# PROCEEDINGS
## OF THE MARINE SAFETY COUNCIL

DEPARTMENT OF TRANSPORTATION UNITED STATES COAST GUARD

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# PROCEEDINGS

## OF THE MARINE SAFETY COUNCIL

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*Commandant*

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## CONTENTS

### FEATURES

Oil in the Bay . . . . . 186
Preparation Minimizes Effects of Oil Spill . . . 192

### DEPARTMENTS

Maritime Sidelights . . . . . 185
Heritage . . . . . 195
Coast Guard Rulemaking . . . . . 196
Nautical Queries . . . . . 198

## COVERS

*Front:* Sunset on the eastern shore of Chesapeake Bay, February 1976. During that month extensive areas of beach and marshland on both eastern and western shores of the Bay were polluted by oil from a partially-sunken tank barge. A combination of weather conditions and the characteristics of the heavy No. 6 fuel oil made it possible for most of the 250,000 gallons lost to go undetected until it reached the shore several days after the sinking. According to the U.S. Fish and Wildlife Service some 20,000 waterfowl, like those in the foreground, died as a result. How it happened is the subject of the article beginning on page 186.

*Back:* "Those daring young men and their flying (and floating) machine." The crew of the NC–4 prior to the history-making flight which is the subject of this month's "Heritage" item. Senior pilot E. F. Stone, second from left, was the first Coast Guard aviator.

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# maritime sidelights

## CLOSING THE DOOR . . .

Coast Guard traveling inspectors recently have noted that paint locker doors are routinely being left open on all classes of vessels. In one inspection, the paint locker door was found to be blocked open by dunnage lashed to the deck. This would have precluded its closing in the event of a fire. Open paint locker doors not only defeat the purpose of the doors as boundaries but also negate the effectiveness of fire-extinguishing agents released into the space.

## . . . AND STAYING ON THE RIGHT SIDE OF IT

Carbon dioxide or Halon 1301 total flooding fire extinguishing systems are acceptable for the protection of various shipboard spaces, such as paint lockers, machinery spaces, boiler rooms, and emergency generator rooms. The currently acceptable arrangements for these systems require a remote system release to be installed near the protected space as well as at the $CO_2$ or Halon storage bank. With this arrangement, a dual release capability is afforded in the event the remote release station is rendered inoperable due to fire or other emergency at that location. On 10 February 1975 the regulations governing inspected vessels were amended to require that additional instructions be posted at all remote release stations explaining how to release the system from the main cylinder bank if the remote release cannot be operated. This requirement applies *only* to those systems where the agent storage cylinders are located *outside* the protected spaces.

Since these amendments have become effective, installations have been noted where the agent storage cylinders were located inside the protected space and instructions were posted by the extinguishing system remote release station which, in effect, directed personnel to enter the protected space to release the agent if the remote release failed. This misinterpretation of the regulations creates a potentially hazardous if not impossible situation for shipboard personnel to contend with. Protected spaces should *not* be entered to release any fixed fire extinguishing system, and any instructions which require actions of this nature should be removed.

## LORAN STUDY

The Coast Guard is supporting a year-long study by two Oregon State University professors aimed at minimizing problems for mariners converting to the new national Loran-C navigation system.

One of the purposes of the research is to determine the benefits and the problems to mariners of switching from the present Loran-A navigation system to the more accurate, longer range Loran-C system. Costs to the mariner, as well as the availability of shipboard equipment and navigation charts will also be examined. Mariners from Alaska to Southern California on the U.S. West Coast, along the Gulf of Mexico, and on the East Coast from Maine to Florida will be contacted in this nationwide effort.

Associate Professors Daniel A. Panshin and R. Charles Vars of OSU will conduct the research project.

Loran-C coverage is presently available along much of the East Coast and in some Alaskan waters. The construction of new stations will complete the coverage of the East Coast and Alaska and provide coverage on the West Coast, in the Gulf of Mexico, and in the Great Lakes Region. The new coverage is scheduled to be available in phases beginning with the West Coast in 1977 and completing with the Great Lakes in 1980.

Loran-A service is scheduled to be phased out in 1979 and 1980 as the new Loran-C coverage becomes available. A 2-year overlap of the two systems will enable mariners to shift over to Loran-C.

## RRAC

The Rules of the Road Advisory Committee will conduct an open meeting on Tuesday, 25 January 1977, in Room 6332 of the Nassif Building, 400 Seventh Street SW, Washington, D.C. The meeting will commence at 10 a.m. Interested persons seeking further details of the meeting should contact Captain R. A. Bauman, the Executive Director of the Committee. His address is Commandant (G–WLE/73), U.S. Coast Guard, Washington, D.C. 20590. Telephone: (202) 426–4958.

## NOTICE

Several months ago, most of our U.S. and Canadian subscribers should have received a mailing list survey card which they were to complete and return to us if they wished to continue receiving the magazine. (This applies to those whose address labels have a code line beginning "TCG06.") The mailing list corrections and deletions resulting from that survey should be completed soon.

If you should stop receiving the magazine within the next several months, it is probably because the card was not returned. We realize that among an audience of seafarers and members of large business organizations some of these cards undoubtedly did not reach the people they should have. If you fail to get the magazine for two consecutive months, please let us know and you will be reinstated on our mailing list. The address is Commandant (G–CMC/81), U.S. Coast Guard, Washington, D.C. 20590.



224-064—2

# Oil in the Bay

*"At dawn the barge could be seen with about 30 to 40 feet of bow above the water, facing westerly and pointing up at an angle of about 30°."*

At 3:05 p.m. on Sunday, 1 February 1976, the tug *Falcon* left the Amoco Refinery at Yorktown, Va., with the tank barge *STC–101* in tow. Bound for the Amoco Terminal at Baltimore, the barge was loaded with about 19,500 barrels of No. 6 fuel oil.

The mate, who had the noon-to-6 watch, was a man with 25 years experience on inland waters, most of which was acquired on the Chesapeake Bay. After being informed by the tankerman that the barge was ready, and after a visual check from the tug of the hatches and trim, the mate moved the barge out into the York River and put it on a short hawser. The draft was 10′6″ forward and 11′ aft, leaving a freeboard of a foot or less. The trip out the river to the Chesapeake Bay was uneventful; the weather was clear and mild, with little or no wind. The noon National Weather Service forecast for the Lower Chesapeake Bay had called for gusty winds shifting to northwest and increasing to 15–30 knots with stronger gusts.

At 6:00 p.m. the watch was changed as the vessel turned into the Back Channel to head up the Bay. When he had reached the open Bay, the captain had the rest of the towing hawser paid out, and the barge was towed about 1,000 feet astern of the tug. At 8:45 p.m. Wolf Trap Light was abeam to port, and the weather was logged at fog and rain with winds southeast at 15 m.p.h. and seas at 1½ feet. At 10:50, Rappahannock River Junction Lighted Bell Buoy R was abeam, and the weather was recorded as clearing. The tug's speed was approximately 4.8 knots, as determined by radar fixes. At this time, the tug was experiencing a favorable wind and fair tide. At 11:50 the weather was logged as wind shifting to the northwest at 25 m.p.h. and seas at 1 to 2 feet. The weather was as predicted for the Bay. At 9:30 p.m. the National Weather Service forecast had the small craft advisory remaining in effect on the Bay; however, along the Atlantic Coast between Cape Henlopen and Virginia Beach, the small craft advisory was changed to gale warnings.

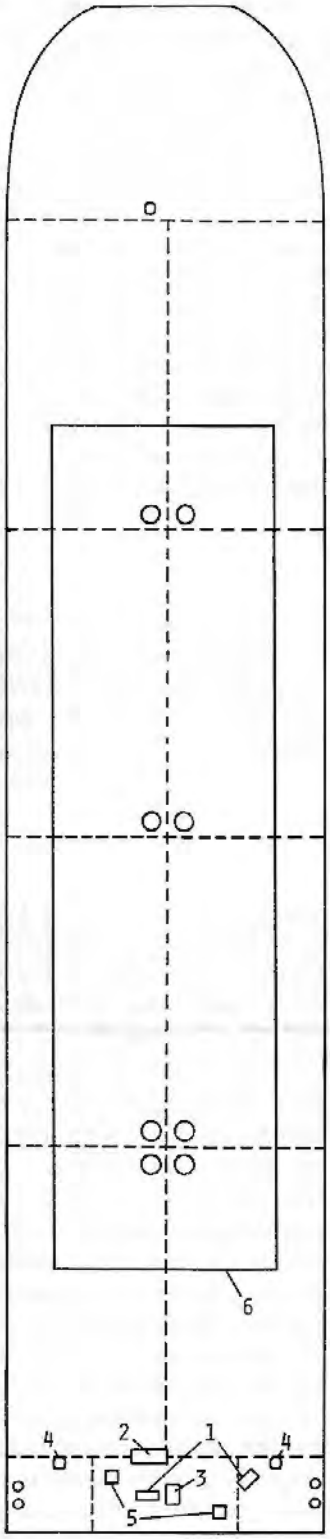
At midnight, the mate relieved the captain at a position approximately 5 miles northeast of Windmill Point Light. Upon relieving, the mate checked the barge visually. It was riding well and running lights were visible. The tug was also riding well. Visibility was good, there were no seas coming over the bow, no ice had formed. The weather was as forecast.

