329	22	42	550
Chief Engineer, Steam	96	9	206	605
First Assistant, Steam	203	5	102	278
Second Assistant, Steam	253	17	124	408
Third Assistant, Steam	146	8	56	254
Chief Engineer, Steam & Motor	13	10	8	196
First Assistant, Steam & Motor	6	3	7	35
Second Assistant, Steam & Motor	58	11	15	48
Third Assistant, Steam & Motor	650	4	35	463
Chief Engineer, Uninspected Vessels	182	81	91	197
Assistant Engineer, Uninspected Vessels	56	10	39	58
Chief Engineer, Fishing Vessels	1	0	1	43
Assistant Engineer, Fishing Vessels	0	1	0	2
Chief Engineer, Ferry Vessels or MODUs	20	4	20	30
Assistant Engineer, Ferry Vessels or MODUs	1	1	5	2
Chief Engineer, Mineral and Oil Vessels	125	45	22	58
Assistant Engineer, Mineral and Oil Vessels	16	2	3	1

Staff Officer Certificates of Registry Issued

Surgeon	10	Purser/HM	1
Professional Nurse	1	Senior Assistant Purser	3
Chief Purser	14	Senior Assistant Purser/PYA	0
Chief Purser/PYA*	0	Senior Assistant Purser/HM	0
Chief Purser/HM**	1	Junior Assistant Purser	22
Purser	8	Junior Assistant Purser/PYA	0
Purser/PYA	0	Junior Assistant Purser/HM	4

* PYA - Physician Assistant

** HM - Hospital Corpsman

Operator Licenses

	Issues	Endorsements	Failures	Renewals
Ocean Operator	2,486	577	2,301	2,264
Inland Operator	1,128	179	948	1,041
Motorboat Operator	2,989	159	3,164	1,607

Radio Officer License

	Issues	Endorsements	Failures	Renewals
Radio Officer	36	N/A	N/A	304

Summary of All License Transactions

	Issues	Endorsements	Failures	Renewals
Deck (Less OUTV & 2/c OUTV*)	2,858	1,167	1,741	3,945
OUTV & 2/c OUTV	897	213	866	6,906
Subtotal	3,755	1,380	2,607	10,851
Engineer	2,351	472	960	3,457
Staff Officer	68	N/A	N/A	N/A
Operator (Ocean, Inland, & Motorboat)	6,603	915	6,413	4,912
Radio Officer	36	N/A	N/A	304
Radar Observer	N/A	3,552	N/A	N/A
Totals	12,813	6,319	9,980	19,524

Total All Transactions 48,636

Comparison

	1982	1983
Licenses Issued/Renewed	24,499	32,337
Endorsements	2,826	2,767
Failures	5,819	9,980
Radar Observer	1,510	3,552
Total Transactions	34,654	48,636

* OUTV & 2/c OUTV - Operator, Uninspected Towing Vessels and Second Class Operator, Uninspected Towing Vessels

Merchant Marine registry and seaman certification statistics on next page

Original Merchant Mariners Documents Issued

	ATLANTIC COAST	PACIFIC COAST	GULF COAST	GREAT LAKES REGION	TOTAL
January 1983	144	136	138	7	425
February 1983	116	220	239	10	585
March 1983	113	241	283	6	643
April 1983	99	101	255	9	464
May 1983	180	156	245	5	586
June 1983	288	194	259	66	807
July 1983	289	184	302	5	780
August 1983	159	267	247	38	711
September 1983	130	151	284	6	571
October 1983	119	166	290	10	585
November 1983	82	149	415	5	651
December 1983	227	81	367	4	679
TOTAL	1,946	2,046	3,324	171	7,487

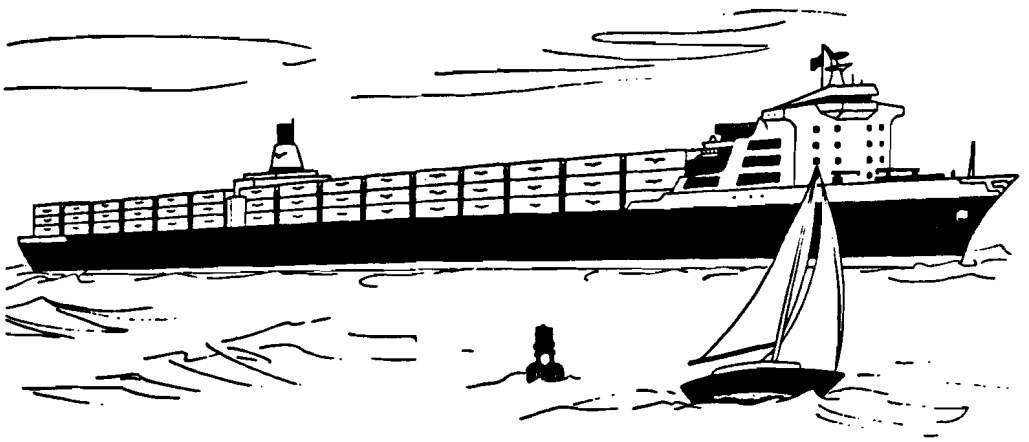
Original and Additional Endorsements Issued

	ATLANTIC COAST	PACIFIC COAST	GULF COAST	GREAT LAKES REGION	TOTAL
AB—any waters, unlimited	616	146	676	26	1,464
AB—any waters, 12 months	66	52	34	0	152
AB—Great Lakes, 18 months	55	43	25	5	128
AB—other	67	237	572	35	911
Lifeboatman	757	257	218	41	1,273
Electrician	22	46	18	4	90
Oiler	101	164	91	10	366
Fireman/Water tender	82	77	67	10	236
Other Q.M.E.D. ratings	1,025	341	131	46	1,543
Tankerman	168	198	960	31	1,357
Entry Ratings and Steward's Department	2,980	1,659	1,204	161	6,004
TOTAL	5,939	3,220	3,996	369	13,524

U.S. Department of Transportation
United States Coast Guard

NAVIGATION RULES

INTERNATIONAL—INLAND



NAVIGATION RULES: INTERNATIONAL—INLAND: A new version of this publication, dated December 23, 1983, and provided with a new durable, water-resistant cover, is available for purchase from the U.S. Government Printing Office. This book contains the rules of the nautical road applicable to all vessels on the navigable waters of the United States as well as on the high seas. It has more than 50 color illustrations of vessel lighting. The book also includes sections on the COLREGS demarcation lines, penalty provisions, alternative compliance procedures, and the vessel bridge-to-bridge radiotelephone regulations.

