PROCEEDINGS
OF THE MARINE SAFETY COUNCIL

DEPARTMENT OF TRANSPORTATION UNITED STATES COAST GUARD

Vol. 29, No. 1 CG-129 January 1972


WILLIAM H. CAMERON AWARD
Presented to the
Industrial Section
SAFETY COUNCIL

MARINE SECTION WINS CAMERON AWARD

At the National Safety Congress and Exposition in Chicago on October 26 and 27, 1971, the Marine Section of the National Safety Council, under the leadership of John L. Horton, was presented the Cameron Award.

This marked the first time the Marine Section, one of 28 industrial sections representing all sectors of industry, had won the award.

The Cameron Award was established 11 years ago in the memory and honor of Mr. William Cameron who was founder and first managing director of the National Safety Council. The award, the most coveted in its field, is presented for excellence in furthering the cause of safety. It is based upon a section's performance in each of the following 10 broad areas:

1. Technical publications,
2. Membership promotion,
3. Safety Newsletter pertinent to the participating section,
4. Research into a safety problem peculiar to the section on which little information is available and instituting a program to solve the problem,
5. Program presented at the National Safety Congress dealing with safety problems pertinent to the section,
6. Audiovisual aids such as posters, slides, and films emphasizing safety,
7. Off-the-job safety program promoted to the section's employees,
8. Training program designed to reach those not otherwise normally receiving training in safety,
9. Associations—working with the section's associations to promote safety and membership for their members, and
10. Any special activities not clearly falling under any of the above categories.

John Mark, the National Safety Council's coordinator of the Cameron Award competition, emphasized that, "The competition for the Cameron Award has been a very valuable means of encouraging the development of effective and well-thought-out safety programs along lines proven to improve safety in industry."

Outgoing General Chairman of the Marine Section of the National Safety Council, John L. Horton (right) is congratulated by his successor as General Chairman, Capt. Richard N. LePage (left) after the Marine Section won the Cameron Award.

John Horton, general chairman of the Marine Section for 1970–71 and assistant marine manager for Cleveland Cliffs Iron Co., was largely responsible, along with the many

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members of this executive committee, for the Marine Section's success in last year's competition. He accepted the award on behalf of the Marine Section. Mr. Horton commented, "It is apropos that the National Safety Council's Marine Section won the Cameron Award. At no other time in history has there been such an emphasis on safety in the marine field. In fact, safety is fast becoming the watchword of the American Merchant Marine. In the past year, the Maritime Industry has conducted what amounts to a national campaign to promote safety at sea, on the docks, and in the shipyards * * *. New safety challenges must be met as high technology superships come down the ways as a result of the 1970 Merchant Marine Act's 300-ship building program. Our industry's safety directors and their companies—representing both labor and management—will be working closely with government to meet these challenges to insure that the 'flag of safety' that flies proudly over the fleet of today will still wave with honor over the fleet of tomorrow."

Mr. Horton was awarded a plaque in appreciation for his outstanding and devoted service as General Chairman of the Marine Section. In addition, each member of the section's executive committee will receive a medallion replica of the Cameron Award at the Annual Awards Day Luncheon of the Marine Section to be held in New York in June 1972.

The Marine Industry is to be congratulated for its outstanding achievement of acquiring a record of 124 of a possible 130 points to win the award. Capt. Richard N. LePage of Farrell Lines, Inc., has succeeded Mr. Horton as general chairman of the Marine Section for 1971–72 year. It is expected that the entire Marine Industry will continue to maintain an outstanding record in all of the vital aspects of safety. ⚓

ACTING EDITOR HAS THIRTY YEARS' SERVICE

Mr. Theodore A. DeNardo, acting editor of the Proceedings of the Marine Safety Council *since 1967, was recently honored by a certificate and a pin commemorating his more than 30 years of active Government service, presented by Rear Adm. W. F. Rea, III (left), Chief, Office of Merchant Marine Safety at U.S. Coast Guard Headquarters.*

Mr. DeNardo entered Government service at the Washington Navy Yard. From there he went to the Internal Revenue Service. He came to the Coast Guard in 1953 as an editorial clerk on the staff of the Merchant Marine Council, and he has advanced to his current position as supervisory editor on the Marine Safety Council Staff. For nearly two decades he has worked on the Proceedings, *and for 4 years he has been acting editor of this publication.*

The Coast Guard deeply appreciates Mr. DeNardo's many years of service to the Government, to the Coast Guard, and to the Merchant Marine Industry through the Proceedings.

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THIS COPY FOR NOT LESS THAN 20 READERS—PLEASE PASS IT ALONG

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FRONT COVER: A Great Lakes bulk ore carrier, laden with ore from the Upper Lakes, makes her way in the entrance to the Cuyahoga River in the Port of Cleveland. Efforts are currently being made to extend the shipping season on the Lakes. The structure off the starboard quarter of the ore carrier is Coast Guard Station, Cleveland.

INSIDE FRONT COVER: The William H. Cameron Award presented annually to the outstanding Industrial Section of the National Safety Council. See feature on page 3.

BACK COVER: Lesson from a particularly grim casualty. Courtesy Safety Bulletin, Chevron Shipping Co.

DIST. (SDL No. 94)

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B: n(40) ; c(16) ; e(5) ; f(4) ; gh(3) ; bkijnq(1)
C: abcdefgimnou(1)
D: i(5) ; abdeklmnsuvx(1)
E: d(1)
F: kjp(1)
Lists 141 M, CG–13, CG–20

PROCEEDINGS

OF THE

MARINE SAFETY COUNCIL

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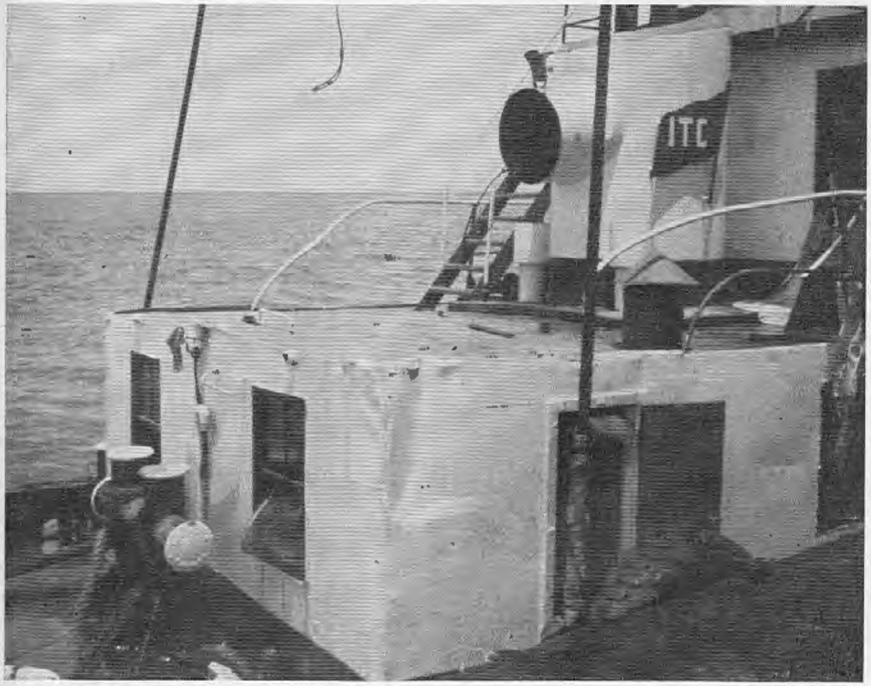
TOWBOAT FOUNDERING KILLS TWO



WITH A FREEBOARD aft of only 5 or 6 inches and 9 inch combings under the open door to the galley (lower right), the vessel's stern had to settle less than a foot and a half before water would flood the galley.

THE M/V JOAN ELLIS departed the Southwest barge fleet moorings at Houston, Tex., at 9 p.m. on July 22, 1970, bound for Brownsville, Tex., via the intracoastal waterway. Within seven hours, the vessel would sink and two of her five crewmembers would lose their lives.

The 52-foot uninspected towboat was towing four empty barges, each just under 200 feet long, made up in tandem and towed blunt and forward. The lead barge was a distance of 10 feet from the tug's stern. *See page 14 for a description of the towing hawser/bridle arrangement.* The barges trailed slightly to starboard because of the northeasterly wind. As the tow made its way down the San Jacinto River, the master was at the helm and a deckhand stood watch. Also on board were a pilot, a second deckhand, and the cook.

