



COAST GUARD

Season's Greetings



PROCEEDINGS

OF THE MERCHANT MARINE COUNCIL

The Coast Guard and Maritime Radioactive Materials Traffic . . . SS *Gulfstag* Explosion, Fire and Capsizing . . .

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

Published monthly at Coast Guard Headquarters, Washington, D.C. 20591, under the auspices of the Merchant Marine Council, in the interest of safety at sea. Special permission for republication, either in whole or in part, with the exception of copyrighted articles or pictures, is not required provided credit is given to the Proceedings of the Merchant Marine Council. Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget, February 26, 1968.

CONTENTS

FEATURES

The Coast Guard and Maritime Radioactive Materials Traffic . .	228
SS <i>Gulfstag</i> Explosion, Fire, and Capsizing	233

DEPARTMENTS

24-Hour VHF Recording at Golden Gate	232
Annual Index Volume 25	251

COVERS

FRONT COVER: A seagoing Santa offers Season's Greetings to all our readers. The jolly gentleman would probably be better off with his sleigh and reindeer, judging by his precarious stance and the lack of a life preserver.

BACK COVER: Safety never should take a holiday. A few tips on Christmas tree care are presented. *Courtesy of the National Safety Council.*

The Merchant Marine Council of The United States Coast Guard

Admiral W. J. Smith, USCG	Commandant
Rear Admiral C. P. Murphy, USCG	Chief, Office of Merchant Marine Safety, Chairman
Rear Admiral Roderick Y. Edwards, USCG	Chief, Office of Public and International Affairs, Alternate Chairman
Captain James B. McCarty, Jr., USCG	Deputy Chief, Office of Merchant Marine Safety, Vice Chairman
Rear Admiral D. B. Henderson, USCG	Chief, Office of Engineering, Member
Rear Admiral R. W. Goehring, USCG	Chief, Office of Operations, Member
Rear Admiral W. L. Morrison, USCG	Chief, Office of Boating Safety, Member
Rear Admiral K. S. Harrison, USCGR (Ret.)	Chief Counsel and Member
Captain G. H. Read, USCG	Chief, Merchant Vessel Personnel Division, Member
Captain Eric G. Grundy, USCG	Chief, Hazardous Materials Division, Member
Captain Winford W. Barrow, USCG	Chief, Merchant Vessel Inspection Division, Member
Captain W. L. Aitkenhead, USCG	Chief, Merchant Marine Technical Division, Member
Dr. Charles C. Bates	Science Advisor to the Commandant, Member
Mr. Robert O. McDonald	Chief, Merchant Vessel Documentation Division, Member

Captain Leonard E. Penso, USCG
Executive Secretary and Member

T. A. DeNardo, Acting Editor

Season's Greetings

At year's end the spirit of Christmas is once again felt across the land and on the seas. I extend to all seamen and their loved ones everywhere my best wishes for a joyous holiday and a safe voyage through the coming year.

W. J. SMITH,
Admiral, U.S. Coast Guard,
Commandant.

DIST. (SDL NO. 87)

A: abcde(2); fghijklmnopqrstuv(1)
B: n(40); c(16); e(5); f(4); gh(3); bdikmpq(1)
C: abcdefgimnou(1)
D: i(5); abdefklmruvw(1)
E: d(1)
F: p(1)
Lists 141M, 111,203

MARINE ENGINEERING REGULATIONS (CG-115)

REVISION EFFECTIVE JULY 1, 1969

Due to delays encountered in publishing the revision and modernization of the Marine Engineering Regulations (CG-115), the publicized effective mandatory date of January 1, 1969, was extended to July 1, 1969, by the Marine Engineering Regulations to be published in the Federal Register of December 1968. However, during the period prior to July 1, 1969, either the existing requirements or the requirements in the revised Marine Engineering Regulations (46 CFR Parts 50 to 63, inclusive, Subchapter F) may be used.

These revised Marine Engineering Regulations are based on the proposals in the Merchant Marine Council Public Hearing Agenda dated December 4, 1967 (CG-249), and the comments received in connection with the Public Hearing held on December 4, 1967. Interested persons have been afforded an opportunity to participate in the consideration of these marine engineering proposals, and changes were made therein as a result thereof. The very favorable acceptance of these proposals was reflected in many of the comments received, as well as in verbal opinions expressed at informal meetings held with various interested groups where these proposals were discussed. The actions of the Merchant Marine Council with respect to the comments and the proposals were approved by the Commandant.

The following is a brief resume of important changes made in the marine engineering proposals as a result

of reviewing and considering nearly 500 comments submitted:

A. In the revised 46 CFR Part 54 and other regulations the term "un-fired pressure vessel" was changed to "pressure vessel." Section VIII of the ASME Code for some time has contained requirements for a group of fired pressure vessels. In the 1968 ASME publication the title to section VIII refers to pressure vessels, and in order to have the marine engineering regulations agree with the ASME Code this change was made. In effect it does not change the requirements.

B. The Tubular Exchanger Manufacturer's Association (TEMA) has provided for a new class B heat exchanger which augments the coverage of classes C and R in the 1968 edition of TEMA. The regulations have adopted the 1968 edition of TEMA for these 3 classes of heat exchangers.

C. With respect to brazed boiler steam air heaters, the provisions of 46 CFR 52.01-95(d) will permit brazed construction up to 525° F. on skin air heaters used in boilers. This change is based on the development of new brazing alloys and successful experience in their use in low pressure operation of the heaters or in heaters within an enclosure.

D. The radiographic examination of boilers, fabricated by welding was modified as set forth in 46 CFR 52.05-20. It requires that all boiler parts made of pipe material containing only circumferential points shall be inspected as required by Table 56.95-10 of Part 56 (Piping) in lieu

of ASME requirements. This modification was made because the ASME Code would exempt practically all such welds in a marine boiler from radiography due to the fact that the central station (utility type) boilers for which the ASME Code is basically written contains much larger components than marine (main) boilers.

E. The requirements for hot water supply boilers in 46 CFR 53.01-10 (b) were revised to allow electric fired hot water supply boilers which have a capacity of not greater than 120 gallons and a heat input not greater than 200,000 B.t.u. per hour, after being listed as approved by the Underwriters' Laboratories, Inc., under their Standard 174.

F. With respect to pressure vessels used for low temperature applications, the toughness tests in 46 CFR Subpart 54.05, and §§ 54.25-10 (low temperature operation—ferritic steels) and 54.25-15 (low temperature operation—high alloy steels) were revised, but basically the requirements remain very similar. These changes clarify the intent and make a better arrangement than originally proposed. These requirements are very similar to the recommendations in the Navigation and Vessel Inspection Circular No. 7-67.

G. With respect to exemptions from shop inspection and plan approval of vessels containing water at a pressure not greater than 100

(Continued on page 249)

THE COAST GUARD AND MATERIALS

Lt. Comdr. Terry R. Grant

INTRODUCTION

THE COAST GUARD traces its involvement in merchant marine safety back to the mid-nineteenth century, when steam power plants began to supplant wind and tow-mules. In 1871 the Steamship Inspection Service was first empowered to regulate the carriage of a few specified hazardous cargoes. Then in 1929 the United States participated in the International Safety of Life at Sea (SOLAS) Conference, out of which came a comprehensive set of safety standards for the construction, equipping, manning, and navigation of ships, with the emphasis on passenger vessels. Among its provisions was one calling for each administration to "determine what goods are to be considered dangerous goods" and to "indicate the precautions which must be taken in the packing and stowage thereof."¹ The enabling legislation was tardily passed in late 1940 and stands today without substantive alteration. Known as the Dangerous Cargo Act, it has as its purpose:

... to provide for the safe carriage of explosives or other dangerous articles or substances on board

This article was presented by the author at the Second International Symposium on Packaging and Transportation of Radioactive Materials in Gatlinburg, Tennessee, October 14-18, 1968. LCDR Grant is the nuclear affairs officer in the Hazardous Materials Division of the Office of Merchant Marine Safety, U.S. Coast Guard Headquarters. He graduated from the Coast Guard Academy in 1958 and served five years on various cutters, including a tour as Engineer Officer on CGC *Storis*. He holds a B.S. degree in Physics from the U.S. Naval Postgraduate School, Monterey, California, and is doing graduate work at the George Washington University, Washington, D.C.

vessels; to make more effective the provisions of the International Convention for the Safety of Life at Sea, 1929, relating to the carriage of dangerous goods; and for other purposes.²

In its present form the law makes the Coast Guard the enforcement agency for the law and requires the Commandant of the Coast Guard to establish regulations to make it effective. The regulations thus issued

are codified in Title 46 of the Code of Federal Regulations, Parts 146 to 149,³ often called the dangerous cargo regulations. These serve the same purposes for water transportation as do Parts 170-190 of Title 49 for rail and highway transport. They apply to cargoes carried on cargo and passenger ships of any nation while on the navigable waters of the United States.

Under other laws⁴ and Executive Order 10173 the Coast Guard is charged with "the safeguarding against destruction, loss, or injury from sabotage or other subversive acts, accidents, or other causes of similar nature, of vessels, harbors, ports, and waterfront facilities in the United States. . . ." The authority of the Coast Guard extends to regulation and control of the movements of vessels within ports, control of access of persons to vessels and waterfront facilities, and control of dangerous cargoes on waterfront facilities.

³ Available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, price: basic book \$2.50, Supplement: 20 cents.

⁴ Espionage Act of June 15, 1917, 40 Stat. 220 (50 U.S.C. 191) as amended by Public Law 679, 81st Congress, 2d Sess., approved August 9, 1950.

¹ International Convention for the Safety of Life (1929), Article XXIV.

² U.S. Congress, House, Committee on Merchant Marine and Fisheries, *Hearings, Dangerous Cargoes*, 76th Cong., 3d Sess., 1940, p. 1.

MARITIME RADIOACTIVE TRAFFIC

U.S. Coast Guard, Headquarters

This authority is the basis of the Coast Guard's Port Safety Program.

ADMINISTRATION AND ENFORCEMENT

Both the Dangerous Cargo Regulations and the Port Safety Regulations (33 CFR 6) are enforced in the field by 55 Coast Guard Captains of the Port and their assigned officers and enlisted personnel. They make frequent inspections of waterfront areas, conduct harbor patrols, spot-check the loading and stowage of hazardous cargoes, and supervise the loading of commercial explosive shipments. They are backed by staffs in the twelve district offices and in our Washington headquarters.

Most questions concerning the dangerous cargo regulations are referred to the Package Engineering Branch of the Hazardous Materials Division in Headquarters. The staff and leadership of the Hazardous Materials Division are in almost daily contact with the Office of Hazardous Materials in the Department of Transportation (DOT). The division chief represents the Commandant of the Coast Guard on the Hazardous Materials Regulations Board.

The Coast Guard's regulations for radioactive materials differ from the DOT (former ICC) regulations in format, but definitions and shippers'

requirements are alike. There are, of course, special stowage requirements for the carrier's use. A table of separation distances for film, persons, and radioactive materials is included, taking into account shielding furnished by other cargo and the ship's structure.

Our procedures for authorizing non-specification radioactive materials containers and large quantities of radioactive materials have also been different. In land transport, packaging was until about a year ago approved by the Bureau of Explosives of the association of American Railroads for specified contents; once approved the containers could be moved about freely. The Coast Guard has required that each shipboard loading of these packages (and the containers bearing Canadian Board of Transport Commissioners permits) be authorized by the Commandant because of the land transport orientation of the Bureau and the BTC. About eighty such authorizations were written in 1967 for shipments of 888,000 curies of by-product materials and 3,200 kilograms of fissionable isotopes.

