PROCEEDINGS
OF THE MARINE SAFETY COUNCIL

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PROCEEDINGS

OF THE MARINE SAFETY COUNCIL

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COVER

The SS Atigun Pass on sea trials late last year. The 165,000 dwt tanker was the first of a series of four built at Avondale Shipyards and chartered to Standard Oil of Ohio for use in the Alaska trade. The Atigun Pass took on her first cargo of crude this month and delivered it to a trans-shipment point in Panama.

The 906-foot, 1.2-million-barrel-capacity vessel and her sister ships incorporate anti-pollution features and navigational aids including segregated ballast tanks, crude oil washing capability, inert gas systems, backup radar, and collision avoidance assist.

Safety and environmental protection features have taken on new importance during the past year as a result of both domestic regulatory action and efforts at the international level to curb tanker casualties.

This month, the foreign tank vessel boarding program has completed its first year, and efforts toward an international solution have taken a long stride forward. Those two of the several approaches to the problem which this country began early last year are featured in this issue.

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Safety and the Foreign Tanker Boarding Program

by Commander William J. Ecker

Information and Analysis Staff, Office of Merchant Marine Safety

As a prelude to the discussion of the Foreign Tank Vessel Examination Program, it is important to realize that there is a great deal of difference in the scope of involvement and control that the U.S. Coast Guard exerts over a U.S. flag tanker versus a foreign flag tanker calling at a U.S. port. From the initial review of its plans before construction until it is scrapped or sold to a foreign owner, the U.S. flag tank vessel has continuous involvement with the U.S. Coast Guard to insure that it is in compliance with applicable federal regulations and international agreements.

A foreign flag tanker, on the other hand, having the necessary certificates and being from a nation signatory to the international convention for vessel safety has been largely exempt from domestic regulation. The primary exceptions to this are those vessels required to obtain a Letter of Compliance for the carriage of hazardous cargoes in bulk, and those vessels examined for cause, such as involvement in a vessel casualty in U.S. waters.

While there have been other reasons for Coast Guard involvement with a foreign flag tanker, such as examination for compliance with the pollution prevention regulations, essentially, from the standpoint of the commercial vessel safety program, reoccurring examination of a foreign flag vessel used to be out of the ordinary. That state of affairs changed dramatically this past winter.

The present expanded foreign tank vessel boarding program was born on the evening of 17 December 1976 in Los Angeles Harbor, with the explosion of the SS Sansinena. That casualty resulted in six deaths plus three missing and presumed dead, injuries to 58 persons, release of approximately 20,000 gallons of bunker oil into the harbor, and loss of a vessel valued at $21.6 million.

The Sansenina explosion was one of a number of tragic incidents that began two days earlier (15 December) with the grounding of the Argo Merchant 28 miles southeast of Nantucket Island, resulting in a spill of 7.3 million gallons of No. 6 fuel oil and the loss of the vessel. These two casualties were followed by no less than 11 others within a 3-month period, resulting in extensive oil spillage and loss of life.

The Commandant, in response to conditions found by the SS Sansinena Marine Board of Investigation issued orders on 21 January 1977 that qualified marine inspectors be assigned immediately to examine the cargo venting and handling systems of foreign flag tankships calling at U.S. ports. Subsequent Commandant Notices were issued in the next several weeks, in amplification of the original order, detailing the goal of the program, i.e. the elimination of possible dangerous cargo vapor emissions and likely sources of ignition. Field offices were instructed to conduct the examinations in accordance with the General Safety Control Premises of the Safety of Life at Sea (SOLAS) Convention.

In the eleven-plus months (21 January 1977 - 1 January 1978) that the foreign tanker examination program has been in effect, there have been 2,710 examinations of 1,320 different vessels in United States coastal ports as well as ports in Puerto Rico, Hawaii, and Alaska. Of this total of 2,710 vessel examinations, 1,252 revealed no deficiencies aboard the vessels; the remaining 1,458 examinations resulted in the issuing of deficiency letters to the masters.

The number of foreign tank vessel examinations by country of registry, Figure 1, shows that Liberian-registered tankers have been examined almost 2.6 times as frequently as those from Greece, the latter being followed closely by vessels from Norway, Great Britain, Panama, Japan, and 39 other countries.

As examination results were received in Coast Guard Headquarters, the year each vessel was built and its tonnage were researched in an effort to correlate vessel age, country of registry, deadweight tonnage range, and deficiency profile.

It was found that the average age of foreign flag vessels being examined was slightly less than 10 1/2 years. The age profile revealed that 22.4 percent were 1-5 years of age, 18.2 percent

were 6-10 years old, 25.5 percent were 11-15, 21.2 percent were 16-20, and 7.2 percent were older than 20 years.

The largest grouping of foreign flag tank vessels fell into the 20,000 to 40,000 d.w.t. range. This sizing is quite comparable to active U.S. flag tank vessels of similar ocean service, and relates, to a great extent, to the configuration and controlling depths in U.S. navigable waterways.

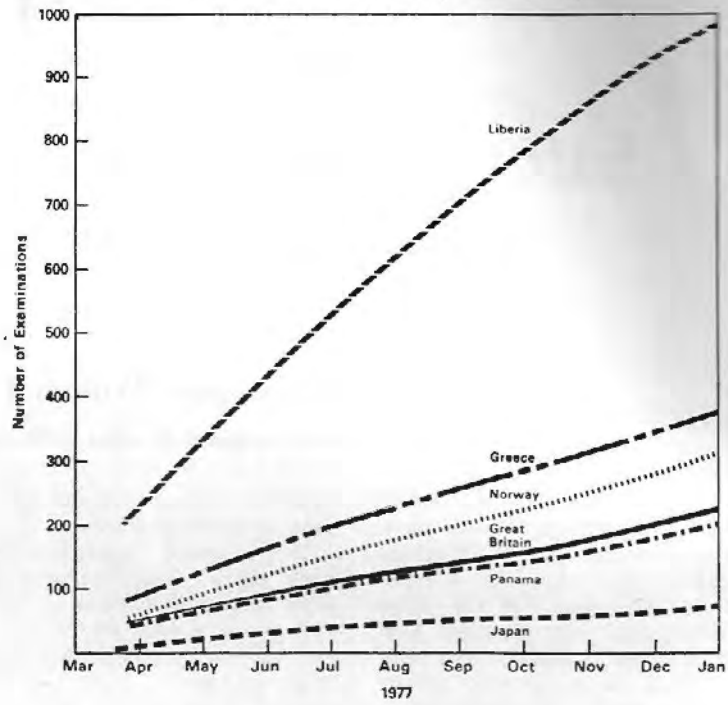
In the foreign tanker examination program thus far, 8,033 deficiencies have been reported. Table 1 shows individual examinations and deficiencies for each country as compared with the total number of examinations and deficiencies. Among the vessels of the most frequently examined countries, Greece shows the largest negative spread (percent of deficiencies is higher than percent of examinations), with Liberia, Norway, Italy, and France exhibiting a slight negative spread, and the other countries either being equal or else showing a lesser deficiency-to-examination percentage.