The master and first deckhand carried out normal operating procedures including the checking of the machinery space bilges, until relieved by the pilot and the second deckhand at 11 p.m. Before retiring to his cabin, the master personally checked the engineroom but apparently saw no excess water in the bilges.

The pilot found the open waters of Galveston Bay which lay ahead of him to be much less friendly than those encountered during the first hours of the trip. Shortly after taking the helm, he ran into small choppy seas estimated at 2 to 3 feet in height. Wheel wash and the slap of the seas against the barge together with the bow wave of the lead barge caused water to splash over the stern bulwark onto the afterdeck of the tug.

For a number of reasons outlined on page 8, both the U.S. Coast Guard Marine Board of Investigation and the National Transportation Safety Board calculated the tug's freeboard aft to have been approximately 5 to 6 inches.

At about 3 a.m., the pilot approached a point in the channel where he would make a turn to starboard into the Galveston-Freeport cutoff of the intracoastal waterway. As speed was reduced to make the turn, the vessel began to feel sluggish, and response to the helm was poor. The pilot sent the deckhand aft to check the engineroom bilges and, for at least the third time that evening, there was no report of excess water. The pilot resumed the previous speed but within 10 minutes told the deckhand to check the bilges again as he felt the vessel becoming even more sluggish. After the deckhand had gone below, the pilot looked out the after pilothouse windows and saw the wash of seawater generated by the choppy sea and the bow wave of the lead barge coming over the vessel's stern bulwark and carrying well up on deck. *For the NTSB conclusions on* *the effect of this water see "Inside the Joan Ellis" on page 8.* The pilot raced the engines two times as a signal to the deckhand to get out of the engineroom. Appearing at the port engineroom door, the deckhand waved to the pilot in an apparent attempt to communicate something to him and the pilot assumed that there was either no water in the bilges or that the meaning of his racing the engines had been understood. Since the deckhand died, it was impossible to determine what he found upon his inspection of the engineroom.

From the port engineroom door, the deckhand walked to the afterdeck which was by then covered with approximately 1 foot of water according to the NTSB's conclusions.

The master awoke and left his cabin within the next few minutes. Observing what by this time was a foot and a half of water on the afterdeck, he rushed to the pilothouse to warn the pilot that the vessel was sinking; he then ran aft in an attempt to reach the towing hawser and to slack it off the bitt. From the second deck he saw the taut hawser tending at a slight angle to starboard, the barge 35 to 40 feet astern, and the deckhand standing near the bitt on the deck below. The Marine Board of Investigation concluded that this deckhand, "on his own initiative, aware of the danger of the barges overrunning the boat, attempted to cast off the towing hawser by throwing off several turns to allow the hawser to run off the bitt. The distance between the towboat and barge increased as the hawser payed out until the bitter end of the hawser lodged between the towing rail and the angle iron grating support on the stern."

This deckhand's shouts of warning awoke the other deckhand who had stood watch with the master and had retired to his bunk. Once this man was on deck, he realized that the vessel was listing sharply to starboard and the stern was going down. He shouted to the deckhand on the afterdeck to cut the towline and he saw him move nearer the stern. The Marine Board of Investigation could not determine why the second deckhand returned from the afterdeck to his compartment where he perished when the tugboat sank.

THE AFTERDECK of the *Joan Ellis* is shown as it appeared after the vessel was refloated. At the far left, the bitter end of the towing hawser is shown where it snagged. The other end of the hawser lies on deck, frayed and broken where it parted under the strain of the vessel's maneuvers and the tow.

The pilot, at this time increased to full speed and put the vessel's helm over in a shallow turn to starboard in an attempt to hold the vessel's stern up by tension and to get the boat out of the path of the barges. As the stern submerged further, the power failed, the lights went out, and the vessel heeled sharply to starboard, almost on beam's end. Both the pilot and the master left the vessel, the pilot hearing a shout from the cook in his berthing space below. The vessel sank rapidly by the stern.

The NTSB found that a sudden heeling moment was imposed by the hawser as it fetched up and jammed while still on the bitt after having been allowed to run. Large quantities of water poured through the open engineroom door and the vessel, assuming an extreme starboard list, sank suddenly by the stern.

The investigators found evidence to support these conclusions when the *Joan Ellis* was raised to the surface. A part of the 7-inch towing hawser was parted about 5 feet from the turn on the bitt. Several strands appeared to have been severed and the remainder were frayed as though parted under strain. Bits of rope yarn were in the broken weld of the dislodged flat plate lighting fixture on the bulkhead above the towing bitt.

In addition, the NTSB concluded that the pilot's emergency change in course and increase in speed aggravated the strain on the hawser. His lack of familiarity with the operating characteristics of the vessel, they determined, also accounted for his failure to detect earlier that the towing vessel had taken on water aft.

As the *Joan Ellis* sank, the pilot, in the water, saw the lead barge strike

INSIDE THE JOAN ELLIS . . . .

The *Joan Ellis* was built in 1955 in Houston, Tex. She is 52 feet long, has a beam of 19 feet, and a draft of 7 feet 1 inch. Propulsion is by twin diesels providing a total 800 horsepower to twin screws. The towboat is not a Coast Guard inspected vessel. Load line regulations are not applicable, nor is the vessel maintained in class by the American Bureau of Shipping.

The *Joan Ellis* had previously sunk in 1965 and again in 1967. The first sinking was due to a leaking stern tube packing gland, and the second was caused by the vessel's being overrun by barges.

INTERNAL SPACES

At the time of the casualty, her hull was subdivided into six compartments with the largest, the machinery space, located midships. Fuel tanks were located both fore and aft of the machinery space. The remaining compartments were the forepeak and, toward the stern and abaft the engineroom, a void with two independent water tanks of 1,200 gallons total capacity and farther aft, another void through which the rudder stock housings were installed.

Access to the forepeak space was by a manhole on the foredeck which was normally secured. The two spaces aft of the after fuel tanks were watertight compartments. Access to the space containing the independent water tanks was through a 15-inch circular manhole, located on the starboard side of the deck. The cover was fitted flush with the deck and secured by means of a center bolt and underdeck cross bar arrangement. Investigators found the cover wasted and holed at the boss of the center bolt hole. The space was drained only by gravity through a 1-inch pipe running forward through the fuel compartment into the engine space. There were no valves or shutoffs in this line.

The entrance to the aftermost space was through a rectangular manhole on the starboard side of the deck, fitted with a cover plate designed to be secured by 30 bolts and a gasket. This space flooded with only eight of the bolts in place. The rudder stock housings ran through this space to the deck above. There was no internal piping.

The machinery space, which comprised about three-quarters of the vessel's internal volume below the main deck, contained the two diesel main propulsion engines, two diesel driven generators with switch gear air compressors, hydraulic steering pumps and motor, batteries, one electrically powered 1¼-inch bilge pump, and a float operated bilge alarm system. The bilge pump took suction only from the machinery space bilge and the bilge alarm system was electrically connected through a switch to an alarm bell located on the forward engineroom bulkhead. The same alarm bell was also connected to vital main engine systems such as cooling water and lube oil pressure. Power for the alarm and the galley range came from the same electrical circuit, and *when the stove was not turned on, the alarm was not energized!* Although investigators found the guided float rod for the bilge alarm bent and slightly distorted, it was free to move vertically when activated by hand.

The galley space located in the after part of the deck house over the after part of the machinery space, had two entrances from the main deck, port and starboard sides, through wooden joiner doors, 30 by 60 inches, fitted with 9-inch coamings. The deck doors to this compartment had been hooked open at the time of the casualty.

The galley deck lay 1 foot below the main deck. This space drained to the engineroom bilge through two 1¼-inch unvalved drain lines at each after corner.

NTSB ANALYSIS

No design plans or building specifications were available for the NTSB to review in making its determination of the cause of this sinking. From information gathered by the Marine Board of Investigation, the NTSB concluded that the bow wave of the barge caused about 1 foot of water to lay on the afterdeck for several hours, resulting in progressive flooding of the aftermost compartments through manhole covers improperly secured. Water flowing from the aftermost and fresh water compartments partially flooded the engineroom bilges. As the trim increased by the stern, water entered through the open galley doors and from there drained into the already flooding engineroom.