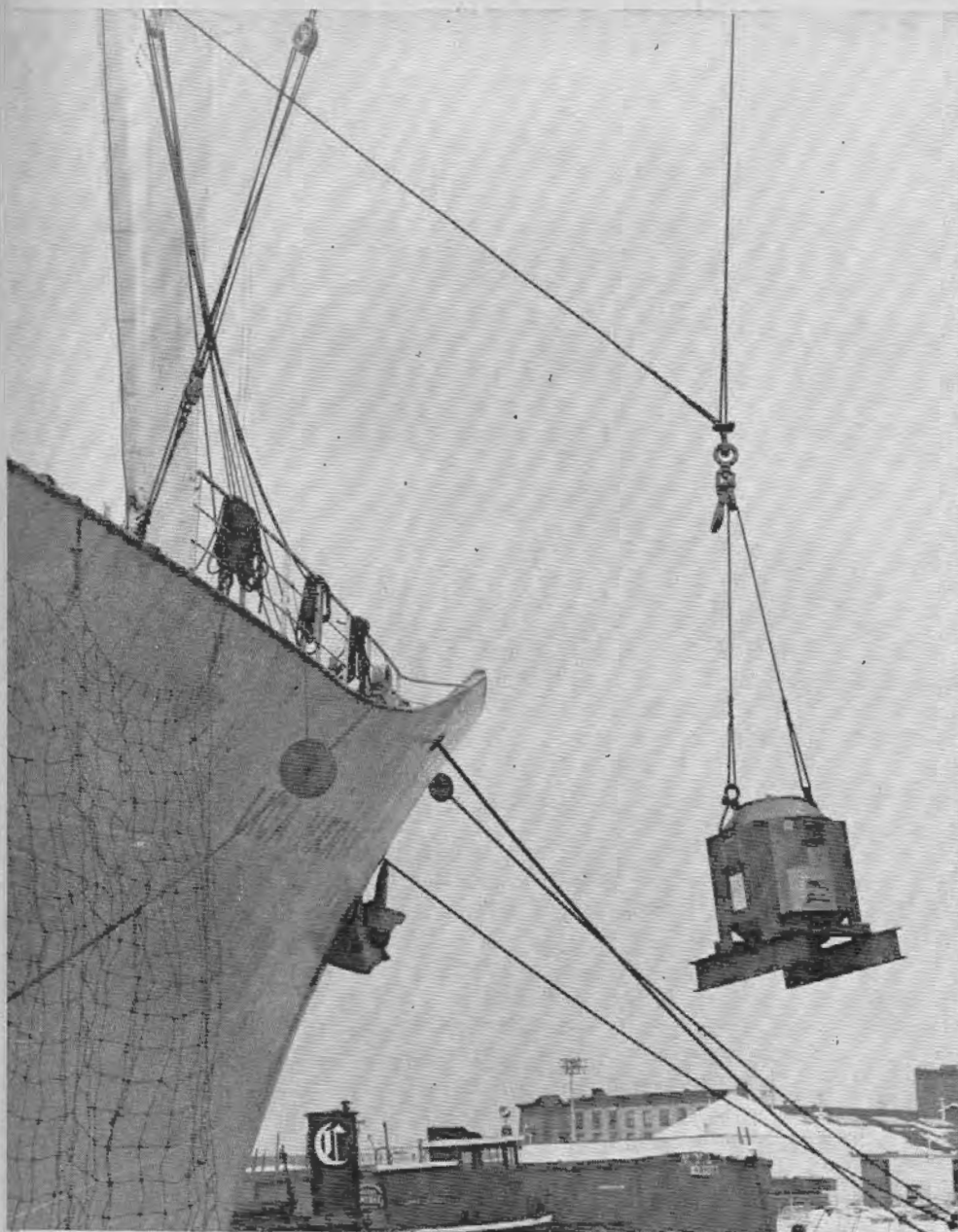
Under the present Department of Transportation special permit system, the Commandant reviews the application for a special permit before it is issued if the applicant has indicated

the packaging will be used in water transport. The special permit, if it is granted, states then the particular modes of transport authorized. If shipboard carriage is included, there will be a requirement for advance notification of each movement to the appropriate Coast Guard Captain of the Port,⁵ but no further approval is required from the Commandant. (Of course, local requirements must also be met.)

It has been the practice of the Captains of the Port to dispatch a dangerous cargo team to monitor the loading or off-loading of each shipment of radioactive materials for which he receives notification. The team usually checks the exterior radiation levels, the labeling, and the shipboard stowage. These checks have served to reassure the people handling the cargoes on and off the ship, thus promoting their acceptance along with a rational regard for their hazards in maritime commerce.

Should there ever be a radiological incident or accident on the waterfront the Coast Guard Captain of the

⁵ This condition is imposed in special permits for water transport of all hazardous materials. Where radioactive materials are concerned, there is also a regulatory requirement for advance, written notification in 33 CFR 126.27 (b).



A HEAVILY shielded shipment of radioactive Cobalt-60 is loaded on board a cargo vessel in New York.

Port is empowered by 33 CFR 6 to exercise a broad degree of control over the movements of vessels and people in the port area. He is equipped to conduct gross contamination surveying and can isolate affected waterfront areas. He would call upon a radiological assistance team for more technically qualified

help for contamination control and cleanup, as provided by the Inter-agency Radiological Assistance Plan.

FUTURE REGULATION DEVELOPMENT

As with the other administrations in the Department of Transportation, the Coast Guard is seeking to achieve

a balance between degree of hazard and probability of exposure, safety and cost, reasonableness and enforceability, maturity and timeliness.

The Dangerous Cargo Act requires that—except in an emergency—substantive changes in the dangerous cargo regulations issued by the Commandant be published and public hearings held before promulgation. This has the effect of tying changes to an annual cycle: amendment preparation in the autumn, publication in the public hearing agenda in December, public hearing in March, and promulgation in April or May with an effective date of 1 July, then preparation of the next set of changes, and so on. Therefore it is very difficult to make changes become effective simultaneously with changes in Title 49 (for land transport), since the latter need not be put before a public hearing nor are they tied to a calendar. In actuality, however, the Department has not been able to make changes in the radioactive materials regulations so fast as to create any real conflict. (DOT published its most recent change to its regulations for radioactive materials as Docket No. HM-2 in the Federal Register of October 4, 1968. The corresponding changes to the Coast Guard Dangerous Cargo Regulations were proposed in the 1968 Public Hearing Agenda. At this writing, the final version, which will incorporate modifications to HM-2 made since the preparation of the public hearing agenda, is being prepared for publication in the Federal Register. Both DOT and Coast Guard changes will become effective December 31, 1968.)

More important are the differences in handling, stowage, and environment between overland and marine transport. For instance, shipboard loading and off-loading may involve lifting cargo to considerable heights. Once on board and in a hold, the cargo may be inaccessible because of other cargo stowed around and over it. The ocean voyage may last two or three weeks or more. During that time

the cargo must endure vibration from the propulsion system, a rocking motion from the ship's roll, and a pounding motion when the ship is rising and falling with the waves. The severity of these forces is not easily imagined or foreseen by one who has never gone to sea. And when disaster strikes at sea a ship seems a very small island; its crew cannot back away from a fire or other source of injury very far before making intimate contact with the water. A shipboard casualty in port may threaten a densely populated community or business area and disrupt tremendous amounts of shipping. These are some of the considerations given in the development of hazardous materials regulations for water transport. Although there have been tragic fires and explosions at sea and in port involving dangerous and general cargoes, none, happily, has involved radioactive materials.

Yet another difference between land and ocean transport is that ocean traffic is mostly international whereas in the United States the surface freight is generally moving in domestic commerce. Ocean carriers and import and export shippers have a much greater interest in international understanding and compatibility for labels and other regulated aspects of their commerce than do strictly domestic carriers and shippers. The Coast Guard has been working many years with representatives of other governments in the development of a truly international dangerous goods labeling system and code of recommended regulations,⁶ but by law the Coast Guard's regulations must be entirely complementary to those for land transport in the U.S. Because of the participation of the U.S. Atomic Energy Commission, carrier groups, and nuclear industries in the work of the International Atomic Energy Agency we are much closer to international harmony in the transporta-

tion of radioactive materials than any other classification of hazardous cargoes.

Technological change is another influence to which the Coast Guard must be sensitive. Sophisticated stowage and handling methods are now coming into use or being developed. Inter-modal containerized freight is one of these developments, although not yet much used by shippers of radioactive materials. There are about forty United States-flag container-ships in service and about 100 containerships under construction or on order around the world.⁷ Several high-speed ships have been put into

service in the Atlantic to carry motor vehicles and containerized cargo. These ships use the roll-on/roll-off method of handling their cargo of trucks, trailers and automobiles. At this writing the first irradiated fuel roll-on shipment has been proposed for such a ship. Coming soon are lighter-aboard-ship (LASH) vessels which will carry their cargo in many small barges. Someday, perhaps, irradiated reactor fuel will be transported in such craft. Further into the future, huge surface-effect ships riding just above the ocean surface may speed cargoes between continents at costs intermediate between those of conventional ships and aircraft.

The Coast Guard's dangerous cargo regulations need modification to keep pace with the changing technology. Some broad and serious study is needed to anticipate risks and to determine the form and substance of future regulations.

⁷ *Marine Sciences Affairs—A Year of Plans and Progress*, The Second Report of the President to the Congress on Marine Resources and Engineering Development (Washington: U.S. Government Printing Office, 1968), p. 82.



THE CAPTAIN of the Port dangerous cargo team verifies that the radiation from a radioactive materials package is within safe limits.

⁶ Inter-Governmental Maritime Consultative Organization (IMCO), *International Maritime Dangerous Goods Code*.

We need to know more about the radiation doses actually received by transport workers—both the long-shoremen and the ships' crews. The separation tables in the present regulations are based on assumed exposure times and the Federal Radiation Council protection guides which limit exposures to 0.5 rem yearly except for radiation workers, whereas the United Kingdom and the Inter-Governmental Maritime Consultative Organization use a dose limit of 1.5 rem.⁸ Consequently, we have different values in our tables of separation distance. These might be resolved if we could show that our assumed exposure times are overly conservative.

We would like to know more about the shape of the nuclear industries of the future and the role of water transportation in their support. With the growth of the nuclear power industry in the next decade, for example, will come much more traffic in irradiated reactor fuel—a cargo well suited for barge and ship transportation. But there may be other important developments which might be foreseen if the field were studied using systems analysis techniques. Without foresight, regulation will tend to be by reaction, uneven and untimely. By anticipating the needs of the future, we will be able to train our personnel, to build on a good technological base, and to emphasize the preventive and protective roles of regulations *before* accident history defines the problems.

Obviously these problems and considerations are not going to be handled by the Coast Guard alone nor even by the Department of Transportation. We will be working with other agencies, other governments, and industry groups, always keeping in mind that our ultimate concern must be the public interest.

Radioactive materials movements have received a disproportionate

⁸ IMCO, *International Maritime Dangerous Goods Code Class 7—Radioactive Substances*, p. 7013.



amount of our administrative and regulatory effort when compared with that given other hazardous cargoes. As we gain experience and knowledge this situation should change. Meanwhile, the fruits of these efforts are an unmarred safety record and increasing acceptance of these cargoes by the general public, by carriers, and by labor. ‡

24-Hour VHF Recording at Golden Gate

Another national "first" was inaugurated recently when all ship VHF radiotelephone communications in the San Francisco Bay Region were recorded on a 24-hour basis.

Two special, slow-speed tape recorders—each capable of operating continuously for a full day—have been installed at the Marine Exchange's Main Lookout Station at Pier 45, San Francisco. The units will alternate on 24-hour duty to record the heavy volume of radiotelephone traffic between the station and ships, tugs and equipment operating through the Golden Gate, and on the Bay and river navigation system. Monitored are channels 10 and 18A (156.50 MHz. and 156.90 MHz.)—the former used for commercial messages and dispatching, the latter for movement, location, weather, and related safety and navigation purposes.

When it went operational in January last year, the Exchange-sponsored reporting system was the Nation's first comprehensive harbor ship radio plot program. Development of a similar system is now planned for the Delaware Bay by Philadelphia port interests, and the U.S. Coast Guard is studying sophisticated equipment applications to harbor ship traffic congestion and low-visibility problems.

The San Francisco-headquartered operation utilizes a graphic display console and movable "tiles" which represent the 5,000 ships (plus naval units, tugs, and local units) which annually arrive at the Golden Gate. The concept was borrowed directly from the Federal Aviation Authority, and the addition now of a full tape recording capability also duplicates the FAA's aircraft control system. The ship communications tapes will be retained for a period sufficient to permit transcripts and records in the event of mishaps or to confirm actual content of messages. ‡



Aerial photo taken by Coast Guard HU-16E aircraft showing Gulfstag down by the stern, after main deck awash with after house engulfed in flames.

SS 'GULFSTAG' EXPLOSION, FIRE, AND CAPSIZING

The actions taken on the Gulfstag case follow in chronological order.

MARINE BOARD OF INVESTIGATION

FINDINGS OF FACT

1. At approximately 0305 CST on 24 October 1966, the tanker SS *Gulfstag*, en route from Port Arthur, Texas, to Port Tampa, Florida, with a cargo of gasoline, diesel oil, and Stoddard solvent, suffered a series of explosions, caught fire and subsequently capsized, resulting in the loss of eight lives.

2. Vessel data is as follows:

NAME: SS *Gulfstag*
OFFICIAL NUMBER: 251066
SERVICE: Tanker (T-2 Jumboized)
BUILT: Chester, Pa. 1944; rebuilt at Baltimore, Md., 1958

GROSS TONS: 12,775
NET TONS: 8,185
LENGTH: 552.5' (Registered)
BREADTH: 75.3'
DEPTH: 39.3'
PROPULSION: Turbo-Electric
HORSEPOWER: 6,000
HOME PORT: Wilmington, Delaware
OWNERS: DELSHIPS, INC., 100 W. 10th St., Wilmington, Delaware
OPERATORS: Gulf Oil Corporation, 1290 Avenue of the Americas, New York, N.Y.
MASTER: Larry LaRue, 4401 Lakeshore Drive, Port Arthur, Texas (License—Master Oceans No. 312710)

CERTIFICATE:
LAST INSPECTION
FOR CERTIFICATION:

BIENNIAL:
DATE: 6 June 1966
PORT: Port Arthur, Texas
LAST INSPECTION: (as above)

The *Gulfstag* was equipped with the following primary lifesaving devices:

- a. No. 1 Lifeboat—Steel, 24', oar-propelled, 37-person—midship house, stbd
- b. No. 2 Lifeboat—Steel, 24', oar-propelled, 37-person—midship house, port
- c. No. 3 Lifeboat—Steel, 24', hand-propelled, 31-person—after house, stbd
- d. No. 4 Lifeboat—Steel, 24', oar-propelled, 27-person—after house, port
- e. No. 1 Liferaft—Rubber, inflatable, 10-person—midship house, port, boat deck
- f. No. 2 Liferaft—Rubber, inflatable, 15-person—after house, stbd, boat deck

The lifeboats were mounted on hand-operated quadrantal davits using manila falls for launching and retrieving the boats. The No. 1, No. 2 and No. 4 lifeboats and all of the davits were manufactured by the Welin Boat & Davit Company. The No. 3 lifeboat was manufactured by the Marine Safety Equipment Corporation. Both of the liferafts were manufactured by the U.S. Rubber Company.