A vessel's age grouping was contrasted with the overall number of deficiencies for that vessel to develop a deficiency distribution by age. Table 2 compares the age profile developed earlier with this deficiency distribution and reveals that the 53.9 percent of vessels in excess of 10 years of age accounted for 72.9 percent of the deficiencies found in the administration of this program.

A tabulation of the deficiency types shows that cargo ventilation system deficiencies were discovered at a rate twice that of the next nearest type. The percentage distribution of individual deficiency types among age groupings is similar to the overall distribution among the same age grouping. For example, 19 percent of the deficiencies discovered in the ventilation system, cargo piping system, pumproom, electrical system, and fire protection systems were found aboard vessels of less than 10 years of age, with the remaining 77 percent (4 percent had unknown ages) found on vessels older than 10 years.

Figure 1

Examinations by Country of Registry



The only one of the six major deficiency categories that did not exhibit as high a percentage favoring older tank vessels was in the area of cargo handling gear deficiencies. The distribution for this category was 29 percent for vessels 1-10 years old, with the remaining 69 percent (2 percent had unknown ages) attributable to tankers over 10 years of age. This is logical considering the vital role that the cargo handling system plays in the daily operation of a tank vessel. It is the attention given to this system, vice the others, that accounts for the closer percentage distribution between age groupings.

An enumeration and evaluation of the deficiency types follows:

Cargo venting system (2,764 deficiencies). This singular area accounts for the largest number of deficiencies. The most common of these are (1) defective or missing flame screens, (2) defective or missing pressure/vacuum valves, (3) wasted and holed vent piping, and (4) wasted and holed vent masts and vent headers. These four items have been reported with almost equal frequency.

Cargo piping systems (1,294 deficiencies). This includes bunker fuel as well as cargo fuel piping systems, with the main deficiency throughout the vessel being wasted, holed, and leaking pipiug, flange, and spool piece connections.

Cargo handling equipment (858 deficiencies). There are five discrepancies reported with equal frequency, and a number of others of lesser frequency. The former are (1) inoperative or excessively leaking cargo pumps, (2) wasted and leaking steam piping to cargo pumps (3) leaking, wasted, or inoperative cargo valves, (4) inoperative stripping pumps, and (5) cement boxes in way of wasted sea suction connections to ballast piping.

Less frequently, the inspectors have found (1) inoperative cargo pump remote shutdowns, (2) inoperative gauges and cargo monitoring equipment, and (3) leaking or inoperative cargo heating coils.

Fire protection systems (593 deficiencies). There has been a variety of discrepancies in this area, with the first five items listed below being reported most

frequently. The deficiencies are (1) wasted, missing, and holed steam smothering system piping, (2) inoperative valves in steam smothering system, (3) inoperative fire dampers in pumproom ventilation systems, (4) wasted and holed firemain system piping, (5) inoperative fire pumps and firemain valves, (6) missing firehose, (7) portable fire extinguishers missing or requiring service, (8) semi-portable CO_2 systems requiring service, and (9) inoperative sprinkler systems or foam monitors.

Pumproom (737 deficiencies). The most frequently found pumproom deficiencies consist of (1) presence of excessive product in the bilges, (2) wasted and missing ventilation supply and exhaust ducting, and (3) missing or holed ventilation supply and exhaust duct flame screens. Other deficiencies found within the pumproom areas include (1) inoperative bilge pumps and disconnected reach rods, (2) flammable materials and loose tools adrift, (3) defective pumproom weather deck watertight doors, and (4) missing or broken ladder rungs.

Electrical systems (513 deficiencies). The electrical examination is concentrated mainly in the pumproom areas and on the weather deck, with the primary deficiencies being (1) defective explosionproof lights and junction boxes, and (2) jury-rigged wiring and installations. Other electrical deficiencies are (1) dead-ended wiring, and (2) inadequate or non-approved lighting, such as drop cords and fixtures with exposed light bulbs.

Structural deficiency (183 deficiencies). The most frequently reported structural deficiencies are (1) cracks in the pumproom bulkheads between the cargo tanks and the pumproom, causing cargo leakage into the pumproom, and (2) cracks and holes between the pumproom and the engineroom. Other structural deficiencies include (1) defective main deck watertight doors leading into deck houses, (2) cement boxes on hull and sea suction valves, and (3) cracks in main deck and superstructure bulkheads.

Personnel protective equipment (126 deficiencies). The three

Table 1. - Comparison by country of registry.

Country	Vessel Examinations		Deficiencies	
	Number	Percent of Total	Number	Percent of Total
Liberia	991	36.5	3033	37.8
Panama	189	6.9	447	5.6
Greece	374	13.8	1660	20.7
Norway	306	11.2	943	11.7
Great Britain	206	7.6	475	5.9
Japan	67	2.4	167	2.1
Singapore	76	2.8	82	1.0
Netherlands	43	1.5	20	0.2
Italy	51	1.8	150	1.9
France	34	1.2	117	1.5
Finland	33	1.1	78	0.9
Denmark	31	1.1	16	0.2

Table 2. - Comparisons by vessel age.

Age group (years)	Percent of vessels examined		Percent of deficiencies found	
1-5	22.4		7.6	
6-10	18.2		14.9	
11-15	25.5		30.7	
16-20	21.2	53.9	32.4	72.9
Above 20	7.2		9.8	
Age unknown	5.4		4.6	

Age group	Deficiency type	Percent of total deficiencies of that type
1-10	Ventilation system, cargo piping system, pumproom, electrical system, fire protection systems	19.1
Above 10		76.6
Age unknown		4.3
1-10	Cargo handling gear	29.0
Above 10		68.5
Age unknown		2.5

Table 3. - Foreign tanker traffic as determined by frequency of examinations at major ports.