STABILITY & FREEBOARD

The vessel had been reengined and modified since its construction. Raising the wheelhouse one deck level and renovating the master/pilot's quarters on the deck below added more weight to the topside structure and adversely affected the stability of the vessel. In addition, at the time of the casualty, the fuel and water tanks were full or nearly full, having been topped off at the last port. All of these factors contributed to reducing the freeboard at the stern to less than 5 or 6 inches according to the findings of the NTSB. The bulwark rail around the after deck is 18 inches high, penetrated at intervals by a number of freeing ports which vary in size from 6 by 12 inches to 3 by 6 inches.

the pilothouse and the string of barges on its own momentum continue over the tug. The oncoming tow forced the master himself underwater as the lead barge passed over him. Surfacing about amidships and clear of the first barge, he managed to locate the deckhand who had stood watch with him and the two of them clung to a section of the wooden grating from the towboat.

Only 15 minutes had passed since the pilot had reduced speed in preparation for the turn.

Within an hour, a downbound towing vessel rescued the master and the deckhand. The survivors used a waterproof flashlight which had floated free from the bridge of the *Joan Ellis* to signal the passing tug.

The pilot, after the foundering, swam toward a nearby buoy but was not able to reach it. He clung to some floating debris until picked up by the same vessel that rescued the other two survivors. The NTSB concluded that the waterproof flashlight was primarily responsible for the rescue of the three men. It is probable that one or more of the survivors may have drowned before they could have been seen in daylight.

Coast Guard search and rescue ef-

FLOODING OF the *Joan Ellis*'s water tank compartment was apparently the result of this manhole cover being wasted and holed. The NTSB was highly critical of the cover's deteriorated condition and concluded that the flooding of the tank compartment and of the aftermost compartment of the vessel helped to cause the vessel's foundering.

forts began little more than a half hour after the sinking but the missing men could not be located.

The barges were found lightly aground and undamaged the following day, 2 days after the casualty, salvage efforts were successful in raising the *Joan Ellis*. On board were the bodies of the cook and the missing deckhand.

The fact that this was the third sinking of this vessel raised a serious question as to its seaworthiness, the NTSB concluded. The inadequate bilge system, the lack of a general alarm and watertight closures on deck and the 5-inch freeboard, insufficient for even inland waters, all contributed heavily to the sinking. The NTSB particularly criticized the electrical system which permitted the bilge alarm to operate only when the galley stove was turned on.

The NTSB concluded that the loss of the two crewmembers might have been avoided had the vessel been equipped with a general alarm.

The *Joan Ellis* sinking follows closely behind the loss of the M/V *Marjorie McAllister* as described in the September 1971, *Proceedings.* These sinkings were the eighth and ninth such uninspected vessel casualties noted by the NTSB since January 1969.

In its findings, the NTSB strongly endorsed the legislation which is being considered by the Congress to require the licensing of persons in charge of the navigation of towing vessels. In addition, the NTSB reaffirmed its previous recommendations concerning offshore towing vessels and the need for an analysis of towing vessel casualties in inland waters to determine the need for legislation requiring inspection of all towing vessels. Also recommended was that the Coast Guard analyze casualty reports of towing vessels to evaluate the need for regulations re-

NONE OF THE crew of the *Joan Ellis* used any of the lifesaving devices aboard the vessel. Among the unused equipment were life preservers, life rings, and the skiff shown in this photograph still lashed in place behind the ladder and the rail on the second deck.

THE TOWING HAWSER/BRIDLE ARRANGEMENT

The lead barge was being towed with its blunt stern forward on a short hawser with bridle, to facilitate handling and to prevent the barge overrunning the stern of the tug. The bridle consisted of two parts of 1⅛-inch plow steel wire, eye spliced at each end. The eyes on the after ends were placed over button bollards on each side of the lead barge and led forward around outboard of the bits at each corner, coming together at the 7-inch nylon hawser, connected there by means of two shackles, one which was through a thimble in the eye splice of the hawser. On board the *Joan Ellis*, the hawser was made fast to the towing bitt on the afterdeck in such a manner as to bring the shackles of the bridle approximately 2 feet aft of the towing bitt and the distance between the stern of the boat and the lead barge to approximately 10 feet. On board, the hawser was led aft from the bitt and faked on wooden gratings installed on the stern, aft of the towing rail. These gratings were fitted across the stern and lay loosely on angle iron supports approximately 15 inches off the deck and several inches below the 18 to 20 inch height of the towing rail which ran athwartships from bulwark to bulwark. The barges were secured together, headlog to headlog, by soft lines secured from bitt to bitt and with crosslines to prevent sway.

LIFESAVING EQUIPMENT

Aboard the *Joan Ellis* were several life preservers stored in the pilothouse and four more in the crew's sleeping quarters along with two Coast Guard approved 24-inch ring buoys. There were no rafts or buoyant apparatus on board. A skiff was lashed to the starboard rail outboard of the master's cabin on the second deck.

Investigators found that none of the survivors wore life preservers. One of the ring buoys fouled by its grab line on the rail outboard of the pilothouse door and the other floated away when the salvage team raised the vessel. Neither had been used by the crew.

The NTSB concluded that an inflatable liferaft would greatly increase the chances of survival for person in similar circumstances.

WHEELHOUSE EQUIPMENT

The equipment included a magnetic compass, whistle pull, radios, and radar. Radio gear was capable of use on distress voice frequencies and those frequencies commonly used on the intracoastal waterway to arrange passing with other vessels and to communicate with the home office. There was no general alarm system operable from the wheelhouse nor was there any means to determine engine direction or revolutions per minute.

The investigation revealed that none of the communication equipment was in use at the time of the casualty.

CREW

The pilot had served on the *Joan Ellis* for only 9 days and had only a Merchant Mariner's Document endorsed for tankerman. No member of the crew held a valid Coast Guard issued license nor was required to hold one. The NTSB determined that the deckhand on watch at the time of the casualty was inexperienced.

quiring inflatable liferafts of sufficient capacity to accommodate all persons on board.

The Marine Board of Investigation concluded in its report that there was evidence that the pilot on watch erred in his judgement in that:

(*a*) He failed to recognize the symptoms of instability due to flooding and free surface.

(*b*) He failed to notify the master or to alert the crew when danger was imminent.

(*c*) His final actions with regard to helm movement and increase of engine revolutions per minute aggravated an already grave situation and probably hastened the vessel's sinking.

The Marine Board also concluded that the casualty might have been prevented or at least its effects mitigated had:

(*a*) The pilot recognized his predicament in time.

(*b*) The pilot notified the master and crew of impending danger.

(*c*) The vessel been fitted with a general alarm system operable from the bridge.

(*d*) The persons on watch conducted proper security rounds about the vessel while underway.

(*e*) The vessel been fitted with a quick-release device rigged between the towing bitt and the hawser, operable from the wheelhouse or accesssible part of the after deck.

The National Transportation Safety Board officially determined the probable cause of the foundering of the *Joan Ellis* to have been:

> [The] flooding of the two aftermost compartments through deck manholes, resulting in settling of the stern and the ultimate massive flooding of the engineroom through open deck doors. Contributing to the casualty were: the strain imposed by the towing hawser when the vessel turned to starboard and increased speed; the splashing of waves from the barge over the stern; the inadequate freeboard; the inadequate bilge system; the nonwatertight manhole covers; the low sills under weatherdeck doors; the galley deck level which is a foot lower than the main deck; and the absence of stop valves in the drains from the fresh water compartment and galley into the engineroom bilges. Loss of life might have been prevented if the vessel had been equipped with a general alarm system.

NOTE.—The above article is based upon the Marine Casualty Report of the incident, comprised of the U.S. Coast Guard Marine Board of Investigation Report and Commandant's Action, and the action by the National Transportation Safety Board released October 27, 1971. Copies of the Marine Casualty Report may be obtained by writing U.S. Coast Guard (MVI-3/83), 400 Seventh Street SW., Washington, D.C. 20590. ⚓

THE IMCO CODE FOR CHEMICAL SHIPS

Robert J. Lakey

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INTRODUCTION

DURING THE PAST decade, the world has experienced a revolution in the production and transportation of chemicals. Where once movement in drums or barrels was sufficient to meet demands, specially built or converted tankers are now required. To meet the increasing problems of supply and demand and to minimize the hazards to populous areas, chemical companies have constructed complex manufacturing and terminal facilities close to the sea: for example, the petrochemical complex in Texas on the Houston Ship Channel, the many facilities at Rotterdam, and the ICI complex at Teesside. Many vessels now traverse the trade routes loaded with extremely hazardous chemicals. With the expansion of the chemical industry into a worldwide business, port safety has become a complex international problem. Products manufactured in the United States destined for the Netherlands are transported in vessels flying flags foreign to both countries.