3. The following named persons are missing as a result of this casualty, and presumed lost.

IRVIN R. CHATAGNIER, Chief, Engineer, Bk-157095-G1, 2319 Wignall Avenue, Port Arthur, Texas

RICHARD BOLCOMBE, 3rd Asst. Engineer, Z-1201194, 31 Perkins St., Gloucester, Massachusetts

PAUL STRAUGHAN, Oiler, Z-824316-D2, 545 Stillwell Blvd., Port Arthur, Texas

GUNNAR E. TAFT, Boatswain, Z-104285, 2018 Ray Avenue, Groves, Texas

JOSEPH P. ZIAJOR, Able Seaman/Deck Maintenance, Z-347208, 2911 Pearl Avenue, Groves, Texas

CHARLIE PERNELL, Steward, Z-112319, 2230 E. 17th Street, Port Arthur, Texas

JOSEPH THOMAS, Pantryman, Z-167391, 625 W. 18th Street, Port Arthur, Texas

JESSE E. JEFFRIES, Chief Pumpman, Z-251636, 4236 Rachel Ave., Port Arthur, Texas, died at the U.S. Public Health Service Hospital, New Orleans, Louisiana, on 12 November 1966, as a result of burn injuries suffered on board the *SS Gulfstag* on 24 October 1966, and complications.

The following named persons were injured as a result of this casualty and were hospitalized at the U.S. Public Health Service Hospital, New Orleans, Louisiana.

MILTON GUTHRIE, Oiler, Z-402867, 5205 8th Street, Port Arthur, Texas

PAUL F. BERRY, Fireman/Watertender, Z-761345-D1, 1131 Fairfield Avenue, Indianapolis, Indiana

4. The weather at the time of the casualty was clear, with a calm sea, bright moonlight and good visibility. The radar was in good operation and indicated no other vessels or objects in the near vicinity except a nearby offshore platform which could also be clearly seen. The wind was from the north-northeast at approximately 4-6 knots.

5. At 1955 on 21 October 1966 the *SS Gulfstag* arrived and docked at the Gulf Oil Docks, Berth No. 3, Gulf Basin, Port Arthur, Texas with a full load of gasoline. At approximately 2345 on 21 October the vessel began discharging her cargo to shore. At 0040, on 23 October 1966, all cargo on board was discharged and loading of new cargo commenced at 0100. At approximately 1430 on 23 October 1966, loading of cargo was completed and the vessel was secured for sea. The vessel was loaded as indicated by Exhibit "A" and the final ullages of all cargo tanks were listed in accordance with Exhibit "H", the minimum being 3'9". The final draft of the vessel at the time of her departure from Port Arthur, Texas, at approximately 1530 on 23 October 1966, was 29'05" forward and 30'09" aft. There were no spillages or leaks noticed by anyone during the discharging, loading and securing procedures prior to sailing.

6. Upon completion of loading operations the Chief Mate, Frank McPherson, entered and checked the condition of the after pumproom. He found a small amount of unidentified liquid in the bilge, but stated that in his opinion there were no unusual conditions or leaks. He then called the Chief Pumpman (J. E. Jeffries) who secured the pumprooms. The 2nd Pumpman, Homer Fontenot, also entered the pumprooms and checked the valves, bilges, and pumps and secured the hatches upon leaving the pumproom. The deck maintenance man, J. P. Ziajor, sounded all void spaces, cofferdams and pumproom bilges, and gave the readings to the Chief Mate as the vessel left the dock. In the Chief Mate's opinion, the vessel was in a safe and normal condition to sail. The Chief Pumpman reported to the Chief Mate that the pumprooms were all secured properly. The vessel proceeded to sea. As far as the Board could ascertain, the pumprooms were not entered again after the sailing of the vessel.

7. At approximately 0305 on 24 October 1966, while underway approximately sixty miles south-southwest of Morgan City, Louisiana, the vessel was shaken by a severe explosion which appeared to occur in the vicinity of the after pumproom. Within a period of seconds, it was again shaken by a second, more severe explosion, in the same general area. At the first explosion, all electrical power

was lost. At the time of the first explosion, the persons on watch and their locations were as follows:

- a. JAMES GUNNELL, 2nd Mate—Wheelhouse
- b. PAUL FORD, Quartermaster—Wheelhouse
- c. DURIEL HARRIS, Able Seaman—Bow
- d. ROLAND BRADHAM, Ordinary Seaman—Crew's Messroom
- e. EUGENE SCHMIDT, 2nd Asst. Engr.—Fireroom
- f. BERT BARRETT, Fireman/Watertender—Fireroom
- g. PAUL STRAUGHAN, Oiler—Engineroom

As far as the Board could ascertain, all other persons on board were in their bunks at this time.

8. James Gunnell, the 2nd Mate, in the wheelhouse, heard what he expressed as a dull but severe explosion at exactly 0305, and the lights went off simultaneously. Hearing the gyro alarm he proceeded back to the gyro room and upon arriving there at about 0305½ he felt a second very severe explosion. While looking out of the porthole aft from the midships house at the time of the second explosion, he saw that the top of the after pumproom appeared to be blown off and that a sheet of flame was coming out of the after pumproom and the forward ends of the after house passageways. The Master arrived on the bridge about that time and energized the general alarm circuit. Gunnell secured the gyro and he and the Captain proceeded aft on the raised catwalk to see if they could get any water on the fire. However, with the loss of power, there was no water pressure on the firemain. At that time the Master decided to anchor the vessel, so the Second Mate, Gunnell, and the Quartermaster, Ford, went forward where they dropped the port anchor with the assistance of the Able Seaman, Harris, and the Third Mate, Wurschy. The vessel came to rest at anchor on five (5) shots of chain. Gunnell then proceeded back to the midships section where the No. 1 lifeboat was lowered into the water.

9. Eugene Schmidt, the Second Assistant Engineer, was on watch, and was standing in front of the starboard boiler in the fireroom at the time of the first explosion. Bert Barrett, the fireman-watertender, was also on watch in the fireroom. Paul Straughan, the oiler, was on watch in the engineroom, standing by the log desk on the port side, forward, of the upper level. The concussion from the first explosion threw Schmidt against the front of the starboard boiler, and the lights went out throughout the engineroom and fireroom spaces. He then, immediately, stepped through the watertight doorway into the upper level of the engineroom and found it engulfed in flames. Being unable to approach the log desk, where the oiler was last known to be, he retreated into the fireroom at which time he felt a second less severe explosion. He then glanced at the clock on the bailey board, which was lit up by the flames now coming out of the fireroom ventilators, and noticed the time was 0306. Schmidt obtained an emergency flashlight from the fireman, Barrett, and

attempted to enter the lower level of the engineroom through the shaft alley, but the lower level was aflame. He retreated to the fireroom. He then attempted to climb the ladder into the fidley in an effort to get to the CO₂ release controls for the engineroom bilges, but the heat and smoke drove him back down to the fireroom. At this time the fireman was attempting to enter the upper level of the engineroom, using a portable fire extinguisher. He and Schmidt decided there was no way to reach the oiler who was still somewhere forward in the engineroom. They attempted to get out through the door leading from the steering gear room into the port main deck passageway, but found the door would not move. They next tried the escape trunk (ex-ammunition hoist trunk) from the steering gear room to the after poop deck, and managed to get out on the poop deck aft. They never saw the oiler, Paul Straughan, again.

10. Neither Schmidt nor Barrett were aware prior to the explosions, of any unusual or unsafe conditions in the engineroom or in the vicinity of the forward engineroom. Neither was in a location or position to notice any particular orientation or location of the damage as a result of the initial explosion, other than that it and the second explosion occurred forward of their location in the fireroom.

11. Roland Bradham was on watch at the time of the casualty. Bradham had gone aft to the crew's pantry on the poop deck of the after house about 10 minutes before the initial explosion, to make coffee. When he passed the after pumproom he noticed that both pumproom doors were closed and everything appeared to be normal. About 10 minutes later, at 0305, he felt an explosion and was thrown across the crew's pantry against the port side. At the same time he saw a bright flash outside the porthole. Bradham got up from the deck and ran up onto the boat deck to see what had happened. He saw there was a fire forward of him and he went back down to the engineers' quarters, aft, to try and wake everybody up. Seeing it was impossible to enter the engineers' quarters due to smoke and flames, Bradham returned to the poop deck, went forward on the port side, down to the main deck and then forward to the midships house. In passing the after pumproom, Bradham saw both of the doors had been blown off and the pumproom was afire. Bradham departed the *Gulfstag* safely in one of the forward lifeboats.

12. The Master, Larry LaRue, stated that he was first awakened when he was jarred or caused to jump out of his bunk from an undetermined cause at about 0305. He immediately looked out of the porthole to see if a collision had occurred, and seeing nothing, he then headed for the bridge. On the way to the bridge he felt an explosion. Upon reaching the bridge he went out on the bridge wing and looked aft and the whole after end of the vessel was afire. As he was looking aft another explosion occurred and flames came out of the pumproom area and

the smokestack. LaRue went back into the wheelhouse and activated the general alarm, locking the control lever in the "on" position. Upon talking to the Second Mate, he found that no attempt had been made to contact anyone aft by telephone. An effort was then made to telephone the Chief Engineer, the engine room and the after crew's messroom with no success. The Master ordered the port anchor dropped and then obtained the vessel's position which he gave to the Radio Officer, Frederick Seid, who was attempting to contact the Coast Guard by radio. The Radio Officer told the Master that his main antenna had been broken and that he was rigging a jumper on the ship-to-shore radio-telephone antenna. Captain LaRue then cut off the 500 Kc auto-alarm, which was in operation, while Seid transmitted the distress message. A moment later he turned the auto-alarm transmitter back on and then discovered that the transmitter could not be shut off with the switch in either position. The Master then met the Chief Mate down on the deck and they opened a fire hydrant to attempt to get a fire hose in operation. There was no pressure on the fire main system. At this time the Chief Mate attempted to approach the after pumproom. He was forced back by another eruption of flame and smoke from the pumproom which he and the Master noticed had both watertight doors blown off. The Master then directed the Chief Mate to lower the starboard No. 1 lifeboat. This the Chief Mate did with the assistance of several men who had come forward up the port side from the after section of the vessel. He then told the Third Mate, Peter Wurschy, and another seaman to lower the Port No. 2 lifeboat into the water in case they needed it. He then kicked the releasing device on the 10-man inflatable life raft so that it would be readily available to toss overboard. Captain LaRue and the Chief Mate then decided that they had no means available to fight a fire of this size. The Chief Mate checked the midship pumproom doors and released the fixed CO₂ into it. He then ordered the No. 1 and No. 2 lifeboats to move up forward of the break of the bow where they would be partially shielded from any potential further blasts. The lifeboats were secured with painters to the bow of the *Gulfstag*. The Captain, the Chief Mate, and the Second Mate remained aboard the vessel, on the bow, in hopes that another vessel would come along which could furnish adequate fire-fighting equipment. Then the Captain saw the Port No. 4 lifeboat had been lowered into the water aft and was moving away to the port beam of the vessel. Immediately thereafter the Captain noted the tanker *Atlantic Prestige* which had arrived on the scene and was laying to approximately one (1) mile off. He saw the *Atlantic Prestige* pick up his No. 4 lifeboat survivors and noticed that the No. 2 lifeboat was approaching the vessel *Western Sun*, which had also just arrived on the scene. Then the No. 1 boat worked its way over to the *Atlantic Prestige*. All of the men in the

lifeboats were picked up by the *Atlantic Prestige* and the *Western Sun*. Fearing that the *Gulfstag* might drag her anchor and drift into one of the oil rigs in the vicinity, the three remaining men let out two (2) more shots of chain on the anchor. The Master decided nothing further could be done on the *Gulfstag*, so he used a flashlight and signaled by flashing light to the *Atlantic Prestige*. That vessel received his signal and dispatched a lifeboat which picked up Captain LaRue, the Chief Mate and the Second Mate and took them aboard the *Atlantic Prestige*. It was now about 0600 and breaking daylight.

13. The after quarters and house were completely isolated from the bridge and forward area of the ship due to the initial explosion severing communications. With the exception of a few persons, no one was able to go forward from the after house. Following the second explosion, the forward bulkhead of the after house was rapidly engulfed in flames and dense smoke. Homer Fontenot, the Second Pumpman, and Jesse Jeffries, the Chief Pumpman, were quartered in the first room on the forward starboard side of the poop deck. They were awakened by an explosion and found themselves standing up facing each other. All the lights were out and the passageway outside the compartment was dark. Both men made their way to the watertight door on the forward end of the passageway adjacent to their compartment. However, upon opening the door, all they saw was fire and smoke. Fontenot turned around, yelled, "Come on, Jeff, let's go through a porthole," and went back into what he thought was his own room, but which was actually the Quartermaster's room immediately aft of his own. He could see someone else moving in the almost total darkness of the room and thought it was Jeffries. He opened a porthole, climbed out on deck and ran aft onto the stern. Upon reaching the stern he realized that the person with him was the Quartermaster and not Jeffries. He then saw Jeffries standing close by and asked him how he got out. Jeffries told him that he had gone out through the door, thinking that he (Fontenot) had gone through ahead of him, and then told him he was all burned. Jeffries had some butter which he had taken from the messroom, and Fontenot helped him rub it on his burns. Fontenot helped an unidentified person on the boat deck release the inflatable (15) man rubber life-raft on the stern and throw it in the water. It appeared to him to sink out of sight without opening or inflating. However, it was later found floating and completely useable.