Office	Inspections
Port Arthur, TX	482
New Orleans, LA	377
New York, NY	235
Los Angeles, CA	231
Seattle, WA	117
San Francisco, CA	108
Philadelphia, PA	121
Galveston, TX	107
Portland, ME	106
Houston, TX	98
San Juan, PR	80
Hampton Roads, VA	92
Corpus Christi, TX	85
Baltimore, MD	71
Boston, MA	63
Honolulu, HI	67
Others	270

most common deficiencies are (1) missing fireman's outfits, (2) missing or defective explosive meters, and (3) inoperative auxiliary generator.

Lifesaving equipment (21 deficiencies). The deficiencies have centered about (1) missing liferings, (2) missing or inoperative lifering lights, and (3) defective lifeboats.

Ship's ventilation system (11 deficiencies). The most common discrepancy has been wasted and holed ventilation ducting, permitting the egress of explosive vapors into the living spaces of the vessel.

Navigation safety regulations (727 deficiencies). The major deficiency reported has been the lack of posted vessel maneuvering information and, to a much lesser extent, the lack of U.S. navigation publications and updated charts of the areas to be transited.

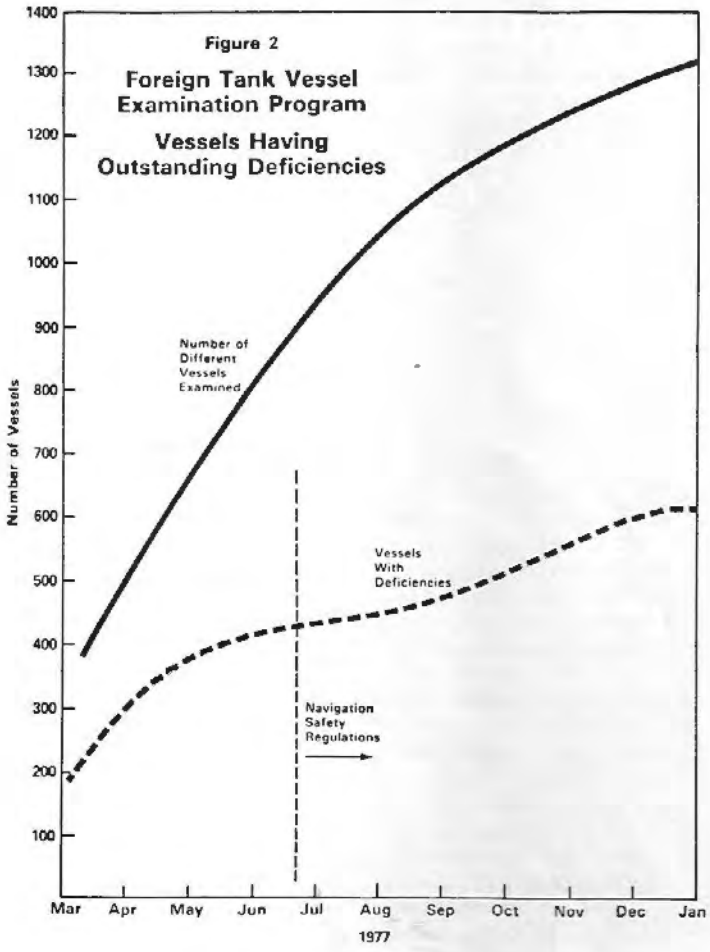
The impact of this newly created program has caused considerable strain on existing Coast Guard personnel resources. Accordingly, the Coast Guard has requested and will receive during fiscal year 1978 approximately 100 additional inspectors for assignment to field offices for the foreign tanker examination program. The priorities for assignment of these personnel resources will be determined primarily by the level of activity of a particular Marine Safety Office or Marine Inspection Office. Table 3 indicates the frequencies of foreign tank vessel examinations at various ports throughout the United States. The list is not all-inclusive but shows only the more active ports.

The major question to ba answered is "Has this new program, during its infancy, increased the overall safety level aboard foreign flag tank vessels?"

Figure 2 shows the trend of the periodic deficiency listing mentioned earlier as compared with the total number of different vessels examined during the same period. It is quite evident that the resurgence, around 1 July 1977, in the number of vessels with deficiencies is due to the influence of the navigation safety regulations. The more recent decrease in the slope of the curve representing number of different vessels examined supports the thought that the great majority of the foreign flag tank vessels trading at our ports have been examined at least once in the past year.

The large numbers of vessels continuing to show deficiencies are older vessels whose general condition would tend to preclude a "clean bill of health" upon close examinations of this kind. Therefore, it is anticipated that the slope of the curve representing vessels with deficiencies may level off for periods of time, but a significent decline in this slope is not foreseen in the immediate future.

The deficiency letters themselves indicate that some vessels are remaining on the deficiency listing only because it was con-



sidered safe in these instances to defer permanent repairs until the next scheduled drydocking period. This, as well as the nature of some of the Navigation Safety Regulation deficiencies, has tended to inflate the figures representing number of vessels with outstanding deficiencies.

Evidence of an improving level of safety can be seen in Table 4, which represents a comparison of conditions before and after 1 June 1977, the effective date of the Navigation Safety Regulations. Overall, there was a reduction in the number of deficiencies per examination in the later period. With the exception of Japan, all of the countries exhibited a reduction in the number of deficiencies per examination in the second half of the year. This reduction would have been greater were it not for the increased requirements of the Navigation Safety Regulations.

The lower half of Table 4 shows a similar comparison of the percentage of examinations free of deficiencies. The overall results are similar to those in the upper half, in that the more recent period had a higher percentage of deficiency-free examinations. Except for the United Kingdom, all of the six countries had an increasing number of examinations free of deficiencies, again in spite of the influence of the Navigation Safety Regulations.

Overall, Table 4 supports the statement that this program has helped effect needed repairs to specific shipboard systems, and that there has been a general improvement in the overall level of safety in foreign tankers calling at U.S. ports.

Since the commencement of this program, the Coast Guard has denied entry to two vessels under the authority of the Ports and Waterways Safety Act, and has detained 10 additional vessels under the control provisions of SOLAS 60, Chapter 1, Regulation 19, which states that such steps shall be taken to insure that the ship shall not sail until it can proceed to sea without danger to the passengers or the crew.