In 1965 the U.S. Coast Guard, because of concern for port safety, began a program of plan review and inspection of foreign flag vessels deemed to present potential unusual risks to the U.S. ports. (*1*) More recently, other countries, among them Italy and the Netherlands, have instituted similar programs for vessels transporting chemicals in their ports. In 1967 in response to a request by the United States, the Maritime Safety Committee (MSC) of the Intergovernmental Maritime Consultative Organization (IMCO) established a Subcommittee on Ship Design and Equipment. The subcommittee's "Terms of Reference" stated:

> * * * to consider the construction and equipment of ships carrying bulk cargoes of dangerous chemical substances other than petroleum and similar flammable product normally carried in tankers, and to recommend suitable design criteria, construction standards, and other safety measures to minimize the risk involved in loading, carrying, and discharging such cargoes.
>
> In carrying out this task the subcommittee will consider:
>
> (i) The hazards of each product with respect to the ship itself and its crew as well as the hazards to the neighborhood;
>
> (ii) Special hazards affecting the design or adaptation of the ship, such as specific gravity, and the pressure and temperature at which the cargo is carried; and
>
> (iii) The influence of these hazards on the design, construction, or adaptation of the ships carrying the goods in question. (*2*)

In February 1971, the subcommittee forwarded a proposed Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (*3*) to the MSC for consideration, thereby completing the first phase of its work program.

This paper discusses the development of the IMCO Code for Chemical Ships. Attention is focused on the need for special requirements for products having unusual or severe hazards. A listing of national regulations and classification society rules for chemical ships is provided as a ready reference for those interested in shipping chemicals in bulk by sea.

EDITOR'S NOTE.—This article is from a paper delivered by Robert J. Lakey to the *Second International Symposium on the Transport of Hazardous Cargoes by Sea,* May 11–14, 1971. The IMCO assembly recently adopted the IMCO Code for Chemical Ships unanimously, recommending member nations incorporate the code in national requirements.

IMCO CODE FOR CHEMICAL SHIPS

The subcommittee began work developing the code in January 1968. From numerous papers (*4, 5, 6, 7*) offered at the first session, it was clear the code was to be based upon a concept of integrity and reliability of the cargo containment system, as failure to contain the cargoes of the type described in the "Terms of Reference" could lead to widespread pollution of sea and atmosphere with attendant injury to crewmembers, innocent people, and property. With the complexities involved and the need to consider other important problems, the subcommittee established a special Ad Hoc Working Group to work on the code. This group consisted of representatives from Norway, the United Kingdom, and the the United States with observers from the International Chamber of Shipping (ICS). The group was later joined by representatives of the Netherlands and was assisted from time to time by representatives of the Federal Republic of Germany, of Italy, and of the Union of Soviet Socialists Republics.

Through 10 meetings in 3 years, the Ad Hoc Working Group produced not one but two codes. In addition to the code described by the subcommittee's "Terms of Reference," the MSC later requested the

(a) Product name	(b) Ship type	(c) Tank type	(d) Tank vents	(e) Tank environmental control	(f) Electrical instruments	(g) Gaging	(h) Vapour detection	(i) Fire protection [1]	(j) Special requirements (see ch. IV)
iso-Butyl Acrylate	2	2G	Cont.	No	SP	R	I–T	A	4.10.
n-Butyl Acrylate	2	2G	Cont.	No	SP	R	I–T	A	4.10.
iso-Butyraldehyde	3	2G	Cont.	No	SP	O	I–T	A	4.12.7.
n-Butyraldehyde	3	2G	Cont.	No	SP	O	I–T	A	4.12.7.
Camphor Oil	3	2G	Cont.	No	SP	O	I	B	
Carbolic Oil	2	2G	Cont.	No	SP	C	I–T	A	4.9, 4.14.
Carbon Bisulfide	2	1G	Cont.	Inert	No Use	C	I–T	C	4.1, 4.9, 4.14.
Carbon Tetrachloride	3	2G	Cont.	No	St.	R	T	----------	4.9, 4.13.1, 4.13.2.
Caustic Soda	3	2G	Open	No	St.	O	No	----------	4.12.1.
Chlorobenzene	3	2G	Cont.	No	SP	R	I–T	B	
Chloroform	3	2G	Cont.	No	St.	R	T	----------	4.9.
Chlorohydrins, Crude	2	2G	Cont.	No	SP	C	I–T	A	4.9, 4.14.
Chloro Sulfonic Acid	1	2G	Cont.	No	----------	C	T	----------	4.8.2, 4.8.3, 4.8.4, 4.8.5, 4.8.6, [illegible] 4.8.8, 4.9, 4.14.

FIGURE 1.—*Summary of Minimum Requirements*

subcommitte prepare interim recommendations for existing ships to be used while the more extensive code was being developed.

INTERIM RECOMMENDATIONS FOR EXISTING SHIPS

The recommendations for existing vessels were developed as an operating guide for vessels which transport dangerous chemicals in bulk. These recommendations were published as MSC/Circular 70. (*8*)

The more comprehensive code, (*3*) completed at the sixth session of the Subcommittee of Ship Design and Equipment, is based upon a philosophy of relating cargo containment features of vessel design, construction, and operation to the hazards of the various chemicals covered by the code. Figure 1, Summary of Minimum Requirements, is the solution to the difficult problem of implementing that philosophy. In order to understand the solution, it is necessary to examine the elements of the code.

CHAPTER I—GENERAL

The important part of chapter I that relates to the basic philosophy of the code is the scope with respect to the products covered.

> The code applies to bulk cargoes of dangerous chemical substances other than petroleum or similar flammable products as follows:
>
> (*a*) Products having significant fire hazards in excess of petroleum and similar flammable products, and
>
> (*b*) products having significant hazards in addition to or other than flammability.

Products which have been reviewed and determined to meet the above criteria are listed in table I. The U.S. Coast Guard's Hazard Evaluation System (*9*) was used as a basic guide for determining which products come within the scope of the code. (Principally, only products with high ratings—i.e., 3 or 4—in the hazard evaluation system (*9*) (*see fig. 2*) are included in the code.) Additional hazard evaluation systems made available by Norway and the United Kingdom assisted in making these determinations. The code is limited at present to those products which are liquids at normal temperatures. This limitation was selfimposed by the Ad Hoc Working Group to permit the code to be developed in a more timely manner. Extension to gases is the second phase and has begun.

Chapter I also provides the following phased time period for existing ships to come into compliance with the code: (1) Existing ships should comply with all operational requirements contained in the code after the effective date; (2) Existing ships should comply with vapor detection equipment requirements and personnel protection standards for their cargoes within 1 year after the effective date; (3) Existing ships should comply with tank vent requirements, gaging standards, and fire protection standards for their cargoes within 2 years after the effective date; and (4) Existing ships should comply with remaining sections of the code as soon as possible but, in any case, within 6 years after the effective date. Rigid compliance is not expected, and certain dispensations from the code are permitted and enumerated. The remainder of chapter I contains important administrative information on the effective date of the code, certification, equivalence, and how new products may be included.

CHAPTER II—CARGO CONTAINMENT

This chapter contains features of major significance to the design of ships; for the first time, measures to prevent the cargo from release appear as a ship design standard. Recognizing that damage resulting from collision or grounding may lead to uncontrolled release of the cargo, three degrees of physical protection for the cargoes were developed. The degrees, or "ship types," define the location of the cargo with respect to the ship's side and bottom and the extent to which a ship should be capable of remaining afloat after damage. The assignment of ship types to the various cargoes takes into account the nature and severity of the product's hazard to the environment should it be released.

