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The Merchant Marine Council of the United States Coast Guard

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COVER PICTURE

The *Eugene F. Moran* is a versatile tug, designed primarily for harbor work, but may be employed in the coastwise trade. She is 106' in length over guards, with a molded beam of 27', a draft of 9' forward and 13' aft; she is equipped with diesel-electric propulsion developing 1,750 h. p. The improvements in the *Eugene F. Moran* include all inside passageways, more efficient ventilation, and many other refinements.—Photo by Morris Rosenfeld, New York, N. Y.

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SAFE NAVIGATION IN AND OUT OF PORT WITH THE AID OF HARBOR RADAR

This Paper Presented at the Maritime Safety Panel at the Twenty-fifth Annual Convention of the Propeller Club of the United States and the American Merchant Marine Conference, October 17, 18, 19, 1951.

By CAPT. JOSEPH J. SAWASKA—HARBOR RADAR INFORMATION CENTER, THE PORT OF NEW YORK AUTHORITY

Safe navigation is the first consideration of every master, mate, and pilot, regardless of the area, whether it be on the high seas or inland waters.

Our subject today has to do particularly with safe navigation in and out of the port of New York.

The experimental Harbor Radar Information Center at Fort Wadsworth on Staten Island was authorized by the Port of New York Authority Commissioners on February 9, 1951. This trial installation was completed ready for operation May of this year. The purpose and objective of this radar station was to test the feasibility of using radar to give ships their positions in relation to the channel and other vessels during periods of thick weather or low visibility.

This great harbor of New York which handles the major part of the United States foreign trade deserves every available modern device for assuring the safe and efficient operation of shipping in the port of New York and its approaches.

An admirable site for the Harbor Radar Information Center was made available at a low rental by the Department of the Army, Fort Wadsworth, Staten Island, on high ground overlooking the Narrows and the main channel entrance to the harbor. Two of the principal radar manufacturers, the Sperry Gyroscope Co. and the Raytheon Manufacturing Co., have cooperated by making the necessary radar equipment available without capital cost. The Port Authority engaged a special staff for the project, paid the cost of erecting the radar antennas and installing the equipment, and purchased and installed the necessary radio transmitters and receivers and other technical equipment.

The steamship lines, the New Jersey and New York-Sandy Hook Pilots Associations, the Army, the Navy, and the Coast Guard are all cooperating and are represented on an active Harbor Radar Advisory Committee under the chairmanship of Admiral Edmond J. Moran, President of the Moran Towing and Transportation Co. The steamship lines have undertaken to determine monthly, for an entire year, the actual delays experienced by them which have been occasioned by low visibility conditions and to estimate the cost of such delays.

The officers and members of the pilots associations have been extremely helpful in giving advice on the character of the problems they face when aboard a ship in foggy weather. They have cooperated very closely in the conduct of test runs, first aboard small vessels and more recently aboard ocean vessels actually entering or leaving the harbor.

If feasible in the New Jersey-New York harbor, shore-based harbor radar would work as follows in aiding the navigation of ships during periods of limited visibility:

When the pilot leaves the pilot boat at the mouth of Ambrose Channel and boards an incoming vessel, he carries with him a portable radio transmitter and receiver (improved walkie-talkie). As soon as he has taken his position on the bridge of the vessel, he can establish radio-telephone communication with the Harbor Radar Information Center. Regardless of atmospheric visibility conditions, the operators at the Harbor Radar Information Center are able to observe the location of the vessel in relation to channel markers, shore lines, and other vessels on their instruments.

As the ship proceeds up the channel, the pilot may be advised at frequent intervals of his exact position so that he will be able to know where he is in relation to a specific buoy or other known location, and to other vessels that may be in the channel at the same time. This aids the pilot to bring the vessel safely into the harbor even though he is not able to make visual observations or to locate objects "around the bend" with ship's radar.

The first objective of the Harbor Radar Information Center was to develop an effective operating system and to determine the feasibility of the use of harbor radar as a navigational aid. So far, our main attention has been directed toward this question of over-all feasibility, rather than upon evaluation of the merits of particular types of equipment.

The following list of objectives are self-explanatory—

1. To provide pilots with additional information concerning traffic and aids to navigation, enabling them to bring their vessels into and out of port in adverse weather conditions with a maximum of safety at all times.
2. To prevent the "piling-up" of large numbers of vessels in the vicinity of the pilot station awaiting clear weather.
3. To render valuable assistance to the U. S. Coast Guard in air-sea rescue operations.
4. To maintain a "double-check" on positions of buoys and other aids to navigation.
5. To assist shipping operators and maritime officials with accurate information regarding the anchorages and positions of vessels under way in the harbor at any time.
6. To supply a more efficient method of forwarding up-to-the-minute information for docking purposes.
7. To provide continuous harbor condition information such as weather conditions, obstructions, heavy rain areas, etc.
8. To give the port of New York an effective all-weather harbor every day of the year, regardless of conditions.

Representatives of the various shipping companies, both foreign and domestic, pilot commissioners, pilots and interested Government agency officials have visited the Harbor Radar Information Center. They have shown keen interest in watching "on-the-scene" exercises being carried out between Harbor Radar Information Center and vessels leaving and entering the port of New York.

Up to the present time, "live runs" have been made with single vessels both outbound and inbound and it is proposed to begin multiple test runs (two or more ships) within a few weeks. We have found that we are able to maintain 150 yards accuracy from the Battery to the pilot station, which is less than one-quarter channel width. Our radar equipment is still being improved by the manufacturers and we hope that we will eventually cut down the 150 yards as our experiments progress. We hope that the pilots will soon take over the bridge end of communication without being accompanied by a staff member of Harbor Radar Information Center.

A number of the masters that have participated in this harbor radar experiment have expressed favorable comments on the value of the project at its present stage of development and as to their hopes for its future progress.

Capt. E. M. Swan of the S. S. *Parismina* has expressed his opinion in a letter dated July 19: "From Pier No. 9, North River, to Craven Shoal Buoy, the weather was clear and many questions were asked over the portable radio-phone to the Harbor Radar Information Center. *All were answered satisfactorily and had the weather been thick, we would have been able to proceed safely.* From Craven Shoal Buoy to the pilot station, a heavy thunderstorm was encountered and at times the *visibility was less than half a mile.* We continued to ask the radar operator various questions with regard to proper courses, location of shipping, speed of shipping, etc. We checked the answers with our own radar and the harbor radar information was nearly perfect. The results were excellent and I feel that ship masters can proceed with confidence with the information that the Harbor Radar Information Center passes on."

Capt. J. W. Eppleman of the S. S. *Metapan* made the following comments: "The *Metapan* sailed at 11:12 a. m., visibility was 1½ miles decreasing at times to ½ mile. Continuous contact was maintained with the Harbor Radar Station; bearings and distances of ships, buoys, etc., were received and checked visually and by ship's radar. *All* bearings, distances, course, and speed of our ship were given with great accuracy. Example 1.—Advised two targets ahead, one on each beam—2,000 yards visible. Advised to maintain course to pass between at about 150 yards. Targets were small steamer to port and steam barge to starboard. Accurate. Example 2.—Advised that a large target proceeding up channel, 2,200 yards, had swung wide of Buoy No. 14. Advised us to haul to westward to clear. Hauled to starboard and sighted the S. S. *Ile De France* about 1,200 yards on port bow. Example 3.—Advised several small craft in channel between Buoys Nos. 2 and 4. Sighted several fishing craft at about 1,000 yards as advised. I believe when proper controls are established and the Harbor Radar Information Center is in full operation, that this service will be of great assistance in piloting New York harbor during low visibility."

Another letter from Capt. G. L. Armstrong of the S. S. *Hibueras*—"I believe 'Harbor Radar' a necessary and valuable aid to navigating the channels and harbor and will become very efficient in due time."

Capt. J. K. Norton of the S. S. *African Sun* had this to say: "I wish to extend my compliments to you and your staff for the fine work you are doing in radar development in the port of New York. Your demonstration on August 22, 1951, aboard this vessel on the evening of our departure for Cape Town was certainly carried out in a fine and precise fashion. It spoke well of the excellent equipment in use, and of the mastery in the use of such by you people. Wishing you continued success in this undertaking."

A system of navigation aid that would avoid the shipping delays now caused by low visibility conditions obviously would be of immense economic importance to this port. It is estimated that the fixed cost of operating a 10,000-ton cargo vessel is at least $2,000 a day, so that delays are exceedingly expensive. Delay to a large liner is, of course, even more expensive. The actual out-of-pocket losses to the maritime industry as a result of adverse weather conditions are not fully known but may easily run $500,000 or so a year in the port of New York.

At present, the Harbor Radar Information Center is still actually in the experimental stage and we are well aware of the fact that there are innumerable problems yet to be solved. Also, there is no doubt that some shipping delays would occur even with the possible use of the most elaborate system of navigation aids that we can visualize today. If a harbor radar system proves to be capable of reducing those delays to a minimum, however; and if it is found to be sufficiently dependable to be relied upon under emergency conditions; and if its costs are not too high, its value to the port of New York should be beyond question.

DEVELOPMENTS IN ELECTRONIC NAVIGATIONAL SYSTEMS AND DEVICES—PART I

These papers presented at the U. S. Coast Guard Panel at the 25th Annual Convention of the Propeller Club of the United States and the American Merchant Marine Conference, Oct. 17, 18, 19, 1951.

BY CAPT. J. W. RYSSY, USCG

You, gentlemen, who are vitally interested in marine affairs, and the Coast Guard which is continually working to promote those affairs, face some very intricate problems regarding electronic navigational aids for our ships, not only those navigating the high seas, but those plying our coasts and entering our harbors.

The science of electronics has been very kind to the navigator, in fact, so kind that it has produced such a wealth of electronic navigational aids that the very real problem now is what aids we should select, develop and install. A ship which only plies the coast or runs from harbor to harbor may require one type of navigational aid. Another ship which navigates the trade routes of the Atlantic and Pacific may require another. We must keep them all in mind when we plan our electronic navigational aid systems. Unfortunately, we cannot have all types of electronic navigational aids as the limitation of the frequency spectrum and over-all costs soon catch up with the planner who would pursue such a course. In choosing a plan, certainly no one would be satisfied to sacrifice our coastal radiobeacon system to provide precision harbor entrance systems. Furthermore, the medium frequency spectrum where our radiobeacons operate is a long-distance frequency whereas precise harbor entrance requirements rarely, if ever, extend further than 25 miles. Ultra high frequency, very high frequency and microwaves meet this requirement and should be used here to prevent waste of that part of our natural resources contained in the frequency spectrum and to further spread out what we have available for the use of more consumers, that is, the maritime industry. Hence the national policy of the United States specifies radar, radar aids and UHF radio telephone as harbor entrance aids.

Medium frequency radio beacons are used where their longer distance coverage reaches out from the harbors and provides aid to bring our ships into the more precise harbor entrance systems. Incidentally, another consideration enters the problem at this point. We in the United States marine field have ever been conscious of safety of life at sea. Here is a chance to correlate the safety of life at sea devices, shipboard radar and radio direction finders, with navigational aids planning. If shore navigational aids are properly selected we can eliminate the need to carry a device that may place a ship on a precise line of position when it is within 200 miles of the coast, but one which will be useless outside this range on the high seas and in times of distress. Further, the safety of life at sea convention requires radio direction finders on many ships, so why not provide the shore aids whereby this device can be put to work for navigational purposes.

We can get a further clue as to the proper planning of the United States electronic navigational aids systems by examining the geometry of the United States coast along with our shipping lanes and adjoining areas which encompass the maritime industry. I would like to speak broadly in this regard. The shipping lanes that approach the United States are not a converging system such as that found on the northern coast of Europe. We have long coasts with shipping lanes approaching all of our ports on both coasts from Canada to Mexico, and including Alaska. This is actually a diverging system. For instance, the Gulf of Mexico appears of reasonable dimensions when viewed on a mercator chart, but let me assure you that anyone who has studied the aids to navigation problem of the Gulf of Mexico will find that the problem is in terms of several hundreds of miles. Further, the fishing grounds off the coast of the United States cover broad areas and this industry is no small part of our economy. In fact, it is spreading and growing every day, such as the shrimp fishing grounds in southern waters and crab fishing in Alaskan waters. So also grows the area in which we must conduct search and rescue. Also let us consider the areas closer to shore. Anyone who has flown over our coastal waters on a bright holiday afternoon is astonished at the number of small pleasure craft that appear here and on reflection considers the potential emergency situations that may develop should the weather suddenly close in. Certainly these vessels must be provided with a device that will not run into a cost of four figures. Our aids to navigation system must lend itself to a low cost and simple device to

Be Safety Conscious

meet small craft needs and still provide a system that will cover offshore commercial fishing grounds and the main ocean trade routes.