On another level, the Coast Guard has been pressing vigorously to have adopted by the international community the tanker initiatives announced by President Carter in his 17 March 1977 message to Congress. This has been pursued the International Maritime Consultative Organization (IMCO) through established committees for Maritime Safety and Marine Environmental Protection, as well as special working groups. The results of those efforts have been encouraging. [See page 25.]

In closing, analysis of the available data on the results of the examinations shows that the program has achieved a certain measure of success in raising the overall level of safety of tankers calling at our ports. We hope – and expect – that this will reduce the incidence of casualties of the kinds which we suffered with such frequency last winter.

Table 4. – A comparison of deficiencies/examination and percentage of examinations without deficiencies for several countries before and after 1 June 1977.

	Before 1 June			After 1 June		
Registry	No. of Def.	No. of Exam	Def/Exam	No. of Def.	No. of Exam	Def/Exam
Liberia	1821	494	3.7	1212	497	2.40
Panama	271	99	2.7	176	90	1.96
Greece	841	181	4.6	819	193	4.20
Norway	425	126	3.4	518	180	2.90
U.K.	262	95	2.8	213	111	1.90
Japan	91	40	2.3	76	27	2.80
Total	4393	1332	3.3	3640	1378	2.60
	Examinations Without Deficiencies					
Registry	No. of Exam Without Def.	No. of Exam	% of Exam Without Def.	No. of Exam Without Def.	No. of Exam	% of Exam Without Def.
Liberia	221	494	44.7%	243	497	48.9%
Panama	45	99	45.5%	45	90	50.0%
Greece	56	181	30.9%	67	193	34.5%
Norway	56	126	44.4%	80	180	44.4%
U.K.	53	95	55.8%	50	111	45.0%
Japan	19	40	47.5%	15	27	55.6%
Total	612	1332	45.9%	640	1378	46.4%

About the Author

Following graduation from the Coast Guard Academy in 1960, Commander Ecker served on the Cutters Westwind and Winnebago, and then served a tour at the San Francisco Marine Inspection Office. There followed two tours as shipboard engineering officer, first on the Cutter Resolute and then on the Mellon.

From 1971 to 1974, he was on loan to the U.S. Merchant Marine Academy, serving on the faculty of the Engineering Department. During this period he acquired a master's degree in management engineering through an off-duty program at Long Island University. Commander Ecker has served at Coast Guard Headquarters as Chief of the Information and Analysis Staff, Office of Merchant Marine Safety, since 1975.

National Safety Council EXECUTIVE COMMITTEE, MARINE SECTION

FOURTH BI-ANNUAL 1978 MARINE SAFETY POSTER CONTEST

1st Prize — GOLDEN SAFETY POSTER AWARD – to be presented at the 1978 National Safety Council Congress, in Chicago, Illinois.

2nd Prize — SILVER SAFETY POSTER AWARD – to be awarded to employer's representative attending the above Congress for eventual presentation to the 2nd Prize Winner.

Sponsor's Award — SPECIAL GOLDEN SAFETY AWARD – Plaque to employer of First Prize winner to be awarded to corporate representative attending the above Congress as a thank you for their cooperation and interest in furthering safety in our industry.

RULES

1. Contest open to any and all employees in the maritime industry, who like to draw. All posters must be on a Marine Safety subject. Any maritime operation or situation afloat or ashore may be used.
2. Confine drawing to 7½" x 10" on standard 8½" x 11" white paper, using either black or red ink only. **Draw for vertical display only.** We print from your artwork. Bold letters and strong art counts as well as subject matter. Emphasize only one idea.
3. Sign your work. Submission automatically gives copyright to Executive Committee Marine Section, National Safety Council and entrant releases all rights thereto.
4. Employer's name and address, as well as entrant's name, address and position, must be PRINTED and submitted with each entry.
5. All entries must be post marked on or before midnight, June 30, 1978. As many entries may be submitted as desired.
6. Winners will be notified via employer as soon as possible after closing date.
7. Carefully read and comply with all the above rules, and mail your entries to:
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Golden Award Winner

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International Tanker Agreement

Most of the tanker safety and pollution prevention initiatives proposed last year by President Carter now have been achieved internationally as a result of the International Conference on Tanker Safety.

Those initiatives, transmitted to Congress on 17 March of last year, were referred to the Intergovernmental Maritime Consultative Organization (IMCO) as a proposal for international action. At the national level, the Coast Guard, as directed by the President, embodied the same proposed requirements in notices of proposed rulemaking in the Federal Register of 16 May 1977 (42 FR 24868).

The U.S. delegation to the Conference, held in London during the week of 6-17 February, was headed by Deputy Secretary of Transportation Alan A. Butchman, and Rear Admirals W. M. Benkert, Chief, Office of Merchant Marine Safety, and Sidney A. Wallace, Maritime Policy Advisor to the Secretary of Transportation.

The President's initiatives involved three primary areas of effort:

(1) Improvement of tank vessel inspection and certification requirements,

(2) Improvement of design, construction, and equipment standards for tank vessels, and

(3) Improvement of crew standards.

The Conference developed requirements in the first two areas, and the third, crew standards, will be the subject of a major diplomatic conference scheduled for this summer. That meeting, the International Conference on Crew Training and Certification of Seafarers, will be held in London 14 June - 7 July 1978. The United States has been deeply involved in the 5 years of preparation for this conference and expects that major improvements will result.

With regard to the two principal areas addressed in the Conference just concluded, the following are the highlights.

Inspection and Certification - The Conference took a major step toward the elimination of substandard ships by adopting a series of inspection and certification measures for tank vessel inspections, as well as requiring administrations to institute a program of unscheduled inspections. Tankers over 10 years old will be subject to required intermediate surveys to ensure continuing compliance with the applicable requirements. Conference participants agreed that these improved inspection and certification procedures should produce dramatic beneficial results.

Design, Construction, Equipment - Most of the standards for new tankers proposed by the U.S. were adopted, with some requirements even more stringent than those originally sought. The only deviations from the U.S. proposals for new tankers were exemption of small product carriers from the segregated ballast tank requirement and adoption of the concept of protectively-located segregated ballast tanks as an equivalent to mandatory fitting of double bottoms.

Among the specific measures adopted in this area were the following:

New crude carriers of 20,000 dwt will be required to be fitted with protectively-located segregated ballast tanks, crude oil washing systems, and inert gas systems.