Chemicals	Fire	Health			Water pollution			Reactivity		
		Vapor irritant	Liquid or solid irritant	Poisons	Human toxicity	Aquatic toxicity	Aesthetic effect	Other chemicals	Water	Selfreaction
	I	II	III	IV	V	VI	VII	VIII	IX	X
Acetaldehyde	4	2	1	2	2	3	2	2	0	2
Acetic Acid (Glacial)	2	2	3	2	1	2	2	3	0	0
Acetic Anhydride	2	3	3	3	1	[a]2	2	3	2	0
Acetone	3	1	0	0	1	1	1	2	0	1
Acetonitrile	*3	1	1	3	2	1	1	2	0	0
Acetone Cyanohydrin	*1	[b]1	2	4	4	[a]3	3	[b]2	[b]3	0
Acrolein (Inhibited)	3	4	3	4	4	3	3	3	0	3
Acrylic Acid (Inhibited)	2	3	3	2	1	[a]3	2	2	0	3
Acrylonitrile	*3	3	1	3	4	3	2	3	0	3
Adiponitrile	*1	1	1	3	3	2	3	2	0	0
Allyl Alcohol	3	3	2	3	2	3	2	2	0	1
Allyl Chloride	*3	3	2	3	2	[a]1	2	2	0	1
Aluminum Triethyl	*4	NA	4	3	0	[a]2	3	4	4	0
N-Aminoethyl Ethanolamine	*1	1	3	1	1	[a]1	3	3	0	0
Ammonia, Anhydrous	*1	4	2	2	2	2	2	3	2	0
Ammonia, Aqua (28 percent)	*1	2	2	2	2	3	2	3	0	0
Amyl Acetate, iso-	3	1	0	1	1	3	2	1	0	0
Amyl Acetate, primary	3	2	1	1	1	3	2	1	0	0
Amyl Alcohol, n-	3	1	0	2	2	2	2	2	0	0
Aniline	*1	1	1	3	3	2	4	3	0	0
Asphalt (Typical)	1	1	[a]2	1	0	1	4	0	0	0
Benzene	3	1	1	3	1	3	2	1	0	0

FIGURE 2.—*U.S. Coast Guard Hazard Evaluation System*

The highest standard of physical protection, ship type 1, is required for those substances considered to have the greatest environmental hazard (i.e., which on release would have wide reaching effects beyond the immediate neighborhood of the vessel). Ship type 1 requires the cargo to be located inboard from the side of the vessel a distance equal to one-fifth of the beam, and above the bottom a distance equal to one-fifteenth of the beam. Further, ship type 1 must be able to withstand prescribed damages (two compartment standard of subdivision and damage stability throughout its length).

Ship type 2 is required for those cargoes with significant hazards but whose release does not have wide reaching effects. Specifications for ship type 2 require the cargo to be located inboard from the side of the vessel a minimum distance of 760 mm., and above the bottom a distance of one-fifteenth of the beam, thereby providing the cargo protection against low-energy collisions and groundings which are often associated with vessels in port. Increased survivability of the vessel is also required. Ships of lengths in excess of 150 meters must provide a two-compartment standard of subdivision and damage stability throughout its length. Ships of less than 150 meters must meet a two-compartment standard of subdivision and damage stability in the cargo portion of the vessel, and a one-compartment standard of subdivision and damage stability for the engineroom.

Ship type 3 is prescribed for products having lesser hazards and is close in division to normal tanker, although it is significant to note that increased survivability is required.

Underlying all the ship types is the growing concern for the protection of the environment regardless of the product carried in the vessel. In determining the survival capabilities, the following damage conditions are assumed:

Collision:

Longitudinal extent, one-third $L^{2/3}$ or 14.5 meters, whichever is less.

Transverse extent, a distance of B/5 or 11.5 meters, whichever is less.

Vertical extent, upward from the base line without limit.

Stranding:

Vertical extent, a distance of B–15 or 6 meters, whichever is less.

Longitudinal extent, for the forward one-third of the vesel a distance of L/10 is assumed; for the remainder, a distance of 5 meters is assumed.

Transverse extent, for the forward one-third of the vessel a distance of B/6 is assumed; for the remainder, a distance of 10 meters is assumed.

These damage assumptions are based upon casualty information available to the subcommittee. (*10, 11, 12*)

The cargo containment chapter also includes the following among other major provisions which will affect design of ships.

CARGO SEGREGATION

Cargoes subject to this code must be segregated from machinery and boiler spaces, accommodation spaces, and other service spaces. Cargoes which react in a hazardous manner with other cargoes must be segregated from those cargoes by cofferdams, void spaces, or mutually compatible cargoes. Further, tanks containing cargoes which react in a hazardous manner with other cargoes must have separate piping and vent systems.

LOCATION AND ARRANGEMENT OF ACCOMMODATION SPACES

Accommodation spaces on vessels which carry cargoes subject to this code must be located aft of cargo pumprooms and cargo tanks. The arrangement of the accommodation space must be such as to preclude cargo vapors from being drawn into it.

CARGO PIPING

The sections dealing with cargo piping outline the design parameters for the piping systems and give considerations to the location of the cargo piping. For example, cargo piping may not be installed under the deck between the outboard side of the cargo containment spaces and the skin of the vessel unless the clearances required under the ship type section

Table I.—PRODUCTS INCLUDED IN THE IMCO CHEMICAL CODE

Acetic Acid	Ethyl Ether
Acetic Anhydride	2-Ethyl-3-Propyl Acrolein
Acetone Cyanohydrin	Ethylene Cranohydrin
Acetonitrile	Ethylene Dibromide
Acrylonitrile	Ethylene Dichloride
Adiponitrile	Formaldehyde, 37 percent aqueous solution
Allyl Alcohol	Formic Acid
Allyl Chloride	Furfural
Aminoethanolamine	Hydrochloric Acid
Ammonia, Aqua, less than 28 percentage	Isoprene
Aniline	Methyl Acrylate
Benzene	Methyl Methacrylate
L-Butyl Acrylate	Monoethanolamine
n-Butyl Acrylate	Monisopropanolamine
L-Butyraldehyde	Morpholine
n-Butyraldehyde	Motor Fuel Anti-Knock Compounds
Camphor Oil	Nitric Acid, 70 percent and greater concentrations
Carbolic Oil	Oleum
Carbon Disulfide	Phenol
Carbon Tetrachloride	Phosphoric Acid
Caustic Soda	Phosphorus
Chlorobenzene	Propionic Acid
Chloroform	Propylene Oxide
Chlorohydrins, Crude	Pyridine
Chlorosulfonic Acid	Styrene Monomer
Cresols (mixed)	Sulfur, liquid
Crotonaldehyde	Sulfuric Acid
1,2-Dichloropropane	Triethanolamine
1,3-Dichloropropene	Triethylenetetramine
Diethanolamine	Vinyl Acetate
Dimethylformamide	Vinylidene Chloride
Epichlorohydrin	
Ethyl Acrylate	

are maintained. These minimum distances may be reduced when it can be shown that damage to the piping would not cause release of the cargo. Cargo transfer control systems are also prescribed.

TANK VENT SYSTEMS

Vessels which carry cargoes subject to this code must have vent systems designed to minimize the possibility of cargo vapor accumulating about the deck. Further, recognizing the work of the International Oil Tanker and Terminal Safety Group, (*13*) the vent systems are required to be arranged in such a manner so the vapor discharge is directed upward in the form of a jet.

Two types of tank vent systems are included in the code. The first, open venting, is a system which offers no restriction except for friction losses to the free flow of cargo vapors from the tank and is permitted for cargoes of lesser hazards. The second type, control venting, is a vent system using pressure vacuum relief valves fitted to each tank with vent exits extending to 4 meters above the deck. The vent exits from a controlled venting system must be located a distance of at least 10 meters from the nearest air intake or opening into accommodation or other service spaces. Control venting is required for tanks used to transport flammable and/or toxic cargoes.

MATERIALS OF CONSTRUCTION

Vessels must be constructed of materials suitable for the cargoes to be carried. This section contains considerations for selecting the materials of construction for vessels which transport cargoes subject to this code. These include determinations of the following:

1. The corrosive effect of the cargo,
2. Whether or not a hazardous reaction can take place between the cargo and the materials of construction, and
3. Whether or not a planned lining or coating system is compatible with the intended cargoes.

PUMP AND PIPELINE IDENTIFICATION

The deck of a modern chemical tanker is a labyrinth of piping and pumping systems. This section requires that pumps, valves, and pipeline systems be distinctively marked to identify the tanks they serve. This requirement provides a means of eliminating disastrous errors that can occur if a product is pumped into the wrong tank.