There are two other considerations that have a bearing on our electronics aid to navigation problem. First, we in the United States place a high value on human life and we all know that if there is a chance for rescue the entire rescue machinery of the United States will be set in motion to effect that rescue. A primary requisite of search and rescue is a proper navigation grid system on which to base the search pattern. Our electronic navigational aid system should provide this grid. Secondly, the United States maintains, along with other nations, several ocean station vessels. A large part of the duties of these vessels involves furnishing navigational information to overseas aircraft. The ocean station vessels must know their correct position at all times under all conditions. Hence electronic navigational aids for these vessels must be independent of weather and adverse propagation conditions. I believe that your imagination will give you sufficient details as to what such an electronics navigational aid system contributes to the national defense of the United States.

With the foregoing in mind we can now proceed to reduce our navigational problems to terms of systems. The United States advocates radar and radar aids for harbor navigation because it provides the navigator with navigational information that is completely under his control. It does not require the expenditure of long distance frequencies. It furnishes him with an excellent safety device that can be used at all times and there appears to be ample opportunity for increase in the accuracy to which this system can be developed should the need be indicated.

Considering the configuration of our coastline together with the requirements for medium distance aids the United States advocates, in addition to radar and radar aids, the use of shipboard medium frequency direction finders and radiobeacons. This supports a reasonably priced device for small craft and utilizes the frequency that is satisfactory to carry our ocean-going vessels safely out into the long distance system. The speaker following me on this program will outline some methods that are under consideration to increase the utility of both radar aids and radiobeacons. Some advancements have been made in the field of microwaves that provide promise for a low priced aid for small vessels.

The United States policy for long distance aids supports the use of loran along with shipboard medium frequency radio direction finders and radiobeacons. Here again the medium frequency radiobeacons point to a dual utility device on shipboard and give a thought to the preservation of spectrum space by using the proper frequency considering the distance to be covered.

Loran has been challenged, but let me remind you of my statement regarding the Gulf of Mexico and our diverging traffic lanes. A 250 mile aid cannot meet our requirements. Even with the 900 mile day time coverage of loran we find ourselves badly pressed to give proper long distance electronic navigational aid service to all areas requiring coverage. Some have suggested the use of a low frequency in combination with other systems to provide this coverage. Passing over electromagnetic considerations which in many cases are prohibitive in themselves, let me assure you as one who has had part of the job of placing navigational aids in large parts of the world that the size of antennas and ground space for antenna sites required for low frequency systems is no small consideration. A 2 mc. loran antenna performs perfectly well at a height of 85 feet. Low frequency systems require antennas of the order of 300 feet in height and higher. The geometry of any long distance navigation aid system does not always place the transmitting station in a flat terrain or on any easily accessible coast. The consideration of antenna size, antenna height, and the area of the transmitting site precludes the thought of extending long distance aids to many areas if low frequency aids were to be used. The original choice of two megacycle loran continues to be a wise one for many reasons.

Part II, by Commander Guy L. Ottinger will discuss some of the new developments of electronics navigational aids which I am sure will convince you that the electronics aids to navigation problem is being actively pursued.

PART II

BY COMMANDER GUY L. OTTINGER, USCG

The previous paper has developed the general aspects of the navigation picture together with the electronic systems advocated by the United States to efficiently provide for the needs of the Mariner. Let us look now into the modern tools available within the framework of the above systems.

The old faithful radio direction finder is still with us and present day models are not much different from the earlier models. In the early 1920's most of the direction finding was done by means of shore based direction finders in which system the ship transmitted a series of MO's on the direction finding frequency and a group of shore stations took bearings and sent them to the ship. Early in World War II as the combination of shipboard direction finder and shore radiobeacon became widely established, the United States abandoned shore direction finding for navigational purposes. There are however a number of other countries still providing this service.

Various forms of quasi-electronic systems such as submarine signals and hydrophones had their heyday. The echo sounding machine remains with us today out of this group as a must for all ships.

As a result of the great amount of research, experimentation, and installation for the military during the war, the mariner inherited a number of revolutionary systems which have proved to be of great value in improving navigation and safety at sea. In the short range field we have Radar and Radar Aids. In the long and medium range field there is a large network of internationally operated Loran stations. In Europe several long range Consol stations and medium range Decca chains provide service.

Marine Radio Direction Finder

While it is true that the rotating loop pointer indicator type of marine radio direction finder is quite similar to the model of 25 years ago, there are several improvements in various stages of development.

The automatic direction finder offers a means of simplifying and shortening the time required to take a bearing. With this instrument the receiver is tuned to the proper frequency and a needle or pointer automatically indicates the correct bearing without sense ambiguity. The possibilities of operators' errors are reduced and the watch officer will spend less time taking bearings and more time conning the ship. Automatic marine direction finders were successfully built and demonstrated in the early 1930's while military equipment of this type is widely used and has been for some time. The present lack of marine acceptance is probably due to the simplicity, reliability, and low cost of the manually operated equipment. Aircraft, both large and small, exclusively employ the automatic direction finder and have done so for years. There are of course differences in construction and design needed to adapt this equipment for marine use.

Another device to improve direction finder accuracy and operating convenience is a visual null indicator used in conjunction with aural null indication.

With the increasing number of radiobeacons cases of reported interference between such signals are more frequent and the navigator finds in certain areas more difficulty in quickly obtaining reliable bearings. Improved selectivity in receivers will materially assist in reducing this problem. The International Telecommunication Union meeting at Atlantic City in 1947 recognized this problem and authorized an additional 10 kc. in the radio frequency spectrum immediately above the present radiobeacon band. A study is being made of the whole radiobeacon allocation problem with a view toward providing improved and additional service. This is of necessity a complicated and slow process because radio frequency allocations must be coordinated nationally and internationally.

Loran

The Loran system of navigation is undergoing a continual evolutionary improvement both for shipboard receivers and service coverage.

The mariner finds himself with Loran receiving equipment far superior to that available to the aviator. Direct reading Loran equipment has been on the market and widely used since the beginning of commercial service. With such a set the navigator makes a pulse match and then reads the Loran reading directly from a Veeder-Root type of counter. Another technical feature leading to improved operation is an automatic synchronizing circuit which locks the signals in position thus simplifying the operation for the navigator.

The most important development with great promise of future application is the automatic tracking Loran receiver. This receiver is operated in the same manner as any direct reading receiver up to the time a pulse match and reading is made. Then the navigator throws a switch and automatically the receiver maintains a perfect pulse match and the counter continuously indicates the correct Loran line of position reading. The Coast Guard has converted several of its marine receivers for this type of operation. Figure 1 shows the converted Loran receiver. The small box on top is all that is added to a standard Coast Guard Marine Loran Receiver.

The International Ice Patrol Aircraft used the automatic tracking receiver with good results during last season's Ice Patrol. In this case two receivers were used—the automatic receiver was set up on the most rapidly changing Loran line of position and the other, a standard airborne receiver, was operated on another more slowly changing Loran Rate. With this system much time could be saved as the plane's position was known at all times. Thus it was no longer necessary to circle icebergs while the navigator established his position. It was found that this receiver was capable of automatic operation under weak signal conditions when manual operation was almost impossible. Skywaves are usable but more care is required and the navigator must watch the scope and read the counter when both signals are normal.

Figure 1.—Loran Receiver Indicator, Continuous Indicating, Modified Model RD-131.

The mariner now has a means to provide himself with a position with a minimum of effort and time whenever he is in an area having Loran service. The basic research and engineering had been done; all that is necessary is to repackage two Loran receivers to provide for continuous automatic tracking of two Loran rates. Here indeed is a major step forward in Loran navigation!

Additional Loran service has recently been established for the approaches to New York Harbor, Delaware Bay, and Chesapeake Bay. The eastern half of the Gulf of Mexico began receiving Loran service last August. A chain of high power Loran stations is now under construction in the Gulf of Alaska—the on air target date is January next.

The ground station equipment is being improved to provide more accurate and reliable service. High power is available where needed. New narrow-band transmitters have greatly reduced the interference potentialities to other services operating on frequencies adjacent to Loran.

Marine Radar

No other device has evoked the interest and immediate acceptance that Radar has on merchant vessels. Here indeed was felt to be the single-handed means to end all collisions. In some respects Radar has not lived up to these expectations. Collisions have occurred between two vessels each of which was fitted with the latest Radar. However in order to place the proper perspective on this situation I refer you to the Proceedings of the Merchant Marine Council for September 1951. Briefly this article reports on the number of ship collisions occurring during the fiscal year ending June 30, 1951, and points up the value of Radar aboard ships as contrasted with those not being so equipped. Of the 182 collisions that occurred on all waters, 90 cases were involved where one or both vessels were equipped with Radar. Attention is invited to the fact that only 9 collisions occurred where visibility was poor and both ships were Radar-equipped. In the majority of the cases the collisions were directly due to human failures.

The Radio Technical Commission for Marine Services is establishing a special committee to study the matter of collisions between Radar-equipped vessels. The purpose of this study is to advise the membership as to possible means to improve the above situation.

Before discussing the latest tools at hand for the mariner to improve this situation let's take a further look at what actually happens. Basically ships' officers are prone to believe that the Radar replaces their seaman's eye. This is not correct for many reasons, the most important of which is the fact that a Radar signal does not show the aspect and other details of the target. To do this we would need a Radar much superior in resolution to what is now available and practicable. In fact what we need is detail of the order of color television. When a ship makes a course change it should be immediately apparent. Information should be made available to take the place of red and green running lights, the masthead and range lights, the silhouette of the ship and even the deck house lights. Our best Radar only gives us an instantaneous range and bearing on the target. In some cases indication of the other vessel's bow and stern is visible but by this time it is usually too late to do anything about the situation.

Several improvements have been made to shipboard Radars. The average size of the indicator tube has increased considerably the past two years. Some manufacturers are employing sixteen- and seventeen-inch

Figure 2.—Microwave Pelorus Employing Truncated Paraboloidal Antenna.

tubes. Larger size tubes permit the navigator to obtain at a glance all of the information available on the tube and the maximum detail within the capabilities of the Radar. The situation is closely parallel to television receiver development.

The minimum range of Radars has been pushed down to about 50 yards thus improving safety in confined waters. The Canadian Research Council has demonstrated a low power Radar with a minimum range of 10 yards. This Radar uses separate antennas for transmitting and receiving.

The ability to mitigate the effects of sea and precipitation clutter has been improved. In addition to the general improvement in operation of controls for this purpose one manufacturer has come forth with a combined 3 and 10 centimeter Radar so that the navigator may obtain the maximum all weather operation on the open seas as well as high resolution in confined waters.

Some progress has been made in improving the detail or resolving power of shipboard Radar by the use of new designs and larger antennas. However, we cannot get much further here without having antennas of fantastically large dimensions. Higher frequencies could be used but in this case reliability is lost as propagation difficulties, sea clutter and atmospheric absorption render the Radar useless a large percentage of the time.

The general instrumentation of Radar controls and lighting has undergone a steady improvement. "Feel" coded knobs, placement of knobs to improve ease and naturalness of use, and incorporating only needed controls extend the usefulness of Radar. One Radar provides the standard size indicator tube and in addition a small supplemental safety scope that remains at a constant range scale of 2 miles.

Figure 3.—Echo-box DERM Mounted on Breakwater, Wildwood, N. J.

To provide the advantages of Radar to tugs and fishing vessels and those having limited installation space a smaller, less expensive Radar is now available. This Radar is capable of high quality performance and reliability although the indicator tube is smaller and the maximum range is reduced.

All of the above features and others not mentioned for lack of time describe the advanced state of the present marine Radar.

Operators' training and experience is essential in order to obtain complete and optimum utilization of Radar data, particularly in the avoidance of collisions. Poor evaluation of Radar information is probably due to lack of experience and failure to plot the movements of the other vessel. It may not always be practicable to run a Radar plot and determine the other vessel's course and speed; however, officers that are trained and familiar with this technique certainly have a better understanding and visualization of the problem. The Coast Guard is encouraging the Electronic Industry to develop a reasonably priced, simple semiautomatic plotting device.

Radar Aids to Navigation and Identification

The mariner still has difficulty and needs additional help to come closer to replacing his seaman's eye. He needs identification of other vessels and targets to improve safety of navigation and to allow him to communicate directly with the other vessels. Radar aids can also extend the range of Radar. There are a number of devices of varying complexity already developed that show promise for these applications.