New product carriers 30,000 dwt and above will be required to he fitted with protectively-located segregated ballast tanks. Inert gas systems will be required on ships of 20,000 dwt and above.

Existing crude carriers of 40,000 dwt and above will be required to have clean ballast tanks, segregated ballast tanks, or crude oil washing systems. The clean ballast tank option would be phased out after a 2-year period for crude carriers 70,000 dwt and above, and after 4 years for crude carriers of 40-70,000 dwt. For ships 70,000 dwt and above, an inert gas system will become mandatory 2 years after the coming into force of the Protocol to the 1974 SOLAS Convention, and 2 years later for ships of 20,000-70,000 dwt.

Existing product carriers - Clean ballast tanks or segregated ballast tanks will be required on ships of 40,000 dwt and above at the time of the coming into force of the 1973 Marine Pollution Convention and Protocol. Inert gas systems will be required for ships of 70,000 dwt and above 2 years after the Protocol to the 1974 SOLAS Convention comes into force, and 2 years later for ships of 40,000-70,000 dwt and down to 20,000 dwt for ships which are fitted with high-capacity washing machines.

While the effective dates mentioned above are predicated on the coming into force of earlier protocols, the Conference approved two resolutions which enjoin the administrations to implement the provisions of the protocols without waiting for formal ratification. The United States intends to pursue that line of action.

The Coast Guard is developing a comprehensive action plan to implement the results of the Conference, and expects to publish in March a notice outlining the Conference results, the general reqnirements developed, and a proposed schedule for U.S. implementation of the safety and pollution prevention measures adopted.

Benzene Regulations

An Update

by Lieutenant Commander John E. Lindak and Lieutenant Thomas J. Haas

Cargo and Hazardous Materials Division, Office of Merchant Marine Safety

For most of this century, state regulations, technical association standards, and, more recently, federal regulations have set limits on the allowable occupational exposure to benzene vapors. Those limits were based upon findings that benzene "poisoning" and blood abnormalities were occurring among exposed workers, even at relatively low concentrations.

In recent years, increasing evidence linking benzene to leukemia has prompted the Occupational Safety and Health Administration to apply more stringent standards. Those efforts have met with considerable resistance.

An article in the August 1977 issue described the widespread official and public concern regarding the health hazards of benzene vapors. Although the last word certainly has not been heard on the regulation of occupational exposure, there have been some developments on the subject since that article appeared. Here the authors provide an update on the status of benzene regulations, both OSHA's and the Coast Guard's, and also review the measures that the Coast Guard has instituted to protect its own personnel from the hazard.

The latter discussion includes some valuable basic information on monitoring and respiratory protection equipment which will be of benefit to both Coast Guard personnel and vessel operators. References to specific manufacturers of that equipment are for example only, and are not intended to indicate Coast Guard endorsement.

OSHA Standards

The Occupational Safety and Health Administration's (OSHA) recent efforts to promulgate a new, more stringent benzene standard are moving steadily forward. OSHA's emergency temporary standard (ETS) was stayed in court in May 1977, and never became effective. However, OSHA's permanent standard, first proposed in the Federal Register of 27 May 1977, has been published in its final form in the 10 February 1978 Federal Register and will become eferal Register and will become effective on 13 March 1978, unless it too is stayed by court action.

The permanent standard reduces the maximum permissible time-weighted average exposure over an 8-hour day from 10 ppm to 1 ppm. A ceiling level of 5 ppm for any 15-minute period during the workday is allowed.

The standard also establishes an "action level" of 0.5 ppm. That is, if the initial benzene vapor concentration measurements at a work site are below 0.5 ppm, subsequent periodic monitoring or routine medical surveillance of personnel will not be required.

Unlike the ETS and the proposed permanent standard, the final permanent OSHA benzene standard applies to all chemical mixtures containing benzene - in any percentage. This means that gasoline will be regulated during bulk transport and storage. Another major change in the permanent standard is that it specifically adresses maritime tanker and barge transportation of benzene.

Coast Guard Regulations

The Coast Guard currently has no benzene regulations that provide protection in the form of exposure standards for personnel under its jurisdiction. There is no problem with respect to protection of the Coast Guard's own personnel, since all federal agencies have been directed by executive order to comply with applicable OSHA safety and health standards. The Commandant can therefore apply the current OSHA standards - or even more stringent requirements - to his own personnel, specifying exposure limitations, equipment requirements, etc.

The other side of the question concerns the protection of maritime industry personnel under

Coast Guard jurisdiction.

During the past 6 months, a Coast Guard emergency temporary standard for benzene was drafted which paralleled the OSHA ETS requirement for a 1 ppm or less vapor exposure level. However, in view of the fact that the OSHA ETS had been prevented by court action from becoming effective, it was readily apparent that a Coast Guard ETS for benzene would encounter similar problems and delays. Still, the problem of a regulatory void for personnel under Coast Guard jurisdiction existed and some positive action had to be taken.

A notice of proposed rulemaking for benzene carriage requirements may be released early in 1978. This proposed rule would apply the current OSHA benzene exposure level and call for a 10 ppm 8-hour time-weighted average, with a 25 ppm ceiling time-weighted average over any 10-minute period during the 8 hours, and 50 ppm as a peak exposure level.

This proposed rule is a pragmatic attempt to establish a regulatory standard which will provide an acceptable measure of protection to maritime personnel, and which will be economically and technologically feasible to implement. However, recognizing OSHA' efforts, the Coast Guard is still examining the appropriateness of a 1 ppm standard for the marine iudustry.

Recent Casualties

There has been a certain amount of criticism regarding the emphasis being placed on benzene and the extremely low allowable exposure levels. Comments such as "...I've been in benzene tanks many times, been knee-deep in the stuff, and uothing happened to me," or "...there's no problem out there; I've been in inspection for 20 years and I'm in great shape"; "I don't need a respirator; I've been in all kinds of chemical tanks, and the doc says I'm in excellent health."

Actually, these people have been very lucky - so far - as two recent cases within the Coast Guard suggest.

In September 1977, a machinery technician was diagnosed as having acute mylogenous leukemia, a form of cancer that has been linked to benzene vapor exposure. The treatment prescribed was approximately 7 days of chemotherapy and a 3-week wait, then a repeat of the treatment if there was no remission. A repeat was necessary; in fact, a third session of chemotherapy was necessary to put the disease into remission.