HOW TO ORDER THE NEW BOOK: The book can be ordered by either telephone or mail. To order by telephone, call (202) 783-3238, ask for the book by name, and give the stock number (#050-012-00205-3). You may pay using your VISA or MasterCard. To order by mail, fill out the order form below and mail it to the address shown.

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Keynotes

The Coast Guard published the following items of general interest in the Federal Register between February 16, 1984, and March 12, 1984:

Final rules:

CGD 12-84-01	Marine Parade; Pacific Inter-Club Yacht Association Opening Day Parade on San Francisco Bay; correction (published February 16)
CGD7 83-08	Drawbridge Operation Regulations; Wilmington River, Atlantic Intracoastal Waterway, Georgia (February 24)
CGD3 83-038	Drawbridge Operation Regulations; Great Channel, New Jersey (February 24)
CGD 83-042	Drawbridge Operation Regulations; Schuylkill River, Pennsylvania (February 24)
CGD2-84-01	Safety Zone; Illinois Waterway, Mile 152.4 to Mile 153.4 (February 24)
CGD11 84-002	Special Local Regulations; NJBA (National Jet Boat Association) Regatta, Colorado River, (February 27)
CGD-11-84-001	Special Local Regulations; Parker Enduro Regatta, Colorado River (February 27)
CGD 11-84-008	Special Local Regulations; Sunshine Marina Boats Drags, Colorado River (February 27)
CGD 82-073	Visual Distress Signal Equipment Requirements (February 27)
CGD 83-050	Independent Laboratory (March 1)
—	Ice Navigation Season; Northern Chesapeake Bay and Tributaries; notice of termination of season (March 1)

Notices of proposed rulemaking (NPRMs):

CGD 08-83-02	Drawbridge Operation Regulations; Louisiana; withdrawal of proposed rule (February 16)
CGD3-84-04	Safety Zone; Arthur Hill, New York (February 24)
CGD 79-077	Workplace Safety and Health Requirements for Facilities on the Outer Continental Shelf; correction and extension of comment period (February 28)
CGD8-83-09	Regulated Navigational Area; Sabine Neches and Calcasieu Waterways, Port Arthur, Texas, and Lake Charles, Louisiana (March 1)
CGD13-84-02	Seattle Opening Day Yacht Parade and Crew Race (March 8)
CGD13 84-03	Regatta, Seattle SEAFAIR 7-11 Freedom Cup Race (March 8)

Notices:

CGD 83-068	Port Access Routes Study; Unimak Pass, Alaska; notice of study (February 27)
CGD 84-009	Towing Safety Advisory Committee; notice soliciting applications for membership (March 1)
CGD 84-018	Coast Guard Academy Advisory Committee; notice of meeting (March 8)
CGD 84-014	Houston/Galveston Navigation Safety Advisory Committee; notice of meeting (March 8)
CGD 84-015	Lower Mississippi River Waterway Safety Advisory Committee; notice of meeting (March 8)
CGD 84-016	Lower Mississippi River Waterway Safety Advisory Committee, Auxiliary Waterways Subcommittee; notice of meeting (March 8)
CGD 84-017	Lower Mississippi River Waterway Safety Advisory Committee, River Navigation Subcommittee; notice of meeting (March 8)
—	National Recreational Boating Safety and Facilities Improvement Fund; notice of availability of financial assistance to national nonprofit public service organizations (March 12)
CGD 84-013	Guidelines for Bringing Existing Foreign Flag Vessels Under United States Flag; notice inviting public comment (March 12)

Comments or requests for copies of rulemakings or notices 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

Comments may be delivered to the Marine Safety Council office, Room 4402 at Coast Guard Headquarters, 2100 Second Street, SW, Washington, DC, between the hours of 9:00 a.m. and 4:00 p.m. Monday through Friday. Comments will also be available for inspection or copying during those hours.

Final rules:

Visual Distress Signal Equipment Requirements (CGD 82-073)

These rules amend the regulations governing the carriage of visual distress signal equipment on boats. Members of the boating public had expressed considerable confusion over some of the words used ("coastal waters," "bays," "sounds") in the section of the regulations that identifies the waters on which visual distress signal equipment is required. The rule has been rewritten to clearly define those waters.

The rules were not intended to include restricted or otherwise confined waters where a boater would normally be able to attract the attention of others nearby. The change establishes a definition not dependent on the size or name of a body of water and delimits those areas where visual distress signals are most needed.

The rules, published in the Federal Register February 27, 1984, become effective August 27, 1984.

Independent Laboratory (CGD 83-050)

This final rule, published March 1, 1984, increases from one to three the number of Coast Guard-accepted laboratories to which a manufacturer may turn for testing, labeling, and listing of its portable fire extinguishers. The list previously included only Underwriters Laboratories, Inc. Added to the list are Underwriters Laboratories

of Canada and Factory Mutual Research Corp., the latter for Halon-type portable fire extinguishers only.

The rule went into effect on the date of publication.

Notices:

National Recreational Boating Safety and Facilities Improvement Fund

The Coast Guard has funds available to provide financial assistance to national nonprofit public service organizations to help them conduct boating safety activities. This announcement seeks proposals for all types of projects that will promote boating safety on a national level. Innovative approaches are welcome. One area of special interest is the problem of alcohol abuse in boating.

Specific information on organization elibility, proposal requirements, award procedures, and financial administration procedures and application forms (SF424)) can be obtained by writing Commandant (G-BP/42), U.S. Coast Guard, Washington, DC 20593 or calling Mr. Ladd Hakes at (202) 426-1052.

All proposals must be received by June 10, 1984.