14. Clifton Charles, the Chief Cook, and Willie Joseph, the Second Cook, were quartered in the second compartment aft on the port side of the poop deck. Charles was awake, smoking a cigarette at the time of the initial explosion. At about 0305 he felt a blast and the lights went out. He opened the door to the passageway to find out what happened. However, he could not get into the

passageway due to smoke, so he woke up Joseph and told him they had to make it out of the porthole. Charles heard the door to the Steward's room immediately aft of his own, open and then close again, and he heard the Steward call out "WILLIE—WILLIE—WILLIE," but Charles and Joseph were unable to give him any assistance. They went out through the portholes onto the port side deck and went aft on the poop deck.

15. Howard H. Keith, the First Assistant, was quartered in the first room forward on the port side of the boat deck. He was awakened suddenly and although not aware of what had happened, started putting on his pants. While partially dressed, the door to his room blew open and smoke rolled in through the door. He closed the door twice, but it would not remain closed, and the room was rapidly filling with smoke. Keith opened his forward porthole, went through it onto the boat deck, and proceeded aft down onto the poop deck where he met Schmidt, the Second Assistant, and Barrett, the Fireman/Watertender, who were just coming out of the steering room escape trunk. Schmidt told Keith there was no use going down there, that everything was on fire. Keith looked around at the people already gathered on the after poop deck, and told Schmidt, "Let's get a fire axe and try to get the Chief out, the Chief and Third." Not being able to find a fire axe, they used a piece of pipe and broke the porthole out of the Third Assistant's room on the starboard side of the boat deck. However, the smoke was so heavy in the Third's room, they were unable to enter. They were not able to get to the Chief's room at all, due to the heat and smoke in that area of the boat deck. Keith and the men who had been gathered on the poop deck then lowered the No. 4 lifeboat on the port side of the after house into the water. Everyone who had made it out of the after house got into the boat and made their way over to the *Atlantic Prestige* which was lying off the port beam of the *Gulfstag*.

16. Peter K. Wurschy, the Third Mate, was quartered in the midship house and was awakened a little after 0300 by what he described as a thumping noise. He tried to turn on his bunk light but finding it out of order grabbed a flashlight and went into the passageway to investigate. In the passageway he met McPherson, the Chief Mate, and they proceeded down to the main deck together. Just before reaching the main deck they felt an explosion and saw flames at the afterhouse. They returned to their rooms, put on additional clothing, and then returned to the main deck in an attempt to get water on deck with which to fight the fire. However, there was no fire main pressure on deck, so they returned to the midship house where Captain LaRue ordered them to drop the port anchor. Some of the crew members who had gathered on the bow had no life jackets so Wurschy and Earl Wise, Able Bodied Seaman, went down into the boatswain locker in the lower hold and obtained the addi-

tional life preservers which had been stowed there for emergency use. After the life jackets had been distributed, Wurschy went to the midships boat deck. At the Master's instructions, No. 1 and No. 2 lifeboats were lowered into the water, crew members were embarked, and the boats then secured to the bow of the *Gulfstag* by their sea painters. Wurschy and Wise manned the No. 2 lifeboat. They moved it over alongside No. 1 lifeboat and picked up three more men to help row No. 2 lifeboat. A few minutes later they rowed toward someone in the water who was yelling, and found one of the wipers, James Hiott, who had jumped overboard from the *Gulfstag* and was holding on to a ring buoy. No. 2 boat then rowed away from the *Gulfstag*. The occupants were taken aboard the *SS Western Sun*. Two of the men, Paul Berry, Fireman/Watertender, and Milton Guthrie, Oiler, had been burned and were given first aid treatment on board the *SS Western Sun* before being evacuated by a Coast Guard helicopter.

17. All of the crewmembers who survived the explosions and fire remained calm, organized themselves, and were able to successfully launch three of the four lifeboats, and release both of the inflatable life rafts. The inflatable life raft which had been thrown overboard from the stern was later seen adrift, astern of the *Gulfstag* prior to the vessel capsizing. The life raft was checked by the crew of a Coast Guard helicopter and found to have no persons in or near it. The life raft which had been released amidships by Captain LaRue was seen, inflated, with a light on top still attached to the vessel after the *Gulfstag* had capsized. It was retrieved, unused, by the tug *Titan*. The No. 3 lifeboat, located on the starboard side of the boat deck of the after house could not be lowered due to the heat and smoke in that particular area (the lee side of the *Gulfstag*, at that time). Also, the manila falls were beginning to smoke and burn. The men lowering the No. 4 lifeboat located on the port side boat deck of the after house, also complained about the rope falls getting hot and beginning to smoke.

18. Of the seven missing men, Paul Straughan was the Oiler on watch in the engineroom at the time of the casualty; Joseph Thomas, the Pantryman, was last seen after the casualty going back into the burning after house; Straughan, Thomas and the other five men who were missing, that is, Gunnar Taft, Joseph Ziajor, Irvin Chagnier, Richard Bolcome and Charlie Pernell, were never again seen by anyone. The five persons who were not seen by anyone after the explosion were not on watch at this time and would normally have been asleep in their quarters in the vessel's after house. As shown on enclosure 16 of the record, Gunnar Taft and Joseph Ziajor were quartered in the third room aft on the starboard side of the poop deck, adjacent to the engineroom casing. Charlie Pernell was quartered in the third room aft on the port side of the poop deck and Joseph Thomas was quartered in the fourth room aft on the port side of the poop deck.

Irvin Chatagnier was quartered in the first room on the starboard side of the boat deck, and Richard Bolcome was quartered in the third room aft on the starboard side of the boat deck. This entire after house quarters area was filled with dense smoke and heat immediately following the initial explosion and rapidly filled with flames after the second explosion. It was only a matter of a few minutes before the intense heat inside the after house precluded anyone from re-entering to search for persons either injured or trapped within the house.

19. At approximately 0320 on 24 October 1966 the U.S. Coast Guard Radio Station, New Orleans, Louisiana, received a distress signal on 500 Kcs from the SS *Gulfstag* advising that she was afire at a position 65 miles south of Point au Fer Reef. The information was relayed to the 8th Coast Guard District Rescue Coordination Center, New Orleans, Louisiana, which immediately ordered Search and Rescue aircraft into the air from the Coast Guard Air Stations at Biloxi, Mississippi, and New Orleans, Louisiana. The RCC also ordered the 82-foot Coast Guard Cutter *Point Lookout* and the 82-foot Coast Guard Cutter *Point Verde* to proceed from Morgan City, Louisiana, and Venice, Louisiana, respectively, and assist upon arrival at the scene of the casualty. At 0342 Coast Guard Radio, New Orleans, commenced directing all vessels in the immediate vicinity to proceed and assist the SS *Gulfstag*. The Coast Guard Air Station, Biloxi, Mississippi, reported a Search and Rescue aircraft HU-16E in the air en route to the scene at 0349. At 0500 the HU-16E aircraft dispatched from Biloxi, Mississippi, arrived on the scene and commenced searching the area for survivors. At 0510, an HH-52A helicopter was dispatched from the Coast Guard Air Station, New Orleans, Louisiana, to assist in the search efforts, and at 0543 a second HH-52A was dispatched from New Orleans to assist on-scene operations. At 0520 the SS *Western Sun* reported that she had picked up six survivors at the scene and two of them were burned. Then at 0545 the SS *Atlantic Prestige* advised that she had picked up an unknown number of survivors at the scene and one of them had burns over seventy (70) percent of his body and required immediate evacuation. The SS *Steel Navigator* arrived on the scene and launched a lifeboat to search for survivors. However, no other survivors were found in the water. At 0600 a second HU-16E aircraft was dispatched from Biloxi Air Station to assist in search operations. At 0630 the first HH-52A dispatched from New Orleans arrived on the scene and using a rescue basket, picked up the three burned survivors, one from the SS *Atlantic Prestige* and two from the SS *Western Sun*, and departed en route to Lakewood Memorial Hospital, Morgan City, Louisiana, at 0645. The burned survivors arrived at the hospital at 0730 and the HH-52A departed en route to Point au Fer to refuel and stand by for further assistance. The Coast Guard aircraft on the scene continued their search patterns.

The SS *Western Sun* departed en route to Sabine, Texas, at 0723 with four (4) survivors aboard.

20. At 1045 the CGC *Point Lookout* arrived on the scene, obtained a list of known survivors, and tied the three drifting lifeboats of the *Gulfstag* together. At approximately 1420, the Master, Larry LaRue, and Chief Mate McPherson boarded the CGC *Point Lookout* intending to remain on the scene until the arrival of a salvage tug. At 1425 the SS *Atlantic Prestige* departed the scene enroute to New Orleans with twenty-three (23) survivors aboard. It had now been established that seven crew members of the SS *Gulfstag* were missing and believed to have been trapped in the burning after quarters of the vessel. The *Point Lookout* then began a search of the area in conjunction with on scene aircraft, and prepared a surface marker to be used in the event the *Gulfstag* should sink. The CGC *Point Verde* arrived on the scene at 1530 to assist in search operations. At 1642, search by aircraft was discontinued and surface vessels remained on the scene. The *Point Verde* departed the scene at 1750 with the three *Gulfstag* lifeboats in tow, enroute to the Coast Guard dock at Venice, Louisiana.

21. At approximately 0030 on 25 October 1966 the tug *Titan* arrived on the scene to investigate the possibilities of salvage of the *Gulfstag*. An attempt was made by the *Point Lookout* to place the Captain and Chief Mate of the *Gulfstag* aboard the tug *Titan*; however, the weather conditions at this time were an 18 mile per hour wind from the NNW, seas five (5) to six (6) feet from NNW, and it was considered too risky, so no further attempt was made. At 0830 the CGC *Iris* arrived on the scene. The *Iris* lowered a motor lifeboat, and the boat crew, although operating under very adverse sea conditions, safely transferred the Captain and Chief Mate from the *Point Lookout* to the salvage tug *Titan* with a skillful display of outstanding seamanship. The *Point Lookout* departed the scene at 1020 and the CGC *Iris* remained on the scene anchored 2,000 yards west of the *Gulfstag*. The *Iris* lowered her small boats and twice attempted to float a blanket of foam over the fire. However, due to sea conditions and wind, the attempt was not very successful and fire continued burning. The *Gulfstag*, which had been slowly settling by the stern deeper in the water, was now down enough to allow water to enter the engineroom skylight. At approximately 1800 on 25 October 1966 the *Gulfstag* rolled to starboard and capsized. After capsizing, the fire was out. About one hundred twenty (120) feet of the bow and forefoot section remained afloat, keel in the air. At 0615 on 28 October 1966 the M/V *Flood Tide* arrived on scene with a salvage party aboard, and an underwater survey commenced, to determine the condition of the hull and feasibility of salvage. The underwater survey by salvage divers disclosed no apparent damage to the vessel's underwater body.

22. At about 1700 on 28 October the salvage vessel *Cable*, owned by Merritt, Chapman & Scott Corporation

arrived on scene to begin salvage operations on the *Gulfstag*. Upon arrival of the *Cable*, the *Titan* departed the scene. The CGC *Iris* departed on the following day. The services of Dick Evans Divers of New Orleans, Louisiana, were retained by Merritt, Chapman & Scott Corporation for diving and salvage operations. Dick Evans Divers worked from the M/V *Flood Tide*, owned by Tidewater Marine Service, Inc., of Morgan City, Louisiana.

23. An underwater survey of the *Gulfstag*, conducted by the divers, disclosed that the afterhouse superstructure was buried in the soft sea bottom. They were unable to enter the vessel or to work under the exposed after pumproom area for fear of building up an air pocket, which might cause the vessel to shift or roll. However, evidence was found in the area of the after main deck house lifelines which indicated that the explosion had shattered valves and pipe fittings in the area of the after pumproom. There was no indication of any fractured hull fittings or damage in way of seachests and their connections.

24. Due to inclement weather conditions, salvage efforts proceeded very slowly. During salvage operations the divers and the vessel were continually hampered by gasoline and heavy black oil which floated to the surface from the after section of the *Gulfstag*. The gasoline fumes became very strong at times and the M/V *Bect II* was employed to spray an emulsifier on the surface of the leaking cargo. However, the emulsifier had very little effect and as a result, diving operations had to be discontinued from time to time until explosimeter readings indicated a safe atmosphere for continuing work.