The attending physician expressed the opinion that the case was a direct result of local handling and exposure to benzene. The petty officer was an instructor of fuel oil test classes being conducted at Machinery Technician School at the Reserve Training Center, Yorktown, Va. There, he was repeatedly exposed to benzene vapors while demonstrating the use of the Gerin lube oil test kit. The solvent contained in the kit was 100 percent benzene.

An industrial hygienist subsequently called in to sample the air during the test kit lecture found benzene concentrations in the poorly ventilated classroom to be well above the current 10 ppm OSHA standard. In fact, some readings were into the 100 ppm range, which is well above the benzene odor threshold of approximately 75 ppm. As a result of this incident, a message to all districts instructed personnel to discontinue the use of the solvent (100 percent benzene) in the Gerin lube oil test kits (ALDIST 283/77).

This man had been exposed to relatively high concentrations of benzene. While he may have been hypersensitive to benzene vapors, the fact remains that the possible correlation between benzene exposure and leukemia cannot be overlooked.

The petty officer is only 26 years old, and is a husband and father. As of the writing of this article, the outlook was encouraging. The progression of the leukemia was slowed by chemotherapy, but he will have to be monitored for the rest of his life. Remission is never permanent; it could be for days or years.

An informal investigation of this incident was conducted and forwarded to the Commandant for action to publicize the problems associated with (service-wide) benzene exposure. It concluded that there was indeed a job/injury correlation.

A second recent case came to light in December of 1977, when a recently retired chief warrant officer with over 20 years in marine inspection died of leukemia. According to the reports, the man could have been exposed to benzene many times while inspecting tank vessels. It is impossible to document whether his work practice of entering cargo tanks without respiratory protection led to benzene exposure which eventually caused leukemia. However, the possibility remains.

The two incidents just described testify to the possibility of job-related injury which can occur from benzene exposure in the maritime environment.

Personnel Protection

Among the actions which were taken by the Coast Guard for the protection of its own personnel was the issuance of an instruction entitled "Technical Guide: Practices for Respiratory Protection" (Commandant Instruction 6260.2, dated 22 January 1976). This document provided basic information on the selection, use, maintenance, and limitations of respiratory protective devices, particularly cartridge respirators of the type necessary for benzene vapor protection.

For the benefit of industry personnel as well as Coast Guard inspectors we offer the following additional suggestions regarding monitors and respirators.

Field monitoring to the 10 ppm benzene level can be accomplished by the use of a colorimetric detector tube and pump assembly. Bendix, Mine Safety Appliances, and Draeger are a few of the companies presently manufacturing such devices. Iu fact, Draeger has recently offered a 0.5 ppm tube for the detection of benzene vapor. Colorimetric detector tubes offer fair reliability and

reproducibility of results. However, remember that these tubes give a measurement of benzene vapor concentration at only one specific location - the opening of the tube itself.

An important advantage of using detector tubes is their capability to provide speedy, inexpensive, and on-the-spot results. Some tubes are pre-calibrated and can be read directly in ppm of benzene. This is important to Coast Guard marine inspector who wishes to know the prevailing benzene vapor concentration before, not after, he enters a confined space.

More complex and costly portable toxic vapor detectors are available. One, for example, is the MIRAN Portable Ambient Air Analyzer which incorporates infrared spectroscopy. Another is the HNU Photoinoization Analyzer. Their manufacturers indicate that these detectors have excellent specificity for benzene vapors and can instantly detect benzene vapor concentrations to 1 ppm or less. The high cost, complexity, and calibration requirements of these devices necessitate their use by trained, experienced personnel - i.e. NFPA-certified marine chemists or industrial hygienists.

Assuming that the air environment has been monitored, and that there is benzene vapor present, but in concentrations no greater than 10 ppm, we have suggested that the marine inspector don a half-mask respirator. This device, if properly fitted and worn, will give the inspector protection to below the 1 ppm level. If available, a full-face-mask filter respirator should be used since it ensures the wearer an even better fit. There are many reputable companies producing the half-face and the full-face respirators - MSA, 3M, Scott, Norton, and American Optical, to name a few.

The Commander, Eighth Coast Guard District has recently purchased approximately 80 full-and half-face respirators for marine inspectors and Captain of the Port use.

A word of caution is necessary about the chemical cartridges used in these respirators. Use the cartridge only once, then discard it. This safety practice is recommended by NIOSH to ensure that a fresh cartridge is always being utilized. At vapor concentrations below 75 ppm, benzene is not detectable by odor, so you will have no warning when the chemical cartridge in your respirator has lost its effectiveness. Therefore, frequent changes provide a necessary and inexpensive (less than $2.00 per cartridge) safety factor.

In atmospheres containing 10 ppm or more of benzene vapor, the following respiratory devices currently are being used by Coast Guard personnel:

The Bio Marine "Biopack 45" is a NIOSH and Coast Guard approved, self-contained breathing apparatns which is front-mounted and lightweight (17 lbs), and relatively long term (45 minutes). A major drawback of this device is that it does not operate in a "positive pressure" mode. "Positive pressure" means that there is always a slight positive air pressure in the face mask, so that if there is a faulty fit, the mask will leak outward, not inwards. However, this device can be used for tank entry for most toxic vapors, as long as monitoring indicates that the toxic vapors are present in concentrations no higher than 100 times the threshold limit value.

Table 1. - Representative costs of protective equipment.

Half-face mask	8.00
Full-face mask	40.00
Filter cartrdiges	1.70
"Biopak 45"	660.00
Space oxygen cylinder ..	115.00
CO_2 absorber.....	52.00
Self-contained positive-pressure breathing apparatus	650.00
Detector tube pump	75.00
Detector tubes(10)	10.00
Portable photoionizer gas analyzer	3000.00
Portable infrared gas chromatagraph	3000.00

At least three companies are manufacturing a fully positive-pressure, self-contained breathing apparatus - Scott, Survivair, and MSA. This type or respiratory device has virtually no limitations regarding benzene or oxygen concentrations in the spaces where it is used, since it contains its own air supply, usually of 30-minute duration. These devices are heavy (32 lbs), back-mounted, and rather cumbersome. However, they provide the highest level of personnel respiratory protection available.

Table 1 lists the approximate costs of respirators and monitors. Each respirator purchased for Coast Guard use must carry a NIOSH approval number.

In addition to guidelines on respiratory protection, the Coast Guard has issued internal directives on health monitoring of its personnel.