Guidelines for Bringing Existing Foreign Flag Vessels Under United States Flag (CGD 84-013)

The Coast Guard is reviewing present guidelines for certification and inspection of foreign-flag vessels to be brought under U.S. flag. As part of the process, the Coast Guard is soliciting public comment on the guidelines, which can be found in Navigation and Vessel Inspection Circular (NVIC) No. 10-81. That NVIC was reproduced in the notice published for CGD 84-013 in the Federal Register on March 12, 1984.

The Coast Guard is reviewing the guidelines to determine if they need to be revised, expanded, or completely rewritten.

CGD 84-013 was published as a notice inviting public comment rather than a notice of proposed rulemaking, since it is not clear that the guidelines need to be codified as regulations. The Coast Guard is also seeking comment on that point.

The comment period is open until May 11, 1984. Comments should be mailed or delivered to the Marine Safety Council at the address shown in the paragraph in boldface type on the preceding page. Further details on CGD 84-013 are available from LCDR Thomas H. Gilmour, U.S. Coast Guard (G-MTH-2/12), Washington, DC 20593; tel.: (202) 426-2160.

Actions of the Marine Safety Council

CGD 84-011 User Fees for Selected Coast Guard Services

At its March meeting, the Marine Safety Council discussed a rulemaking project which would establish user fees for certain services being provided by the Coast Guard. The proposed regulation would be limited in scope, establishing fees only for services rendered directly to the user or specifically requested. Being considered for inclusion in the proposed rulemaking are

- Issuance of permits for private aids to navigation
- Marking of obstructions
- Domestic icebreaking
- Inspection of small passenger vessels
- Issuance of a license or permit related to a small passenger vessel
- Provision of copies of laws required on board passenger vessels
- Vessel equipment approval
- Factory inspections
- Outer continental shelf facility inspections
- Liquid bulk facility inspections
- Cargo of Particular Hazard inspections
- Issuance of regatta permits
- Provision of regatta patrols

The Coast Guard expects to recover about $10 million per year if the regulation is promulgated.

As this issue went to press, a notice of proposed rulemaking was being readied for publication in the Federal Register in April or May 1984.

Methyl Alcohol: CH_3OH

Synonyms:	methanol wood alcohol carbinol hydroxylmethane
Physical Properties	
boiling point:	65°C (149°F)
freezing point:	-94°C (-137°F)
vapor pressure at	
0°C (32°F):	30 mm Hg
20°C (68°F):	96 mm Hg
Threshold Limit Values (TLV)	
Time Weighted Average:	200 ppm; 260 mg/m3
Short Term Exposure Limit:	250 ppm; 310 mg/m3
Flammability Limits in Air	
lower flammability limit:	6% by vol.
upper flammability limit:	36.5% by vol.
Combustion Properties	
flash point (o.c.):	16°C (61°F)
flash point (c.c.):	12°C (54°F)
autoignition temperature:	464°C (867°F)
Densities	
liquid (water = 1.0):	0.8
vapor (air = 1.0):	1.1
Identifiers	
U.N. Number:	1230
CHRIS Code:	MAL
Cargo Compatibility Group:	20 (Alcohols, Glycols)

Beech, birch, hickory, maple, and oak—these trees gave this issue's Chemical of the Month, methyl alcohol, its common name, "wood alcohol." In the past, methyl alcohol was derived primarily through what is called "destructive distillation" of these hardwoods: the wood was subjected to high temperatures in the absence of air or oxygen and decomposed into solids, liquids, and gases. Today, most methyl alcohol is produced synthetically, by high-pressure catalytic synthesis from carbon monoxide and hydrogen. The synthetic product is much purer than its predecessor.

The uses to which methyl alcohol is put are many and varied. Methyl alcohol is used in the manufacture of plastics, soaps, stains, dyes, artificial leather, shatter-proof glass, enamels, paint and varnish removers, cleaning and dewaxing preparations, embalming fluids, antifreeze mixtures, resins, drugs, and perfumes. In addition, it is used as a fuel, a solvent, a denaturant for ethyl alcohol, and a dehydrator for natural gas.

Methyl alcohol is a clear, colorless, volatile, flammable, poisonous liquid. It presents a serious fire risk. Its vapor in air is flammable anywhere from the 6% concentration level to the 36.5% level and will ignite at temperatures as low as 12°C (54°F). Special care should be taken to keep sources of ignition away from areas where vapor may be present. If a fire should start, firefighters should protect themselves from exposure to the toxic gases and vapors which may form, such as carbon monoxide and formaldehyde. Dry chemical, alcohol foam, and carbon dioxide are effective extinguishants.

The health hazard most commonly associated with methyl alcohol is blindness, but, in cases of severe exposure, death can result. Once in the bloodstream, methyl alcohol attacks the liver, the kidneys, and the central nervous system, particularly the optic nerves. Most of the serious cases of methyl alcohol poisoning are the result of deliberate ingestion of the substance, presumably by people who confuse methyl alcohol with the ethyl alcohol used in liquors. A second source of exposure is inhalation of high concentrations. By this we mean the kinds of concentrations mariners would be breathing in places where common sense would

dictate they not go—an unventilated tank, for example. Fumes from an ullage opening, breathed by a mariner in passing, should not be a cause for concern.

A person who has swallowed methyl alcohol or breathed high concentrations of the substance may start showing the following symptoms: headache, weakness, drowsiness, lightheadedness, nausea, vomiting, drunkenness, irritation of the eyes, and blurred vision. The victim may seem to recover and then suffer a relapse up to 30 hours later. Prolonged exposure to high concentrations of methyl alcohol may cause sleep problems and digestive disturbances, in addition to the maladies already noted.

Methyl alcohol is very slow to be eliminated; it should be regarded as a cumulative poison. In other words, while a single instance of exposure to methyl alcohol fumes (even to fumes of a fairly high concentration, say, 0.1%, or 1,000 parts per million) may produce no harmful effects, daily exposure may result in the accumulation of sufficient methyl alcohol in the body to produce serious illness.

Professional medical care should be sought immediately for anyone suffering from the effects of exposure to methyl alcohol. If the victim has swallowed methyl alcohol--and if the victim is conscious—, he or she should be made to vomit. Syrup of ipecac is effective for this purpose; if that is not available, a finger on the back of the throat will suffice. A victim who has been overcome by methyl alcohol fumes should be taken to fresh air. If the case of inhalation was an especially severe one, the victim may need artificial respiration.