The Radar pelorus or microwave direction finder conceived by the National Research Council of Canada consisting of a small directional antenna, simple amplifier and headphone or meter indication is designed to function on microwave signals such as those transmitted by Radars and Ramarks. It is an easy matter to take an accurate bearing on trans-

Figure 4.—Radar return from DERM in Figure 3.

missions from another Radar set. This tells the navigator that the other ship has an operating Radar and with the bearing he can, in most cases where several targets are on the screen, identify the target under consideration. As a further refinement, marine Radars could vary the repetition rate with regard to the ships' head, i. e., the normal rate could be used when the antenna is scanning over the starboard side and the rate could be increased when the antenna was traversing the port sector. The Radar pelorus could indicate the port or starboard aspect of the target by a red or green light: Figure 2 illustrates a Radar pelorus.

The DERM or delayed echo reflector is a device which receives the Radar signal, delays it awhile and then sends it back to the Radar. Such a signal causes a little tail to extend back of the normal Radar echo. Installation of this equipment on a target that is free of background clutter is a possible means of identification for bridge piers, breakwaters, and ships. DERM's have the further advantage of being a passive device not requiring local power for their operation. A DERM is shown in figure 3 and its Radar signal in figure 4.

THE RADAR MARKER OR RAMARK functions as a Radarbeacon in about the same way as a radiobeacon operates. The beacon transmits continuously and the navigator tunes his Radar, by depressing a button or lever, to the beacon frequency. He then observes on his Radar scope a beam of light extending from the center to the periphery on the bearing of the beacon. Figure 5 is a scope picture of RAMARK. Ramarks can be made simple and low powered for possible short distance ship application and higher powered for navigation applications requiring extension of normal Radar range as well as identification. The keying rate of the Ramark can be varied to provide identification among Ramarks. Attention is invited to the fact that the Radar must be equipped to receive on the beacon frequency. Most, if not all of the commercial Radars, are designed so that such a modification can be readily installed. Three installations of Ramark have been made on Atlantic Coast lightships and one on a Great Lakes Light Station. A West Coast lightship installation is now being made.

The Coast Guard now has a number of buoys equipped with radar reflectors. The addition of reflectors can be expected to about double the Radar detection range and reliability over that obtained on a regular buoy. We now have some 50 buoys equipped with Radar reflectors. The design of a modified buoy is shown in fig. 6.

Figure 6.—Radar Reflector Cluster Mounted on Lighted Buoy.

Figure 5.—Ramark Signal Superimposed on Radar Presentation.

An interesting application of the Coast Guard reflector design was made at Long Beach, Calif., by the Board of Harbor Commissioners. A buoy reflector was installed on the Long Beach Pilot Boat to facilitate its positive identification in connection with operation of the shore-based Radar station. Preliminary results have been gratifying as the pilot boat is now a good Radar target—the Radar pip being about twice the original size and the intensity shows bright at all times. Figure 7 is a photograph of this vessel. For his own protection the owner of a small vessel could use this method to improve the Radar visibility of the vessel.

Another secondary application of Radar is shore based Radar for Harbor Surveillance at major ports. These Radars are elaborate affairs, strategically located and capable of viewing all parts of the Harbor and approaches with a high order of precision. The observers on shore plot and track a number of vessels simultaneously with sufficient accuracy to pass on pilotage advice. In the United States trial installations are now undergoing evaluation at New York, N. Y., Long Beach and San Francisco, Calif., and Baltimore, Md. Abroad, Liverpool, England, and Le Havre, France, have such a system.

One other very important adjunct to Marine Safety is universality of radio telephone communication. Until masters can talk with other masters and shore points we will not be able to make the fullest use of Radar equipment as a means of reducing marine casualties.

Figure 7.—Radar Installation aboard Long Beach Pilot Boat; Long Beach Harbor Commissioners Photo.

Conclusion

This paper has reviewed several modern developments in electronic aids to navigation available to the mariner. Briefly for long distance navigation Loran has come of age with the design and trials of the automatic indicating Loran Receiver. Radar has undergone improvements in resolution, larger indicator tubes, reduced minimum range, and better instrumentation. The mariner has at the same time gained in training and experience. Several Radar aids for navigation and identification such as the Ramark, DERM, and Microwave Pelorus were discussed.

The Coast Guard, other Government agencies, the marine industry, and the radio equipment manufacturers are constantly trying to solve the day-to-day problems of the mariner by improvements to the electronic tools in the navigator's workbox.

LIFEBOAT NAVIGATION

presented by

Commander R. T. Alexander
U. S. Coast Guard, Treasury Department

before the

Joint Ion-R. T. C. A.-R. T. C. M. Meeting
Held at the Hotel Astor, New York City, on
September 19, 20, 21, 1950

To many folks, the mention of lifeboat navigation invokes a mental picture of the epic voyage of Captain Bligh. Since those days, there have been a couple of changes here and there. So let us leave the men of the *Bounty* to their niche in the lore of the sea, and look at the practical problems that face seamen and airmen of today who are unfortunate enough to find themselves in a very small craft on a very large ocean.

Many excellent and practical books and papers have been prepared which deal with techniques of navigation, that is, with how most survivors can best shape their course for the nearest Times Square. In fact so much has been written about how to navigate to dry land, that perhaps it is time to consider the other possible courses of action. Perhaps the question of "What (line missing) do" should be explored before we get involved in how to do it.

It would appear that the subject of "when to navigate" is of at least equal importance today with "how to navigate." It appears possible that actions and equipment of the searching craft may have direct bearing on the best course of action of survivors and upon equipment of the survival craft.

This discussion is based upon peacetime situations. In peacetime, we assume that there will be no deliberate action by men or craft to reduce the probability of survival. In wartime, we must include a consideration as to the desire, ability, and probability of the enemy interfering with survival and rescue. However, if basic concepts are sound, it appears likely that war will require local modification of equipment and techniques rather than radically new approaches to the problem.

As soon as the immediate problems of embarking in lifeboats, of picking up survivors, of getting clear of vessel or plane are under control, the question arises as to whether to navigate, that is to strike out for land or to remain at the scene of the casualty. This decision should be made carefully since it can greatly influence the probability of survival.

It is well to dwell a bit upon the elements which enter into this decision for not only is it of importance to survivors but also since the planning of a search for the survivors must estimate the most probable course of action of the survivors in order to effect prompt rescue.

To evaluate this consideration, the survivors must evaluate their answers to the following questions:

1. How long will it be until others know the casualty?
2. What types and how many craft are likely to search for us?
3. How long will it take searching craft to reach our area?
4. How long will searching craft require to make contact with us?
5. What are the chances of searching craft missing us?
6. How long would it take us to reach land by direct navigation?
7. How accurate will searching craft know our position?

Information regarding a casualty usually takes one of three forms, either direct radio transmission from disabled craft or the absence of scheduled transmissions, or the failure of the craft to arrive at her destination at a scheduled time. With large surface craft, the probability of a direct radio transmission almost becomes a certainty. With aircraft, the absence of scheduled transmission and the relatively short times en route together make maximum elapsed time for initiation of search, something less than 24 hours. Survivors of small surface craft will find it difficult to estimate time required for knowledge of their plight to become known ashore, if direct radio transmission was not made, since the lack of a regular schedule of communications, together with usually indefinite ETA may cause several days to elapse before initiation of search.

The types and numbers of craft which are likely to promptly enter the search is largely dependent upon the location of the casualty and the number of lives involved. If the casualty location is at a point frequently traversed by both planes and ships, then both planes and ships may be expected to initiate search as soon as information as to casualty has been broadcast. On the other hand, if casualty occurs in an area not frequently traversed by plane or ship, then some delay will occur in order to locate and divert ships and planes to the search.

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The time required for searching craft to reach the area is dependent upon the proximity of surface craft, the proximity and availability of aircraft, and the speeds of the craft available. The survivor will usually be able to make only a general estimate of this time.

The accuracy with which position of the casualty is known to the searching craft will to a large extent determine the size of the initial area to be searched. If a position is transmitted prior to abandoning the disabled craft, the accuracy is bound to be better than if it must be estimated by other parties in relation to a previous position course and speed. The estimated position of a ship is likely to be more accurate than the estimated position of a plane due to its slower rate of travel from last reported position. The accuracy of a transmitted position from plane or ship will be of the same order of accuracy. However, in the case of the plane the point of ditching is likely to be considerably further from the transmitted position than the point of abandoning ship.

The estimated time for survivors to search land by direct navigation is dependent upon their location relative to land, the direction of wind and current, the prevailing weather, the effectiveness of means of propulsion at hand.

The probability of sighting and the time required for searching craft to make contact are subject to many variables. The probable time required to locate survivors is dependent on the size of the area to be searched and number and capabilities of the searching craft as well as probability of detection. It is at once evident that when survivors strike out for land that they are increasing the area to be searched. While probability of detection is subject to many variables, it is well established that the probability of detection is increased if all survival craft keep together. While this is easier said than done, even when all craft attempt to remain at scene of the casualty, it can be readily seen that in striking out for land, the variable performance of each craft is bound to result in spreading out and decreased probability of detection.

If we take the elements so far discussed and apply them to various specific situations, we will find that in peacetime, it is rare for survivors to find themselves in a situation where the chances of survival can be improved by striking out for land. It appears that the few cases where direct navigation to land is advantageous are most likely to be associated with small surface craft such as pleasure craft and fishing vessels.

However, we cannot neglect the fact that the search may fail to locate the survivors. Each search involves elements of chance or probability of detection. If we throw enough planes and ships into the search, we can raise this probability by brute force. This is not only an expensive procedure, but in many cases, the search force will be only a single craft which can devote but limited time to searching for survivors.

It is apparent that the amount of equipment which can be carried in a survival craft is limited. This limitation makes it desirable to conserve expendable items which are useful in attracting attention until the survivors *know* a search craft is in the vicinity. The operation of nonexpendable items such as the radio transmitter and sun mirror are likely to be more effective if the survivors *know* that a searching craft is in the area. While there are many reports of searching craft which although seen by survivors, fail to sight survival craft, it is probable that there are just as many near misses where neither craft was aware of the presence of the other. Naturally, it is impossible to obtain reports of such cases.

The searching craft is large in respect to lifeboat or raft. The limit on the amount of equipment that she can carry for this purpose is one of cost rather than weight or space. If we can develop the concept of the responsibility of the searching craft to make its presence known, then it is believed that the savings in search time and savings possibly through reconsideration of survival craft equipment, would amortize the cost and give added probability of detection.

The first approach toward implementation of this concept might well be in the visual-detection problem, for all search must finally stand or fall on visual sighting of survivors. At night a searching ship with running lights only can be seen by survivors a relatively short distance due to interference of seas, varying aspect of the vessel, and the motion of the boat. This distance will vary with circumstances, but let us use 4 miles as a reasonable figure. The searching vessel at 10 knots thus makes its presence known over 80 square miles per hour. Suppose that by use of searchlights pointed vertically or high-intensity parachute flares, the search vessel may be easily sighted at 10 miles. She now makes her presence known over 200 square miles each hour. If the survivors have flares which can be easily sighted, the same distance of 10 miles, then we have increased the effectiveness of each searching vessel by a factor of 2½. With aircraft, the same reasoning applies, but the range at which aircraft can be sighted at night is less than a surface vessel due to lower power running lights and decreased interval of observation. In both cases, the use of searchlights or landing lights would increase the detection range of searching craft by survivors, but the blinding effect of glare from the lights would probably decrease the range at which searching craft could see the survivors' flares. However, if high candlepower flares were used by ship at half-hour intervals and by planes at 5- to 10-minute intervals, there would be a marked rise in the probability of making contact with survivors.

This concept is temporarily unproductive in daytime, not because of inability to extend the visual range of the plane or ship, but rather because we do not have equipment in the survival craft capable of reliably attracting attention of searching craft at the ranges which searching craft are visible to survivors. We have added signal mirrors, dye markers, and smoke flares; only the signal mirror is effective at long visual range. The solution may well lay in changing our approach to smoke signals. Present-day smoke signals are required to burn for a definite duration. However, in all but the lightest wind, the smoke is carried away before it can build up to an effective visual signal. If we would concentrate on producing the greatest practical volume of smoke in the *shortest* time, we would greatly improve the utility of the smoke signal. If we can produce a dark-colored, high-altitude, detonating smoke signal that will produce a cloud of smoke 60 feet in diameter and be small enough packaged for lifeboat use, then we will have a signal with a potential 10-mile daylight range and could proceed with similar devices for increasing the visibility of the searching craft.