An instruction on "Occupational Health Monitoring" dated 28 June 1977 (COMDTINST 6260.5) defines the requirements for periodic medical examinations of all Coast Guard personnel who are exposed during the course of their duties to varions designated hazardous materials. Requirements specific to benzene are a pre-placement medical examination prior to assignment to a billet involving benzene vapor exposure, quarterly follow-up exams, and a termination medical exam upon completion of duties and re-assignment.

A message on "Benzene Exposure" dated 12 October 1977 (ALDIST 286/77) specified mandatory blood tests and reporting procedures for personnel exposed to benzene.

In an instruction issned on 21 October 1977 (COMDTINST 6260.8, "Emergency Temporary Benzene Standard"), the Commandant ordered a survey to determine the number Coast Guard personnel who may have been exposed to benzene. Preliminary responses indicate that literally hundreds of Coast Guard personnel have been previously exposed to benzene. While widespread, the majority of these personnel exposures, however, appear to be low level, of short duration, and at very infrequent intervals.

Reactions

Coast Guard units at the "business end" of the problem have reacted in a number of ways to their new awareness of the chronic benzene vapor hazard.

Several Marine Safety and Marine Inspection Offices are deferring all internal inspection of benzene tank vessels for a specified period of time - usually 6 months - until further information and guidance are received and the necessary monitoring/respiratory equipment obtained. Others require a marine chemist's gas-free certificate with a suitable 1 ppm or less endorsement before permitting a Coast Guard marine inspector to enter a benzene tank. Those units fortunate enough to possess respiratory gear require a 10 ppm or less endorsement and allow personnel wearing respirators to enter benzene tanks.

Under the circumstances, the NFPA-certified marine chemist is suddenly placed in a unique position. Generally lacking the monitoring or respiratory equipment necessary to provide adequate personnel protection for tank entries, the Coast Guard marine inspectors naturally turn to the marine chemist and rely on his "safe for man" endorsement.

At this point, let's step back for a minute and visualize the predicament of the marine chemist.

NIOSH has published the fact that benzene is carcinogenic, necessitating a threshold limit value of 1 ppm or less. The relevant OSHA emergency regulations have been held up in court, and the revised OSHA permanent benzene standard is not yet effective. Coast Guard emergency or final regulations for benzene carriage aboard tank vessels have not been published, and primary Coast Guard guidance is contained in a single safety message which was sent to all Marine Safety Offices, Marine Inspection Offices, and Captains of the Port.

With little advance notice the marine chemist is asked to certify a tank "safe for man" by insuring that the benzene vapor concentration is 1 ppm or less. This suddenly acquired responsiblility pushes the limit of his experience, training, and equipment. However, the Coast Guard marine inspector in a transient regulatory situation such as this will turn to the marine chemist. He expects that if the marine chemist's present equipment or techniques are insufficient, he will either improve them or, failing that, will not certify a tank "safe for man."

Outlook

There are at present 1,800 to 2,000 suspected carcinogens among the thousands of chemicals utilized in this country. Yet, in the 7 years since its creation, OSHA has been able to establish exposure regulations on only 17 of them. The lengthy proceedings over the proposed benzene standard are an example of the time-consuming efforts required to regulate a single carcinogen.

In order to speed up their regulatory procedures, OSHA has proposed a new policy for identifying, classifying, and regulating toxic substances which are potential carcinogens (Federal Register, Vol. 42, No. 192 - Tuesday, October 4, 1977).

Rather than initiating a separate rulemaking fo each individual carcinogen, a systematic classification scheme would be used with automatic, standardized regulations for those substances in the carcinogenic category.

Basically, four categories will be established. The most important and rapid regulatory action would be taken for substances in Category I - that is, toxic substances found to cause cancer in humans as evidenced by two independent laboratory animal tests. Substances in this category would automatically cause an amergency temporary standard to be promulgated which would immediately control exposure at the lowest level technically feasible. The ETS would then be followed by a proposal for a permanent standard within the next 6 months. If a chemical's cancer-causing activity has been reported to some degree, but not confirmed, it would fall into Category II and a rule-making proposal would be issued after 2 months. Two additional categories include substances for which more information is needed or which are not found in the American workplace.

Assuming the OSHA "national carinogen policy" does become law, Coast Guard marine safety personnel may soon encounter a wide variety and large number of toxic materials which suddenly have extremely low allowable exposure levels. In this event, the recent monitoring and respiratory protection problems posed by the benzene low level toxicity will set the pattern for a number of other toxic cargoes. Experience gained from coping with the benzene problem will be highly useful in dealing effectively with these other materials.

About the Authors

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After a tour in the Office of Research and Development at Headquarters, he served as engineering officer of the cutter Hamilton during 1974-1975.

LIEUTENANT TOM HAAS is presently Chief of the Occupational Safety and Health Section of the Cargo and Hazardous Materials Division at Headquarters.

Following graduation from the Coast Guard Academy in 1973, he served as operations officer on board the buoy tender Acacia, homeported in Port Huron, Mich. Lieutenant Haas was then selected for postgraduate study at the University of Michigan, from which he holds Master of Science degrees in chemistry and environmental health sciences - toxicology.

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

DECK

1. The daily path of a celestial body that is parallel to the celestial equator is the

A. altitude circle.
B. vertical circle.
C. diurnal circle.
D. hour circle.

2. A Master would be well advised to file a marine note of protest if

A. portions of his vessel's cargo were illegally impounded in a foreign port.
B. longshore labor went on strike in the port causing undue vessel delay.
C. cargo was received at ship side which was damaged in land transit.
D. the vessel encountered heavy weather which may have caused bottom damage.

3. Galvanizing would be suitable for protecting wire rope which is used for

A. topping lifts.
B. cargo runners.
C. stays.
D. any of the above.

4. Which of the following conditions could cause a gyro-compass to develop an easterly error?

A. Azimuth motor too tight.
B. Adjusting screw too far out.
C. Locking latch is up.
D. Voltage becomes too high.

5. A vessel may acquire a list if the center of gravity is
I. off the centerline.
II. too high in the vessel.

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

ENGINEERS

1. Of what significance is the size of the opening in the control orifice in the steam supply line to a low pressure evaporator?

A. The orifice size varies the steam supply pressure according to demand.
B. The orifice size controls the amount of steam admitted to the evaporator.
C. The orifice size determines the degree of steam desuperheat.
D. The orifice size limits steam supply to the regulating valve.