In cases of minor skin or eye contact, medical care may not be necessary, but the victim may wish to seek medical advice. If methyl alcohol has splashed in the eyes, they should be flushed with large amounts of water for about 15 minutes, the lower and upper lids being lifted occasionally. Skin on which methyl alcohol has splashed should be washed with soap and water. Clothing that has become wet with liquid methyl alcohol should be laundered before being worn again.

As is the case with most chemicals, an ounce of prevention is worth a pound of cure. Precautionary measures which will prevent overexposure include adequately ventilating work areas and, when necessary, providing employees with respirators. Since repeated or prolonged contact with liquid methyl alcohol will cause defatting of the skin, employees should be provided with impervious clothing, gloves, and face shields. Safety goggles will protect the eyes. Regular physical examinations (preferably annual or even semi-annual examinations), including tests of vision, the liver, the kidneys, and the central nervous system, should be undertaken to alert potential victims of cumulative poisoning.

With few exceptions, the regulations governing transport of methyl alcohol generally follow those for flammable liquids. Methanol may be shipped at normal temperature and pressure and by ship, tank car, tank truck, or plane. The specific capacity limits, packaging requirements, and labeling requirements vary according to the mode of transportation.

The U.S. Coast Guard considers methyl alcohol a Grade C flammable liquid and regulates it for shipment by tank barge or tankship under Subchapter D. The U.S. Department of Transportation classifies it as a Flammable Liquid. The International Maritime Organization assigns methyl alcohol to the Hazard Class 3.2 and includes it in Chapter VII of its Chemical Code (chemicals to which the Code does not apply). The International Maritime Dangerous Goods (IMDG) Code entry for methyl alcohol can be found on page 3087.

Robert P. Wagner is a second-class Cadet at the Coast Guard Academy. He wrote this article under the direction of instructor LCDR Thomas 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. The information on health hazards and first aid measures was taken from the occupational health guidelines issued by the U.S. Department of Health and Human Services and the U.S. Department of Labor.

Grain Loading

As described in an account in the August 1983 issue of the Proceedings, *the SS PILGRIM was nearly lost when shifting of its cargo, grain, caused the vessel to list dangerously. This month the Coast Guard's Naval Architecture Branch takes another look at the casualty and the effect it may have on the International Maritime Organization grain loading standards.*

When the SS PILGRIM was loaded, the usual efforts were made to prevent cargo shifting. The vessel was judged to be in compliance with the International Maritime Organization grain loading standards and was issued the appropriate National Cargo Bureau documents certifying stability and correct loading. Once underway, the vessel ran into bad weather, and problems with flooding and cargo shifting almost caused its demise. Did the grain loading standards prove their worth in the case of the SS PILGRIM? The answer has to be yes. Despite the severe flooding and the extreme weather encountered, the shifting and resulting list never became excessive enough to cause the vessel to founder.

The SS PILGRIM casualty did, however, point up three areas where adjustments might be made to the IMO standards, as these are embodied in Chapter VI of the 1974 Safety of Life at Sea (SOLAS) Regulations, Carriage of Grain. Before we look at the proposed changes, let's look once again at the existing regulations and the problems encountered by the SS PILGRIM.

Chapter VI is a departure from traditional grain loading methodology, which relied on installation of special hardware, such as shifting boards, to prevent the shifting of grain. The criteria in Chapter VI were written to afford a vessel adequate reserve stability in the event of a cargo shift, rather than place actual physical limits on cargo shifting. Chapter VI requires that, for the carriage of grain, the intact stability of a vessel be evaluated and the following criteria be met:

- if the surface of the grain in the cargo holds were to shift an assumed 15^{o}, the vessel would list no more than 12^{o};
- a minimum area (specified in the regulations) will be provided between the righting arm curve and the heeling arm curve;
- the vessel will have an initial metacentric height (GM) of no less than 0.98 feet.

The criteria are similar in approach to intact stability criteria for other vessels in that they involve professional judgments. They were developed after considerable grain shift testing, careful consideration of the need for residual stability, and the establishment of conservative margins of safety. The assumed grain shift of 15^{o} was decided on by the delegations to the International Maritime Organization after a review of several experiments done on the geometric pattern of grain shift. The limit of 12^{o} for an angle of list was found to be a reasonable

value compatible with the need to a) prevent the entry of sea water through openings in the ship's structure and b) enable the crew to operate and restart the vessel's machinery and take effective damage control measures, if necessary.

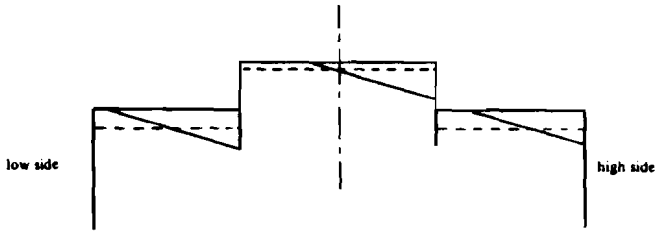
Now let's look at what happened to the SS PILGRIM. On October 18, 1979, an initial 4° list to port was detected; this appears to have been caused either by the free surface effect of water taken on in the port fuel oil settler tank or by a slight grain shift caused by the ship's taking heavy rolls. As water entered the second deck athwartship passageway through the side port and garbage chute, an additional list was created, causing a further shift in the grain cargo. Because the vessel now had a port list in heavy seas, water entered the No. 5 cargo hold, the No. 6 port deep tank, and the No. 6 lower tween deck through poorly maintained deck structures and vents. This, like the water coming through the side port and garbage chute, further aggravated the grain shift.

The ship made it into Capetown under its own power on October 21. A survey of the cargo holds revealed that the average angle of grain surfaces was 17.5°, with the largest angle of 19.5° found in the No. 2 lower tween deck hold and the smallest angle of 13° found in the No. 5 lower tween deck hold. Why had the grain shifted beyond the 15° used as the basis for the International Maritime Organization standards?