While the most direct and practical benefits from this concept are apparent in the visual-detection problem, it may be possible to apply the concept to other fields. Consider for a moment the Gibson Girl. The survivors are supposed to crank it from time to time and then hope for results. Would it not be more fruitful to also provide simple receiving equipment which when actuated by searching craft would indicate the presence of searching craft nearby and thus insure best utilization of the Gibson Girl. If survivors know that a craft is searching for them, they are less likely to strike out for land with all the hazards that attend this course of action.

Of considerable significance to the problem of survival-craft navigation and the equipment of such craft, is the time available between first notice of casualty and the moment when the ship or plane will have to be abandoned. In surface-craft casualties, the problem of navigating lifeboats is becoming extremely rare. Except for collision, there are usually quite a few minutes which elapse between first notice of the casualty and the time of abandoning ship. In collision, the lack of warning is compensated for by the fact that one ship almost always remains afloat and able to immediately pick up survivors. In case of fire and stress of weather, there is time to get off radio signals together with accurate position and usually time to transmit for radio bearings to be taken. With aircraft casualties, the search problem is very acute due to the speed with which casualties can occur. However, due to lack of means of propulsion, the navigation problem of survivors of aircraft is relatively simple. In wartime, the surface-ship problem changes radically until there is little difference remaining from that of aircraft survivors.

It would, therefore, seem advisable to navigate only when you can see land and have propulsion necessary to get there. It appears likely that equal or better chances of survival through rescue are usually to be attained by staying at scene of casualty. Improvement of the ability of both survivors and searching craft to make their presence known to each other will increase probability of rescue and decrease the time between drinks.

There will be cases where searching craft are not available; cases where search was abandoned without making contact with living survivors; where survivors must navigate for nearest land. Too often in thinking of the survival problem, we think of these cases alone without considering their relative importance in the over-all situation. Percentage wise, the number of such cases is very small. By far, the large majority of all survivors of aircraft and marine casualties have been rescued as a result of search rather than by their own navigation.

The process of arriving with equipment which shall be carried by a ship's lifeboat is a most difficult one. The problem of equipment for the inflatable boat of aircraft is much more difficult due to limitations of weight and space. It is all too easy to suggest that this item or that item be added. Favorable experience with a particular item results in pressure for its inclusion. It is essential that we continually reexamine our equipment requirements periodically in the hard cold light of which items contribute most to the over-all chance of survival. This progress can easily bog down in the technical details of hardware, if we fail to examine the basic boundaries of the actual situations. It is too easy to focus attention on the spectacular case where certain equipment has saved one or two lives and lose sight of hundreds of lives which were lost.

For example, we could concentrate on navigational gear and propulsive equipment and minimize contact equipment on a theory that each survival craft should be capable of navigating to the nearest land under all circumstances, and that search efforts would be minimized. But would this increase the over-all chances of survival? The best navigational equipment and the best of navigational methods will only contribute as much as the chance of the survivor group including some individual skilled in their use.

The problem of equipment for survival craft is intimately and directly related to other aspects of the casualty problem. We should pause to reflect that in marine disasters in general, and in naval warfare in particular, the number of lives lost by drowning and exposure far exceeds the total loss of life from all other causes. In aircraft disasters, the facts are not as clear but it is probable that the same statement is applicable to those who survive the crash or ditching. These deaths were not due so much to failure of search efforts or lack of navigational facilities, but to the tragic fact that the men drowned or died from exposure before either search or navigation could help them.

The direct cause of death was in the large majority of cases due to effects of exposure, exposure in the process of getting to survival craft, exposure in or on board survival craft, or exposure due to inability to get aboard survival craft.

The problem of protection from exposure cannot be solved by equipment of the survival craft alone, but in considering equipment of the survival craft, the highest priority should be given to items that reduce the effects of exposure. If we cannot have both sails and blankets, let us choose blankets; if we cannot have both compass and lights to guide survivors in the water to survival craft, let us choose lights.

After consideration of equipment to protect from exposure, we face the problem of other equipment to prolong life or equipment to increase probability of detection or navigational and propulsion equipment. The human being is remarkably tough. A man protected from exposure can survive several days without water, 1 to 3 weeks with water but without food. Without navigational equipment the craft may still be found. The lack of means of attracting attention does not prevent sighting. We have a nice problem in probabilities. It is obvious that next priority after exposure protection should go to the category of items that give greatest increase in probability of survival. While the point is debatable, it presently appears that means of attracting attention such as radio and flares should have priority 2—for the number of living survivors is more directly related to the speed of rescue than to the navigational problem or subsistence problem.

Food and water should probably have third priority. Here we immediately come up against the problem of how much. To provide sufficient food and water for the maximum time required to navigate to land imposes impracticable quantities in both lifeboat and the rubber boat. But what shall we adopt as the irreducible minimum? Where weight and space is at a premium, we must consider the time lapse between casualty and rescue. If we plot a curve of all survival cases with percent rescued as ordinate and days elapsed as abscissa, we would find a very rapid use in percentage of rescues in first 48 hours, a small rate of increase between 48 and 72 hours, and probably a very slow rise after 72 hours. It would, thus, seem that providing water and food for periods over 72 hours would increase chances of survival in only a small percentage of cases.

At last we come to navigational equipment and propulsion equipment. Some items in this class are directly related to other classes and should be given priority with these classes of equipment. For example, oars or other short range propulsion equipment are related to the problem of reducing exposure by maneuvering survival craft to remove survivors from the water. Other items such as drogues are related to keeping craft from being swamped. However, equipment for prime purpose of propelling craft over long distances and navigational equipment are believed to warrant low priority on the basis that in the over-all picture, they contribute less toward the average chance of survival than the types of equipment given higher priority. This low priority reflects simply that the situations where navigation over long distances to nearest land is warranted are becoming increasingly rare. Even in these rare cases, we must reckon with the low probability of a capable navigator and seaman being in the survival craft.

It may appear that this discussion

minimizes the importance of navigation and assumes that there will always be search facilities available. In the midst of so many navigators, it is not my intent to under-rate the importance of navigation in situations where it is desirable to get from here to yon quickly and accurately. The prime purpose of my remarks is to stimulate discussion as to the desirability of navigation as a principal course of action on the part of those assorted individuals who are unfortunate enough to occupy the position of a very small speck on a very large piece of water.

While search craft will not always be available and in some instances navigation may offer the only hope of safety, we must face the fact that without search, the probability of survival is drastically reduced. This discussion has been based on three aspects of raising the batting average of most survivors in a wet ocean. The question of when and how often navigation is the desirable course of action for survivors; the responsibility of the searching craft to make its presence known to survivors, and a priority of equipment for air and surface craft survivor kits. It has been attempted to show the Marconi and the Wright Brothers have given us tools that were not available to Captain Bligh and to reflect the effect of these implements on the classic situation of a man on a raft in 1950.

"THE ROLE OF THE MERCHANT VESSEL IN OCEAN RESCUE"

This paper presented at the U. S. Coast Guard Panel at the 25th Annual Convention of the Propeller Club of the United States and the American Merchant Marine Conference, Oct. 17, 18, 19, 1951.

BY CAPT. W. R. RICHARDS, USCG

S O S! We all hope that we shall never have to transmit that signal. But it is reassuring to reflect on the response that would result should we find it necessary. Thanks to modern communications, an S O S today quickly speeds assistance from many quarters and the records of heroism and devotion to the saving of life and property to be found in the history of ocean rescues are a tribute to our seafaring men.

Great progress has been made in marine safety in recent years. For example, it was less than 40 years ago that the *Titanic* disaster occurred. When the *Titanic* sailed on her maiden voyage in April 1912, she was the world's newest, largest, and most luxurious ship, and was considered virtually unsinkable. A few nights later an iceberg ripped open her bottom and she sank within 2 hours; 706 survivors were picked up from rafts and lifeboats by the S. S. *Carpathia* but 1,517 had already perished before she arrived. The S. S. *California* was less than 15 miles away at the time of the tragedy and probably could have saved everyone on the striken vessel had her master been aware of the situation. The distress flares were seen aboard the *California* but their significance was not appreciated and the single radio operator on the *California* went off watch just 15 minutes before the distress call was sent by the *Titanic*.

This disaster led to the first International Conference on Safety of Life at Sea, which was held in London in 1914. It provided that passenger ships should have minimum standards of sub-division, minimum boatage and other lifesaving appliances; required the use of radio; established the International Ice Patrol, and recommended the use of fixed routes on the North Atlantic run. Due to the First World War, the 1914 convention never came into force, but many of its provisions were written into our laws, and the International Ice Patrol was established under a separate agreement reached under the sponsorship of the Safety of Life at Sea Convention.

In 1929, after several years of extensive exploratory work, the second International Conference on Safety of Life at Sea was convened in London. The 1929 convention carried on the work begun in 1914, with especial emphasis on watertight integrity and radio. It was accepted by a total of 43 nations and has served its purpose well. It is of interest to note that the second conference was also influenced by a major marine disaster. About 6 months before the conference convened, the S. S. *Vestris* went down in a gale, a hundred miles or so off the coast of Virginia, with heavy loss of life. Once more a vessel within a short distance of the scene, in a position to have rescued all hands, was unaware of the situation as she was not equipped with radio.

With the passing of time and the continuing advances in various technical fields, the need for revision of certain of the provisions of the 1929 Convention became apparent and so the Third International Conference on the Safety of Life at Sea was convened in London in 1948. Among the noteworthy improvements achieved in this conference was the adoption of machinery for keeping the regulations up-to-date by amendments from time to time. Under this conception the 1948 regulations form the basic structure, to be amended or added to as developments may necessitate, and it will no longer be necessary to draft a whole new convention in order to incorporate desired improvements.

Certain sections of the current Safety of Life at Sea regulations will be referred to, later. I would like to point out at this time that the current convention now in effect is the Safety of Life at Sea Convention of 1929. The 1948 Convention will not be in effect until one year after the required number of signatory nations have deposited their ratifications. Therefore, the 1948 Convention requirements are not now in effect.

Other international agreements are pertinent to a discussion of ocean rescue. As was so evident in the *Titanic* and *Vestris* cases, communications are of vital importance. The Safety of Life at Sea regulations outline certain radio requirements for seagoing vessels but detailed communications regulations are to be found in the International Telecommunications Conventions. The radio regulations now in effect are those agreed upon at the Atlantic City Conference in 1947 except that certain provisions with respect to frequencies below 27.5 megacycles are not yet effective and the corresponding provisions of the 1938 Cairo Convention apply.

The International Civil Aviation Organization, or ICAO as it is generally called, is intimately concerned with ocean rescue and has done much to promote international standards in search and rescue. Commercial air travel over the oceans competes with surface shipping but in search and rescue there is a strong community of interest. After all, one steamship line competes with another but this is given no thought when lives are at stake.

The development of commercial aviation emphasized the need for more extensive search and rescue measures. When trouble develops in a plane, events occur rapidly. If assistance is to reach a plane down at sea it must come quickly or it will be too late. Add to this the large uncertainty as to position that may result in the case of a three-hundred-mile-an-hour aircraft and it is easy to see the magnitude of the problem.

The nerve center of the search and rescue organization that has evolved to meet these needs is the rescue coordination center. The coordination center gathers information over its extensive communications net, correlates and evaluates it, and initiates, coordinates, and terminates search and rescue operations.

The importance of coordination in search and rescue operations can hardly be exaggerated. No one organization has any monopoly on rescue operations. When lives are in peril, whoever is in a position to provide effective assistance the quickest must proceed. The coordination center must see that those in the best position to assist are fully informed of the situation and that those whose services will not be needed are so informed.

With this background in mind, let us proceed to a consideration of the role of the merchant vessel in search and rescue and discuss the responsibilities and some of the problems which face the master of the vessel.

Under the Safety of Life at Sea Regulations every passenger ship regardless of size and every cargo ship of 1,600 gross tons or over, engaged on international voyages, must be fitted with a radio-telegraph installation complying with the technical provisions of the regulations. (A passenger ship under these regulations is a ship which carries more than 12 passengers.) Cargo ships of 500 gross tons or more but under 1,600 gross tons are required to be fitted with a radio telephone installation unless they are fitted with the radio telegraph installation required on the larger ships.

Since all of these vessels are required to stand prescribed radio watches on the distress frequencies and since under normal conditions there are always numerous vessels coming and going on the travelled portions of the oceans, the value of the merchant vessel in search and rescue is readily apparent. In a great many cases a nearby merchant vessel will be the first to reach the scene of a distress and in many of them the merchant vessel will be the only assistance able to arrive in time to save life.

Chapter V of the Regulations annexed to the Safety of Life at Sea Convention provides, in part, as follows:

Regulation 10
Distress Messages—Procedure

(a) The master of a ship at sea, on receiving a signal from any source that a ship or aircraft or survival craft thereof is in distress, is bound to proceed with all speed to the assistance of the persons in distress informing them if possible that he is doing so. If he is unable or, in the special circumstances of the case, considers it unreasonable or unnecessary to proceed to their assistance, he must enter in the logbook the reason for failing to proceed to the assistance of the persons in distress.