The early portion of the watch was uneventful. At 2:30 a.m. Chesapeake Channel Lighted Bell Buoy 48 was abeam. The weather was then worsening, with heavy snow and visibility reduced to ¼ to ½ mile. At 3:00 the deckhand on watch looked out the engineroom scuttle hatch and saw that the barge was not riding directly behind the tug. He attributed this to the weather conditions. At this same time, some spray was coming over the bow of the tug. A short while later, he again attempted to check the barge, but visibility was almost zero due to the heavy snow.

At 3:30 the mate logged, "Last I seen barge lights"; however, the barge was still visible on radar. The weather continued to worsen. During the next half hour, the mate heard the broadcast of the National Weather Service forecast revised as of 1:00 a.m. to include gale warnings for the Bay, to be effective at 5:00 a.m. Winds were to be 25 to 30 knots northwest with stronger gusts. Reports of actual weather conditions as observed by other vessels in the area at the time indicate that the weather was much more severe than predicted. Between 4:00 and 5:00 a.m., there was a sudden sharp drop in barometric pressure, with winds increasing to approximately 70 to 80 knots for a short period.

Just before 4:00 the mate woke the captain and informed him of the weather. At this time, spray was coming over the bow of the tug and freezing, and seas were 5 to 6 feet. There was no ice in the water. They decided to head in toward the western shore to get in the lee of the land, rather than cross the mouth of the Potomac River. The mate returned to the wheelhouse and changed to a generally northwesterly course. The 4:00 position was logged as 3¾ miles from Smith Point Light.

At approximately 4:30 the mate mentioned to the deckhand that they were not making headway. He was not sure what the problem was, but attributed it to high winds and heavy seas. The engines remained on full throttle. At 5:40, logbook entries



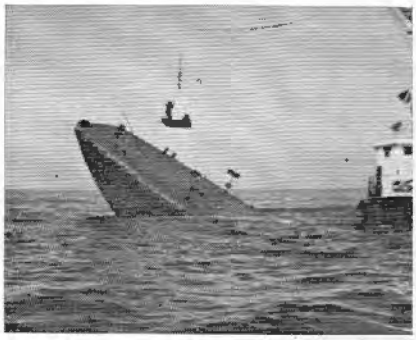

The *STC-101* is a 20,000-bbl. capacity, 1223-gross-ton tank barge built in 1956 and certificated for carriage of Grade B cargoes. It is compartmented as follows: a forward rake compartment; eight cargo tanks numbered 1 through 4, port and starboard; and an aft rake divided into three compartments—a port and starboard void and a center compartment used as a pumproom. Two diesel-driven cargo pumps (1) are located on the deck over the aft rake, port and starboard. There is a 500-gallon fuel tank for the pump engines on deck aft (2). The volume of the pumproom, which contains only cargo piping and valves, is approximately 50% of the entire aft rake. Access is through a hatchway (3) with a watertight door. Access to the port and starboard voids is through manholes (4) fitted with dogged covers.

There are vents on either side of the pumproom hatchway which ventilate the pumproom, each consisting of a 14" x 14" opening in the deck, fitted with an L-shaped hood (5). The openings in these ventilator hoods face outboard and were reportedly fitted with dogged, watertight covers.

The center portion of the deck area is enclosed by an 18-inch-high coaming (6). This spill containment area is drained by one 4-inch threaded drain port in each corner of the coaming. These drain ports are closed by pipe plugs and were so closed at the time of the casualty. Each expansion trunk has a small ullage opening, a pressure-vacuum relief valve for venting the cargo tank, and a manhole opening to provide access to the cargo tank. These manhole openings are fitted with watertight covers which are hinged on the outboard side and secured in the closed position by four dogs on each cover.

stated, "3¾ miles from shore and 3¾ miles from Smith Point, heavy seas and snow."

At 6:00 a.m. the captain came on watch and was informed that no headway was being made. A few minutes later, the snow lessened and the captain directed the tug's searchlight onto the barge. He saw that the bow was high out of the water, and realized that the barge was either sinking or had already sunk by the stern. He immediately called his office by radio and asked for instructions. He was told to keep the barge on the hawser. At about the same time the tankerman was awakened and told that the barge had sunk. A towing company official notified the



Coast Guard Marine Safety Office at Hampton Roads of the situation at 6:25 a.m. and requested assistance. A short time later, however, it was determined that no assistance was necessary.

At dawn the barge could be seen with about 30 to 40 feet of bow above the water, facing westerly and pointing up at an angle of about 30°. Around 9:00 that morning, with winds northwest at 20 to 25 m.p.h. and gale warnings still in effect, a barge company helicopter surveyed the area. A small amount of oil was seen and the Coast Guard at Hampton Roads was informed. The company immediately hired a cleanup contractor to make pollution abatement equipment available, and to assist in salvage operations. At 3:00 p.m. gale warnings were discontinued, and at 8:30 that night a Coast Guard investigator from Hampton Roads met with contractor representatives near the site. The Coast Guard remained in the area monitoring the salvage and pollution abatement operations.

The logbook of the *Falcon* for Tuesday, 3 February 1976, reads in part: "0650—Everything still the same. 1220—Put white light on barge. Oil slick around barge is lube oil and diesel. No black oil." Early in the afternoon, a pollution survey was completed by Coast Guard helicopter, during which the investigator noted a sheen in the vicinity of the barge. At 6:00 p.m. the *Falcon* again logged "everything still the same."

***"The barge was grounded along the entire breadth of the after rake. . . ."***

During the morning of Wednesday, 4 February, an oil boom was set around the bow of the barge. Shortly after noon, the salvors released the hawser that had connected the tug and barge, and at 4:00 p.m. an underwater survey was begun by hard hat with voice communication to the surface.

The diver descended along the centerline pipe, checking all barge openings, as the salvage master was depending upon the buoyancy of the oil to assist in the raising operation. As he descended, he found all of the cargo tank expansion trunk hatches on the port side undogged and wide open; the No. 4 starboard hatch was undogged but closed; and the other three expansion trunk hatches on that side were closed, but not all dogs were in place. At this time, he closed all open hatches and secured all dogs in the proper position, finding that he had to loosen the unsecured dogs prior to fitting them on the hatch covers. All dogs which were in place were checked as slight amounts of oil were noted seeping past the gaskets of some of the closed hatches. Several of the dogs were found not completely tight, and the diver tightened these securely. No oil was seen coming from the tanks which were wide open. By the time he emerged, the diver's suit was covered with heavy oil from feeling has way around.

The tankerman did not become aware that some of the cargo tank hatches were found open until the next morning, and the Coast Guard was not informed of the fact prior to an interview with the diver on 20 February.

A second dive was made on Thursday morning, 5 February, using a descent line to the stern of the barge. At this time, the diver checked the hatches to the void in each corner of the stern rake and the watertight door to the trunk leading into the pumproom. All were closed and dogged tight. The vent to the port side of the pumproom was found lodged under some of the piping near the 14-inch square hole in the deck over which it had been fitted.

The diver also found damage to the shell of the barge. The deck port side aft was set down, the port deck knuckle near the stern was crimped, and the port side shell in way of the stern void was set in approximately 1 foot. The barge was grounded along the entire breadth of the after rake, and the deck at the stern was only about 3 to 4 feet off the bottom, which was hard, mostly sand and some mud. At 1:00 p.m. a chain sling was placed under the stern. The derrick *Cape Fear* began lifting operations at 5:00, but as a strain was taken, a shackle failed and operations were secured for the night.

At 8:00 the next morning wire rope slings were passed around the bow and lowered to the stern. But as

lifting began, the barge started to move. It was immediately set back down and the *Cape Fear* repositioned. On the second attempt, the barge came up. At 3:00 p.m., its stern now near the water's surface, the barge was moved to shallower water in the Great Wicomico River, and the bow was intentionally grounded at 5:30 p.m. There was then 18 to 19 feet of water at the stern.

About 6:00 p.m. voiding of the pumproom began. An opening into the top of the hatchway had been cut to facilitate pumping, and a plywood patch was clamped over the ventilator opening. The starboard void was opened for pumping around 6:45. The port void was opened about 45 minutes later, but it still had some air in it and so was immediately closed. Pumping continued until about 4:00 a.m. the next morning. At this time, the barge was listing to starboard with the deck on the starboard side slightly awash.

On Saturday morning, 7 February, the tanks were opened and gauged. The level of the contents of all tanks appeared unchanged from completion of loading at Yorktown, with the exception of No. 4 port tank which was ¼ full of an oily water mixture. Oil was gravitated from No. 1 starboard tank to No. 4 port to help correct the list. It was found that the internal bulkhead from the No. 4 port tank to the port void was ruptured and leaking. Also, port and starboard pumproom longitudinal bulkheads were bowed into each void and were ruptured and leaking; the after transverse bulkhead of No. 4 port tank was bowed into the port rake; the deck on the starboard side aft was set down. Another underwater survey was conducted nsing scuba gear, and a small crack in the port void bilge knuckle was plugged with oakum and wedges. The bottom plating, port side aft in way of the port void and No. 4 port tank was found to be set up 2 to 3 feet. It was similarly set up several inches on the starboard side aft. All on-scene observers agreed that none of the damage was caused by the salvage operation.