CHAPTER III—SAFETY EQUIPMENT AND RELATED CONSIDERATIONS

Meeting the requirements in this chapter on the code would make each vessel a safe working environment for its operating personnel. Chemical vessels are alive with various operations such as cargo transfer, maintaining cargo state, tank cleaning, and other similar operations, each of which presents hazards to the vessel's personnel. The chapter provides safeguards to reduce or eliminate these hazards. Within chapter III are the following major sections:

1. Ventilation in cargo handling spaces,
2. Electrical requirements,
3. Gaging,
4. Vapor detection,
5. Fire protection, and
6. Personnel protection.

CHAPTER V—ORERATING REQUIREMENTS

At the first session of the subcommittee, it was decided that consideration would be given to the Tanker Safety Guide (Chemicals) (*14*) being prepared by the ICS before developing a comprehensive chapter on vessel operation. Since there was insufficient time to fully consider the most recent draft of the ICS guide before submitting the code to the MSC, an extensive chapter on operating requirements could not be included. Instead, chapter V draws largely upon the operational recommendations contained in the "Interim Recommendations for Existing Ships" (*8*) and enumerates the various requirements contained in the code which have operational implications.

The operating requirement that establishes cargo size limits is one of major significance. For some time the subcommittee had been considering whether or not cargo size limits should be included in the code. (*15, 16, 17*) Some delegations were of the opinion that cargo size limits should be determined by national authorities based upon local conditions, while others felt such limits should be included in the code if it is to be successful. After considerable discussion, it was decided to include "holding figures" and to conduct in-depth studies in this matter. The limits established are as follows:

> (1) The quantity of a cargo required to be carried in a type 1 ship should not exceed 1,250 cubic meters in any one tank; and
>
> (2) The quantity of a cargo required to be carried in a type 2 ship should not exceed 3,000 cubic meters in any one tank. (*8*)

CHAPTER VI—SUMMARY OF MINIMUM REQUIREMENTS

The "Summary of Minimum Requirements" will probably draw more attention than the remainder of the code because it simply and quickly answers the question, "What is required to transport product X." What is more significant, however, is that the "Summary of Minimum Requirements" (fig. 1) represents a systematic approach to considering the hazard potential, the physical properties of the products in their transported state, and the degree of containment provided elsewhere in the code. Since full agreement could not be reached on a single hazard evaluation system, a criteria, or method of relating the physical properties and the hazards to the degree of containment, could not be included in the code. This paper would be incomplete, however, if a discussion of criteria were not included.

The following criteria, based upon the U.S. Coast Guard's Hazard Evaluation System (*9*) (an excerpt of which is shown in fig. 2), was developed to show how hazard evaluation and physical properties may be used to determine minimum requirements for the transportation of the chemicals included in the code.

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PRODUCTS COVERED BY THE CODE

Products with ratings of 3 or 4 in columns II, III, IV, V, VII, IX, or X; and

Products with ratings 0 or "*" in column I.

SHIP TYPE

Type 3—Products with ratings less than 3 in columns IV, V, or IX;

Type 2—Products with ratings of 3 or 4 in columns IV or V. Products with rating 4 in column IX.

Type 1—Certain highly toxic, reactive, or pyroforic compounds, as indicated with ratings of 4 in several columns.

TANK TYPE

Independent gravity — Certain highly flammable cargoes as indicated by the rating of 4 in column I.

Integral gravity—All other cargoes.

TANK VENT

Open—Products with rating of less than 3 in columns II or IV. Products with flash point greater than 150° F.

TANK ENVIRONMENTAL CONTROL

Individual determination based upon product characteristics; i.e., extreme flammability, peroxide formation, etc.

ELECTRICAL INSTALLATION

Determination based upon flammability of each product.

GAGING

Open—Products with ratings less than 3 in columns II or IV.

Restricted—Products rated 3 in columns II or IV.

Closed—Products rated 4 in columns II or IV.

VAPOR DETECTION

I—Products with flash points less than 150° F.

T—Products with ratings of 3 or 4 in columns II or IV.

FIRE PROTECTION

Individual determination based upon the characteristics of each product.

SPECIAL REQUIREMENTS FOR TOXIC PRODUCTS

Products having a rating of 4 in columns II or IV.

SPECIAL REQUIREMENTS FOR CARGOES INHIBITED AGAINST SELFREACTION

Products rated 3 in column X.

SPECIAL REQUIREMENTS—SPECIAL PUMPROOMS

Products having a rating of 4 in columns II or IV.

SPECIAL REQUIREMENTS — OVERFLOW PROTECTION

Products having a rating of 4 in columns II or IV.

REMAINING SPECIAL REQUIREMENTS

Individual determination based upon physical properties and other characteristics.

It is emphasized that such criteria should not be viewed as the final results of the analysis, but instead, they represent the first steps in the evaluation process. The limits of the criteria are recognized during individual product evaluations, and special requirements are developed for products when deemed necessary. Such was the case in developing the IMCO Code.

CHAPTER IV—SPECIAL REQUIREMENTS

The special requirements included in the code are grouped into three subject areas:

1. Special requirements for certain individual cargoes;
2. Special requirements for certain groups of products; and
3. Special requirements for construction and equipment.

Underlying each of the special requirements is the recognition that for certain products the more general parts of the code required extension in order to provide the necessary degree of containment.

CONCLUSION

It has been the purpose of this paper to review the IMCO Code for Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk and to provide an insight into the philosophy and processes that were used in developing the code. The code represents the first step in completing the task set forth by the MSC in the Subcommittee on Ship Design and Equipment's "Terms of Reference". The next step is to extend the work to cover gases, liquified, or compressed, and nonpropelled vessels engaged in international voyages. The subcommittee has assigned this task to the Ad Hoc Working Group, and work has already begun.

The IMCO Chemical Code has been developed because of concerns over personnel and port safety as a result of the risk created by vessels transporting dangerous chemicals. A philosophy of determining minimum containment standards based upon product hazards has been followed throughout. Underlying this philosophy has been the recognition that both personnel and port safety are also dependent upon the vessel being operated properly. The significance of the code is already being felt, as ships presently under construction have been designed to meet these new standards.

In the forefront of everyone's mind is the concern for protecting and improving the environment. Even though the IMCO Code has been developed around safety principles, it is equally applicable as an environmental protection standard, for what better way is there to improve the environment than to prevent the release of products. It is felt the code will become a milestone in the fight to protect the environment and a model to be followed in the many new areas of activity in this field.

REFERENCES

(*1*) U.S. Coast Guard. "Navigation and Vessel Inspection Circular No. 13–65," September 1965.

(*2*) IMCO DE 1/2. "Terms of Reference for the Subcommittee on Ship Design and Equipment," November 1967.

(*3*) DE VI/11, Annex 11. "Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk," February 1971.

(*4*) IMCO DE 1/3. "Consideration of the Terms of Reference of the Subcommittee and Formulation of the Work Programme" Note by France, November 1967.

(*5*) IMCO DE 1/7. "Consideration of the Terms of Reference" submitted by the United States, December 1967.

(*6*) IMCO DE 1/9. "Consideration of the Terms of Reference" submitted by Italy, January 1968.

(*7*) IMCO DE 1/11. "Consideration of the Terms of Reference" submitted by Japan, January 1968.

(*8*) IMCO MSC/Circular 70. "Interim Recommendations for Existing Ships Carrying Dangerous Chemicals which are Liquid at Ambient Temperatures and at Atmospheric Pressure," March 1970.

(*9*) National Academy of Sciences—National Research Council. "Evaluation of the Hazard of Bulk Water Transportation of Industrial Chemicals," Washington, DC, 1970.

(*10*) IMCO DE/27. "Statistics on Grounding and Stranding Damage," May 1970.

(*11*) IMCO DE V/3. "Grounding Casualty Statistics," May 1970.

(*12*) IMCO STAB XI/2. "Subdivision and Damage Stability of Passenger Ships" June 1970.

(*13*) International Oil Tanker and Terminal Safety Group. "International Oil Tanker and Terminal Safety Guide," The Institute of Petroleum, London, England.

(*14*) International Chamber of Shipping. "Draft Tanker Safety Guide (Chemicals)," London, England, October 1970.

(*15*) IMCO DE 11/11. "Safety of Vessels Exclusively Used for Transportation of Dangerous Cargo," submitted by Japan, September 1968.