(b) The master of a ship in distress, after consultation, so far as may be possible, with the masters of the ships which answer his call for assistance, has the right to requisition such one or more of those ships as he considers best able to render assistance, and it shall be the duty of the master or masters of the ship or ships requisitioned to comply with the requisition by continuing to proceed with all speed to the assistance of persons in distress.

(c) The master of a ship shall be released from the obligation imposed by paragraph (a) of this Regulation when he learns that one or more ships other than his own have been requisitioned and are complying with the requisition.

(d) The master of a ship shall be released from the obligation imposed by paragraph (a) of this Regulation, and, if his ship has been requisitioned, from the obligation imposed by paragraph (b) of this Regulation, if he is informed by the persons in distress or by the master of another ship which has reached such persons that assistance is no longer necessary.

(e) The provisions of this Regulation do not prejudice the International Convention for the unification of certain rules with regard to Assistance and Salvage at Sea, signed at Brussels on September 23, 1910, particularly the obligation to render assistance imposed by Article 11 of that Convention.

It will be noted that the foregoing imposes a direct obligation on the master of the merchant vessel and makes no specific mention of a rescue coordination center. What then is the relationship between the master of the merchant vessel and the rescue coordination center?

The answer to this question is inherent in the word "coordination." The coordination center assists by ensuring that insofar as possible all facilities, of whatever nature, that are in a position to render effective assistance are informed of the distress and that they are kept informed of developments as they occur. The coordination center helps the master of the merchant vessel discharge his responsibilities under Regulation 10; it does not relieve him of them.

The coordination center may also help the master of the assisting merchant vessel in a more direct manner. The center has under its operational control extensive facilities for searching, including long range search aircraft, and rescue facilities which, even though they may not be near enough to reach the scene of the distress as soon as an assisting merchant vessel, may subsequently relieve him and thus free him to continue on his voyage.

Chapter V, Regulation 15, of the Safety of Life at Sea Regulations reads as follows:

SEARCH AND RESCUE

(a) Each Contracting Government undertakes to ensure that any necessary arrangements are made for coast watching and for the rescue of persons in distress at sea round its coasts. These arrangements should include the establishment, operation, and maintenance of such maritime safety facilities as are deemed practicable and necessary having regard to the density of the seagoing traffic and the navigational dangers and should, so far as possible, afford adequate means of locating and rescuing such persons.

(b) Each Contracting Government undertakes to make available information concerning its existing rescue facilities and the plans for changes therein, if any.

The ICAO Search and Rescue Standards are explicit. They provide, in part, as follows:

3.1.1 Contracting States, separately or jointly, shall delineate the search and rescue areas for which they will be responsible and establish a rescue coordination centre in each.

* * * * *

3.2.1 Each rescue coordination center shall have means of immediate communication with:

(a) the associated air traffic service unit;

(b) the headquarters of rescue units in its area;

(c) rescue coordination centers in adjacent areas;

(d) appropriate direction finding and position fixing stations in its area;

(e) appropriate stations in its area guarding distress frequencies.

3.2.2 Each rescue coordination center shall have means of rapid and reliable communications with rescue craft and vehicles of rescue units when employed on search and rescue, and with alerting posts.

* * * * *

4.1.3 Each rescue coordination center shall have the latest information on the following aids to search and resuce in its area:

(a) rescue units and alerting posts;

(b) all other private and public resources including transport that are likely to be used for search and rescue;

(c) means of communication in the search and rescue area;

(d) the position, true track, speed and call sign of a many major ships as practicable within the search and rescue area which may provide assistance to aircraft in distress, either directly or by relaying instructions to other vessels. NOTE.—This information is best recorded on a large plotting board.

(e) emergency and survival equipment including number, color, and type of life rafts and pyrotechnics, details of emergency medical supplies, water supplies and the type and frequencies of the emergency portable radio equipment carried on board aircraft engaged in international air navigation over the area.

While the ICAO standards are primarily concerned with the safety of aircraft it should be noted that the search and rescue organization is not so limited. Obviously the organization required to meet the needs of aviation over the oceans is also ideally suited to the needs of surface vessels and the same organization serves both purposes.

In the United States, the Coast Guard has been assigned responsibility for the development, maintenance, and operation of search and rescue facilities to meet the requirements I have outlined.

The international radio regulations cover distress communications in detail and they, too, impose certain responsibilities on the merchant vessel. Pertinent sections of Article 37, which covers distress signals and traffic read, in part, as follows:

1. In the maritime mobile and aeronautical mobile services the procedure laid down in this article is obligatory.

2. No provision of these regulations shall prevent use by a mobile station in distress of any means at its disposal to attract attention, make known its position, and obtain help.

* * * * *

4. Ships:

(1) In case of distress the frequency to be used shall be the international distress frequency, that is, 500 kc/s * * *.

(2) In case of distress for radiotelephone stations working in the authorized bands between 1605 and 2850 kc/s, the frequency to be used is the distress frequency 2182 kc/s * * *.

(3) Ship stations which cannot transmit on the above distress frequencies shall use their normal calling frequency.

5. Aircraft:

Any aircraft in distress must transmit the distress call on the frequency on which the land or mobile stations capable of helping it, keep watch. * * *

* * * * *

13. The distress call has absolute priority over other transmissions. All stations which hear it must immediately cease any transmission capable of interfering with the distress traffic and must listen on the frequency used for the emission of the distress call.

* * * * *

18. A mobile station which learns that another mobile station is in distress may transmit the distress message in either of the following cases:

(a) the station in distress is not itself in a position to transmit it;

(b) the master or person responsible for the ship, aircraft, or other vehicle carrying the station which intervenes, believes that further help is necessary.

19. (1) Stations of the mobile service which receive a distress message from a mobile station which is, beyond any possible doubt, in their vicinity, must immediately acknowledge receipt * * *. If the distress call has not been preceded by the alarm signal, these stations may transmit this alarm signal with permission of the authority responsible for the station * * *, taking care not to interfere with the transmission of acknowledgment of receipt sent by other stations.

(2) Stations of the mobile service which receive a distress message from a mobile station which, beyond any possible doubt, is not in their vicinity, must allow a short interval of time before acknowledging receipt of the message, in order to permit stations nearer to the mobile station in distress to answer and acknowledge receipt without interference.

* * * * *

20. Distress traffic comprises all messages relative to the immediate assistance required by the mobile station in distress.

* * * * *

22. The control of distress traffic is the responsibility of the mobile station in distress or of the mobile station which * * * sent the distress call. These stations may, however, delegate the control of the distress traffic to another station.

23. (1) The station in distress may impose silence either on all stations of the mobile service in the area or on any station which interferes with the distress traffic. * * *

(2) If it believes it to be essential, any station of the mobile service near the ship, aircraft, or other vehicle in distress, may also impose silence. * * *

24. * * *

(2) Any station of the mobile service which has knowledge of distress traffic must follow such traffic, even if it does not take part in it.

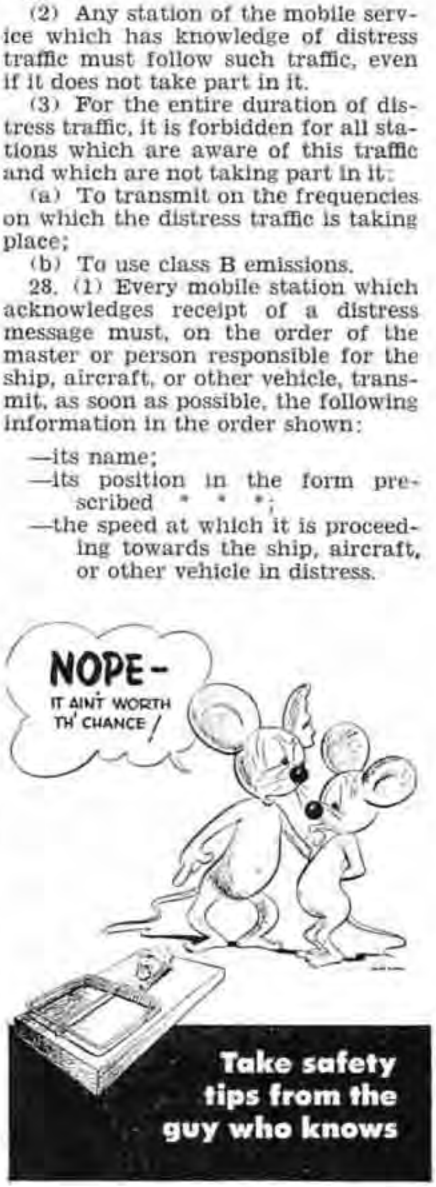
(3) For the entire duration of distress traffic, it is forbidden for all stations which are aware of this traffic and which are not taking part in it:

(a) To transmit on the frequencies on which the distress traffic is taking place;

(b) To use class B emissions.

28. (1) Every mobile station which acknowledges receipt of a distress message must, on the order of the master or person responsible for the ship, aircraft, or other vehicle, transmit, as soon as possible, the following information in the order shown:

—its name;
—its position in the form prescribed * * *;
—the speed at which it is proceeding towards the ship, aircraft, or other vehicle in distress.



(2) Before sending this message, the station must ensure that it will not interfere with the emissions of other stations better situated to render immediate assistance to the station in distress.

29. (1) Any station of the mobile service which is not in a position to render assistance and which has heard a distress message which has not been immediately acknowledged, must take all possible steps to attract the attention of stations of the mobile service which are in a position to render assistance.

(2) For this purpose, with the approval of the authority responsible for the station, the distress call or the distress message may be repeated. * * * At the same time all necessary steps are taken to notify the authorities who may be able to intervene usefully.

Should it appear to you that I have dwelt unnecessarily on communication details, I would like to emphasize that communications are vital to effective search and rescue operations. Few people not directly concerned have any conception of the large amount of traffic that flows into a rescue coordination center during a typical distress case. There is almost always information missing here and there that has to be filled in if the most effective action is to be taken.

A recent case is a good illustration of the valuable contribution of the merchant vessel in ocean rescue. At 1629 GMT, August 24, the Spanish S. S. *Castillo Guadalest* bound from Bilbao, Spain, for Boston, Mass., transmitted an S O S from a position approximately 600 miles east of Boston. Early messages from her indicated a dangerous leak in her hull and requested urgent assistance. Several merchant vessels acknowledged the S O S and reported that they were proceeding. At 2050 the *Castillo Guadalest* broadcast that she was prepared to abandon ship in her lifeboats. At 2350 word was received that the S. S. *Eurystheur* was at the scene picking up the men and at 0010 she advised that she had rescued all hands consisting of 40 crew members and 1 stowaway. Two Coast Guard cutters proceeded in this case but neither could have arrived at the scene until the following morning.

In the majority of present-day distress cases all hands are rescued but there is no room for complacency. The sea is a hard taskmaster and still claims many lives.

In 1948, the British S. S. *Samkey*, a 7,000-ton ship, and the British S. S. *Hope Star*, a 5,000-ton ship, both disappeared at sea, without a trace. The *Samkey* was on a voyage from the United Kingdom to Havana, Cuba, and failed to arrive. A routine radio position report was received from her in the vicinity of the Azores and after that she was never heard from again. The British investigating board found that a shifting cargo was the probable cause of her loss. The *Hope Star* disappeared on a voyage from the United Kingdom to Philadelphia. No distress call was received from her either but from a study of the ocean weather charts in the New York Rescue Coordination Center, coupled with the knowledge that she had transmitted an arrival report requesting that the Philadelphia agent arrange for voyage repairs to take care of weather damage sustained en route, the conclusion was reached that she foundered 400 miles south of Newfoundland about 2 hours after she transmitted the arrival report. An extensive air and surface search was carried out, with the U. S. Air Force, Royal Canadian Air Force, U. S. Coast Guard, and merchant vessels passing through the area participating but no trace of her was ever found.

That same year, the tail end of a September hurricane resulted in two major distress cases. The Portuguese 3-masted auxiliary schooner *Gaspar*, with 40 men aboard, battered by the hurricane about 250 miles off Newfoundland was sinking when she sent out an S O S on the morning of September 15, 1948. The Coast Guard Cutter *Bibb* made a 200-mile run through heavy seas in 10 hours to reach the *Gaspar* and rescue all hands. During these same hours, the S. S. *Leicester*, with 42 persons on board and battered by the same hurricane, transmitted an S O S and then her crew abandoned ship. The S. S. *Cecil W. Bean* rescued 20 survivors and the S. S. *Tropero* rescued 18; 4 were lost. Considerable confusion in communications occurred as a result of these two separate S O S calls at about the same time and in positions close together and it was several hours before the situation was clarified.