On Saturday afternoon, the barge was afloat and the final inspection was made. Everything appeared satisfactory. Throughout the week little oil had been seen on the surface of the water; nevertheless, the barge had been boomed during the entire operation.

During the salvage operations, independent interviews of the tankerman were conducted by representatives of two different underwriters. Each later stated that the tankerman had admitted that he had secured only one dog on each hatch, which he maintained was common practice. The guidelines in the Manual for Safe Handling of Inflammable and Combustible Liquids (CG–174) indicate that "all tank top covers must be checked for tightness, and the ullage covers should be dogged." (Paragraph 3.5.5). There are no specific requirements in this regard in the Tank Vessel Regulations applicable to Grade B tank barges.

***"During the next 5 days oil . . . was found along both the eastern and western shores of the Bay."***

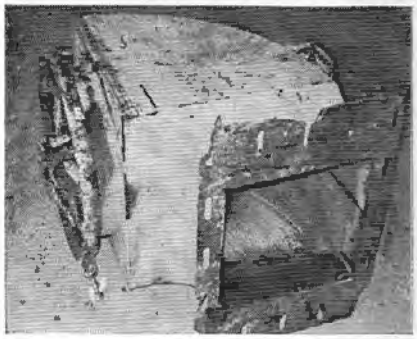
At 4:20 p.m., with the wind at 10 to 15 knots, calm sea, and predicted good weather, the tug *Falcon* took the *STC–101* in tow for Baltimore. The derrick *Cape Fear,* under tow by two tugs, followed the barge up the Bay. Clearance was obtained from the Coast Guard before the barge was permitted to proceed and hourly location and situation reports were made to the Coast Guard enroute. The convoy arrived at Baltimore in the early afternoon of Sunday, 8 February. Subsequently, the oil was transferred to shore tanks and it was determined that nearly 6,000 barrels had been lost.

The first significant amounts of oil in the Bay had been sighted on 4 February in shallow water off the western shore near the sunken barge's position. During the next 5 days, oil which chemical analysis showed to be the same as that carried on the *STC–101* was found along both the eastern and western shores of the Bay. Heavy deposits were scattered on the eastern shore beaches over a linear distance of 15 miles, and deposits of varying concentration were found on the western shore for a linear distance of 24 miles.

It is believed that the thick oil escaping from the barge congealed upon exposure to the cold water and drifted suspended in large globules beneath the surface of the Bay. The turbulence of the water at the time made detection of the submerged oil even more difficult. These globules eventually drifted into shallow water which was then heated during a period of unseasonably warm weather, causing the oil to soften and spread. Cleanup operations continued over a period of 6 weeks until 18 March.

On 20 February the barge proceeded to Norfolk for drydocking and survey. Examination of the port pumproom vent hood indicated that it was bolted at the flange, not welded. A piece of one wasted bolt was found in the deck portion of the

flange. The matching hole on the vent hood flange was not damaged. Another piece of a bolt was found on deck which was the same type as the one found lodged in the flange. As this second bolt was found on the deck of the barge many days after the barge had been raised, it could not be definitely ascertained where it had come from. However, it was identical in appearance even to the areas of corrosion to the bolt found in the deck portion of the flange. Both of these bolts were brass and were extensively deteriorated. This deterioration occurred at about mid-length of the bolt, an area which would have been inside the holes in the flanges when the bolt was installed.



Some wastage was noted on the outboard side of the port vent flange, but the wastage on the remaining three sides was not significant. The cover for the open end of the vent hood was missing. This cover was hinged at the top and secured by four dogs. Examination of the dogs showed the two upper ones servicable; however, of the lower two, one was missing and the other broken in half and frozen. Prior to the barge's departure from Baltimore all openings were required to be shut, and at this time it was discovered that the starboard pumproom vent hood cover was not dogged. Difficulty was experienced in attempting to close it as all dogs were stiff.

Subsequent to the initial investigation of the casualty conducted at Baltimore, the staff of the Commander, Fifth Coast Guard District, performed calculations on buoyancy and stability for the *STC–101*. The initial calculations indicated that with the barge loaded as it was when it left Yorktown, flooding the pumproom and filling the oil pollution prevention spill rails would cause the barge to sink by the stern until the stern came to rest on the bottom, or until equilibrium was reached with the barge floating with the bow almost vertically above the stern. More refined calculations, however, using a standard Coast Guard computer program indicated that the condition described would cause the barge to assume a position of equilibrium with the stern just beneath the surface. Additional impetus would be required to sink the barge. This could have been provided by the sea state. The effects of the static weight and dynamic forces of boarding waves cannot be quantified; however, calculations show that increasing the draft of the barge (i.e., increasing the weight) just 2½ inches beyond the draft attained by flooding the pumproom and filling the spill rails would cause the barge to be unstable. Additional calculations indicate that when the barge is trimmed by the stern to an angle of about 7° from the horizontal, cargo contained in port and starboard Tanks 1, 2, and 3 would reach the top of the hatch coamings on the expansion trunk. This would permit cargo to flow through any open hatches.

***"A piece of one wasted bolt was found in the deck portion of the flange. . . . The cover for the open end of the vent head was missing."***

An independent consulting naval achitect was employed by the barge owners to perform similar calculations. He stated during the investigation at Baltimore that his tentative conclusion was that with a full pumproom, the barge would sink. The consultant had been the Chief Marine Engineer at Dravo Corporation at the time the *STC–101* was built by that company.

### Conclusions

Among the conclusions and recommendations submitted by the Coast Guard investigating officers on the case were the following:

(1) The cause of the sinking of the barge's stern was the entry of water into the pumproom coupled with the entrapment of large amounts of water inside the pollution prevention coamings on deck. These factors reduced the stability of the barge to the extent that the static and dynamic effect of boarding seas caused the vessel's stern to sink to the bottom.

(2) The water entered through the pumproom port vent either because of a missing vent hood cover or because the entire vent had been carried away, or a combination of both.

(3) The severely adverse sea conditions consisting of 5- to 6-foot boarding seas may have been sufficient to dislodge a poorly dogged vent cover, thus exposing the pumproom to flooding. If the cover had been torn away, the resultant exposed area would have allowed tremendous quantities of water to enter the space quickly.

(4) It cannot be established exactly when the hood carried away. This could have occurred before, during or after the actual sinking of the barge's stern. If it carried away before the sinking, the failure of the somewhat deteriorated bolts which fastened the hood to the deck flange may have been a contributing factor. Had this deterioration been detected and the bolts replaced, the potential for the hood carrying away would have been reduced. On the other hand, a visual inspection with the bolts installed in the flange would not

have revealed the deterioration, and removal of such fastenings for inspection is not normal practice.

(5) The freeboard and stability of the barge would be decreased during periods of boarding seas because of the entrapment of a large amount of water inside the oil pollution prevention coamings on deck, whether or not the associated drain plugs were in place.

(6) The severe weather conditions encountered are directly related to the sinking. They were much more severe than had been forecast and arrived well ahead of the predicted time.

(7) The structural damage to the hull of the barge was caused by a combination of hydrostatic and dynamic pressure as the barge sank and eventually struck the bottom.

(8) The testimony of the tankerman at the formal investigation to the effect that the cargo hatches were securely dogged, with the exception of two or three dogs which were in need of repair, is rejected as being self serving. He told two underwriter representatives that he secured only one dog per hatch, as is customarily done. This admission, made many days before the convening of the Coast Guard investigation, is considered to be much nearer the truth. It is therefore concluded that the cargo hatches were not completely secured when the barge left Yorktown, and that this condition led to the spillage of a considerable amount of cargo.

(9) There is evidence that the tankerman was negligent in that he did not secure the cargo hatches by closing and tightening all four dogs on each hatch. This probably contributed to the resulting oil spill.

(10) As indicated by the buoyancy and stability calculations, the barge's stern may have sunk to a point at which the angle of the barge was greater than 7° but at which the stern was not actually in contact with the bottom; the barge could have been towed for some distance in this attitude. It is also possible that the barge's stern did sink to the bottom and was dragged along for some undetermined distance before it completely stopped the forward progress of the tug. These possibilities could explain the wide dispersal of oil along the eastern and western shores of Chesapeake Bay for linear distances of as much as 23 miles. In other words, the cargo could have started leaking when the angle of trim reached 7° from the horizontal and could have continued to leak intermittently or continuously as the tug and barge progressed some distance up the Bay.

(11) There is evidence of violation of law, 33 USC 1321, in that oil entered the Chesapeake Bay as a result of this casualty.

***"There is evidence that the tankerman was negligent. . . . This probably contributed to the resulting oil spill."***

### Recommendations

(1) It is recommended that further investigation be initiated under the Suspension and Revocation Proceedings in the case of the tankerman, concerning his part in this incident.

(2) Since the tank vessel regulations are silent with respect to securing hatches and vents on a Grade B tank barge before leaving a loading dock, it is recommended that those regulations be reviewed for adequacy in this regard.

(3) It is recommended that the necessity for close examination of venting arrangements on tank barges be further emphasized within the Coast Guard as well as industry.

(4) It is recommended that the Coast Guard reevaluate the need for reserve freeboard requirements on inland barges with routes involving large bodies of water. It is also recommended that the effects of free-surface water in the enclosed oil prevention coamings on tank barge stability and reserve buoyancy be evaluated.