First, we must recognize that the actual behavior of a cargo on board a ship will not exactly match regulatory assumptions. In the case of the SS PILGRIM, several factors contributed to excessive cargo shifting. One already alluded to is the severe flooding suffered by the ship. This, because of the liquid free surface, created a substantial heel. No allowance is made for such additional heeling effects in the intact stability criteria for vessels.

A second factor was the fit of the tween deck hatch covers; the covers were not grain-tight and permitted the grain to flow downward into the lower tween and lower holds. We know this occurred because of the larger-than-expected voids in the upper tween deck holds and smaller-than-expected voids in the lower holds.

A third possible explanation for the excessive shifting involves the "bundles." These are liners laid over dunnage on the "saucer" (the depression in the grain surface) in the hatchway that are filled with grain and then lashed. The



TYPICAL SHIFT PATTERN - The dotted lines show the surface of the grain while it is on the horizontal. The slanted solid lines show the surface at an angle after the grain has shifted. This illustration and the one on the facing page reprinted with permission from the National Cargo Bureau, Inc.'s "General Information for Grain Loading"

bundles on top of the saucers were not secured to the ship's structure (at present, this is not required). As the bundles themselves shifted, they no longer acted effectively to prevent the shifting of grain.

The final factor which must be considered is the feeder holes in the hatch side girders. In the stability calculations performed for the Single Voyage Document of Authorization issued by the National Cargo Bureau, the hatch side girders were considered a solid restraining barrier. The investigators found that grain had shifted transversely through the feeder holes across the top of the bundles in every hatch except the No. 6 upper tween, which was not equipped with feeder holes.

Are the grain loading regulations perfect as they are? No, they are not. We have learned some valuable lessons from experiences such as that undergone by the SS PILGRIM. The transverse shifting of grain through the feeder holes, the vertical shifting of grain through the hatchways, and the shifting of bundles are problems which are not addressed in the current regulations. As a result of the SS PILGRIM casualty, the following changes to the International Maritime Organization standards were proposed at the February 1984 meeting of the IMO Bulk and Hazardous Cargoes Subcommittee. The Subcommittee has accepted these recommendations for discussion as it begins a reappraisal of Chapter VI of the SOLAS Regulations:

- Longitudinal structural members against which voids are assumed to form must be graintight (feeder holes, for example, would be prohibited).

- Bundles must engage the side girders for a depth of at least 3.28 feet (one meter); otherwise, they must be secured to the vessel's structure to prevent movement.

- When compartments are loaded separately, hatchways and other openings above the lower compartments should be sealed and made graintight to prevent the seepage of grain from the upper compartment to the lower compartment.

The Chapter VI grain loading regulations do provide an excellent intact stability standard for the safe carriage of grain and have been instrumental in reducing the number of stability-related casualties of vessels in the grain trade. The Coast Guard will continue to monitor these regulations, updating and revising the corresponding U.S. regulations when necessary. However, as the SS PILGRIM incident demonstrates, loading regulations by themselves will not guarantee safety. Vessel owners and operators must be diligent in fulfilling their responsibility to maintain the watertight integrity of their vessels.

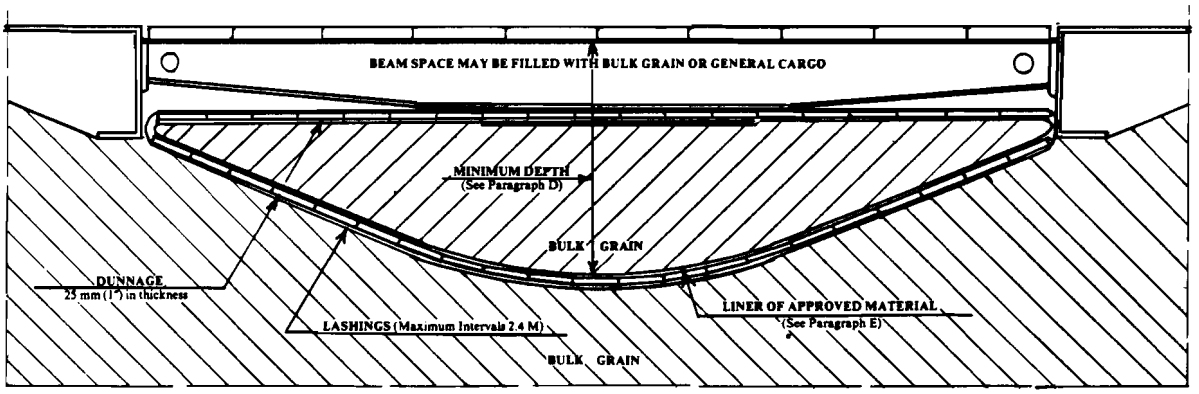
The preceding article was written by LCDR Robert Letourneau, a staff naval architect in the Coast Guard's Marine Technical and Hazardous Materials Division. ‡

Correction

The language used in the August 1983 account of the SS PILGRIM casualty was too sweeping in its characterization of the loading of the vessel. According to that article, "The grain was trimmed so that all grain surfaces were level and all spaces below tween decks and hatch covers were filled." Compartments may be nominally "filled and trimmed," but studies have shown that a void space under the deck still exists even after the hold is considered "filled and trimmed." The larger this void depth, the larger will be the grain heeling moment.

SCHEMATIC DIAGRAM OF A SAUCER SECURED BY BUNDLING OF BULK

See IMCO RESOLUTION A.264(VIII), Part C, Section 1, Paragraphs D & E



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. An overtaking situation occurs when one vessel approaches another from more than how many degrees astern of the beam?

A. 0^{o}
B. 11.25^{o}
C. 22.5^{o}
D. 45^{o}

REFERENCE: Commandant Instruction M16672.2, Rule 13

2. What type of hazardous cargo is indicated by a yellow label?

A. Corrosive
B. Irritant
C. Oxidizer
D. Poison

REFERENCE: 49 CFR 172.426

3. If you sent a distress message and received the code letters "C P," it would mean

A. "Repeat the distress position."
B. "I cannot reach you but have relayed your message."
C. "Your distress signals are understood."
D. "I am proceeding to your assistance."