25. The *Gulfstag* was raised by pumping air into the after pumproom and the No. 11 centerline cargo tank after first plugging the seachests and installing adapters for the 2-inch air hoses in the docking plugs for these two compartments. The overboard discharges and seachests were plugged by using stuffer drain patches and, in some cases, by pouring concrete into the seachests. One air fitting was also installed in the shaft alley. Air was pumped into the fittings in the after pumproom and the No. 11 centerline tank, but not into the shaft alley fitting. The air introduced into the after pumproom and No. 11 tank found its way into all areas of the stern and gradually the inverted stern was filled with trapped air. After several hours of pumping air, at 1700-1800 on 13 December the *Gulfstag* slowly rose to the surface, keel up. Preparations were made to tow it southward to much deeper water for final sinking.

26. The M/V *Cable* secured a 1 5/8" wire through one of the *Gulfstag's* hawsepipes and began towing. However, it was found necessary for the divers to sever the tanker's anchor chain with explosives before any appreciable headway could be made. At about 1000 on 15 December the *Cable* arrived at Latitude 27-41 N, Longitude 91-42.5 W, with a fathometer reading of 200 fathoms depth. The divers began setting timed explosive charges on the hull for the purpose of sinking the *Gulfstag* and burning

off her cargo. The charges exploded at 1215 as set, but failed to either sink the vessel or burn the cargo. However, the explosion ripped small holes in the hull and the vessel began settling very slowly.

27. By the morning of 17 December the *Gulfstag* was completely down by the stern with about 80 feet of the bow protruding up out of the water in a vertical position, and with the remaining length of anchor chain swinging freely. It was estimated that the vessel had been sinking at a rate of about one foot every three to four hours. More explosives were ordered by radio. The Coast Guard was requested to assist in delivering this material. At about 1400 on 17 December the CGC *Point Lookout* arrived on scene with 2,000 pounds of dynamite. However, on 18 December, before the dynamite could be used on the exposed surface of the *Gulfstag*, she suddenly caught fire and began burning furiously. Later on 18 December, the tanker sank out of sight. The *Cable* fixed the final position of sinking, by loran, at Latitude 27-56 N, Longitude 91-35 W in 165 fathoms of water. The escaping gasoline continued to burn furiously on the surface for approximately two more days.

28. At no time during the diving or salvage operations were the bodies or remains of any of the missing persons sighted.

29. Coast Guard records of the last inspection for certification, conducted at Port Arthur, Texas, on 6 June 1966, entered in the Marine Board of Investigation record as Exhibits "F" and "G", and the testimony of the inspecting officers did not indicate any conditions at that time which would have contributed to this casualty. The drydock examination and internal tank inspection conducted at Jacksonville, Florida, on 29 March 1966 did not reveal any structural defects or conditions which would have contributed to the casualty.

30. The crew did not encounter any undue difficulty in launching any of the lifeboats or life rafts, other than the heat, smoke and flames which prevented launching of No. 3 lifeboat. Some difficulty was encountered in lowering No. 2 lifeboat due to the small number of persons available to assist in lowering operations after No. 1 lifeboat had been launched and manned.

31. The firefighting equipment available to fight the fire was inadequate in that the ship's auxiliary power, necessary to run the fire pump, was lost with the first explosion, and the release controls for the engineroom and after pumproom fixed systems were inaccessible due to the fire and smoke in the immediate area of the controls, which were located within the after house.

32. There were no electrical circuits or fixtures within the confines of the after pumproom. The only electrical system associated with the pumproom was the lights, and these were mounted from the engineroom side of the bulkhead with bolts and fitted on the pumproom side with explosion-proof lenses. There was no evidence that any of these lights as installed were in any way defective

although one lens had been replaced at some time in the past because it was cracked during installation.

33. The only bulkhead penetrations in the after pump-room bulkheads, other than solid welded pipe penetrations were four cargo pump drive shafts and a bilge liquid level alarm actuating rod. The electrical section of this alarm was installed entirely on the engineroom side of the engineroom-after pumproom common bulkhead. The section of the alarm in the pumproom was entirely mechanical. The drive shafts and actuating rod were fitted with packing glands and were found to be in proper condition at the time of the last cargo loading prior to the casualty. No evidence could be adduced that there were any weights, tools, or loose objects in the after pumproom of a nature which, by falling or sliding, could be expected to generate a spark and thereby trigger a gasoline vapor explosion.

34. No one who was in the after house can remember hearing the general alarm ringing after the initial explosion, although the Master actuated the controls within seconds.

35. The *Gulfstag* was drydocked in Jacksonville, Florida, on 29 March 1966 for a routine drydocking. The vessel was examined externally and internally and gages were made of the hull plating. The only plates found to be under the minimum allowable, were the M-10 and M-11 plates, which were renewed during this drydock period. The M strake is above the sheer strake line and the 10 and 11 plates are located in the after quarters area and are not contiguous to either the machinery spaces or the after pumproom spaces.

36. As a result of an interview on 1 February 1967 with Mr. Ed Jacobs, Port Engineer, and a visit aboard the SS *Gulfseal*, sister ship to the *Gulfstag*, the following conditions were found to have existed in the sea injection and overboard discharge piping aboard the *Gulfstag* at the time of the casualty. The sea injection and overboard discharge lines were fitted with rubber, flexible expansion joints as listed below:

- (a) One 26" joint between the high and low main circulating inlet lines.
- (b) One 24" joint between the main circulating pump and the main condenser.
- (c) One 24" joint between the main condenser and the overboard discharge valve.
- (d) One 14" joint between the auxiliary circulator and the auxiliary condenser.
- (e) One 4" joint on the air conditioner circulating water sea valve.

In addition to the above joints, there were four additional 12" rubber expansion joints located in the cargo pump condenser system which would not have been subjected to head pressure from the sea.

37. The rubber expansion joints fitted in the sea injection and overboard discharge lines of the *Gulfstag* were manufactured by the Goodall Rubber Company and were

all of style No. E-103. The use of rubber expansion joints is permitted for vessels under 46 CFR 55.07-1, and the Goodall Rubber Company is an approved manufacturer of fittings, listed in CG-190, Equipment List.

38. The four 12" rubber expansion joints were of style No. 4150 manufactured by the United States Rubber Company, an approved manufacturer of fittings, listed in CG-190, Equipment List.

39. As far as the Board could ascertain, no one saw, heard, or in any way detected anything prior to or at the time of the initial explosion which would be of help in determining the exact cause of the casualty. However, the testimony of crewmembers who were on watch at the time of the casualty and survivors located in the after quarters definitely establishes the location of the explosion as being in the after pumproom.

40. Testimony of the Chief Mate and the 2nd Pumpman indicated that there were several inches of liquid in the bilges of the after pumproom when the vessel departed Port Arthur, Texas. The liquid was identified as part water and part gasoline. The exact amount of gasoline on top of the water was not determined but was estimated by the 2nd Pumpman to be about one inch in depth.

41. The Board could ascertain no person amongst the survivors who could state that the contents of the bilges of the after pumproom were pumped overboard after the vessel departed the loading dock at Port Arthur, Texas, on 23 October 1966, although both the Chief Mate and the 2nd Pumpman testified that such a pumping of bilges in both pumprooms was the ordinary and regular routine of the ship after it got to sea, after loading. The after pumproom bilge liquid level alarm had not sounded prior to the casualty.

42. Witnesses who were on watch at the time of the casualty and had passed the area of the after pumproom just prior to the casualty saw no indication of any unsafe conditions nor anything out of the ordinary. No persons other than the watch personnel were seen up and about during the watch on which the casualty occurred.

43. The ventilation fans had been secured when the vessel had completed loading her final cargo and as far as could be ascertained were never again started prior to the casualty. Roland Bradham, Ordinary Seaman, passed the pumproom just minutes before the first explosion and testified that the pumproom doors at that time were secured and all appeared to be normal.

44. The vessel was equipped with a diesel engine-driven emergency generator which could only be started and placed in operation manually. The emergency generator was not provided with an automatic start and changeover relay and therefore was not readily available to furnish power to run the electrically powered fire pumps. When the *Gulfstag* was built in 1944 and when it was jumboized in 1958, there was no official Coast Guard requirement that an emergency power source be provided.

45. The portholes in the berthing area of the after

quarters, which were 16 inches in diameter, provided a second means of escape for many persons who would otherwise have been trapped in their rooms and perished. There is no existing Coast Guard regulation which requires airports in berthing spaces of tank vessels to be of any minimum size or readily openable.

CONCLUSIONS

1. It is concluded that the SS *Gulfstag* burned and partially sank in the Gulf of Mexico on 24 and 25 October 1966 as a result of several explosions which originated in the after pumproom, and of subsequent fire and leakage of sea water, with the loss of the lives of eight crewmembers. Seven lives were lost during the fire on 24 October 1966 and one crewmember died on 12 November 1966 as a result of injuries received during the fire. The *Gulfstag* was eventually salvaged to the point where it floated and could be towed and was finally sunk at sea in 165 fathoms depth on 18 December 1966.

2. An explosion occurred in the after pumproom at 0305S, 24 October, which ruptured the surrounding bulkheads allowing gasoline to flow into the after pumproom and the engineroom bilges from No. 11 cargo tank, thereby causing further explosions and fire, with the subsequent eventual sinking and loss of the vessel.

3. Fuel for the initial explosion was gasoline vapor emanating from liquid gasoline in the bilges of the after pumproom. The source of ignition for the explosion cannot be determined. There were no witnesses who actually saw the explosion closely or who saw the interior of the pumproom between the time it was secured for sea at about 1600S on 23 October and the time of the initial explosion. There was no surviving witness who was located within 50 feet of the focal point of the initial explosion when it occurred. No surviving witnesses examined the material condition of the scene of the initial explosion before the vessel capsized, nor was anyone else ever able to examine this area of the *Gulfstag* before it was finally sunk in 165 fathoms.

4. However, the Board concluded that one of the possible sources of ignition for the explosion was one of the pumproom electric lights. The pumproom lighting system was the only possible source of accidental electrical ignition present in or attached to the pumproom. Failure of a lens and contact of gasoline vapor with a hot bulb could have triggered an explosion. There was no evidence of the dropping of a heavy object which could have caused a spark and possibly triggered an explosion.

5. The nature and location of the casualty on board the vessel prevented anyone from reaching or activating the remote releases for the fixed CO₂ extinguishing systems for the engineroom and the after pumproom. The initial explosion caused a complete power failure which prevented the use of the vessel's electrically-powered fire main system or any topside water fire fighting equipment.

6. The seven lives lost on board the *Gulfstag* were lost in the following manner: (a) Paul Straughan, Oiler on watch in the engineroom, was trapped and died in the engineroom as a result of the first explosion and the rapid spread of flames throughout the engineroom; (b) Irvin R. Chatagnier, Richard Bolcome, Gunnar E. Taft, Joseph P. Ziajor, Charlie Pernel, and Joseph Thomas were trapped within their quarters or adjoining passageways by the heat and smoke from the fire and died as a result of smoke inhalation or burns.

7. Jesse E. Jeffries died in the U.S. Public Health Service Hospital, New Orleans, La., on 12 November 1966 as a result of injuries received 24 October 1966 during the fire on board the *Gulfstag*.

8. The practice on board the *Gulfstag*, as supported by testimony of crewmembers, of leaving varying amounts of liquid in the bilges of the pumprooms after a cargo was loaded, until it was convenient to pump it overboard sometime after the vessel was at sea, while not an unlawful practice or a practice prohibited by regulation, is concluded to be a highly questionable practice which should not be permitted on board any tank vessel. The Board believes that any liquid other than plain water remaining in the bilges of a pumproom of a tank vessel after loading or discharging should be immediately stripped back ashore or into a cargo tank suitable to receive it. If such a practice had been followed on the *Gulfstag* on 23 October 1966, it is likely that this casualty would not have occurred. However, since the practice had been followed on the *Gulfstag* for a considerable length of time and had apparently been condoned by the owners of the vessel, the Board could find no actionable culpable negligence in the fact that this practice was followed on the final loading of the *Gulfstag*.

9. If the power ventilation blowers of the after pumproom had not been secured on the afternoon of 23 October 1966, but had been left running, it is likely that the concentration of gasoline vapors in the atmosphere of this pumproom would never have reached a high enough percentage to be within the explosive range. With liquid gasoline present in the bilges, the Board could see no good reason for securing these blowers and believes that they should have been left running while any gasoline remained in the bilges.

10. With the exception of the rope boat falls, the primary lifesaving devices were adequate for the needs of the crew and were in proper condition. The rope boat falls for boats No. 3 and No. 4 were subject to rapid disablement from heat and flames due to their combustible nature.

11. The stowage of additional life preservers in a forward locker and in the pilot house, as required by 46 CFR 33.35-1, provided vital life preservers for crewmembers who would otherwise have had none available to use.

12. All members of the ship's company of the *Gulfstag*

conducted themselves in a highly commendable manner. Every possible effort was made to rescue persons known or believed to be trapped within the burning after house of the ship.

13. The communications during the casualty and the coordination of search and rescue efforts thereafter were excellent and contributed to the rapid rescue and first aid treatment rendered the survivors. The efficiency in signalling by Morse code with a flashlight, as displayed by the Master and Chief Mate of the *Gulfstag*, reflects well on their professional ability, and supports the need to require examinations in signalling methods for candidates for deck licenses.

14. All Coast Guard rescue units involved, and the ships *SS Atlantic Prestige*, *SS Western Sun*, and *SS Steel Navigator* acquitted themselves ably and well. They responded to the *Gulfstag's* distress signals immediately, and rendered all possible assistance. The good seamanship, professional alertness and efficiency displayed by the *SS Atlantic Prestige* and *SS Western Sun* in rescuing large numbers of the survivors were especially noteworthy and should be recognized by higher authority.