### Commandant's Action

The Commandant approved the report of the investigation, subject to the following comments.

The foundering of the *STC-101* appears to have occurred in the following way. The barge was initially loaded with cargo to an average freeboard of about 15 inches, trimmed 6 inches by the stern. Ordinarily, this loading should not be regarded as unusual. The vessel, built in Delaware in 1956, very likely made a great number of voyages in the Chesapeake Bay under similar loaded conditions. In 1971 the 18-inch-high coaming around the cargo tank trunks was added. Under most conditions the four 4-inch-diameter drains which were fitted should have been sufficient to release water entrapped by the coaming; however, on this occasion the drain ports were left closed by responsible operating personnel. This, coupled with the heavy weather, permitted boarding seas to partially fill the containment area within the coaming. Further trimming by the

(*Continued on page 194.*)

# Preparation Minimizes Effects of Oil Spill

by B. Macfarlane
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*The following was the text of a presentation before the joint meeting of the Marine and Petroleum Sections of the National Safety Congress and Exposition, September 30, 1975, as reprinted in the National Safety Council "Safety Newsletter" of September 1976.*

In February 1974, a tanker collision at Mobil's Paulsboro refinery resulted in a major oil spill.

This review of events following the accident will illustrate what can happen in an oil spill, bring out some of the problems, and, based on our experience, make recommendations which may be applicable to a broader spectrum of disasters.

The Paulsboro refinery is located on the Delaware River in a highly industrial area near Philadelphia. On February 19, 1974, the *Mobil Athos,* an 85,000-ton Mobil tanker was securely moored at the refinery dock. She was discharging her cargo of Nigerian crude and taking on bunker fuel. At 12:35 p.m., the *Notre Dame Victory,* another 85,000-ton tanker owned by a small shipping company, rammed the *Athos.* The force of the collision punctured one of the *Athos'* bunker fuel tanks and moved the *Athos* inshore, completely demolishing the breasting dolphins, loading platform, and finger pier of our No. 1 berth.

The *Athos* was, of course, entered in *Tovalop,* and immediately undertook its responsibility to prevent and/or mitigate pollution damage.

The Paulsboro refinery was prepared to cope with an oil spill. An oil spill contingency plan (OSCP) had been prepared, and this dock was equipped with spill containment booms and a deployment boat. How effectively this plan operated under the conditions created by this accident can best be shown by a chronological description of the *Athos* spill.

The first step of the OSCP—stop the oil flow—was accomplished within three minutes of the collision.

The area that had once been our No. 1 berth was essentially void of any structure. All that remained visible were the remains of two of the five unloading arms and the lines running out to the berth drooping into the water. The boat house and boom deployment boat, which had been located on the pier, were at the bottom of the river.

Due to the loss of our boat, we were unable to deploy the boom. Therefore, an oil spill cleanup contractor, identified in the OSCP, was notified at 12:45 p.m. Within 30 minutes, the contractor's personnel and equipment were on the scene, deploying boom to contain the oil in the immediate vicinity of the *Athos.*

The Coast Guard, responding to our notification of a spill, arrived at 1:20 p.m. At 2:15 p.m., after completing a survey of the damage, the Coast Guard advised us of the extent of the vessel damage and the location of a pool of bunker fuel in the cove west of the dock, which was initially estimated to be about 20,000 gallons.

At 2:30 p.m. an additional contractor's boat arrived; the refinery's on-shore coordinator and the contractor supervisor surveyed the area described by the Coast Guard and located the pool in the cove. Because of the tide and easterly wind condition, it was decided to deploy a boom at Crab Point on the west end of the cove to catch the moving pool. This site was one of 13 locations for boom installation and oil pick-up identified in OSCP. Installation of this boom was begun at 3:30 p.m. as storm conditions began to develop.

### Wind Changed

By 4:30 p.m., the wind had switched to the south and the velocity had increased to 28 mph, gusting to 30mph. This change drove the oil out

into the channel and down river. Heavy rains accompanied the strong winds into the evening.

The exact quantity of fuel lost from the punctured bunker tank was subsequently ascertained to be about 280,000 gallons. Crude spillage was later determined to be 42,000 gallons; this crude oil dissipated quickly and did not present any cleanup problems.

The cleanup was greatly complicated because bunker fuel—a heavy residual fuel—was involved, as opposed to crude oil. At noon the next day we received a report from Sun Shipyard that oil was in their dry dock and surrounding area. No report of any other oil had been given to us by the Coast Guard, and to our knowledge no overflight had been made to locate the oil. At 3 p.m., we decided to obtain a helicopter and make an extensive river survey. Photographs were taken and the locations of oil deposits were charted. During this same time, a Coast Guard helicopter made a similar flight with similar findings. The *Athos* bunker oil had been deposited by the tides and high winds along 12 miles of New Jersey shoreline rocks and beaches, 8 miles of Pennsylvania shoreline, 3 islands, and 8 marinas in Essington, Pennsylvania.

Due to the magnitude of the spill, the U.S.C.G. Atlantic Strike Force was called in by the Captain of the Port to provide technical assistance.

During the next three months, extensive cleanup activities were undertaken. Six refinery personnel were assigned to the task of supervising the cleaning up of the river to the satisfaction of the Coast Guard. To minimize the time required, six oil spill cleanup contractors were retained. The contractor work force during this time averaged about 235 men.

The cleanup can best be characterized by activities at four of the major work sites:

1. On Tinicum Island and nondeveloped shore areas, large quantities of oil were deposited. On this two-mile-long narrow island, oil deposits were in one area up to eight inches thick. The island shoreline is typical of large stretches of the river—a sandy, shallow, sloping shore loaded with river debris. These areas commonly had an oil coating of up to three inches thick at the high water mark and on the debris.

We were directed by the Coast Guard to remove the oil-soaked sand and debris from these stretches of shoreline. In most areas, front-end loaders were used to remove this material, which was then hauled away by dump trucks to a landfill site. In some areas, access roads had to be made to carry out this operation.

### Unique Problems

Tinicum Island, however, presented unique removal problems. Small loaders were ferried out to the island to stockpile the oiled sand and debris. An amphibious duck was later used to haul an estimated 1,500 yards of material ashore. Debris and oil-soaked sand removed from all cleanup sites totaled 34,000 yards. Only one landfill site that would accept this material could be located in the immediate two-state area. The disposal of oil spill debris could well be a serious problem in any future spill cleanup.

2. At Sun Ship, Chester, Pennsylvania large quantities of oil were found in the 16 abandoned wood shipways. At the direction of the Coast Guard, free oil and debris was removed. The oil-contaminated debris and the top covering of the shipways were removed for access to the site. Oil on the old pilings was allowed to remain since it had weathered sufficiently and would not cause further pollution. To prevent oil migration during the cleanup, 4,000 feet of boom was installed.

3. On the Rock Shore areas, several miles of the shoreline involved consisted of riprap. These rocks and the entrained debris were coated with oil. After removal of the debris, the Coast Guard allowed the oiled rocks to remain. The oil had weathered to a hard coating that was not leaching and would present no further threat to the environment.

4. Fortunately, the Delaware River in this area is primarily an industrial river and public areas were not badly affected. One of the few public areas contained a city park, a motel-restaurant, and eight boat marinas. Oil deposition in these areas was light, but unsightly.

High pressure water guns were used to clean the seawall, motel pilings, and some of the marina areas. Careful attention was paid to realistically restoring all of the public property affected by the spill.

The *Athos* story would not be complete without a brief discussion of waterfowl involvement. By February 21, it became obvious on our helicopter flights that many ducks were oil coated and were in trouble. Dr. Phillip Stanton, director of the Wildlife Rehabilitation Center in Upton, Mass., was brought in as a consultant. On February 22, Dr. Stanton surveyed the marsh areas along the Delaware River and determined that at least 800 to 1,000 ruddy ducks had been oil coated.

Dr. Stanton contacted the various state and federal officials and established a duck recovery and cleaning program. Under his direction, two collection stations were established—one in New Jersey, and one in Pennsylvania. The crated ducks were transported to a federal wildlife station for cleaning and rehabilitation. Mobil provided the logistics support for this program that lasted until March 2. During this time, over 1,600 ducks were taken to the wildlife center.

Wildlife involvement in an oil spill has a high public sensitivity. We feel that if we had not taken this timely and positive action through Dr. Stanton, much inflammatory negative publicity to the oil industry as a whole would have resulted.

### Recommendations Given

As a result of our experiences, we would recommend that anyone involved in marine oil movements have a well thought-out oil spill contingency plan. Some portions of our plan that we found very beneficial, or that we have incorporated include:

1. A list of qualified contractors and their capabilities.
2. Set procedures for obtaining a helicopter for surveillance if any questions as to the extent of the spill exist.
3. Approved dump sites for oily debris should be identified.
4. A survey of the surrounding area should be made to identify potentially sensitive areas, such as power plant water intakes, boat marinas, recreational facilities, or wildlife areas. Plans should be made on how to protect these areas from oil spill damage.
5. If wildlife involvement is probable, procedures for handling rehabilitation should be determined.
6. Preselection of boom deployment sites should be made based on protection of sensitive areas, currents, and prevailing winds. Knowing the quantity of boom required, anchor points, deployment angle, and guides for night installation will assist in rapid containment action.