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

4. You are steaming eastward in the North Atlantic in an extratropical cyclonic storm, and the wind is dead ahead. According to the law of Buys Ballot, the center of the low pressure lies

A. ahead of you.
B. astern of you.
C. to the north.
D. to the south.

REFERENCE: Bowditch, Vol. I, 1977

5. The ability of a ship to survive the final stage of flooding at any time during any voyage when one compartment has been damaged is known as

A. one compartment standard.
B. permeability.
C. down flooding.
D. floodable length.

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

ENGINEER

1. A transistor may be used as a(n)

I. amplifier.
II. switch.

A. I only
B. II only
C. Either I or II
D. Neither I nor II

REFERENCE: Grob, Basic Electronics

2. One of the many troubles that occur with pump shaft packing is excessive wear on the rings nearest the packing gland while the rings nearest the impeller remain in good condition. This wear is caused by

A. air entrained in the fluid pumped.
B. the packing rings' rotating in the stuffing box.
C. some packing rings' being cut too short.
D. the packing's having been seated in one adjustment.

REFERENCE: Karassik, Centrifugal Pumps

3. The minimum speed which a diesel engine must attain before ignition can occur depends on

A. the type and size of the engine.
B. the condition of the engine.
C. the ambient temperature.
D. all of the above.

REFERENCE: Maleev, Diesel Engine Operation and Maintenance

4. An explosion or flareback could occur in a boiler if

A. too much excess air were supplied for combustion.
B. the boiler firing rate exceeded the end point of circulation.
C. the fuel being burned had been heated to the flash point.
D. a fire box were not purged before lighting of a fire was attempted.

REFERENCE: Osbourne, Modern Marine Engineers Manual

5. An increase in head load in an R-12 refrigeration system will cause

A. the suction pressure to decrease.
B. the suction temperature to increase.
C. increasing ice formation on the evaporator coil.
D. short cycling of the compressor.

REFERENCE: Dossat, Principles of Refrigeration

ANSWERS

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

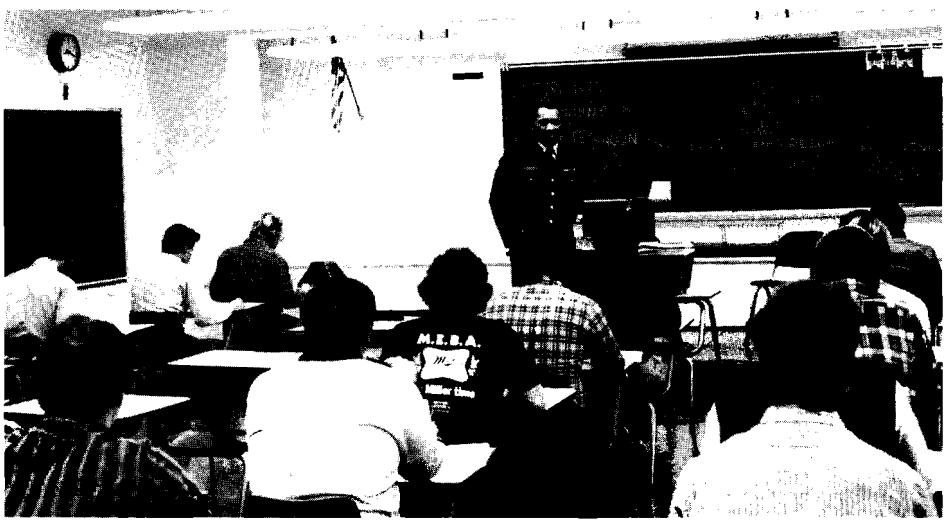
An applicant seeking any type of U.S. Merchant Marine license or certificate must prove that he or she possesses all the necessary qualifications: age, citizenship, experience, good character, good physical health, and knowledge of his or her profession. The last-named element, knowledge, is measured by the professional examination, the subject of this month's article.

Examiners at the Coast Guard's 17 Regional Examination Centers must follow specific guidelines to prevent the unauthorized dissemination of professional examinations. Allowing any of the examinees access to the questions and answers would create two problems: the exam would no longer be a valid measure of knowledge, since some of the applicants could have memorized the answers, and knowledge of the questions and answers would give some of the applicants an unfair advantage over others. (Since there are about 20,000 questions, or "items," which randomly come up on the examinations, publishing 10 Nautical Queries in the *Proceedings* each month is not thought to compromise the examinations.) If the exams are to be reliable indicators of skills and if everyone taking them is to have a relatively equal chance of success, the exams must be kept "confidential." Examiners ensure confidentiality by storing the examination booklets, or "modules," in a combination-lock safe and conducting periodic inventories to ensure that all modules are accounted for.

Unfortunately, the safeguards instituted to protect the professional examinations may contribute to the air of secrecy which often surrounds examinations of this type. We hope that by explaining here how questions are developed and evaluated, we can remove the "shroud of mystery" and also explain what role mariners can play in making the system work.

History

The process of examining and licensing merchant marine personnel goes back a long way. Prior to 1942, it was the



responsibility of the Bureau of Marine Inspection and Navigation. Essay questions for examinations were drafted by local inspectors in 45 to 50 port offices.

With the advent of World War II, the Coast Guard assumed responsibility for merchant marine inspection and licensing. By 1945, Coast Guard Headquarters personnel had developed a set of standardized questions for use in each of the marine inspection offices. A policy statement issued at that time explained the advantages expected to be realized by the change to a standardized system:

- Uniform examinations would provide 100 percent equality for all applicants throughout the United States.
- The effort required to produce and maintain the material needed for examinations would be centralized.
- The questions could be easily updated to reflect advances in the design, operation, and maintenance of merchant vessels and their machinery and equipment.
- Protection of life and property at sea would be improved by the system's assurance that issuance of all licenses would be based on a definite standard.

The essay questions proved to be a source of delay when it came to grading the examinations, and in the 1960s a move to multiple-choice questions was made.

In February 1969 Benjamin Shimberg of the Educational Testing Service of Princeton, New Jersey, completed an extensive report entitled "Licensing of Deck and Engineering Officers in the U.S. Merchant Marine." As a result of this report, a group of experts in the marine field was assembled to determine the job requirements for licensed officers. The standardized multiple-choice examinations developed from their findings and recommendations remain the basic framework for the upper-level exams today. (The less extensive lower-level exams do not require such an outline of job requirements.)