15. The battery-powered General Alarm system worked efficiently in the forward end of the vessel but not at all in the after end due to damage to wiring caused by the initial explosion. If a battery-powered source of current had not been provided for this system, loss of ship's power at the initial explosion would have made the entire system inoperative and may have endangered lives of persons who were forward at the time. If two separate and separated wiring systems had been provided for the General Alarm system between the forward house and the stern area it is possible that one such system would have survived the explosion damage and the alarms would have sounded aft. In this case, additional lives may have been saved.

16. The inability of any personnel to reach the remote release controls for the fixed CO₂ systems for the after pumproom and the engine room, due to smoke and flames, leads to the conclusion that, if widely separated duplicate remote release controls had been provided, one such set of controls might have remained accessible and the vessel might have been saved, and additional lives saved.

17. If the emergency generator fitted on the *Gulfstag* had been installed with an automatic start and change-over relay, it might well have provided the electrical power necessary to operate fire pumps, when normal ship's power failed. Use of fire hoses, fog nozzles, and portable foam systems might have enabled the crew to significantly alter the outcome of this vessel fire.

18. Had the 16-inch portholes installed in the berthing areas of the *Gulfstag* been of lesser diameter, many crewmembers who escaped by crawling through the ports would probably have perished, and the death toll would have been much greater.

19. Although the cause of flooding of the stern of the

Gulfstag following the explosions could not be definitely determined, one likely cause was the consuming of certain portions of the combustible rubber flexible joints in sea connections in the engine room area by fire, with consequent progressive flooding and eventual capsizing. If no joints of combustible nature had been present in these sea connections, it is entirely possible that the stern would not have flooded and that the vessel would not have capsized. In this case, firefighting efforts by an arriving vessel or by the original crewmembers themselves, if they could have returned aboard, might have been able to contribute toward saving the vessel. No evidence could be adduced that there was any shock damage to sea connections, valves, or the hull itself caused by the explosions, which would have caused the flooding.

20. The *Gulfstag* is now resting in 165 fathoms of water in position Latitude 27°56' North, Longitude 91°35' West, and does not constitute a menace to navigation.

21. Prior to the casualty and to the extent ascertainable, the *Gulfstag* was in all respects seaworthy and in full compliance with the Rules and Regulations for Tank Vessels.

22. Other than the practice of not immediately pumping out the bilges and thereby leaving some gasoline in the bilges of the after pumproom for an indefinite period, which practice is believed by the Board to be ill advised but not to be actionable negligence, the Board found no evidence of misconduct, culpable inattention to duty, neglect or willful violation of law or regulation on the part of any licensed or certificated persons, or any failure of inspected material or equipment which contributed to the casualty. The Board found no evidence that any inspector, officer of the Coast Guard, or other officer or employee of the United States, or any other person caused, or contributed to the cause of this casualty.

23. There was no evidence that the casualty was caused by any object or influence outside the vessel, or that any sabotage, willful intent to destroy, or any form of foul play were involved.

RECOMMENDATIONS

1. Based upon the facts adduced from the investigation of this casualty, and the conclusions of the Board, it is recommended that the Coast Guard consider the following changes to the Rules and Regulations for Tank Vessels, Chapter 1, Subchapter D, Title 46, Code of Federal Regulations, Parts 30 through 35:

A. Incorporate in the Rules for Cargo Handling, subpart 35.35, a rule that, if any liquid other than plain water remains in the bilges of any tank vessel pumproom after loading or discharging are completed, as much as possible of such liquid shall immediately be pumped to a shoreside tank or into one of the vessel's cargo tanks suitable to receive it. Incorporate in these same Rules for Cargo Handling a rule that pumproom power ventilation blowers on all tank vessels shall remain in operation

at all times while there is any amount of liquid cargo present in the bilges.

B. Restrict and reduce the use of combustible lifeboat falls.

C. Incorporate the principle that all berthing compartments on tank vessels shall have one other avenue of escape than exit into a passageway, and if such other avenue of escape is an airport, such airport shall be maintained openable by hand and shall have a clear inside diameter of the useable opening of not less than 16 inches. It is recommended that this principle be applied fully to all new construction and to the extent possible to existing vessels.

D. Require that the General Alarm System on all tank vessels be wired with two different circuits, each circuit to be installed as remote from the other as possible; with two different sources of battery power, each source to be as remote from the other as possible; and with at least two switches for activation of the entire system, with at least one such switch to be installed forward and one aft.

E. Require that on all tank vessels on which emergency generators are installed, there shall be an automatic

starting and changeover relay fitted in such manner that the emergency generator will automatically start and will automatically pick up certain predetermined emergency loads whenever ship's power fails.

F. Require that all fixed CO₂ extinguishing systems on tank vessels be fitted with at least two independent sets of remote manual release controls, each set of controls to be as widely separated as possible from the duplicate set of controls for the same system.

2. It is also recommended that the Coast Guard institute a study of the advisability of continuing to permit the use of combustible substances in flexible joints or any other parts of sea connection devices on merchant vessels at such locations where destruction of such joint or part by fire could cause flooding of the hull.

3. It is recommended that the Masters and crews of the SS *Atlantic Prestige* and the SS *Western Sun* be issued an official recognition for their superior performance of duty in effecting the prompt rescue of all survivors of the *Gulfstag* casualty.

4. It is recommended that no further action be taken and that the case be closed.

31 March 1967.

COMMANDANT'S ACTION

1. The record of the Marine Board of Investigation convened to investigate subject casualty has been reviewed and the record, including the findings of fact, conclusions, and recommendations, is approved subject to the following comments and the final determination of the cause of the casualty by the National Transportation Safety Board.

2. On the morning of 24 October 1966 while on a voyage from Port Arthur, Texas, to Port Tampa, Florida, the SS *Gulfstag*, Official Number 251066, a tankship carrying a cargo of gasoline, diesel oil, and solvent, suffered a series of explosions and caught fire. The vessel subsequently capsized on 25 October 1966. The casualty resulted in the loss of eight lives from fire in the after part of the vessel.

3. After completion of cargo loading operations at Port Arthur, Texas, there remained a small amount of liquid gasoline and water in the after pumproom which was not removed before sailing on 23 October 1966. The pumproom doors and power ventilation blowers were secured. The four cargo pumps located in the pumproom were driven by steam turbines installed in the engine room. The pump shafts passing through the gastight bulkhead between those spaces were fitted with stuffing boxes and packing. The initial explosion occurred in the vicinity of the engine room or after pumproom. The source of ignition could not be determined.

4. The initial explosion caused an electrical power failure which prevented the use of the vessel's electrically

driven fire pumps. The fire prevented anyone from reaching and activating the remote release for the fixed carbon dioxide extinguishing systems for the engine room and the after pumproom. The fire continued to burn in the after part of the ship until the stern settled and the vessel capsized.

5. The SS *Gulfstag* was a T-2 tankship of 12,775 gross tons, 552 feet in length, built in 1944. The vessel had been modified in way of her tanks and midship area in 1958 to provide an increase in cargo carrying capacity.

REMARKS

1. Concurring in the conclusions of the Board, it appears that the SS *Gulfstag* burned and capsized in the Gulf of Mexico following several explosions of gasoline vapors in the engine room and after pumproom caused by an undetermined source of ignition and that the lives of eight crewmembers were lost in the fire. The record, however, is considered to contain insufficient evidence upon which to base a definite determination that the initial explosion occurred within the confines of the after pumproom. Failure of a lens in one of the pumproom lights is an unlikely source of ignition in this case. There is evidence in the record that there was fire in the engine room immediately after the initial explosion, that the sheet metal casing of the main generator was found blown off immediately after the initial explosion, and that the top of the pumproom was not blown off until the second explosion occurred. Although the evidence does not support a positive determination as to the specific point of

ignition there were many possible sources of ignition in the engineroom in the event that gasoline or explosive vapors should have found their way into that space.

2. The conclusion of the Marine Board of Investigation that the "practice of leaving varying amounts of liquid in the bilges of the pumproom after a cargo was loaded, until it was convenient to pump it overboard sometime after the vessel was at sea," had apparently been condoned by the owners of the vessel is not supported by the record. Furthermore, it is unlikely that the one-inch layer of gasoline in the bilges could have been completely removed by stripping back ashore or into a cargo tank.

ACTION CONCERNING THE RECOMMENDATIONS

1. No further action is presently indicated in regard to Recommendation 1-A which, in substance, proposes that the manner of bilge cleaning and gas freeing in pumprooms should be spelled out in detail by regulation. Since vapors and some amounts of cargo will be present at various times in the pumprooms of most existing tankships normal operating procedures and regulations have been directed toward the elimination of sources of vapor ignition from pumprooms. Proper ventilation and pumping of pumproom bilges are considered to be basic requirements of good seamanship and proper safety practice. In case of negligence or misconduct by licensed or certificated seamen existing statutes and regulations establish policies and procedures for remedial administrative action. The Tank Vessel Regulations in effect at the time of the casualty required efficient means of ventilating spaces on tankships, and in the case of pumprooms allowed either effective steam or air activated gas ejectors or blowers, or ventilators fitted with heads for natural ventilation. Regulations for Tank Vessels constructed on or after 19 November 1952 require that provisions shall be made for removing drainage from the pumproom bilges and adjacent cofferdams.

2. The general objectives of Recommendations 1-B, 1-E, and 1-F, are met in present regulations applicable to new tankships that are comparable to the SS *Gulfstag* in size and service in the following manner:

1-B—Combustible lifeboat falls may no longer be installed since lifeboat winches with wire falls are required on such vessels, construction of which was started on or after 19 November 1952. There is, moreover, no evidence in the record that the lifeboat falls installed on the SS *Gulfstag* contributed to loss of life.

1-E—Tank vessels with fire main installations contracted for on or after 19 November 1952 must have fire pumps located in separate spaces, and the arrangement of pumps, sea connections, and sources of power must be such as to insure that a fire in any one space will not put all of the fire pumps out of operation. If one of the fire pumps is dependent upon the emergency generator for its source of power to comply with the above requirements,

the generator must be located above the bulkhead deck, or above the freeboard deck, whichever is the higher, and outside the machinery casing. Although the operation may be either manual or automatic, the manual system is defined by the regulations as "one in which a single manual operation, such as the manual operation of a switch from an 'off' to 'on' position is required to cause the emergency lighting and power system to supply power to the emergency loads." The record is not convincing that the absence of any automatic system was a contributory factor in this casualty.

1-F—Regulations for carbon dioxide extinguishing system installations contracted for on or after 1 January 1962 require that all controls and valves for the operation of the system shall be outside the space protected, and shall not be located in any space that might be cut off or made inaccessible in the event of fire in any of the spaces protected. Where provisions are made for the simultaneous release of a given amount of carbon dioxide by operation of a remote control, provisions must also be made for manual control at the cylinders. The cylinders must be located outside the spaces protected and must not be located in any space that might be cut off or made inaccessible in the event of a fire in any of the spaces protected.

3. Various proposals to require a dual general alarm system similar to those in Recommendation 1-D have been under consideration for some time. The change proposed in Agenda Item PH 10-67 considered at the Merchant Marine Council Public Hearing on 20 March 1967 which will be promulgated as a regulation was adopted as the best and most practical means of enhancing the reliability of general alarm systems. The other proposals were considered to be either impractical or to compromise a simple dependable system by complexity. As damage to a single cable between the power supply and the feeder distribution panel can jeopardize the entire system the change actually adopted by the Merchant Marine Council will increase dependability by limiting the length of the cable run by requiring the power supply and the feeder distribution panel to be in the same space and also by providing control of the general alarm system at the location of the power supply. This amendment will also clarify the requirement for four contact makers, except where the power supply is located in or adjacent to the wheelhouse, and the requirement pertaining to the contact maker locations. There is insufficient evidence in the record to support a conclusion that a dual general alarm system as recommended by the Marine Board of Investigation would have reduced the loss of life in this case. Explosions or casualties of this type, of such severity or intensity as to break the continuity of an electrical cable, are almost certain to awaken the crew. Furthermore, it is likely that a dual general alarm system would also be rendered inoperative by such catastrophic casualties that might cause grounds, breaks in cables, and physical destruction of the system components.

4. The blocking of the normal escape routes in this casualty was apparently caused by the unusually sudden intensity of the conflagration. It is not likely that the arrangements of all tank vessels would permit airports to provide a means of escape in accordance with Recommendation 1-C. To serve as an efficient and practicable avenue of escape they must be readily openable by hand, of sufficient size and accessibility, and must lead to an outside deck area or some other safe location. Further, in some marine casualties flooding through airports and weathertight doors leading to weather decks have been determined to be contributing factors. Since the advent of air conditioning trends in design have been away from portlights which can be opened and toward fixed portlights. Tank vessel regulations presently require that where plans and arrangements will possibly permit, all passageways leading to living quarters, or places where anyone may be regularly employed, shall be provided with not less than two avenues of escape. In addition, the structural fire protection requirement for new vessels, especially the requirements for machinery space boundary bulkheads and stairway closures, are considered adequate to prevent the rapid engulfment of passageways by a machinery space fire.