The following equipment was or would have been valuable in the spill cleanup activities:

1. Small portable radios to provide close communication between shore and boat crews, helicopter and ground personnel, and for coordination of cleanup supervision in remote areas.
2. We believe our new boom deployment boat, a 14 x 26 foot, flat-top trimaran has the characteristics which are needed for our facility, adequate power to tow long sections of boom at a reasonable speed, high maneuverability to allow close work, ability to carry up to 2,000 feet of boom on board, and good stability in rough water.
3. A locally mounted wind direction and speed indicator to help predict spill movement.
4. A small tape recorder and camera to keep track of important facts and events during the cleanup. This documentation and photographic record will help if any complications arise at a later date.

Development of an excellent contingency plan and the provision of the best equipment is not the full answer. To complete the picture, the members of the spill response team who will use this equipment must be thoroughly trained. At Paulsboro, supervisors who might be required to direct oil spill containment and cleanups have attended a Mobil course in oil spill prevention and control. This training is then passed on to the response team in practice sessions. ⚓

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# Oil in the Bay

(*Continued from page 191.*)

stern was caused by the flooding of the pumproom, most probably, initially, through the unsecured vent, and later through the deck opening when the port pumproom vent was carried away. As the stern of the barge submerged, increasing external pressure caused the internal bulkheads to rupture leading to flooding of the voids in the after rake. The combined loss of reserve buoyance aft was sufficient to sink the stern of the barge to the bottom.

The Commander, Fifth Coast Guard District, has initiated further investigation under the administrative penalty procedures concerning the evidence of violation of 33 USC 1321.

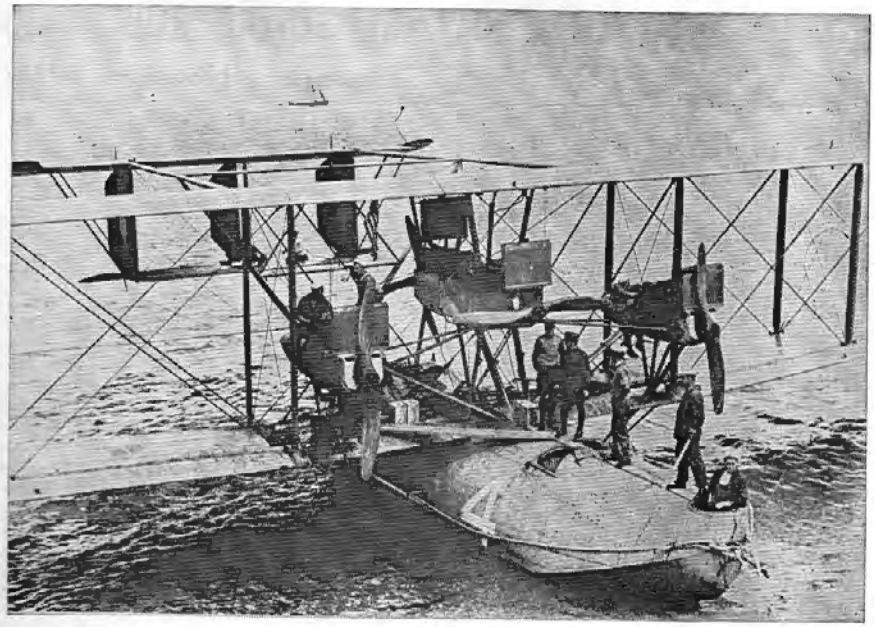
With respect to recommendation (2), an amendment to the Code of Federal Regulations to include requirements for ensuring that all hatches, vents and other closures on tank barges are properly secured while underway will be proposed.

With respect to recommendation (3), a contributing cause of the structural failure of the port pumproom vent was due to the hidden deteriorated condition of the bolts used to secure the vent to the deck. Additionally, the dogs to both the port and starboard vent covers were poorly maintained. In this regard information concerning the necessary maintenance and potental hazards associated with compartment ventilation and attendant closure devices will be disseminated to Coast Guard personnel and the marine industry.

With respect to recommendation (4), reserve freeboard needs and, specifically, general survivability criteria for inland barges are being considered as part of an overall evaluation of construction and design standards of these barges. It is noted that the *STC-101* possessed greater compartmentation in the stern area than is typical of inland barges.

With respect to the 18-inch-high coaming, the Coast Guard is in the process of drafting regulations limiting the height and volume of the cargo spillage containment area to preclude trapping large amounts of water on deck as well as avoiding large free-surface areas which can impair stability. ⚓

# Heritage



As the article in this space in the June issue showed, the Coast Guard has been involved with aviation literally since its inception. In the first quarter century of the history of powered flight, two events are almost universally known. One, of course, was Orville Wright's first flight at Kitty Hawk, the familiar—and only—photograph of which was taken by a member of the Kill Devil Hills Lifesaving Station. The second event was Lindbergh's trans-Atlantic flight in 1927. Though Lindbergh's was the first *solo* flight, he was not the first to cross the Atlantic by airplane. That honor had gone 8 years earlier to the five-man crew of a Navy plane whose senior pilot was the first Coast Guard aviator.

Lieutenants Elmer F. Stone and Norman B. Hall were early advocates of aircraft use for search and rescue operations. In 1916, Stone and five others attended the Navy Aviation School at Pensacola, Florida, while Hall studied aviation and engineering at the Glenn Curtiss Company, which was providing the seaplanes used by these early aviators. In that same year, Congress, recognizing the potential of the airplane, authorized the establishment of 10 air bases to be situated on both coasts and the Great Lakes. However, no money was appropriated.

The entrance of the United States into World War I put a damper on Lieutenant Stone's vision of search and rescue aircraft, as Coast Guard aviators were assigned to the Navy for the duration. Stone was attached to the Bureau of Construction and Repair where he earned a reputation as a skillful and daring test pilot.

After the War the aviation industry burgeoned and the race was on to be the first to cross the ocean. The "Atlantic Air Sweepstakes" began when the Navy prepared three seaplanes for the attempt. They were the NC–1, NC–3, and NC–4, Curtiss aircraft with four high-compression Liberty engines, 126-foot wing spans, and wireless sets with a 350-mile range. Each plane carried a crew of five: a commanding officer who was also the navigator, two pilots, a radioman, and an engineer. The Navy stationed 21 destroyers along the intended route to insure the safety of those attempting the crossing.

On May 8, 1919, the three aircraft left Rockaway, New York, and flew to Halifax. There the NC–4 almost ended its trip before it even started when one of its engines failed, but the crew worked night and day installing a replacement and the plane was able to continue.

The actual crossing began on May 16 when the seaplanes left Newfoundland for the Azores. Circumstances soon became perilous for the crews of the NC–1 and NC–3. The NC–1 was forced down and sunk by bad weather, but the crew was rescued by one of the destroyers along the picket line. The crew of the NC–3 also were forced to ditch their plane and drifted for two days before being picked up.

But the NC–4, commanded by Navy Lieutenant Commander A. C. Reade and piloted by Lieutenant Stone, survived the bad weather and finally landed in the Azores, 15 hours and 5 minutes after leaving Canada. The last leg of the flight was to Plymouth, England, where the NC–4 landed on 31 May, thus becoming the first to successfully complete a trans-Atlantic flight. The trip had covered 3,925 miles and 57¼ flying hours.

This historic accomplishment did much to open up the field of aviation and helped Stone to realize his major ambition, the acceptance of aircraft by the Coast Guard. In 1925 Congress finally provided the appropriations for the Coast Guard to purchase its first planes. On May 23, 1930, Lieutenant Stone was presented the Medal of Honor for extraordinary achievement for his part in the first Atlantic crossing.

Since that postwar flight the Coast Guard has utilized aircraft to an ever greater degree in its mission of search and rescue, and a great deal of the credit for this expansion must be given to Lieutenant Elmer F. Stone, one of aviation's pioneers. ⚓