At 1400 GMT October 22, 1950, Cape Race Radio (VCE) copied the following message on the newly designated 2182 kcs. radio telephone frequency: "S O S NORTH VOYAGEUR LATITUDE 46.10 NORTH LONGITUDE 52.25 WEST APPROXIMATE." As far as is known, Cape Race was the only station to receive the original transmission and no further transmissions were ever made by the *North Voyageur*. Cape Race immediately rebroadcast the distress message on 500 kcs. and continued to rebroadcast the message and other details as they became available every few minutes on 500 and 435 kcs. by radio telephone. The rebroadcasts by Cape Race were widely copied by Coast Guard and merchant vessels and within a few minutes a number of vessels near the scene were cognizant of the distress and proceeding.

The *Selma Thorden* arrived at the scene of the reported distress at 1705 and a Coast Guard search plane, the merchant vessels *Prins Alexander* and *Island Connector* and the trawlers *Fearless* and *Blue Foam* arrived a short time later. The search was negative. The *Prins Alexander*, *Island Connector*, and *Selma Thorden* concluded searching at 1922, 1928, and 2001, respectively, and at 2130 the search plane departed for his base.

Before daylight the next morning the Coast Guard cutter *Sorrel* arrived at the scene of the reported distress and at daybreak a Coast Guard and two United States Navy search planes commenced searching. At 1447 the Coast Guard PBY spotted an overturned brown lifeboat and debris in position 45.17 N., 51.39 W., about 60 miles south southeast of the reported position of the distress and about 125 miles southeast of Cape Race, Newfoundland. A short time later she located a second lifeboat and the cabin of the missing vessel. No survivors were in sight.

The two Navy planes and the cutter *Sorrel* homed on the PBY and at 1800 one of the planes sighted a third lifeboat with eight survivors in it. A short time later the *Sorrel* picked them up. The survivors were of the opinion that the remaining 12 members of the crew of the *North Voyageur* had not gotten away from the vessel, but as one lifeboat was still unaccounted for an intensive search was carried on the following day using four Coast Guard planes, two Navy planes and the Coast Guard cutters *Duane* and *Humboldt*. Additional wreckage was sighted but there were no signs of survivors. The search was abandoned on the evening of the 24th.

The foregoing are just a few typical cases. I hope they will help you to visualize some of the elements of ocean rescue work and emphasize the importance of the nearby merchant vessel in such situations and his relationship to other assisting agencies.

"SAFETY BEGINS BETWEEN THE EARS"

LOSS OF LIFE: ONE FAMILY

How can this tragedy be approached in such a manner as to leave with each reader a realization of the awful consequences that can result from overloading a boat? So many words have been written on the subject, and yet so many similar casualties have occurred, that the use of mere words seems futile.

Every member of the small-boating public needs a scare: A nightmare in which he sees his small son floating face downward in a tangle of weeds, his wife screaming desperately for help which is nonexistent, or her husband silently slipping below the surface after losing his hold on an overturned boat. Think about this for a minute, then read what happened to this family, which set out early in the evening for a few hours of boating and fishing in a homemade square ended boat 11½ feet long, 9 inches deep.

No father held the limp, lifeless body of his son; no child stood wide-eyed, unable to understand why he would never again hear the voices of his mother, father, sisters and brothers, because the petty problems of the entire family of seven were solved when the overloaded boat deposited it, in a tangle of threshing arms and legs, with a mass gasping for air, into the waters of the Calfkiller River in central Tennessee. Add to this total the body of the generous fisherman who provided the outboard motor and obtained the use of the two-person boat.

The last of the eight bodies to be recovered was that of the 9-month old infant, brought unceremoniously to the surface on the end of a dragline. Picture yourself being reunited with your son in this manner.

These are the pertinent facts: The boat was grossly overloaded. The capacity of a boat in cubic feet divided by eight (for rivers) is a rough estimate of the number of persons the boat can safely accommodate; in this case, our figure is two. One requires but very little judgment and no mathematical ability to understand that a boat built for two cannot possibly seat eight persons with safety. Attach a powerful outboard motor to the stern, which, as far as weight is concerned, is about the same as adding another person, and if you can swim, you'll be swimming.

Life preservers are designed to perform a distinct and useful function. Unlike a mechanical refrigerator, you must have it with you to do you any good. The boathouse is no place for a lifesaving device when you are scalp-deep in water. Common sense dictates that lifesaving devices, enough for each person carried, shall be on board. The Federal Regulations say the same thing, for the benefit of patrons of those boat-owners lacking common sense, and they apply also to boats equipped with outboard motors. There were no lifesaving devices on this boat.

The problem of enforcing the law in this respect is not an easy one; the most satisfactory solution being the education of the public. The law is merely an expedient toward saving the lives of you and your family. The boating public should appreciate, through this flagrant example, the tragic possibilities of overloading a small boat. The dead: William Harris, age 29, Mrs. Nancy Harris, age 29, their children: Joan, age 9, Charles, age 8, Carolyn, age 5, Brenda, age 3, and David, age 9 months; and James Thomas Rogers, age 67.

TOPIC: DANGEROUS CARGO

A child, to be made properly aware of the dangers of crossing a street without looking both ways, must be presented with the reason—the answer to the everlasting "WHY." The same holds, generally, for grown-ups who are confronted with restricting regulations with every move they make. To complete this analogy, those in the various branches of the maritime industry who handle dangerous cargoes must be cautioned to look both ways—all ways—in avoiding danger, however remote.

What better examples than the Texas City and South Amboy disasters can be presented? Newspaper and radio coverage was international; photographs viewed by all told the grim tale without words; and the death toll staggered the nation. It may be said that this business is literally "loaded with dynamite."

We are questionably fortunate this year, by being provided with another example of a casualty involving dangerous cargoes. This case resulted in no injuries or loss of life, nor was the vessel seriously damaged, but the possibilities which failed to materialize could have changed the designation from "casualty" to "disaster."

Briefly, the Dangerous Cargo Act vests in the Coast Guard the responsibility for the safe carriage by water of explosives and other dangerous cargoes. The regulations prescribed by the Commandant of the Coast Guard in compliance with the provisions of the law, clarify the conditions under which dangerous articles may be transported by water and include the details of packaging, labelling, handling, and the information required on bills of lading and manifests. In the development of investigations of casualties involving dangerous cargoes, it is usually ascertained that one or more of these regulations have been violated, causing or contributing to the casualty.

It was an unlucky day for the master of the liberty ship *S. S.* ———. For 20 hours his ship had been rolling and pitching among high seas, buffeted by hurricane winds, making no headway in zero visibility. He must have experienced a feeling of utter hopelessness when he saw flames burst through the No. 2 hatch. The fire had had a good start since the high winds immediately dissipated any trace of smoke until the actual break-through, and the intense heat generated in No. 2 hold caused a fire to start in No. 1. It was made a matter of record that the action of the master, officers, and crew in bringing the fire under control under such adverse conditions was in keeping with the highest traditions of the sea.

The cause of the fire was later determined by a Marine Board of Investigation. Loaded aboard the vessel at an East Coast port, were products bearing the Trade-Mark "HTH" and "HTH-15", known otherwise as calcium hypochlorite compounds which may be decomposed by moisture or may decompose spontaneously. For these reasons they have received a classification in the Dangerous Cargo regulations. That part of the consignment contained in steel drums conformed, as far as can be determined, to I. C. C. and Coast Guard standards, but that part contained in fiber boxes failed in several respects to comply: The inside containers exceeded the maximum weight allowed (5 pounds instead of 1 pound); the outside containers exceeded the allowed weight; and the bills of lading and consequently the manifest, did not correctly describe the substance in accordance with the true name as shown in the commodity list.

In this case, a cargo of steel beams shifted during the heavy rolling of the ship in a hurricane and damaged containers of the HTH. Through the action of moisture on the chemical, or spontaneously, enough heat was generated to start a fire. It would be pure conjecture to state, "Had the applicable regulations been complied with this casualty could not have occurred," but these regulations are designed to protect those who handle and transport dangerous articles, and their application *may* have prevented the casualty. Lacking the proper name as it appears in the commodity list, who can determine from the outside of a box what is dangerous and what is not? Calcium hypochlorite would bear investigation by the master; bleach or deodorant or sanitizing agent would appear harmless. Writing of the regulations is not arbitrary but is based on known facts, research, and in many cases on sad but otherwise valuable experience. All prudence and caution must start with the manufacturers or shippers of dangerous articles; must continue with the shipowners or operators, stevedores, vessels' operating forces, and all other persons concerned, so that the highest degree of efficiency consistent with utmost safety may be attained.

TOPIC: PUMPROOM EXPLOSIONS

Two major casualties on board tank vessels during the last fiscal year are worthy of mention. Explosions and fire on both vessels occurred while work was being done on machinery in the pumprooms. In both cases the vessels were loaded: one underway and the other discharging cargo. On December 28, 1950, a tank vessel of over 7,000 gross tons, was en route from Houston, Tex., to Wilmington, N. C. After supper the two pumpmen requested and received permission from the chief engineer to complete repair of the high pressure valve-chest liner and valve in the after pumproom. While effecting this repair a violent explosion occurred. The vessel was then about 12½ miles off Tennessee Reef Light, Florida keys. A second explosion followed. The fire, confined to the after pumproom, was brought under control about 45 minutes after the first explosion. Both pumpmen lost their lives as a result of this casualty.

There are two main points to be determined: the source of the inflammable vapors and the source of ignition. The first question is, in many cases, easily answered; on this vessel there was a history of cargo leakage around the stems of the cargo valves due to improper setting up of the gland or improper packing of the valve. The source of ignition, due to lack of witnesses, must be based on conjecture and supposition. A cigarette lighter was found in the bilges of the after pumproom, therefore it can be assumed that one of the men was smoking, or the lighter had dropped from a pocket and landed on the thumb-press.

A liberty type tank vessel on July 9, 1950, was discharging a cargo of gasoline in California. The centrifugal pump in the forward pumproom used in the discharge operations broke down and was secured for purpose of repair. While the pump was in the process of repair, with raw gasoline in the bilges, an explosion occurred in the forward pumproom, causing the death of the chief engineer, first assistant, and the pumpman. A direct result of this casualty was the death of the master who died of heart failure. The source of inflammable vapor is immediately evident: the engineers were below in the pumproom repacking the gland on the centrifugal cargo pump which was leaking gasoline into the bilges. But again the source of ignition is evasive. It is fairly well established that carelessness of personnel plays a major part in casualties of this nature. Although it is unlikely that any of the engineers were smoking on the job since gasoline vapors were readily discernible, it is quite possible that a spark was struck by a wrench or knife.

Sometimes it becomes necessary to take chances—to deviate from the established rules of safety—and accidents will happen to the most careful. But to protect personnel from the hazards involved in tanker operations all steps toward complete safety must be considered. Repair of pumproom machinery while the vessel is handling cargo introduces additional operating hazards which must be weighed against the necessity of such procedure. Due to the present policy of rapid "turn-around", there is little opportunity to insure a gas-free atmosphere in which to make necessary periodic overhauls of cargo machinery and lines. A simple repair such as repacking a valve becomes a delicate, hazardous operation when this valve is controlling the flow of gasoline.

To go back to our two examples, if the men were not in the pumproom, they certainly would not have been killed. The root of the whole discussion is, however, that had a proper evaluation of the hazard involved in the pumproom repairs, the accidents might not have happened.

RÉSUMÉ OF PERSONNEL INJURIES

The rules and regulations established by the Commandant of the Coast Guard in carrying out the intent of R. S. 4550, as amended (46 U. S. C. 239), are contained in Title 46, Code of Federal Regulations, parts 136 and 137. These two parts are presented together in the Coast Guard publication, CG–200, entitled, "Marine Investigation Regulations and Suspension and Revocation Proceedings." Sub-part 136.05 states in part that the owner, agent, master, or person in charge of a vessel involved in a marine casualty shall give notice as soon as possible to the nearest marine inspection office of the Coast Guard whenever the casualty results in any of the following:

Table 1.—REPORTS OF SERIOUS PERSONNEL INJURY

(Incapacitation for more than 72 hours)

Fiscal years 1950–51

Nature of injury	1950	1951
Falls:		
From ladders	34	35
From gangways	15	5
Into holds	9	10
On deck	42	55
Between vessel and dock	5	8
Total	105	113
Handling hatch covers	7	11
Galley accidents	8	16
Cargo handling	6	9
Rolling vessel	10	9
Caught in winch	13	9
Caught by lines	14	6
Lifeboat handling	8	5
Steam burns	10	13
Heavy weather	5	5
Caught in closing doors	7	8
Miscellaneous	127	140
Total	320	344

(a) Actual physical damage to property in excess of $1,500.