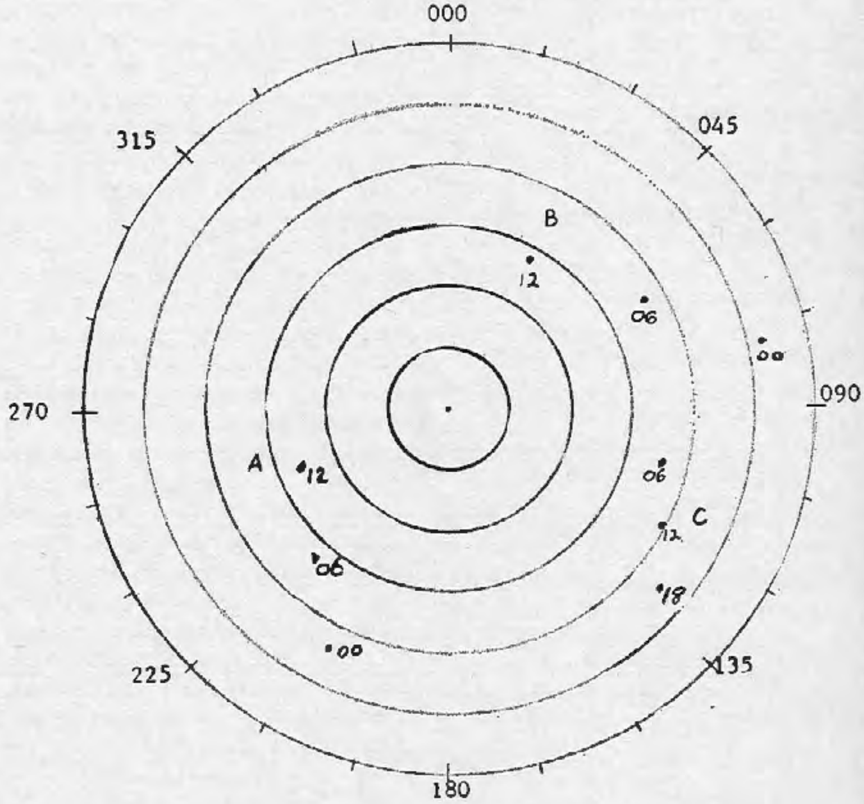
(*16*) IMCO DE V/2/3. "Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bnlk" Comment by the Netherlands, November 1970.

(*17*) National Academy of Sciences—National Research Council. "Factors Involved in Cargo Size Limitations," A Report to the Coast Guard, Washington, DC, July 1970.

All candidates are encouraged to study "Rapid Radar Plotting Techniques" as shown in H.O. Pub. No. 1310. This publication will be the basic reference book utilized in constructing the Coast Guard radar endorsement exams.

Allow yourself 1 minute to answer each question after you have thoroughly studied the following radarscope presentation.

Your radar is presenting a relative motion display, ship's head up. Your course is 000° at 10 knots and the radar is set on the 6-mile scale. You have observed three targets and have marked them at 6-minute intervals.



Q. 1. What will be the CPA of target A?
  a. 270°, 2.0 miles.
  b. 262°, 2.5 miles.
  c. 082°, 2.5 miles.
  d. 221°, 3.3 miles.

Q. 2. What will be the CPA of target B?
  a. 021°, 2.7 miles.
  b. 015°, 3.0 miles.
  c. 077°, 5.2 miles.
  d. 000°, 3.0 miles.

Q. 3. What is the direction and speed of relative movement of target A?
  a. 329°, 10 knots.
  b. 196°, 15 knots.
  c. 351°, 15 knots.
  d. 354°, 25 knots.

Q. 4. What is the direction and speed of relative movement of target B?
  a. 317°, 15 knots.
  b. 291°, 20 knots.
  c. 084°, 15 knots.
  d. 313°, 24 knots.

Q. 5. What is the direction and speed of relative movement of target C?
  a. 180°, 10 knots.
  b. 145°, 10 knots.
  c. 037°, 15 knots.
  d. 000°, 15 knots.

Q. 6. What is the true course and speed of target A?
  a. 351°, 15 knots.
  b. 348°, 20 knots.
  c. 354°, 25 knots.
  d. 329°, 10 knots.

Q. 7. What is the true course and speed of target B?
  a. 291°, 20 knots.
  b. 317°, 15 knots.
  c. 313°, 24 knots.
  d. 300°, 22 knots.

Q. 8. You maintain course and speed and target "B" reduces speed but maintains his present course. The blip for target "B" will:
  a. Fall to the left off RM line.
  b. Fall to the right off RM line.
  c. Continue on same RM line but at a reduced relative speed.
  d. Insufficient information given to determine effect.

Q. 9. What is the true course and speed of target C?
  a. On course 180°, speed 10 knots.
  b. On course 000°, speed 5 knots.
  c. On course 000°, speed 10 knots.
  d. Dead in the water (stationary target).

(*See answers on page 18.*)

Title 46 Changes

Chapter I—Coast Guard, Department of Transportation

SUBCHAPTER N—DANGEROUS CARGOES

PART 2—VESSEL INSPECTIONS

PART 146—TRANSPORTATION OR STORAGE OF EXPLOSIVES OR OTHER DANGEROUS ARTICLES OR SUBSTANCES AND COMBUSTIBLE LIQUIDS ON BOARD CARGO VESSELS

Dangerous Cargo Containers

On pages 12909 and 12910 of the Federal Register (36 F.R. 5246) which appeared July 9, 1971, a notice of proposed rule making was published, which proposed an amendment to the Dangerous Cargo Regulations. A public hearing was held on August 24, 1971 and interested persons were given 53 days in which to submit written comments regarding the proposed regulations.

No objections have been received and the proposed regulations are hereby adopted without change and are set forth below.

Effective date. This amendment shall become effective on December 31, 1971.

The complete text of these changes was published in the "Federal Register" of November 4, 1971.

Chapter I—Coast Guard, Department of Transportation

SUBCHAPTER N—DANGEROUS CARGOES

PART 146—TRANSPORTATION OR STORAGE OF EXPLOSIVES OR OTHER DANGEROUS ARTICLES OR SUBSTANCES, AND COMBUSTIBLE LIQUIDS ON BOARD VESSELS

Miscellaneous Amendments

Corrosive liquids, n.o.s., wet desensitized pentaerythrite tetranitrate, bromine, hydrochloric acid, sodium chlorite, chromic acid, refrigerant gas, chloropicrin and chloropicrin mixtures, and flammable liquid containers.

This amendment to Part 146 of Title 46 of the Code of Federal Regulations allows the carriage on board vessels of bulk shipments of certain corrosive liquids, n.o.s., in tank cars, motor vehicle tank trucks complying with Department of Transportation regulations (trailerships and trainships only) and and portable tanks; wet desensitized pentaerythrite tetranitrate in specification DOT–21C fiberdrums having an inside polyethylene bag; bromide in bottles not over one (1) quart in specification 12A fiberboard boxes; and hydrochloric acid and sodium chlorite solution in specification 2E polyethylene bottles up to one (1) gallon capacity in DOT–12R packaging. In addition, this amendment revises the definition of chromic acid, prohibits its carriage in certain packaging that apparently is no longer in use, and allows its carriage in specification DOT–29 and 33A packaging. This amendment also allows the carriage of chloropicrin and mixtures of chloropicrin containing no compressed gas or class A poisonous liquids in specification 4BW cylinders and increases the quantity that may be carried in authorized cylinders. Refrigerant gases which are nonflammable and nonpoisonous may be carried, as a result of this amendment, in specification DOT–2P and 2Q inside metal containers. This amendment also allows for the carriage of the certain flammable liquids in specification DOT–2S inner polyethylene containers when DOT–2SL containers are authorized. This change applies to acetone; butyraldehyde; ethyl acetate; ethyl methyl ketone; heptane; isopropyl acetate; methyl acetate; methyl acetone; methyl isopropenyl ketone, inhibited; motor fuel, n.o.s.; pentane, methyl petroleum distillate; allyl bromide; antifreeze compounds, liquids; butyl acetate; box toe gum; cement, leather; cigar and cigarette lighter fluid; coal tar distillate; coal tar naphtha; coal tar oil; compounds, cleaning, liquid; compounds, tree or weed killing, liquid; crontonaldehyde; crude oil, petroleum; dimethylamine, aqueous solution; drugs, chemicals, medicines, or cosmetics, n.o.s.; ethylene dichloride; insecticide, liquid; methyl methaacrylate monomer; oil; pyridine; resin solution; sodium methylate alcohol mixture; solvents, n.o.s.; toluol; turpentine substitutes vinyl acetate; xylol; inflammable liquids, n.o.s.; insecticide, liquid (vermin exterminator).