# COAST GUARD RULEMAKING

## (Status as of 1 November 1976)

| | Notice of proposed rulemaking | Public hearing | Deadline for comments | Awaiting final action | Withdrawn | Published as rule | Effective date |
|---|---|---|---|---|---|---|---|
| **BOATING SAFETY** | | | | | | | |
| Lifesaving devices on white water canoes & kayaks (CGD 74-159) comment period extended 6-12-75 | 2- 4-75 | ..... | 7-15-75 | X | ..... | ..... | ..... |
| Standards for flotation (CGD 75-168) | 4-29-76 | ..... | 7-30-76 | X | ..... | ..... | ..... |
| Safe loading and flotation standards (CGD 75-176) | 5- 6-76 | ..... | 6-21-76 | X | ..... | ..... | ..... |
| Low- and non-powered boat capacity (CGD 74-268) | 6-24-76 | ..... | 8-24-76 | X | ..... | ..... | ..... |
| Safety standards for boat gasoline fuel systems (CGD 74-209) | 9-30-76 | ..... | 12- 1-76 | .... | ..... | ..... | ..... |
| Visual distress signals on boats (CGD 76-183); Advance notice | 9-27-76 | ..... | 2- 1-77 | .... | ..... | ..... | ..... |
| Standards for electrical systems (CGD 73-217) | 10- 4-76 | ..... | 12- 1-76 | .... | ..... | ..... | ..... |
| **BRIDGE REGULATIONS** | | | | | | | |
| Fox River, WI (CGD 75-035) | 2- 6-75 | ..... | 3- 7-75 | X | ..... | ..... | ..... |
| Mystic River, MA (CGD 75-053) | 3-27-75 | ..... | 4-29-75 | X | ..... | ..... | ..... |
| West Palm Beach Canal, FL (CGD 75-070) | 3-27-75 | ..... | 4-29-75 | X | ..... | ..... | ..... |
| Norwalk River, CT (CGD 75-216) | 11-21-75 | ..... | 12-31-75 | X | ..... | ..... | ..... |
| Lake Shamplain, VT (CGE 75-222) | 12- 8-75 | ..... | 1- 9-76 | X | ..... | ..... | ..... |
| Missouri R. IA (CGD 75-244) | 2-26-76 | ..... | 3-12-76 | X | ..... | ..... | ..... |
| Mitchell River, MA (CGD 76-014) | 2-19-76 | ..... | 4- 5-76 | X | ..... | ..... | ..... |
| Menominee River, WI (CGD 76-069) | 4-22-76 | ..... | 5-25-76 | X | ..... | ..... | ..... |
| Bayou Teche & Bayou Plaquemine, Brule, LA (CGD 76-093) | 5-27-76 | ..... | 6-29-76 | .... | ..... | 9-16-76 | 10-18-76 |
| Bayou Lafourche, LA (CGD 76-077) | 6-14-76 | ..... | 7-20-76 | X | ..... | ..... | ..... |
| Sabine Lake, TX (CGD 76-112) | 6-24-76 | ..... | 7-26-76 | X | ..... | ..... | ..... |
| Clear Creek, TX (CGD 76-111) | 6-24-76 | ..... | 7-30-76 | .... | ..... | 9-16-76 | 10-18-76 |
| Dodge Island, FL (CGD 76-139) | 8- 2-76 | ..... | 9- 7-76 | X | ..... | ..... | ..... |
| Presumpscot River, ME (CGD 76-135) | 8- 2-76 | ..... | 9- 7-76 | X | ..... | ..... | ..... |
| Black River, MI (CGD 76-138) | 8-23-76 | ..... | 9-28-76 | X | ..... | ..... | ..... |
| Atchafalaya River, LA (CGD 76-168) | 8-30-76 | ..... | 10- 1-76 | X | ..... | ..... | ..... |
| Coffee Pot Bayou, FL (CGD 76-177) | 9- 2-76 | ..... | 10- 5-76 | X | ..... | ..... | ..... |
| Columbia River, WA (CGD 76-172) | 9- 2-76 | ..... | 10- 5-76 | X | ..... | ..... | ..... |
| Curtis Creek, MD (CGD 76-176) | 9- 2-76 | ..... | 10- 5-76 | X | ..... | ..... | ..... |
| Mokelumne River, CA (CGD 74-140) | 9- 2-76 | ..... | 10- 5-76 | X | ..... | ..... | ..... |
| Weymouth Fore River, MA (CGD 76-175) | 9-23-76 | ..... | 10-29-76 | X | ..... | ..... | ..... |
| Oakland Inner Harbor Tidal Canal, CA (CGD 76-119) | 10-28-76 | ..... | 11-30-76 | .... | ..... | ..... | ..... |
| Cheboygan River, MI (CGD 76-160) | 10-28-76 | ..... | 11-30-76 | .... | ..... | ..... | ..... |
| **MARINE ENVIRONMENT AND SYSTEMS (GENERAL)** | | | | | | | |
| Pipelines, lights to be displayed (CGD 73-216) | 9-19-74 Corrected 10-18-74 | 10-21-74 | 11- 4-74 | X | ..... | ..... | ..... |
| Visual identification of tank barges (CGD 75-093) | 2- 5-76 Corrected 2-23-76 | ..... | 3-16-76 | X | ..... | ..... | ..... |
| Anchorages, Port of New York (CGD 74-194) | 3- 1-76 | ..... | 4-15-76 | .... | ..... | 8-26-76 | 10-1-76 |
| Anchorages, Boston Harbor, MA (CGD 76-40) | 3-29-76 | ..... | 5-14-76 | X | ..... | ..... | ..... |
| Navigation safety regulations (CGD 74-77) | 5- 6-76 Corrected 5-13-76 | 6-11-76 Wash. 6-17-76 San Fran. | 8- 6-76 | X | ..... | ..... | ..... |
| Tug assistance (CGD 76-025); Advance notice | 5- 6-76 Corrected 5-13-76 | ..... | 8- 6-76 | X | ..... | ..... | ..... |
| Minimum net bottom clearance (CGD 76-051); Advance notice | 5- 6-76 Corrected 5-13-76 | ..... | 8- 6-76 | X | ..... | ..... | ..... |

| | Notice of proposed rulemaking | Public hearing | Deadline for comments | Awaiting final action | Withdrawn | Published as rule | Effective date |
|---|---|---|---|---|---|---|---|
| MARINE ENVIRONMENT AND SYSTEMS (GENERAL)—Continued | | | | | | | |
| Regulated navigation areas, Apra Outer Harbor, Guam (CGD 74-281) | 5-17-76 | ..... | 6-16-76 | X | ..... | ..... | ..... |
| Anchorages, Puget Sound area, WA (CGD 76-039) | 6-10-76 | ..... | 7-26-76 | .... | ..... | 9-16-76 | 10-16-76 |
| New Orleans Vessel Traffic Service (CGD 75-112) | 6-17-76 | ..... | 9- 3-76 | X | ..... | ..... | ..... |
| Anchorage, Scituate Harbor, MA (CGD 74-193) | 6-21-76 | ..... | 8- 5-76 | .... | ..... | 9-16-76 | 10-16-76 |
| Anchorage ground, Hampton Roads, VA (CGD 76-037) | 8- 8-76 | ..... | 8-23-76 | X | ..... | ..... | ..... |
| Naval anchorage grounds, Waimea, HI (CGD 74-187) | 8- 8-76 | ..... | 8-23-76 | X | ..... | ..... | ..... |
| Anchorage, Lahaina, Island of Maui, HI (CGD 74-191) | 8-16-76 | ..... | 10- 1-76 | X | ..... | ..... | ..... |
| MERCHANT MARINE SAFETY (GENERAL) | | | | | | | |
| Bulk Dangerous Cargoes, Inspection of Barges (CGD 73-271) | 3-11-74 | 4-15-74 | 4-30-74 | X | ..... | ..... | ..... |
| First Aid Certificates (CGD 73-272) | 4- 2-74 | ..... | 6-15-74 | .... | ..... | 10-18-76 | 11-19-76 |
| | Supp. Notice 12- 1-75 | ..... | 1-16-76 | X | ..... | ..... | ..... |
| Metal boring, shavings, turnings, and cuttings (CGD 75-133) | 8- 1-75 | ..... | 9-15-75 | X | ..... | ..... | ..... |
| Marine occupational safety and health standards (CGD 75-101); Advance notice; comment deadline extended 12-11-75 | 8-11-75 | ..... | 1-15-76 | X | ..... | ..... | ..... |
| Tank vessels; air compressors, cargo handling room bilges (CGD 75-017) | 8-13-75 | ..... | 9-29-75 | X | ..... | ..... | ..... |
| Vessel inspection regulations (CGD 75-074) | 9-16-75 | ..... | 10-31-75 | X | ..... | ..... | ..... |
| Fire hydrants and hose (CGD 74-60) | 9-23-75 | ..... | 11-10-75 | .... | ..... | 9-30-76 | 11- 1-76 |
| Unmanned barges carrying certain bulk dangerous cargoes (CGD 75-226) | 3-15-76 | ..... | 4-29-76 | X | ..... | ..... | ..... |
| Elevators and dumbwaiters, ANSI Code (CGD 75-001) | 4- 5-76 | ..... | 5-21-76 | X | ..... | ..... | ..... |
| Noncombustible materials for merchant vessels (CGD 74-129) | 4- 5-76 | ..... | 5-21-76 | .... | ..... | 9-23-76 | 10-25-76 |
| Vapor recovery systems in cargo transfer operations (CGD 75-208); Advance notice | 4- 5-76 | ..... | 6-21-76 | X | ..... | ..... | ..... |
| Towing vessel stability (CGD 76-018); Advance notice | 4-12-76 | ..... | 7- 1-76 | X | ..... | ..... | ..... |
| Tank vessels carrying oil in international trade (CGD 75-240) | 4-15-76 | 5-20-76 | 6-12-76 | X | ..... | ..... | ..... |
| Measurement of vessels (CGD 75-078) | 4-22-76 | ..... | 6- 7-76 | X | ..... | ..... | ..... |
| Segregated ballast, certain existing tank vessels (CGD 76-075) | 5-13-76 | ..... | 6-30-76 | X | ..... | ..... | ..... |
| Lifesaving equipment for Great Lakes vessels (CGD 76-033); Advance notice | 6- 7-76 | ..... | 9- 7-76 | X | ..... | ..... | ..... |
| Bulk dangerous or extremely flammable liquid cargoes (CGD 73-096) | 6-24-76 | 8- 3-76 | 8-20-76 | X | ..... | ..... | ..... |
| Commercial diving occupational safety and health standards (CGD 76-009); Advance notice | 7-15-76 | ..... | 8-16-76 | X | ..... | ..... | ..... |
| Semi-portable $CO_2$ systems testing (CGD 75-225) | 7-26-76 | ..... | 9-10-76 | X | ..... | ..... | ..... |
| Integral diesel fuel tanks, small passenger vessels (CGD 75-184) | 7-26-76 | ..... | 10-26-76 | X | ..... | ..... | ..... |
| Damage stability standards for hopper dredges (CGD 76-080); Advance notice | 8- 2-76 | ..... | 9-16-76 | X | ..... | ..... | ..... |
| Small passenger vessels, first aid kit (CGD 75-042) | 8-19-76 | ..... | 10- 5-76 | X | ..... | ..... | ..... |
| Fees for duplicate documents or licenses (CGD 76-124) | 9- 2-76 | ..... | 10-18-76 | X | ..... | ..... | ..... |
| Foreign flag tank vessels, shipping papers (CGD 76-081) | 9- 2-76 | ..... | 10-18-76 | X | ..... | ..... | ..... |
| Self-propelled vessels carrying bulk liquefied gases (GCD 74-289) | 10- 4-76 | 11-15-76 | 12-15-76 | .... | ..... | ..... | ..... |
| Tank vessels; loading information (CGD 75-041) | 10-12-76 | ..... | 11-29-76 | .... | ..... | ..... | ..... |