The Coast Guard Institute

The Coast Guard Institute in Oklahoma City, which also handles correspondence courses and professional/advancement examinations for Coast Guard personnel, is responsible for preparing examinations for the Merchant Marine. The branch concerned with merchant seaman is the Merchant Vessel Personnel (mvp) Branch.

Roughly 50 percent of the mvp people are licensed maritime academy graduates. Split into two branches, deck and engineering, they write, proofread, evaluate, and revise all Coast Guard examination questions and modules. Before any question leaves the Institute in a module, it has been proofread at least three times and has been reviewed by an education specialist. At present, Institute personnel are entering the questions into the data bank of a computer; when this has been completed, all Coast Guard Institute exams will be randomly generated by the computer. This will give the staff more time to research and write new questions and evaluate existing questions.

"Item writers" draw on a variety of sources to draft the questions and their answers and "distractors" (incorrect choices). As often as the budget permits, they take trips on different types of vessels to get a feel for what is required of the various crew members, from able seaman to master or from oiler to chief engineer. They observe and record every aspect of a target crew member's duties. Institute personnel can also rely on their personal knowledge and experience from training and sea service as well as an

extensive library of reference works. Every question that goes into an exam has a documented published source for reference purposes. Lists of references used are available from Headquarters.

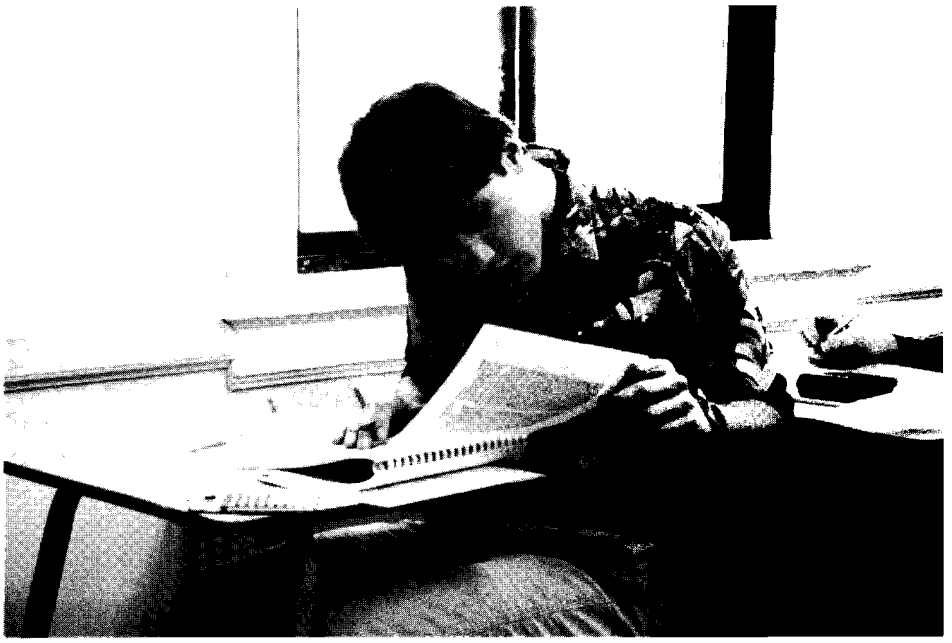
Specimen Examinations

The scope of the examinations and the types of questions asked for the various grades of licenses can be gauged from the Specimen Examinations booklets. These pamphlets are available upon request from Coast Guard Headquarters or any Marine Inspection Office.

Future editions of the specimen examination books will reflect any changes made in the Code of Federal Regulations, Title 46, Part 10, as a result of the Coast Guard's proposal to amend the licensing structure (CGD 81-059, published in the Federal Register August 8, 1983). The proposed changes include the list of examination subjects found in that section of the CFR. The titles of certain subjects may be changed, but the content of the examinations will remain substantially as it is now.

The Coast Guard plans to combine the seven specimen examination books now published into, at most, two publications—you guessed it--one for deck and one for engineering. (Also of interest to the maritime community will be the Institute's plans to publish the 20,000 or so exam questions in two volumes, deck and engineering. These volumes will be available to the public in the very near future.)

One policy which directly affects license applicants has been changed since it was last explained in the specimen examination books:



Reexamination Procedure

Unlimited upper-level deck and engineer licenses (Third Mate, Third Assistant, and higher) - If an applicant fails one or more sections on these examinations, he or she must be reexamined—*only in the sections failed*—during regularly scheduled exam periods. If the applicant does not successfully complete all topics within four months of the first examination, the complete exam must be retaken.

All other deck and engineering licenses - If an applicant fails one or more sections of these examinations, he or she must be reexamined in all of the sections failed. The applicant can be reexamined whenever and as often as scheduling permits at the discretion of the the Officer in Charge, Marine Inspection. If the applicant does not successfully complete all topics within three months of the first exam, the complete examination must be retaken.

Conduct in the Examination Room

Requirements for conduct in examination rooms may vary slightly from location to location. The applicants will be advised by the Coast Guard examiner of any local requirements and must comply with them.

When an examination is administered, whether at a Regional Examination Center or by a traveling examination team at a non-REC facility (such as a training school), only the examinees and Coast Guard examiners will be allowed in the examination room. It will be the responsibility of the Coast Guard examiner to ensure that *everyone* else remains outside the exam room once the examination begins.

Applicants must present an acceptable appearance in the exam room.

No smoking, eating, drinking, or *talking* is allowed in the exam room.

Applicants are not permitted to bring any books, notes, or other reference materials

into the examination room. All reference material such as publications, copies of the Code of Federal Regulations, etc., needed to complete the examination will be provided by the REC, unless a different arrangement is specifically and mutually agreed to by the examiners and the examinees or non-REC examining facility before the exam.

Applicants are encouraged to use their own personal plotting equipment, such as dividers, parallel rulers, triangles, and straight edges. These items will be provided in the examination room but may have been used heavily and not be in the best condition. An applicant may use his or her own non-programmable calculator or computer, star finder, or nautical sliderule. These items may be in short supply at the REC.