(b) Material damage affecting the seaworthiness or efficiency of a vessel.

(c) Stranding or grounding.

(d) Loss of life; or

(e) Injury causing any person to remain incapacitated for a period in excess of 72 hours. It further specifies that the written report required for personal injury accidents, shall be made on Form CG-924-E, Report of Personal Accident Not Involving Death.

Upon receipt of Form CG-924-E at the marine inspection office, outlining the nature and extent of injury, an investigation may be indicated. During the last fiscal year, out of a total of 344 serious personnel injuries reported, 102 were investigated by the various marine inspection offices; these, together with the remaining 242 reports which were not investigated, were assembled at Coast Guard Headquarters for statistical analysis. Ordinarily, the frequency with which a certain type of accident occurs, together with the attendant circumstances, determine the urgency, and perhaps the corrective measures, that may be taken to eliminate or reduce the number of similar casualties. Studies of the statistics have, in the past, resulted in changes or recommendations which have materially cut down the number of serious personnel accidents or deaths, such as guards at dangerous places, specifications for rails on deck, adequate lighting of gangways, etc. As a result, there has been a decline in this type of casualty since the war, although the low point seems to have been reached.

In table 1 it will be observed that the relative number of classified injuries follow very closely between the 2 years compared. Under "Miscellaneous" are included injuries that do not repeat themselves more often than five times and unusual accidents such as the woman passenger who was lacerated by a fishhook cast by a lad on a passing boat, or the seaman who fractured his elbow, after water, which came through his porthole, awakened him, caused him to jump up suddenly, or the deckhand who was burned when the mast of his vessel struck a high-voltage power line.

Falls consistently account for about a third of the total number of casualties and falls on deck and falls from ladders constitute the bulk of the total falls. From the nature of these falls, there does not appear to be reason nor necessity for further changes or recommendations since most of them are the result of sheer carelessness; Stepping backwards, walking on loose articles on deck, walking with arms full, skipping steps on ladders or failure to use steps at all in jumping from one point to a lower one, neglect in watching where one is going; bumping, tripping, stumbling, slipping, turning the ankle. The man-hours of incapacitation and needless suffering are terrific. "Watch Your Step."

CASUALTIES TO VESSELS—FISCAL YEAR 1951

[July 1, 1950—June 30, 1951]

	Groundings and founderings	Collisions with other vessels	Collisions with miscellaneous objects	Fires and explosions	Damage to lifesaving equipment	Heavy weather and matériel damage	Totals
Number of casualties	588	331	257	178	19	199	1,572
Number of vessels involved	588	676	257	178	19	199	1,917
Gross tonnage of U. S. merchant vessels involved	2,062,801	1,413,178	1,164,892	249,930	134,852	1,412,417	6,458,070
Number of inspected vessels involved	342	287	209	43	19	187	1,087
Number of uninspected vessels involved	246	389	48	135	0	12	830
Type of vessels involved:							
Passenger	20	23	8	7	1	8	67
Freight	206	185	128	23	16	110	668
Tank vessels	125	107	62	17	2	62	375
Public vessels		36				1	37
Ferry	12	13	13	4	0		42
Towing	37	115	23	9	0	9	193
Fishing	105	51	12	52	0	7	227
Foreign flag		59					59
Miscellaneous	83	87	11	66	0	2	249
Persons on board:							
Passengers	2,570	1,646	1,955	487	25	999	7,682
Crew	12,443	8,608	6,765	1,346	757	7,934	37,853
Shore workers	0	9		3		15	27
Value of property lost or damaged:							
Vessels	$10,086,260	$9,488,688	$2,324,981	$2,653,162	$47,842	$2,131,239	$26,732,172
Cargoes	$3,031,203	$485,865	$92,705	$580,577	$0	$435,592	$4,625,942
Vessels with damage unreported	44	101	6	8	2	8	169
Cargoes with damage unreported	15	79	3	9	0	4	110
Vessels totally lost:							
Inspected	9	2	1	3	0	0	15
Gross tonnage	17,066	2,054	1,332	1,909			22,361
Uninspected	112	10	8	92	0	0	222
Gross tonnage	5,411	440	26	1,476			7,353
Number of casualties due to personnel fault:							
Employed under license or certificate	48	53	18	0	0	14	133
Others	42	82	23	4	0	5	156
Lives lost in casualties:							
Passengers:							
Off inspected vessels	0	0	0	0	0	0	0
Off uninspected vessels	90	5	2	3	0	0	100
Crew:							
Off inspected vessels	1	39	0	12	1	2	55
Off uninspected vessels	129	29	3	14	0	3	178
Shore workers:							
Off inspected vessels	0	0	0	2	0	3	5
Off uninspected vessels	0	0	0	1	0	0	1
Assistance rendered by U. S. Coast Guard	71	8	7	33	0	8	128
Deaths not involving casualty to vessel:							
Passengers							40
Crew							244
Shore workers							6

NOTE.—Injuries to personnel not involving casualty to vessel: Number of personnel incapacitated for more than 72 hours: 344.

DARKNESS AND DISASTER

There are a great many shipboard operations that cannot or should not be attempted under poor lighting conditions. Improperly lighted gangways have been the cause of many falls between the ship and dock; many of the falls on deck, accounting for over half the falls from all sources, are due to poorly lighted working and walking areas, which fail to disclose such obstacles to "pedal" navigation as padeyes, coamings, articles adrift, etc.

It was because of insufficient light that a deckhand on a New York harbor tug lost his life. The night was very dark, with intermittent rain squalls. The deckhand had stepped from the tug to a barge to handle lines. It was the intention of the master of the tug to shape up his tow of two barges on the face of the pier but the current set one barge into the slip. The deckhand, working in the light of a spotlight from the tug passed a line from the barge around the pilings at the end of the pier, made a "figure eight" over the cleat on the bow of the barge, called "line out" to indicate that his evolution had been completed. The spotlight was then shifted to another activity, leaving the deckhand in darkness.

Very shortly thereafter, a scream from the bow of the barge brought the spotlight back to find the deckhand missing and the line he had been handling paying out. In the sudden darkness the deckhand had inadvertently stepped into a bight of the line; the line became taut from the forward movement of the barge, lifted him off his feet and deposited him, still hanging, between the dock and the barge. The line, acting as a spring, brought the barge into the dock crushing the deckhand against a stringpiece.

Quick action by fellow workers, emergency first-aid treatment on the scene, and rapid removal to a hospital failed to save the life of the seaman who succumbed to injuries received in this accident several days later.

Although a number of adverse conditions were encountered prior to the casualty—a sudden downpour, consequently a slippery deck, the set of the current acting unfavorably from the tug-master's viewpoint, the dark night—it must be conceded that had the deckhand been able to see the bight in his line it is unlikely he would have stepped into it.

Chalk up another death to "improper lighting."

MOPE and DOPE

"Now it's your turn to hold still while I take a step."

Amendments to Regulations

CG-239

Chapter I—Coast Guard, Department of the Treasury

[CGFR 51-52]

Subchapter L—Security of Waterfront Facilities

PART 126—HANDLING OF EXPLOSIVES OR OTHER DANGEROUS CARGOES WITHIN OR CONTIGUOUS TO WATERFRONT FACILITIES

ADEQUACY OF GUARDING, FIRE EXTINGUISHING EQUIPMENT, AND LIGHTING

The purpose for the new regulation designated as 33 CFR 126.15 (n) is to define the word "adequate" as used in 33 CFR 126.15 (a), (j), and (l) with respect to guarding, fire extinguishing equipment and lighting, respectively, on a designated waterfront facility. It is hereby found that compliance with the notice of proposed rule making, public rule making procedure thereon, and effective date requirements of the Administrative Proceduce Act is not required because this regulation is an interpretation of existing regulations.

By virtue of the authority vested in me as Commandant, United States Coast Guard, by Executive Order 10173 (15 F. R. 7005), as amended by Executive Order 10277 (16 F. R. 7537), the following regulation is prescribed which shall become effective on and after date of publication of this document in the Federal Register:

Section 126.15 is amended by adding a new paragraph (n), reading as follows:

§ 126.15 *Conditions for designation as designated waterfront facility* * * *

(n) *Adequacy of guarding, fire extinguishing equipment, and lighting.* That the word "adequate", as used in paragraphs (a), (j), and (l) of this section with respect to guarding, fire extinguishing equipment, and lighting, respectively, means that determination which a reasonable person would make under the circumstances of the particular case. Unless there is gross noncompliance, the judgment and determination of the operator of the facility will be acceptable as fulfilling the requirements unless and until the Captain of the Port inspects the facility and notifies the operator thereof in writing in what respect the guarding, fire extinguishing equipment, or lighting, is deemed inadequate and affords such operator an opportunity to correct the deficiency.

(E. O. 10173, Oct. 18, 1950, 15 F. R. 7005; 3 CFR, 1950 Supp., E. O. 10277, Aug. 1, 1951, 16 F. R. 7537. Interprets or applies R. S. 4417a, as amended, 4472, as amended, sec. 1, 40 Stat. 220, as amended; 46 U. S. C. 391a, 170, 50 U. S. C. 191)

Dated: November 1, 1951.

[SEAL] MERLIN O'NEILL,
Vice Admiral, U. S. Coast Guard, Commandant.

[F. R. Doc. 51-13419; Filed, Nov. 6, 1951; 8:52 a. m., 16 F. R. 11311—Nov. 17, 1951.]

CG-115

Chapter I—Coast Guard, Department of the Treasury

[CGFR 51-55]

Subchapter F—Marine Engineering

PART 57—INSTALLATIONS, TESTS, INSPECTIONS, REPAIRS, AND MISCELLANEOUS REQUIREMENTS

Subchapter Q—Specifications

PART 162—ENGINEERING EQUIPMENT

FUSIBLE PLUGS FOR MERCHANT VESSELS

A notice regarding proposed changes in the regulations for fusible plugs was published in the Federal Register dated August 16, 1951, 16 F. R. 8136-8139, as Item VIII on the agenda to be considered by the Merchant Marine Council, and a public hearing was held by the Merchant Marine Council on September 18, 1951, in Washington, D. C. There were no comments submitted for consideration by the Merchant Marine Council on this item.

The purpose for revising requirements for fusible plugs for merchant vessels is to (a) revise and bring up to date the specification requirements for fusible plugs, (b) add new requirements for fusible plugs in small fire tube boilers, and (c) transfer specification requirements primarily applicable to manufacturers only from Subchapter F—Marine Engineering to Subchapter Q—Specifications in 46 CFR. Since the requirements for fusible plugs apply primarily to the manufacturing of this item, it will not be published in the "Marine Engineering Regulations and Material Specifications."

By virtue of the authority vested in me as Commandant, United States Coast Guard, by Treasury Department Order No. 120, dated July 31, 1950 (15 F. R. 6521), to promulgate regulations in accordance with the statutes cited with the regulations below, the following amendments to the regulatons are prescribed which shall become effective 90 days after date of publication of this document in the Federal Register:

1. Section 57.25-1 *Definitions* is canceled.
2. Section 57.25-5 *Detail requirements* is canceled.
3. Section 57.25-10 *Tests* is canceled.
4. Section 57.25-15 *Rejections* is canceled.
5. Section 57.25-20 *Marking of fusible plugs* is canceled.
6. Section 57.25-25 *Forwarding of samples* is canceled.
7. Part 162 is amended by adding a new Subpart 162.014, containing §§ 162.014-1 to 162.014-8, inclusive, reading as follows:

SUBPART 162.014—FUSIBLE PLUGS FOR MERCHANT VESSELS

Sec.
162.014-1 Applicable specifications and plans.
162.014-2 General requirements.
162.014-3 Types.
162.014-4 Materials.
162.014-5 Construction and workmanship.
162.014-6 Inspections and tests.
162.014-7 Marking.
162.014-8 Procedure of acceptance of fusible plugs.

AUTHORITY: §§ 162.014-1 to 162.014-8 issued under R. S. 4405, 4417a, as amended, secs. 1, 2, 49 Stat. 1544, sec. 3, 54 Stat. 347, sec. 5, 55 Stat. 244, as amended; 46 U. S. C. 375, 391a, 367, 1333, 50 U. S. C. 1275. Interpret or apply R. S. 4418, 4426, 4427, 4429, 4430, 4432, 4433, and 4434, as amended; 46 U. S. C. 392, 404, 405, 407, 408, 410, 411, 412.