NOTE: This table which will be continued in future issues of the Proceedings is designed to provide the maritime public with better information on the status of changes to the Code of Federal Regulations made under authority granted the Coast Guard. Only those proposals which have appeared in the Federal Register as Notices of Proposed Rulemaking will be recorded. Proposed changes which have not been placed formally before the public will not be included:

# *Nautical Queries*

The following items are examples of questions included in the new First Assistant and Chief Engineer and Chief Mate and Master multiple choice examinations.

### Deck

1. The greatest directive force is exerted on the magnetic compass when the

A. needles are nearly in line with the meridian.
B. vessel is near the magnetic poles.
C. variation is near zero.
D. vessel is near the magnetic equator.

2. When steaming at 14 knots, your vessel's fuel consumption is 240 barrels of oil per day. What will be your fuel comsumption per day at 10 knots?

A. 87.5 BBLS
B. 122.5 BBLS
C. 171.4 BBLS
D. 187.5 BBLS

3. Fires of combustible metals (such as magnesium) are labeled Class

A. A.
B. B.
C. C.
D. D.

4. In International waters, the use of the danger signal

A. replaces directional signals.
B. makes the other vessel burdened.
C. indicates doubt as to other vessel's action.
D. makes positive action necessary.

5. The sheave diameter to be used with a 3″ manila rope is

A. 3″.
B. 6″.
C. 9″.
D. 12″.

### Engineers

1. When the rate of heat transfer through tube walls is so reduced that the metal becomes overheated, what condition results in a boiler?

A. Steam Gouging
B. Steam Binding
C. Fireside Burning
D. Fireside Thinning

2. The dew point of air will vary because the

A. dry bulb temperature of the air remains contant.
B. amount of water vapor in the air varies.
C. absolute humidity of the air remains constant.
D. relative humidity of the air also varies.

3. The total heat of unconditioned and untreated air is dependent on the

A. wet bulb temperature.
B. saturation temperature.
C. dry bulb temperature.
D. water vapor superheat.

4. To accurately machine internal threads using a lathe and a threading tool mounted in a boring bar, you must adjust the threading tool

A. 15° above the work center and at 30° to the work axis.
B. 15° below the work center and at half the included angle of the thread.
C. at center height on the work and at 90° to the work axis.
D. on the work center and at 30° to the work axis.

5. Flexible hose under pressure in a hydraulic system will

A. tend to twist about its long axis.
B. expand in length and in diameter.
C. flex at right angles to the applied pressure.
D. contract in length and expand in diameter.

### Answers

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

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

# INDEXES—VOLUMES 32 and 33

## Volume 32 (1975)


| | Page |
|---|---|
| Amendments to Regulations | 46 |
| Benzene Vapors Kill Three | 3 |
| Casualty Reports: | |
| Submersible *Johnson Sea Link* | 96 |
| SS *Hillyer Brown* | 116 |
| MV *Comet* | 193 |
| Casualty Statistics | 8 |
| Casualty Statistics—Western Rivers | 120 |
| Coast Guard Rulemaking | 17, 33, 49, 61, 73, 89, 102, 124, 160, 180, 198 |
| Cold Water Survival | 193 |
| Cold Water Tragedy | 193 |
| Commandant's Speech to the Huntington Propeller Club | 107 |
| Dangerous Drums | 60 |
| Death at the Dinner Table | 14 |
| Diving Manual | 142 |
| Double Jeopardy | 67 |
| Efficiency and Safety | 158 |
| Electrical Hazards | 109 |
| Firefighting Training | 95 |
| For Want of a Nail | 172 |
| Hypothermia | 42 |
| IMCO Recommendations for Vessel Personnel Handling Hazardous Materials in Bulk | 29 |
| IMCO Urges Trial Use of Standard Marine Navigation Vocabulary | 70, 85, 104 |
| Implementation of International Convention for Safe Containers | 6 |
| International Ice Patrol | 39 |
| Lessons from Casualties | 67, 176 |
| Lesson in Survival | 15 |
| Lifeboat Radio Primer | 156 |
| Life Raft Display | 131 |
| Lifesaving Devices | 115 |
| LNG | 152 |
| Loran-C | 171 |
| Marine Safety Council Membership | 143, 159, 179, 201 |
| Merchant Marine Personnel Statistics | 162 |
| MIO Rotterdam | 171 |
| Nautical Queries | 45, 110, 127, 146, 166, 182, 202 |
| New Numbering System for U.S. Domestic Charts | 16 |
| Review of Some Recent Accidents in the Maritime Transportation Mode | 79 |
| Rig Blast | 68 |
| Safe Lifting | 158 |
| *Sea Link* Incident | 96 |
| Smart Duck Club | 151 |
| Smithsonian's Hall of American Maritime Enterprise | 58, 119 |
| Steering Gear Failures | 69 |
| St. Lawrence Seaway Freezups | 187 |
| Tanker Grounding | 116 |
| Tanker Regulations | 175, 190 |
| Tankers: Safety and the Environment | 188 |
| The Coast Guard and Hazardous Materials | 132 |
| The Coast Guard, Marine Safety, and the Great Lakes Merchant Fleet | 55 |
| The 1973 Marine Pollution Convention's Impact on Ships Transporting Hazardous Materials | 23 |
| The Persistent Pillow | 131 |
| Theodosia | 141 |
| Three Dead | 95 |
| TIAC Meeting | 131 |
| Vinyl Chloride Carriage Requirements | 115 |
| What Are Your Chances? | 109 |

# Volume 33 (1976)


| | Page |
|---|---|
| Another Big Bang Out of Crude Oil | 128 |
| *ATC 3060* Explosion | 122 |
| Boating Accidents | 65 |
| Casualty Reports: | |
| *ATC 3060* | 122 |
| *Sea Witch–Esso Brussels* | 86 |
| *STC 101* | 186 |
| *Transhuron* | 170 |
| Casualty Statistics | 8 |
| Coast Guard Rulemaking | 35, 50, 78, 98, 114, 146, 161, 196 |
| Danger Below | 76 |
| Davits . . . Again! | 121 |
| EPIRB Substitution | 21 |
| Federal Register Schedule | 41 |
| Fire Extinguishing System Controls | 185 |
| Flame Screens | 52 |
| Flash Arrestors | 3 |
| Flashbacks | 141 |
| Heritage | 14, 33, 57, 73, 97, 111, 135, 150, 163, 178, 195 |
| Hot Work Permits | 157 |
| IMCO Code for Construction and Equipment of Ships Carrying Liquefied Gases in Bulk | 42 |
| Instant Foam Flotation | 9 |
| International Ice Patrol | 66 |
| Is That Tank Safe? | 74 |
| Lessons from Casualties | 28, 54 |
| Lifeboat Drill Poster | 141 |
| LNG Position Paper | 110 |
| Loran Study | 185 |
| Marine Casualty—Failure and Opportunity | 106 |
| Marine Firefighting Course | 169 |
| Marine Safety Council Membership | 15, 134, 148 |
| Maritime Personnel Training: A Professional Viewpoint | 158 |
| Men at Sea—Then and Now | 4 |
| Mini Loran–C Chain | 157 |
| Nautical Queries | 16, 60, 80, 100, 116, 136, 154, 180, 198 |
| New York Harbor Restrictions for OpSail | 85 |
| NFPA Standards | 41 |
| Oil in the Bay | 186 |
| On the Business End | 169 |
| Operation Sail | 21, 85 |
| Pollution Brochure | 3 |
| Pollution Penalties | 169 |
| Portable Tanks | 23 |
| Preparation Minimizes Effects of Oil Spill | 192 |
| Project Icewarn (Great Lakes) | 65 |
| *Sea Witch–Esso Brussels* | 86 |
| *Sea Witch* Film | 105 |
| '72 Colregs | 149 |
| 63 hours: the Loss of the *Transhuron* | 170 |
| Small Boat Anchoring | 41 |
| Steering Gear Failure | 105 |
| Tank Safety | 105, 142 |
| The Marine Inspector and the Marine Chemist | 70 |
| The Metrics Are Coming | 85 |
| Vessel Maneuvering Simulation Model | 21 |