5. A study as proposed in Recommendation 2, concerning the use of combustible substances in flexible joints

of sea connections, has been in progress for some time. Agenda items of the Merchant Marine Council Public Hearing on 4 December 1967 included proposals for revision of the Marine Engineering Regulations (Subchapter F) relative to reinforcing and cover material of expansion joints. Although certain material for flexible expansion joints may be capable of withstanding the intense heat generated by the fire on the SS *Gulfstag* the type of flexible expansion joint used on sea connections must be a practical joint that is not likely to fail due to any of the factors normally encountered in marine service.

6. I am in agreement with the Board that the rescue vessels acquitted themselves ably and well and that the good seamanship, professional alertness, and efficiency displayed by the SS *Atlantic Prestige* and the SS *Western Sun* in rescuing a large number of survivors were especially noteworthy and should be recognized. The superior performance of duty in effecting the prompt rescue of all survivors of the casualty has been officially recognized by Letters of Commendation on behalf of the masters and crews of the SS *Atlantic Prestige* and the SS *Western Sun*.

W. J. SMITH,
Admiral U.S. Coast Guard,
Commandant.

19 December 1967.

NATIONAL TRANSPORTATION SAFETY BOARD'S ACTION

This accident was investigated by the U.S. Coast Guard under the authority of R.S. 4450 (46 U.S.C. 239) and the regulations prescribed by 46 CFR 136. The Marine Board of Investigation proceedings commenced on 27 October 1966 at Port Arthur, Texas. The Coast Guard report of the investigation of the accident and the Commandant's action thereon are included in and made a part of this report. By publication of this report the National Transportation Safety Board does not adopt those portions of the Coast Guard report which are concerned with activities within the exclusive jurisdiction of the Department of Transportation and the Coast Guard. The National Transportation Safety Board has considered those facts in the Coast Guard report of this accident investigation pertinent to the Board's statutory responsibility to make a determination of cause.

ANALYSIS AND CONCLUSIONS

In analyzing the facts of this case the National Transportation Safety Board finds that there are two possible sequences of events:

A. Initial explosion occurred in after pumproom;

1. Accumulation of gasoline existed in pumproom bilge.

2. Power ventilation to pumproom was secured.

3. Explosion in pumproom ruptured engineroom bulkhead and also the bulkhead of No. 11 center cargo

tank resulting in gasoline flowing into engineroom where many sources of ignition existed to trigger secondary explosions and intense fire.

B. Initial explosion occurred in engineroom;

1. Gasoline accumulated in after pumproom from leakage at pumps, valves, piping or fractured or deteriorated area of No. 11 cargo tank bulkhead.

2. Pumproom bilge alarm failed to operate or was not heard.

3. Liquid level rose to height of four feet and leaked into engineroom through fractured or deteriorated area of engineroom bulkhead, or

4. Liquid level rose to height of seven feet and leaked into engineroom through pump drive shaft vapor seals at engineroom bulkhead penetrations.

5. Undetected low lying vapors accumulated in engineroom and were ignited from electrical source.

Concerning the first alternative the record does not indicate any known source of ignition, and in accordance with present regulations, no sources of ignition are permitted in pumprooms. The most probable source appears to be a spark caused by a falling tool or other metallic object due to normal vibration of the vessel.

With regard to the second alternative there are many electrical sources of ignition in the engineroom in close proximity to the engineroom-pumproom bulkhead. However, it appears unlikely that a leak in the pumproom of such proportion to create the head of gasoline required,

would have gone unnoticed by the Chief Mate and the two pumpmen who inspected and secured the space following cargo operations. In addition, it appears highly improbable that all the other necessary elements were present.

The Board concludes that the probable cause of the accident was the explosion of gasoline vapors in the after pumproom. The source of ignition is unknown.

RECOMMENDATIONS

The National Transportation Safety Board concurs with the recommendations of the Marine Board of Investigation concerning the pumping of pumproom bilges, 1-A; operation of power ventilation, 1-A; combustible lifeboat falls, 1-B; additional escape units and berthing compartments, 1-C; emergency power systems, 1-E; and CO₂ extinguishing systems, 1-F.

With respect to Recommendation 1-A, the Board concludes that the practice of permitting liquid cargo to remain in pumproom bilges and securing the power ventilation systems in the pumprooms is extremely hazardous. Proper ventilation and pumping of pumproom bilges may be considered to be basic requirements of good seamanship and proper safety practices; nevertheless, the failure in this case to follow such practices resulted in a catastrophic accident. For this reason the Board recommends that rules and regulations be promulgated requiring that the bilges be pumped as thoroughly as possible, immedi-

ately following a cargo transfer, to shoreside tanks or into one of the vessel's tanks suitable to receive such liquid. Further rules should also be promulgated to provide that pumproom power ventilation blowers on all tank vessels remain in operation whenever there is any amount of liquid cargo present in the bilges.

The facts of this accident clearly show that there should be an alternative means of escape from all berthing compartments on tank vessels. This should include manually operated airports of not less than 16 inches diameter and kickout panels.

The Board further recommends that consideration should be given in future design of tank vessels to provide for relief for the forces of explosion in spaces where explosive vapors may accumulate.

Released: 29 May 1968.

By the National Transportation Safety Board:

/s/ JOSEPH J. O'CONNELL, Jr.,
Chairman.

/s/ OSCAR M. LAUREL,
Member.

/s/ JOHN H. REED,
Member.

/s/ LOUIS M. THAYER,
Member.

/s/ FRANCIS H. McADAMS,
Member.

The recommendations made by the National Transportation Safety Board were referred to the Merchant Marine Council Committee, and the following memo-

randum from the Commandant to the National Transportation Safety Board indicates the disposition of the various items.



DEPARTMENT OF TRANSPORTATION UNITED STATES COAST GUARD

Address reply to:
COMMANDANT (MVI-3)
U.S. COAST GUARD
WASHINGTON, D.C.
20591

5943
18 September 1968

MEMORANDUM TO CHAIRMAN, NATIONAL TRANSPORTATION SAFETY BOARD

From: Commandant

Subj: National Transportation Safety Board Actions on Marine Boards of Investigation

1. This is in reply to your letter of 26 July 1968 regarding the S.S. *Gulfstag* Marine Board of Investigation in which you requested information as to the contemplated actions of the Coast Guard on your recommendations in the case.

2. Your recommendation that consideration should be given in future design of tank vessels to provide for relief for the forces of explosion in spaces where explosive vapors may accumulate was placed before the Merchant Marine Council Committee for consideration at its meet-

ing of 5 August 1968 in the form of a proposed regulation to become effective on vessels constructed on or after 1 January 1969. The proposed regulation which would require relief for forces of explosion under the conditions prescribed in your recommendation was fully discussed but after due consideration by the Merchant Marine Council Committee was not adopted for present implementation because of its impracticability under the present state of the art. Available information indicates that an area greater than the entire top of existing pumprooms would be required to relieve the forces of a low grade explosion. The Coast Guard will continue to keep abreast of technological developments in the field.

3. Four of the recommendations of the Marine Board of Investigation which were subsequently approved by the NTSB were also submitted to the Merchant Marine Council Committee in the form of proposed regulations concerning escape routes, CO₂ extinguishing system remote releases, combustible lifeboat falls, and means of removing cargo and vapors from pumprooms. The principal objectionable features of these proposals were that their general objectives are already met in present regulations applicable to newer vessels and the impracticability of imposing new requirements of this type on vessels already built. Without a "grandfather" clause to eliminate the inequity of requiring existing vessels to comply with more stringent requirements of new rules, it has been found difficult and sometimes impossible to gain the necessary support for progressive safety standards whether they may be prescribed by regulation, statute, or international convention.

4. Due deliberation, resulting in a decision of the Merchant Marine Council Committee to take no further action to implement the proposed regulations at present, included the following considerations with respect to the various proposals based on your recommendations:

A. ESCAPE ROUTES (Portholes)

(1) The presence of portholes on the SS *Gulfstag* did not in fact provide a means of escape for six (6) of the crewmembers who allegedly perished in their rooms.

(2) Blocking of the normal escape routes on the SS *Gulfstag* was caused by the unusually sudden intensity of the conflagration.

(3) It is not likely that the arrangements of all tank vessels would permit airports to provide a suitable means of escape. Means of escape must be readily openable, of sufficient size, accessible, and must lead to an outside deck area or some safe location. Escape overboard is not always practicable, nor advisable.

(4) In some marine casualties flooding through airports and weathertight doors leading to weather decks has been a contributing factor.

(5) With the advent of air conditioning, the trend in design has been away from portlights which can be opened and toward fixed portlights. This also assists in keeping living areas free of explosive vapors.

(6) Present regulations require that where plans and arrangements will possibly permit, all passageways leading to living quarters, or places where anyone may be regularly employed, shall be provided with not less than two avenues of escape.

(7) Structural fire protection requirements for new vessels, especially those for machinery space boundary bulkheads and stairwell closures, are believed to be adequate to prevent the rapid engulfment of escape passageways by most machinery space fires.

B. CO₂ EXTINGUISHING SYSTEM (Remote releases)

(1) Regulations for new installations require that all control valves for the operation of the system shall be outside the spaces protected, and shall not be located in any spaces that might be cut off or made inaccessible in the event of fire in any of the spaces protected.

(2) In new installations where provisions are made for the simultaneous release of a given amount of carbon dioxide by operation of a remote control, provisions must also be made for local control at the cylinders.

(3) In new installations the cylinders themselves must be located outside the spaces protected and must not be located in any space that might be cut off or made inaccessible in the event of a fire in any of the spaces protected.

(4) The "grandfather" clause in the regulation pertaining to remote control of CO₂ systems is not unduly restrictive as it is applicable to the CO₂ installation rather than the ship. New installations or systems on existing ships must comply with the latest requirements regardless of the age of the vessel.

(5) Another factor warranting consideration is whether in casualties including violent explosions followed by intense fire the CO₂ system will remain intact whenever the release controls might be located and whether the release of CO₂ would be effective in extinguishing such a fire being fed with large quantities of gasoline. Other extinguishing mediums or additional systems might be necessary to insure the control of fires under such conditions.

C. LIFEBOAT FALLS

(1) Combustible lifeboat falls may no longer be installed since lifeboat winches with wire falls are required on such vessels, construction of which was started on or after 19 November 1952.

(2) Incombustible falls might not prove to be compatible with existing launching equipment and replacement of all davits would be wasteful when compared to the slight benefit that might be gained from such extensive alterations.

(3) There is no evidence in the record that the lifeboat falls installed on the SS *Gulfstag* contributed to loss of life.

D. MEANS OF REMOVING CARGO AND VAPORS FROM PUMPROOMS

(1) These recommendations were evidently based on the conclusion of the Marine Board of Investigation that "fuel for the initial explosion was gasoline vapor emanating from liquid gasoline in the bilges of the after pumproom and that if the power ventilation blowers of the after pumproom had not been secured it is likely that the concentration of gasoline vapors in the atmosphere of the pumproom would never have reached a high enough percentage to be within the explosive range."

(2) It is unlikely that the last inch of gasoline could have been pumped from the pumproom bilges whether or not shore lines or slop tanks were available.

(3) It is also unlikely that ventilation blowers will prevent the concentration of vapors in the atmosphere of pumprooms from reaching a high enough percentage to be within the explosive range.

(4) Since vapors and some amount of cargo will be present at various times in the pumprooms of most tankships normal operating procedures and regulations have been directed toward the elimination of sources of vapor ignition from pumprooms rather than maintaining pumprooms gas free.

(5) Proper ventilation and pumping of pumproom bilges are considered to be basic requirements of good seamanship and proper safety procedures for which both administrative remedial measures and criminal sanctions are already available. Federal criminal statutes contain provisions for a fine and imprisonment for sending or attempting to send a vessel to sea in an unseaworthy condition. In case of negligence or misconduct on the part of licensed or certificated seamen existing statutes and regulations establish policies and procedures for remedial administrative action by revocation and suspension proceedings.

(6) At present there is no requirement on such vessels as the SS *Gulfstag* for power actuated ventilation. A requirement that power ventilation blowers remain in operation at all times while there is any amount of liquid cargo present in the pumproom bilges would therefore not be effective on vessels without power ventilation.

(7) There is already a requirement in present regulations for tank vessels constructed on or after 19 November 1952 that provisions shall be made for removing drainage from the pumproom bilges and adjacent cofferdams.

5. The recommendation of the Marine Board of Investigation "that the Coast Guard consider a change in the regulations to require that on all tank vessels on which emergency generators are installed there shall be an automatic starting and changeover relay fitted in such a manner that the emergency generator will automatically start and automatically pick up certain predetermined emergency loads whenever ship's power fails" was referred to the Merchant Marine Council for consideration in the form of a letter from the Chief, Merchant Vessel

Inspection Division, setting forth the views of that Division and the Merchant Marine Technical Division.

6. This recommendation was apparently based on the conclusion of the Marine Board of Investigation that "if the emergency generator fitted on the SS *Gulfstag* had been installed with an automatic start and changeover relay it might well have provided electrical power necessary to operate fire pumps when normal ship's power failed and that the use of fire hose, fog nozzles, and portable foam systems might have enabled the crew to significantly alter the outcome of the fire."

7. The real problem is a source of motive power for fire pumps and that problem would not have been solved by automatic starting and changeover relays on the SS *Gulfstag* as the generator was located in the engineroom casing where it could not be expected to operate in an intense fire.