2. In a soloshell, double-effect distilling unit, the evaporator feed in the second effect is heated by

A. auxiliary steam.
B. air ejector steam.
C. first-effect distillate.
D. flash chamber leak-off.

3. In a diesel engine, the spring force required for proper valve operation is determined by

A. maximum firing pressure.
B. minimum firing pressure.
C. cam contour.
D. length of the spring.

4. The path of scavenging air within an engine cylinder utilizing the crossflow scavenging method is controlled by the

A. upward direction of the exhaust ports.
B. number of ports at the cylinder base.
C. shape of the piston crown.
D. position of the piston in the cylinder.

5. The electric starting motor of a diesel engine engages the flywheel ring gear by a (an)

A. automatic follow-up.
B. muff coupling and release.
C. friction-type clutch.
D. automatic pinion shift.

ANSWERS

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

Engineers
1. B 2. C 3. C 4. C 5. D

MERCHANT MARINE SAFETY PUBLICATIONS

The following publications may be obtained from the nearest marine safety office or marine inspection office of U.S. Coast Guard. 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 federal regulations are published in the Federal Register, printed daily except Saturday, Sunday, and holidays.) Following the title of each publication in the table below are the date of the most recent edition and the dates of the Federal Registers affecting each.

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 D.C. 20402.

CG No.	TITLE OF PUBLICATION
101-1	Specimen Examinations for Merchant Marine Deck Officers (2d and 3d Mate) (4-1-77).
101-2	Specimen Examinations for Merchant Marine Deck Officers (Master and Chief Mate) (4-1-76).
108	Rules and Regulations for Military Explosives and Hazardous Munitions (4-1-72). F.R. 7-21-72, 12-1-72, 6-18-75.
*115	Marine Engineering Regulations (6-1-73). F.R. 6-29-73, 3-8-74, 5-30-74, 6-25-74, 8-26-74, 11-14-74, 6-30-75, 9-2-75, 9-13-76, 9-26-77.
123	Rules and Regulations for Tank Vessels (8-1-77). F.R. 8-17-77, 9-12-77, 12-19-77.
169	Navigation Rules - International - Inland (5-1-77). F.R. 7-11-77, 7-14-77, 9-26-77, 10-12-77, 11-3-77, 12-6-77, 12-15-77.
*172	Rules of the Road - Great Lakes (7-1-72). F.R. 10-6-72, 11-4-72, 1-16-73, 1-29-73, 5-8-73, 3-29-74, 6-3-74, 11-27-74, 4-16-75, 4-28-75, 10-22-75, 2-5-76, 1-13-77, 11-3-77, 12-6-77.
174	A Manual for the Safe Handling of Flammable and Combustible Liquids and Other Hazardous Products (9-1-76).
176	Load Line Regulations (2-1-71). F.R. 10-1-71, 5-10-73, 7-10-74, 10-14-75, 12-8-75, 1-8-76.
182-1	Specimen Examinations for Merchant Marine Engineer Licenses (2d and 3d Assistant) (4-1-75).
182-2	" " " " " " " (First Assistant) (4-1-76).
182-3	" " " " " " " (Chief Engineer) (4-1-76).
184	Rules of the Road - Western Rivers (8-1-72). F.R. 9-12-72, 12-28-72, 3-8-74, 3-29-74, 6-3-74, 11-27-74, 4-16-75, 4-28-75, 10-22-75, 2-5-76, 3-1-76, 6-10-76, 7-11-77, 12-6-77, 12-15-77.
*190	Equipment Lists (5-1-75). F.R. 5-7-75, 6-2-75, 6-25-75, 7-22-75, 7-24-75, 8-1-75, 8-20-75, 9-23-75, 10-8-75, 11-21-75, 12-11-75, 12-15-75, 2-5-76, 2-23-76, 3-18-76, 4-5-76, 5-6-76, 6-10-76, 6-21-76, 6-24-76, 9-2-76, 9-13-76, 9-16-76, 10-12-76, 11-1-76, 11-4-76, 11-11-76, 12-2-76, 12-23-77, 4-4-77, 4-11-77, 4-21-77, 5-19-77, 5-26-77, 6-9-77.
191	Rules and Regulations for Licensing and Certification of Merchant Marine Personnel (11-1-76). F.R. 3-3-77, 8-8-77.
227	Laws Governing Marine Inspection (7-1-75).
239	Security of Vessels and Waterfront Facilities (5-1-74). F.R. 5-15-74, 5-24-74, 8-15-74, 9-5-74, 9-9-74, 12-3-74, 1-6-75, 1-29-75, 4-22-75, 7-2-75, 7-7-75, 7-24-75, 10-1-75, 10-8-75, 6-3-76, 9-27-76, 2-3-77, 3-31-77, 7-14-77, 7-28-77, 9-22-77, 9-26-77, 12-19-77.
257	Rules and Regulations for Cargo and Miscellaneous Vessels (9-1-77). F.R. 9-26-77, 9-29-77, 12-19-77.
258	Rules and Regulations for Uninspected Vessels (4-1-77). F.R. 9-26-77.
259	Electrical Engineering Regulations (7-1-77). F.R. 9-26-77.
268	Rules and Regulations for Manning of Vessels (7-1-77).
293	Miscellaneous Electrical Equipment List (7-2-73).
323	Rules and Regulations for Small Passenger Vessels (Under 100 Gross Tons) (7-1-77). F.R. 9-26-77, 12-15-77, 12-19-77.
329	Fire Fighting Manual for Tank Vessels (1-1-74).
439	Bridge-to-Bridge Radiotelephone Communications (12-1-72). F.R. 12-28-72, 3-8-74, 5-5-75, 7-11-77.
467	Specimen Examinations for Uninspected Towing Vessel Operators (10-1-74).
497	Rules and Regulations for Recreational Boating (7-1-77). F.R. 7-14-77, 8-18-77.

Changes Published During July - December

CG-123 & 257, Federal Register of December 19.
CG-169, Federal Registers of December 6 & 19.
CG-172, Federal Registers of November 3 & December 6.
CG-184, Federal Registers of July 11, December 6 & 15.
CG-239, Federal Registers of July 14 & 28, September 22 & 26, & December 19.
CG-323, Federal Registers of December 15 & 19.
CG-439, Federal Register of July 11.

* Out of stock.

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