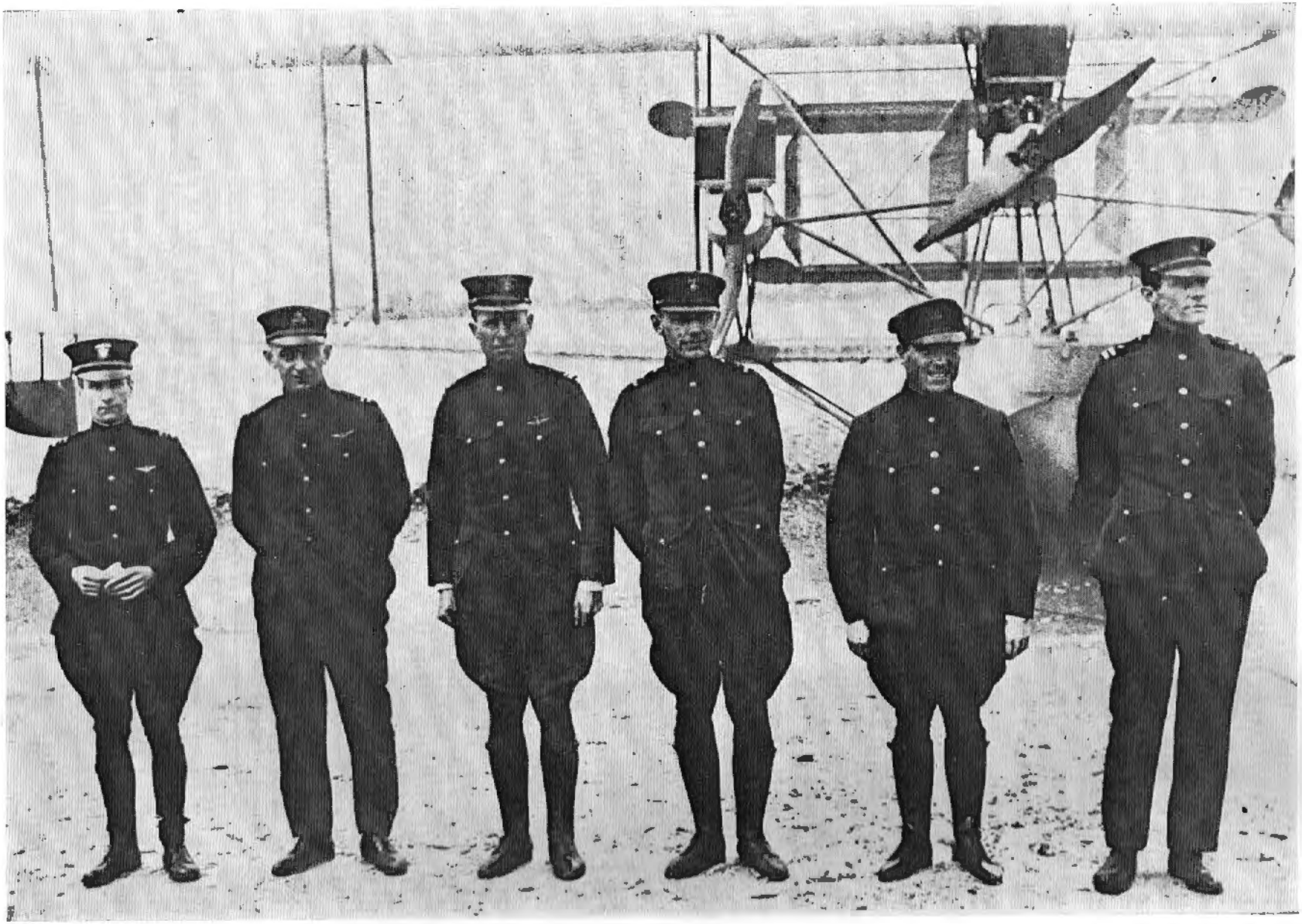
# MERCHANT MARINE SAFETY PUBLICATIONS

The following publications of marine safety rules and regulations may be obtained from the nearest marine inspection office of the U.S. Coast Guard.* Because changes to the rules and regulations are made from time to time, these publications, between revisions, must be kept current by the individual consulting the latest applicable Federal Register. (Official changes to all Federal rules and regulations are published in the Federal Register, printed daily except Saturday, Sunday, and holidays.) The date of each Coast Guard publication in the table below is indicated in parentheses following its title. The dates of the Federal Registers affecting each publication are noted after the date of each edition.

The Federal Register will be furnished by mail to subscribers, free of postage, for $5.00 per month or $50 per year, payable in advance. The charge for individual copies is 75 cents for each issue, or 75 cents for each group of pages as actually bound. Remit check or money order, made payable to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

| CG No. | TITLE OF PUBLICATION |
|---|---|
| *101 | Specimen Examinations for Merchant Marine Deck Officers (Chief Mate and Master) (1–1–74). |
| 101–1 | Specimen Examinations for Merchant Marine Deck Officers (2d and 3d Mate) (5–1–75). |
| 108 | Rules and Regulations for Military Explosives and Hazardous Munitions (4–1–72). F.R. 7–21–72, 12–1–72, 11–14–74, 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, 6–30–75, 9–13–76. |
| *123 | Rules and Regulations for Tank Vessels (1–1–73). F.R. 8–24–73, 10–3–73, 10–24–73, 2–28–74, 3–18–74, 5–30–74, 6–25–74, 1–15–75, 2–10–75, 4–16–75, 4–22–75, 5–20–75, 6–11–75, 8–20–75, 9–2–75, 10–14–75, 12–17–75, 1–21–76, 1–26–76, 2–2–76, 4–29–76, 9–30–76. |
| 169 | Rules of the Road—International—Inland (8–1–72). F.R. 9–12–72, 3–29–74, 6–3–74, 11–27–74, 4–28–75, 10–22–75, 2–5–76, 3–1–76, 6–10–76. |
| *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. |
| *174 | A Manual for the Safe Handling of Inflammable and Combustible Liquids (6–1–75). |
| 175 | Manual for Lifeboatmen, Able Seamen, and Qualified Members of Engine Department (3–1–73). |
| 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 | Specimen Examinations for Merchant Marine Engineer Licenses (Chief Engineer and First Assistant) (1–1–74). |
| 182–1 | Specimen Examinations for Merchant Marine Engineer Licenses (2d and 3d Assistant) (4–1–75). |
| 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. |
| 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. |
| *191 | Rules and Regulations for Licensing and Certification of Merchant Marine Personnel (6–1–72). F.R. 12–21–72, 3–2–73, 3–5–73, 5–8–73, 5–11–73, 5–24–73, 8–24–73, 10–24–73, 5–22–74, 9–26–74, 3–27–75, 6–2–75, 7–24–75, 8–13–75, 12–11–75, 7–26–76, 10–18–76. |
| *200 | Marine Investigation Regulations and Suspension and Revocation Proceedings (5–1–67). F.R. 3–30–68, 4–30–70, 10–20–70, 7–18–72, 4–24–73, 11–26–73, 12–17–73, 9–17–74, 3–27–75, 7–28–75, 8–20–75, 12–11–75, 5–6–76. |
| 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. |
| *257 | Rules and Regulations for Cargo and Miscellaneous Vessels (4–1–73). F.R. 12–22–72, 6–28–73, 6–29–73, 8–1–73, 10–24–73, 12–5–73, 3–18–74, 5–30–74, 6–24–74, 1–15–75, 2–10–75, 8–20–75, 12–17–75, 4–29–76, 6–10–76, 8–5–76, 9–30–76. |
| 258 | Rules and Regulations for Uninspected Vessels (5–1–70). F.R. 1–8–73, 3–2–73, 3–28–73, 1–25–74, 3–7–74. |
| *259 | Electrical Engineering Regulations (6–1–71). F.R. 3–8–72, 3–9–72, 8–16–72, 8–24–73, 11–29–73, 4–22–75. |
| 268 | Rules and Regulations for Manning of Vessels (12–1–73). |
| 293 | Miscellaneous Electrical Equipment List (7–2–73). |
| *320 | Rules and Regulations for Artificial Islands and Fixed Structures on the Outer Continental Shelf (7–1–72). F.R. 7–8–72. |
| 323 | Rules and Regulations for Small Passenger Vessels (Under 100 Gross Tons) (9–1–73). F.R. 1–25–74, 3–18–74, 9–20–74, 2–10–75, 12–17–75, 9–30–76. |
| 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. |
| 467 | Specimen Examinations for Uninspected Towing Vessel Operators (10–1–74). |

## CHANGES PUBLISHED SEPTEMBER–OCTOBER 1976

CG–115, Federal Register of September 13.
CG–239, Federal Register of September 27.
CG–190, Federal Registers of Sept. 2, 13, & 16; Oct. 12.
CG–123, 257, & 323, Federal Register of September 30.
CG–191, Federal Register of October 18.

*Due to budget constraints or major revision projects, publications marked with an asterisk are out of print. Most of these pamphlets reprint portions of Titles 33 and 46, Code of Federal Regulations, which are available from the Superintendent of Documents. Consult your local Marine Inspection Office for information on availability and prices.