Before the examination begins the candidates will be thoroughly briefed by the examiner on the procedures to be followed during the examination and in the use of the multiple-choice answer sheets and comment sheets. *These instructions must be followed carefully to ensure that the answers are properly recorded and scored.*

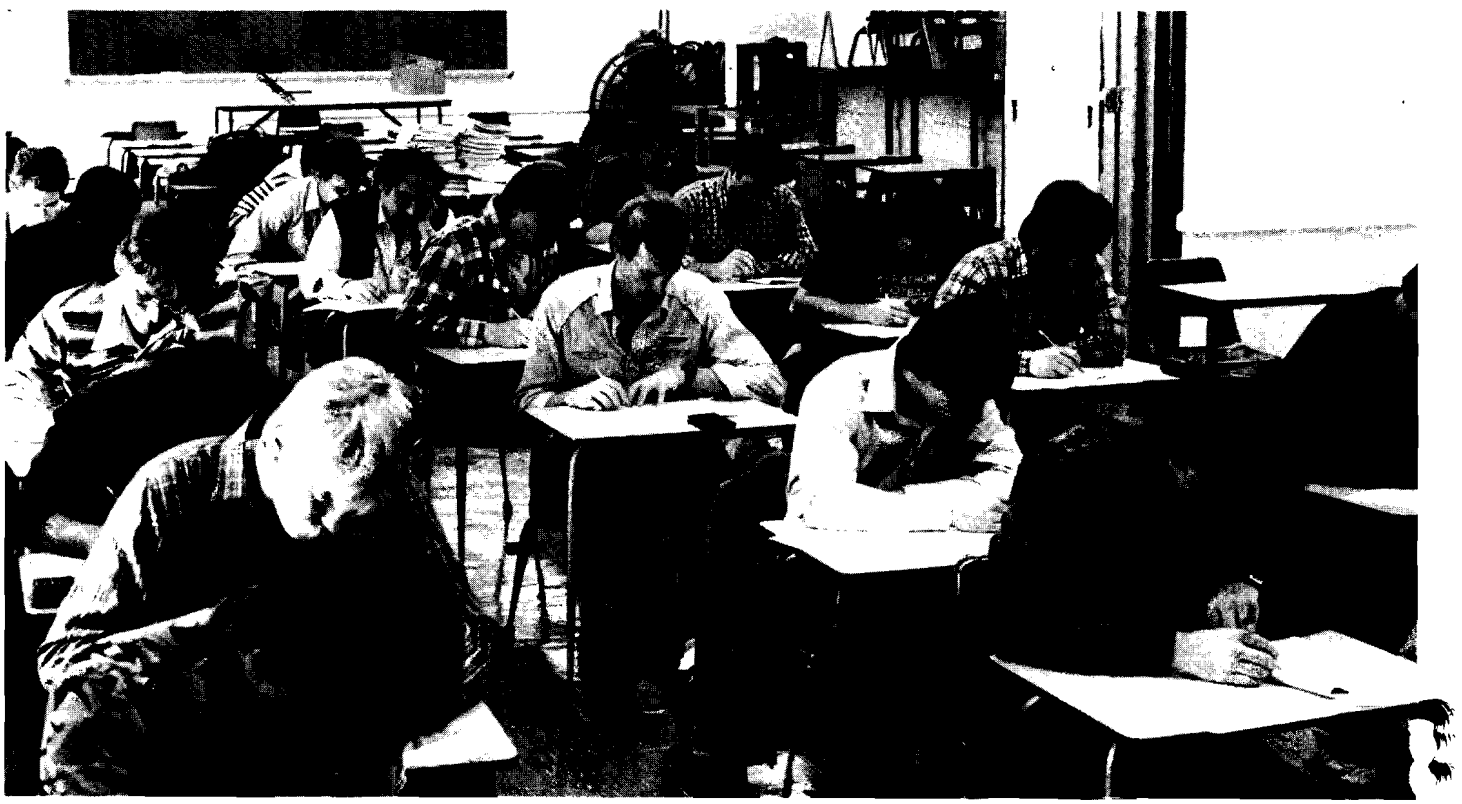
Applicants may not write in the examination booklets; writing in the books will constitute grounds for failing an applicant on the entire exam!!

As each section of the examination is completed, the test booklet, answer sheet, comment sheet, and all scrap paper must be given to the examiner before the applicant leaves the room. Applicants should not attempt to remove any materials from the exam room.

Examining officers are forbidden to discuss the merit or accuracy of any exam question with applicants. (An examiner may, at his discretion, assist an applicant who has difficulty understanding the *meaning* of a question.) If applicants object to a particular question, they shall choose what they think is the *best* answer and mark the answer sheet accordingly. Applicants are encouraged to complete comment sheets provided by the examiner. They should explain as clearly as possible what their objection to the question is. Comment sheets will be forwarded to the Coast Guard Institute for evaluation. If the objection has merit, the Institute will advise the examination center and credit for the applicant's answer will be given accordingly.

The comment sheet must be submitted when the answer sheet is given to the examiner. No comment sheets will be accepted after an examinee submits an answer sheet and leaves the exam room.

Any applicant found to be



engaged in any unfair practices during the examination, including referring to concealed notes, communicating with other applicants, or removing written material from the examination room without the express authority of the examiner, will be dismissed from the examination and considered to have failed the examination. A reexamination will not be permitted for six months.

Evaluation of Questions

The question evaluation process is a very important one. As already mentioned, submission of a comment sheet by an applicant will cause the Coast Guard to study a question and its answers. The Coast Guard also has a second means of control: each month a statistical analysis is done of the answers selected nationwide by applicants for the upper-level licenses. A research psychologist interprets the data and notes questions that, in his opinion, require some scrutiny. Items questioned by either an applicant or the research psychologist are checked and either modified, deleted, or kept unchanged.

Naturally, the more comments received, the more influence the affected public will have on the examination process. The Coast Guard welcomes input from mariners and urges applicants for licenses to make known any disagreements they might have. Only by getting involved can mariners help make the system work.

More information and any publications referred to in this article can be obtained from the Merchant Vessel Personnel Division at Coast Guard Headquarters:

Commandant (G-MVP-3)
U.S. Coast Guard
Washington, DC 20593
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