Effective date. This amendment shall become effective on December 31, 1971.

The complete text of these changes was published in the "Federal Register" of November 5, 1971.

Approved Equipment

Commandant Issues Equipment Approvals; Terminates Others

U.S. Coast Guard approval was granted to certain items of lifesaving, and other miscellaneous equipment and materials. At the same time the Coast Guard terminated certain items of lifesaving, and other miscellaneous equipment and materials.

Those interested in these approvals and terminations should consult the Federal Registers of November 3, 6, 10, and 23, 1971, for detailed itemization and identification.

ANSWERS TO NAUTICAL QUERIES

(*from page 17.*)

1. b. 262°, 2.5 miles.
2. a. 021°, 2.7 miles.
3. c. 351°, 15 knots.
4. b. 291°, 20 knots.
5. a. 180°, 10 knots.
6. c. 354°, 25 knots.
7. c. 313°, 24 knots.
8. a. Fall to the left off RM line.
9. d. Dead in the water (stationary target).

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 Sunday, Monday, and days following 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 $2.50 per month or $25 per year, payable in advance. The charge for individual copies is 20 cents for each issue, or 20 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. Regulations for Dangerous Cargoes, 46 CFR 146 and 147 (Subchapter N), dated January 1, 1971 are now available from the Superintendent of Documents price: $3.75.

CG No.	TITLE OF PUBLICATION
101	Specimen Examination for Merchant Marine Deck Officers (7–1–63).
108	Rules and Regulations for Military Explosives and Hazardous Munitions (5–1–68). F.R. 6–7–68, 2–12–69, 10–29–69.
115	Marine Engineering Regulations (7–1–70). F.R. 12–30–70.
123	Rules and Regulations for Tank Vessels (5–1–69). F.R. 10–29–69, 2–25–70, 6–17–70, 10–31–70, 12–30–70.
129	Proceedings of the Marine Safety Council (Monthly).
169	Rules of the Road—International—Inland (9–1–65). F.R. 12–8–65, 12–22–65, 2–5–66, 3–15–66, 7–30–66, 8–2–66, 9–7–66, 10–22–66, 5–11–67, 12–23–67, 6–4–68, 10–29–69, 11–29–69, 4–3–71.
172	Rules of the Road—Great Lakes (9–1–66). F.R. 2–18–67, 7–4–69, 8–4–70.
174	A Manual for the Safe Handling of Inflammable and Combustible Liquids (3–2–64).
175	Manual for Lifeboatmen, Able Seamen, and Qualified Members of Engine Department (3–1–65).
176	Load Line Regulations (2–1–71) F.R. 10–1–71.
182	Specimen Examinations for Merchant Marine Engineer Licenses (7–1–63).
184	Rules of the Road—Western Rivers (9–1–66). F.R. 9–7–66, 2–18–67, 5–11–67, 12–23–67, 6–4–68, 11–29–69, 4–3–71.
190	Equipment Lists (8–1–70). F.R. 8–15–70, 9–29–70, 9–24–71, 9–30–71, 10–7–71, 10–14–71, 10–19–71, 10–30–71, 11–3–71, 11–6–71, 11–10–71, 11–23–71.
191	Rules and Regulations for Licensing and Certificating of Merchant Marine Personnel (5–1–68). F.R. 11–28–68, 4–30–70, 6–17–70, 12–30–70, 6–17–71.
200	Marine Investigation Regulations and Suspension and Revocation Proceedings (5–1–67). F.R. 3–30–68, 4–30–70, 10–20–70.
220	Specimen Examination Questions for Licenses as Master, Mate, and Pilot of Central Western Rivers Vessels (4–1–57).
227	Laws Governing Marine Inspection (3–1–65).
239	Security of Vessels and Waterfront Facilities (5–1–68). F.R. 10–29–69, 5–15–70, 9–11–70, 1–20–71, 4–1–71, 8–24–71.
249	Marine Safety Council Public Hearing Agenda (Annually).
256	Rules and Regulations for Passenger Vessels (5–1–69). F.R. 10–29–69, 2–25–70, 4–30–70, 6–17–70, 10–31–70, 12–30–70.
257	Rules and Regulations for Cargo and Miscellaneous Vessels (8–1–69). F.R. 10–29–69, 2–25–70, 4–22–70, 4–30–70, 6–17–70, 10–31–70, 12–30–70, 9–30–71.
258	Rules and Regulations for Uninspected Vessels (5–1–70).
259	Electrical Engineering Regulations (3–1–67). F.R. 12–20–67, 12–27–67, 1–27–68, 4–12–68, 12–18–68, 12–28–68, 10–29–69, 2–25–70, 4–30–70, 12–30–70.
266	Rules and Regulations for Bulk Grain Cargoes (5–1–68). F.R. 12–4–69.
268	Rules and Regulations for Manning of Vessels (5–1–67). F.R. 4–12–68, 4–30–70, 12–30–70.
293	Miscellaneous Electrical Equipment List (9–3–68).
320	Rules and Regulations for Artificial Islands and Fixed Structures on the Outer Continental Shelf (11–1–68). F.R. 12–17–68, 10–29–69, 1–20–71, 8–24–71, 10–7–71.
323	Rules and Regulations for Small Passenger Vessels (Under 100 Gross Tons) (7–1–69). F.R. 10–29–69, 2–25–70, 4–30–70, 10–31–70, 12–30–70.
329	Fire Fighting Manual for Tank Vessels (7–1–68).

CHANGES PUBLISHED DURING NOVEMBER 1971

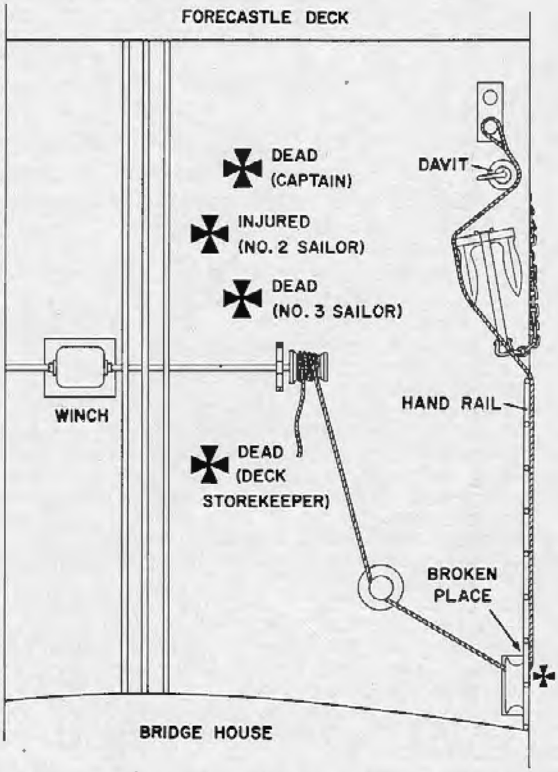
The following have been modified by Federal Registers:

CG–190, Federal Registers November 3, 6, 10, and 23, 1971.

Subchapter N of Title 46 CFR, Federal Register November 4 and 5, 1971.

Four men killed by whiplashing hawser

A grim lesson from another company's experience



This shocking accident dramatizes the devastating forces unleashed from failure of a synthetic hawser under heavy strain. The illustration is copied from a hand-drawn sketch prepared by the tanker's Chief Mate. This is what reportedly happened:

The ship lost the port anchor at the loading port. Divers' efforts to locate the missing anchor were not successful, so it was decided to ship the spare 8-ton anchor to the port chain. The chain had been slacked down and hauled around by a nylon hawser to a point off the starboard bow where it was hung off and secured to the spare anchor on deck.

The Master was supervising and three sailors were on deck performing the work. It would appear from the illustration that the crew was trying to skid or trip the anchor over the side by means of the nylon hawser.

The nylon hawser broke from the strain and the resultant whiplash swept the deck, killing outright everyone but the No. 2 sailor who died in the hospital hours later.

Ships' Safety Committees: How would you have handled this job, bearing in mind that the ship had no booms or other heavy lifting gear? There were no shoreside cranes or other facilities available for assistance.

U.S. GOVERNMENT PRINTING OFFICE: 1972