8. The problem is better solved by the present regulation which provides that "tank vessels with fire main installations contracted for on or after 19 November 1952 must have fire pumps located in separate spaces, and the arrangement of pumps, sea connections, and sources of power must be such as to insure that a fire in any one space will not put all of the fire pumps out of operation."

9. The recommendation would not make automatic emergency generators mandatory, only that existing generators be made automatic. The recommendation does not explicitly cover the possible use of independently driven fire pumps nor the practicability of relocating the emergency generator outside the machinery casing. The casualty occurred on an old vessel protected by the "grandfather" clause. To make the proposed regulations retroactive to all tankships would be expensive and of questionable value in casualties such as the present involving violent explosions and intense fires in the space where the generator is located.

10. As previously noted in the "Commandant's Action" on the SS *Gulfstag* Marine Board of Investigation, it is impractical to implement the proposals as regulations due to inequities involved in making such requirements retroactive and due to the fact that in general the objectives are met in the regulations applicable to newer vessels. Nevertheless, some elements of the proposals are not covered in detail in the present regulations applicable only to new vessels. The adoption of these elements, even if applicable only to new ships, might tend to enhance safety and to this end the Coast Guard will continue its efforts in ascertaining the circumstances surrounding marine casualties and in considering all proposals to determine if their implementation as regulations will increase the overall level of safety.

11. It is hoped that this explanation of the disposition of your recommendations will be helpful.

(S) W. J. SMITH.

MARINE ENGINEERING REGULATIONS

(Continued from page 227)

p.s.i.g., nor a temperature above 200° F., the requirements were limited in 46 CFR 54.01-15(a)(1), to include pressure and temperature since the ASME Code uses only size as a restriction.

H. The requirements for flanged joints in 46 CFR 56.30-10 were revised to permit increased use of socket and slip-on flanged joints and sleeve connections.

I. The requirements for tubing joints in 46 CFR 56.30-25 were revised to liberalize the types permitted, but certain bite type connections are excluded.

J. The requirements for determining the size of the bilge suction pipes are by formulas in 46 CFR 56.50-50, and by a note a special reduction is given to tank vessels. A second note is added to give a special reduction to bulk carriers with full depth wing tanks served by a ballast system. In this instance, a special reduction will allow a modification of "B" (beam) in the formula determining the bilge pipe suction size to be the actual breadth of the compartment rather than the vessel. This change is analogous to the treatment of tank vessels with regard to "L" (length) in the same formula.

K. Valves for the purpose of draining water from diesel fuel tank lines are permitted by the change in 46 CFR 56.50-60(f), but only in the case of diesel driven machinery and then if suitably located.

L. The requirements for fluid power and control systems in 46 CFR Subpart 58.30 were revised. The design requirements for hydraulic shock are optional rather than mandatory. Testing of certain cast materials with minimal elongation remains mandatory. Testing of fluid power and control system containing accumulators fitted with rupture discs, parts easily

damaged by over pressure, etc., will be limited so as not to damage the system.

M. With respect to general construction requirements for nuclear vessels, the revised regulations in 46 CFR Parts 37, 79, and 99 are more general than previously. Comments were made that certain restrictions in the proposals were based on existing arrangements and therefore overly restrictive to innovations in design, arrangements, etc. After informal discussions with interested persons who submitted comments, including the Maritime Administration officials, changes were made which generalize the requirements.

N. In order to avoid delays in the permitted use of changes, interpretations, or exceptions in referenced and adopted industry specifications, standards, and codes, the wording of 46 CFR 50.15-1 was revised to clarify the meaning of "current issue." This phrase means that issue, including any addenda and changes, in effect on the date the work is contracted for, or, if no contract exists, the date fabrication is begun.

A number of comments were rejected. The following is a brief resume of actions taken with respect to such comments:

a. Requests to have class II pressure vessels included in exemptions from plan approval and shop inspections were not accepted. This subject, however, will be studied further, especially in the light of experience gained under the revised requirements in this document.

b. Requests to reevaluate the temperature and pressure level separations for the various classes of pressure vessels and piping were not accepted. Since sufficient data and information on this subject to reach conclusive determinations were lacking, this subject will be studied further.

c. Requests to require the transfer of welder qualification information from one company to another were not accepted. The company perform-

ing the qualifying of a welder has title to the qualification information. Therefore, it is within the prerogative of such company to decide whether or not it will transfer the welder qualification information to another organization.

d. With respect to incorporation by reference of adopted codes, standards, and specifications in the marine engineering regulations (Subchapter F), a number of comments suggesting further identification were not accepted. It is felt that the reservations in 46 CFR 50.15-30 provide sufficient controls over the changes in such referenced material which do not provide for the marine environment, or do not meet minimum statutory or regulatory requirements. ‡

STORES AND SUPPLIES

Articles of ships' stores and supplies certificated from October 1 to October 31, 1968, inclusive, for use on board vessels in accordance with the provisions of Part 147 of the regulations governing "Explosives or Other Dangerous Articles on Board Vessels" are as follows:

CERTIFIED

The Dow Chemical Co. 2030 Abbott Rd. Center, Midland, Mich. 48640: Certificate No. 833, dated October 18, 1968, CHLOROTHENE VG.

Petrolite Corp. 369 Marshall Ave., Saint Louis, Mo., 63119: Certificate No. 834, dated October 21, 1968, MC-150.

AFFIDAVITS

The following affidavit was accepted during the period from September 15 to October 15, 1968:

Air Dry Corporation of America, 15201 Keswick St., Van Nuys, Calif. 91405, Fittings.¹

¹Limited to Models MO-3000 and MO-4000 Entrainment Separators and Models NR-3000-1 and NR-4000-1 Purifier Cylinders for use at 3,000 psi and 650° F.

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 may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. Subscription rate is \$1.50 per month or \$15 per year, payable in advance. Individual copies may be purchased so long as they are available. The charge for individual copies of the Federal Register varies in proportion to the size of the issue but will be 15 cents unless otherwise noted in the table of changes below. Regulations for Dangerous Cargoes, 46 CFR 146 and 147 (Subchapter N), dated January 1, 1968 and Supplement dated July 1, 1968, are now available from the Superintendent of Documents, price: basic book \$2.50, Supplement: 20 cents.

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).
115	Marine Engineering Regulations and Material Specifications (3-1-66). F.R. 12-6-66, 12-20-67, 6-1-68.
123	Rules and Regulations for Tank Vessels (5-2-66). F.R. 12-6-66, 12-9-67, 12-27-67, 1-26-68, 1-27-68, 2-10-68, 4-12-68, 6-1-68, 10-2-68.
129	Proceedings of the Merchant Marine 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, 12-23-67, 6-4-68.
172	Rules of the Road—Great Lakes (9-1-66).
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 (1-3-66). F.R. 12-6-66, 1-6-67, 9-27-67, 7-12-68.
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, 12-23-67.
190	Equipment Lists (8-1-66). F.R. 9-8-66, 11-18-66, 2-9-67, 6-6-67, 6-14-67, 6-30-67, 8-29-67, 10-7-67, 4-16-68, 4-17-68.
191	Rules and Regulations for Licensing and Certificating of Merchant Marine Personnel (5-1-68).
200	Marine Investigation Regulations and Suspension and Revocation Proceedings (5-1-67). F.R. 3-30-68.
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).
249	Merchant Marine Council Public Hearing Agenda (Annually).
256	Rules and Regulations for Passenger Vessels (5-2-66). F.R. 12-6-66, 1-13-67, 4-25-67, 8-29-67, 12-20-67, 1-27-68, 4-12-68, 10-2-68.
257	Rules and Regulations for Cargo and Miscellaneous Vessels (1-3-66). F.R. 4-16-66, 12-6-66, 1-13-67, 12-9-67, 1-26-68, 1-27-68, 2-10-68, 4-12-68, 6-1-68, 10-2-68.
258	Rules and Regulations for Uninspected Vessels (3-1-67). F.R. 12-27-67, 1-27-68, 4-12-68.
259	Electrical Engineering Regulations (3-1-67). F.R. 12-20-67, 12-27-67, 1-27-68, 4-12-68.
266	Rules and Regulations for Bulk Grain Cargoes (5-1-68).
268	Rules and Regulations for Manning of Vessels (5-1-67). F.R. 4-12-68.
270	Rules and Regulations for Marine Engineering Installations Contracted for Prior to July 1, 1935 (11-19-52). F.R. 12-5-53, 12-28-55, 6-20-59, 3-17-60, 9-8-65.
293	Miscellaneous Electrical Equipment List (4-1-66).
320	Rules and Regulations for Artificial Islands and Fixed Structures on the Outer Continental Shelf (10-1-59). F.R. 10-25-60, 11-3-61, 12-28-61, 4-10-62, 10-13-62, 8-31-62, 4-24-63, 10-27-64, 7-29-65, 8-9-66, 10-15-68.
323	Rules and Regulations for Small Passenger Vessels (Under 100 Gross Tons) (1-3-66). F.R. 12-6-66, 1-13-67, 12-27-67, 1-27-68, 4-12-68.
329	Fire Fighting Manual for Tank Vessels (4-1-58).

CHANGES PUBLISHED DURING OCTOBER 1968

The following have been modified by Federal Registers:

CG-123, CG-256, and CG-257, Federal Register, October 2, 1968.

CG-320, Federal Register, October 15, 1968.

ANNUAL INDEX—VOLUME 25

	Page		Page
Acceptable Hydraulic Components.....	181, 222	National Transportation Safety Board and Com-	
Affidavits.....	102, 142, 162, 181, 199, 222, 249	mandant Actions.....	70, 134, 155, 191, 233
Amendments to Regulations.....	17,	Nautical Queries.....	16, 36,
	37, 58, 81, 100, 141, 161, 178		57, 80, 97, 122, 140, 160, 177, 202, 214
A Port Safety Dilemma.....	47	Navigation and Vessel Inspection Circulars:	
A Rough Start.....	55	No. 6-67.....	59
Awards:		No. 7-67.....	60
American Merchant Marine Institute Jones		No. 8-67.....	61
F. Devlin Awards.....	196	No. 0-68.....	101
Captain Edward L. Good Receives Tradition		No. 1-68.....	62
of the Sea Award.....	35	No. 2-68.....	101
Legion of Merit to Rear Admiral Charles P.		No. 3-68.....	142
Murphy USCG and Rear Admiral Mark		No. 4-68.....	180
A. Whalen USCG.....	139	No. 5-68.....	181
SS McKinley Wins Gallant Ship Award.....	98	New Attempt at Shape Safety.....	138
SS Steel Maker Receives Highest Award.....	15	New Ambrose Offshore Light Station New York	
SS Stella Lykes Receives Award.....	213	Harbor.....	12
Tug Julia C. Moran Cited as "Gallant Ship".....	34	New Bulk Dangerous Cargo Regulations.....	147
USNS General Nelson M. Walker Receives		Operation, Maintenance and Inspection of Wire	
Distinguished Service Rescue Award.....	56	Rope.....	91
Boating Statistics.....	118	Oxygen—Friend or Foe?.....	171
Bridges.....	167	Play It Cool.....	215
Cargo Deep Tanks.....	158	Public Hearing 1967.....	23
Certain Plastic Lifesaving Devices No Longer		Public Hearing 1968.....	127
Approved.....	18	Public Hearing 1968 Proposals.....	28
Climbing Ladders.....	215	Questions and Answers on Search and Rescue	
Dunnage Adrift.....	99	Operations.....	183
Empty CO ₂ Fire Extinguisher.....	190	Reader's Questionnaire (November).....	Center Fold
Eye Injuries.....	157	Safety as Others See It:	
Filing Complaints Against Seamen.....	17	Acetylene Fires.....	198
For the Want of a Trap Two Boilers Were Lost.....	8	Fire Hoses Should be Fire Ready.....	198
Fusible Plugs.....	181	Oil Spill Fire in Engine Room.....	199
IMCO Activities Updated.....	87	Safety Problems in the Merchant Marine.....	3
International Ice Patrol.....	25	Safety and Radiotelephone Communications on	
Lessons from Casualties:		the Great Lakes.....	128
Carelessness Kills.....	120	Ship Operation (Tankers).....	187
Death Seat.....	120	Shipboard Fire Safety Test Facility Planned.....	195
Improper Loading.....	120	Stores and Supplies.....	17,
Line Handlers Beware.....	14		42, 59, 82, 102, 142, 162, 181, 199, 222, 249
Two Who Returned.....	120	The Coast Guard and Boating Safety.....	112
Lifeboat.....	100	The Coast Guard and Maritime Radioactive	
Live and Let Live.....	107	Materials Traffic.....	282
Maritime Sidelights.....	15,	U.S. Coast Guard Academy Annual Competition.....	197
	34, 56, 98, 121, 139, 159, 196, 213	U.S. Coast Guard Auxiliary.....	115
Merchant Marine Casualty Statistics.....	216	U.S. Coast Guard 1967.....	77
Merchant Marine Detail Saigon.....	197	U.S. Merchant Mariner's Information System.....	174
Merchant Marine Personnel Statistics.....	200	Unleashed Gangplanks.....	173
More Sinned Against Than Sinning.....	67	Walkie Talkies Create Trouble.....	176

Merry Christmas and a Safe One!