§ 162.014-1 *Applicable specifications and plans*—(a) *Specifications.* The following specifications, of the issue in effect on the date fusible plugs are manufactured, form a part of this subpart.

(1) A.S.T.M. standard specifications:

B 61, Specification for steam or valve bronze casings.
B 143, Specification for tin-bronze and leaded tin-bronze sand castings.

(b) *Plan.* The following plan, of the issue in effect on the date fusible plugs are manufactured, forms a part of this subpart:

Drawing No. 162.014-1 (b), Acceptable fusible plugs.

(c) *Copies on file.* Copies of the above specifications and reference plan shall be kept on file by the manufacturer, together with letters of acceptance issued by the Coast Guard for heats of fusible plugs meeting Coast Guard requirements. The Coast Guard specification and reference plan may be obtained upon request from the Commandant, United States Coast Guard Headquarters, Washington 25, D. C. The A. S. T. M. specifications may be purchased from the American Society for Testing Materials, 1916, Race St., Philadelphia 3, Pennsylvania.

§ 162.014-2 *General requirements.* (a) The manufacture and testing of water-side and fire-side fusible plugs intended for use in boilers installed on merchant vessels subject to inspection by the Coast Guard shall be in accordance with the requirements in this subpart.

§ 162.014-3 *Types.* (a) Water-side plugs are fusible plugs which are inserted from the water-side of the boiler plate, flue or tube to which they are attached.

(b) Fire-side plugs are fusible plugs which are inserted from the fire-side of the boiler plate, flue or tube to which they are attached.

§ 162.014-4 *Materials*—(a) *Casings.* The casings of fusible plugs shall be made of bronze meeting the minimum requirements of A. S. T. M. specification B 61, or B 143, grade 1A or 1B.

(b) *Fillings.* Fusible plugs shall be filled with material of the following composition:

	Percent
Pure tin, minimum	99.3
Copper, maximum	.5
Lead, maximum	.1
Total impurities, maximum	.7

§ 162.014-5 *Construction and workmanship.* (a) The casings of fusible plugs shall be machined to the dimensions not less than those shown in Dwg. No. 162.014-1 (b), Sketch A for 3/8'' (i. p. s.) water-side plugs, Sketch B for 1/2'' (i. p. s.) and larger water-side plugs, Sketch C for 1/2'' (i. p. s.) and larger fire-side plugs, and Sketch D for 3/8'' (i. p. s.) fire-side plugs.

(b) The bore of the casing shall be filled with fusible metal from the water end to the point of least diameter of the bore. The tin filling shall be carefully alloyed to the casing.

§ 162.014-6 *Inspections and tests*—(a) *Inspections.* Fusible plugs specified by this subpart are not subject to inspection at the place of manufacture.

(b) *Tests.* Fusible plugs specified by this subpart shall be subject to the tests prescribed in this subpart. The manufacturer shall bear the cost of such tests.

(1) *Number of test samples.* Two sample plugs shall be selected at random from each heat or lot of 500 plugs or fraction thereof, for physical test and chemical analysis. (See § 162.014-8.)

(2) *Impact test.* The filling of one sample plug shall be tested for tightness by striking the small end of the plug three blows equivalent to 5 foot-pounds of energy per blow. If these tests reveal a loose filling the entire lot or heat shall be rejected.

(3) *Chemical analysis.* The casing of one sample plug shall be tested for chemical analysis by drilling or cutting the sample casing in such a manner as to be represenative of the entire cross-section. The filling of one sample test plug shall be melted out of the casing by a ring burner and caught in a clean graphite crucible to be used as a sample for check analysis. The chemical compositions thus determined shall conform to the requirements specified in § 162.014-4. Failure to comply with these requirements shall be cause for rejection of the entire lot or heat.

(4) *Alloying test.* The inside of the casing used for chemical analysis shall show that the tin filling was properly alloyed to the casing. Evidence of improper or incomplete alloying shall be cause for rejection of the entire lot or heat.

§ 162.014-7 *Marking.* (a) The name or trade-mark of the manufacturer shall be stamped on the face of the casing for identification.

(b) All fusible plugs shall be numbered in accordance with the number of the heat from which the plugs were filled. For example, the first pouring shall be number 1, and all plugs filled from this heat shall be numbered 1; the next pouring shall be number 2, and all plugs filled from this heat shall be numbered 2, etc. The heat number shall be plainly stamped on the large end of the filling. When more than 500 plugs are poured from one heat, the plugs shall be subdivided into lots of not more than 500. When the heat is subdivided, the number of the lot shall also be plainly stamped on the large end of the filling. The first lot of the heat shall be numbered 1, the next lot 2, etc.

(c) The heat and lot numbers shall be not less than 1/32 inch in height.

§ 162.014-8 *Procedure of acceptance of fusible plugs*—(a) *General.* A fusible plug manufacturer who desires to have his product accepted for marine use shall submit a request to the Commandant, United States Coast Guard Headquarters, Washington, D. C. The manufacturer will then be notified to send the required test samples (see § 162.014-6 (b)) to an acceptable test laboratory for physical and chemical tests required by § 162.014-6. The test samples furnished shall bear the same number as the heat or lot it was selected from and shall be representative of the fusible plugs of such heat or lot.

(b) *Forwarding of letter of transmittal.* At the time the samples are sent to the test laboratory the manufacturer shall forward direct to the Commandant (MMT), United States Coast Guard Headquarters, Washington 25, D. C., a letter containing the following information and a copy of this letter shall also be forwarded to the test laboratory:

(1) Number of heat and lot.

(2) Size and type of fusible plugs manufactured from each heat.

(3) Number of fusible plugs manufactured from each heat.

(4) Number of samples of fusible plugs forwarded to test laboratory from each heat.

(5) Name of manufacturer or trademark stamped on casing of fusible plug.

(c) *Forwarding of test laboratory's report.* The original test laboratory's report of the physical test and chemical analysis of sample fusible plugs for each heat or lot shall be forwarded to the Commandant (MMT), United States Coast Guard Headquarters, Washington 25, D. C.

(d) *Acceptance or rejection.* Upon receipt of the test laboratory's report of the tests required by § 162.014-6 on the sample fusible plugs submitted, the Coast Guard will issue to the manufacturer a letter of acceptance or rejection of the heat or lot number represented by the sample plugs. The Coast Guard reserves the right to reject any heat or lot of fusible plugs for failure to conform to any of the requirements in this subpart, or for any other defect which might render them unsafe or inoperative.

Dated: November 20, 1951.

[SEAL] MERLIN O'NEILL,
Vice Admiral, U. S. Coast Guard,
Commandant.

[F. R. Doc. 51-14156; Filed, Nov. 27, 1951; 8:51 a. m., 16 F. R. 11965—11/28/51.]

Equipment Approved by the Commandant

(CGFR 51-44)

By virtue of the authority vested in me as Commandant, United States Coast Guard, by Treasury Department Order No. 120, dated July 31, 1950 (15 F. R. 6521), and in compliance with the authorities cited below, the following approvals of equipment are prescribed and shall be effective for a period of 5 years from date of publication in the Federal Register unless sooner canceled or suspended by proper authority, and the following change in name of a manufacturer of approved equipment shall be made:

WINCHES, LIFEBOAT

Approval No. 160.015/50/0, Type HM lifeboat winch for use with mechanical davits, fitted with wire rope not more than ½-inch in diameter and with not more than 7 wraps of the falls on the drums. Approval is limited to mechanical components and for a maximum working load of 6,600 pounds pull at the drums (3,300 pounds per fall); identified by left hand assembly dwg. No. L-22000-E3 dated April 8, 1949, and revised June 19, 1951, manufactured by the Marine Safety Equipment Corp., Point Pleasant, N. J.

(R. S. 4405, 4417a, 4426, 4488, 4491, 49 Stat. 1544, 54 Stat. 346, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 367, 375, 391a, 404, 481, 489, 1333, 50 U. S. C. 1275; 46 CFR 33.10-5, 59.3a, 60.21, 76.15a, 94.14a, 160.015)

LIFE RAFTS

Approval No. 160.018/13/0, Type B life raft, for other than ocean and coastwise service, 9.67' x 7.75' x 2.67', 18-person capacity, identified by general arrangement dwg. No. M-99-10, dated April 4, 1951, and revised August 22, 1951, manufactured by Marine Safety Equipment Corp., Point Pleasant, N. J.

(R. S. 4405, 4417a, 4426, 4481, 4488, 4491, sec. 11, 35 Stat. 428, 49 Stat. 1544, 54 Stat. 246, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 367, 375, 391a, 396, 404, 474, 475, 481, 489, 1333, 50 U. S. C. 1275; 46 CFR 160.018)

CONTAINERS, EMERGENCY PROVISIONS AND WATER

Approval No. 160.026/21/0, Container for emergency provisions, dwg. No. 101, dated June 11, 1951, manufactured by H. & M. Packing Co., 2726 San Fernando Road, Los Angeles 65, Calif.

(R. S. 4405, 4417a, 4426, 49 Stat. 1544, 54 Stat. 346, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 367, 375, 391a, 404, 489, 1333, 50 U. S. C. 1275; 46 CFR 33.15-1, 59.11)

HAND PROPELLING GEAR, LIFEBOAT

Approval No. 160.034/10/1, Type X, hand propelling gear identified by hand propelled gear unit dwg. No. 99-2, dated July 7, 1949, revised July 26, 1951, submitted by Marine Safety Equipment Corp., Point Pleasant, N. J. (Supersedes Approval No. 160.034/10/0 published in the FEDERAL REGISTER dated June 13, 1950.)

(R. S. 4405, 4417a, 4426, 4488, 4491, 49 Stat. 1544, 54 Stat. 346, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 367, 375, 391a, 404, 481, 489, 1333, 50 U. S. C. 1275; 46 CFR 33.15-1, 33.15-5, 59.11, 160.034)

LIFEBOATS

Approval No. 160.035/11/1, 16.0' x 5.7' x 2.3' steel, oar-propelled lifeboat, 12-person capacity, identified by general arrangement dwg. No. G-362-F, dated June 12, 1951, manufactured by C. C. Galbraith & Son, Inc., 99 Park Place, New York, N. Y. (Supersedes Approval No. 160.035/11/0 published in the FEDERAL REGISTER dated July 31, 1947.)

Approval No. 160.035/16/1, 22.0' x 6.3' x 2.8' steel, oar-propelled lifeboat, 25-person capacity, identified by general arrangement dwg. No. G-2225, dated June 27, 1951, manufactured by C. C. Galbraith & Son, Inc., 99 Park Place, New York, N. Y. (Supersedes Approval No. 160.035/16/0 published in the FEDERAL REGISTER dated July 31, 1947.)

Approval No. 160.035/20/1, 24.0' x 8.0' x 3.5' steel, oar-propelled lifeboat, 40-person capacity, identified by general arrangement dwg. No. G-126-M-R, dated March 9, 1951, manufactured by C. C. Galbraith & Son, Inc., 99 Park Place, New York, N. Y. (Supersedes Approval No. 160.035/20/0 published in the FEDERAL REGISTER dated July 31, 1947.)

Approval No. 160.035/87/1, 14.0' x 5.0' x 2.17' steel, oar-propelled lifeboat, 9-person capacity, identified by general arrangement and construction dwg. No. 49R-1412, dated August 20, 1950, revised October 30, 1950, manufactured by Lane Lifeboat & Davit Corp., 8920 Twenty-sixth Avenue, Brooklyn 14, N. Y. (Supersedes Approval No. 160.035/87/0, published in the FEDERAL REGISTER dated July 31, 1947.)

Approval No. 160.035/208/2, 12.0' x 4.42' x 1.92' steel, oar-propelled lifeboat, 6-person capacity, identified by construction and arrangement dwg. No. 12-1, dated November 5, 1947, revised August 2, 1951, manufactured by Marine Safety Equipment Corp., Point Pleasant, N. J. (Supersedes Approval No. 160.035/208/1 published in the FEDERAL REGISTER dated Feb. 17, 1951.)

(R. S. 4405, 4417a, 4426, 4481, 4488, 4491, 4492, 35 Stat. 428, 49 Stat. 1544, 54 Stat. 346, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 367, 375, 391a, 396, 404, 474, 481, 489, 490, 1333, 50 U. S. C. 1275; 46 CFR 33.01-5, 59.13, 76.16, 94.15, 113.10, 160.035)

BOILERS, HEATING

Approval No. 162.003/117/0, Model M-800 heating boiler for steam or hot water service, all welded plate construction, dwg. No. DAB-25033, dated July 19, 1951, approved for a maximum design pressure of 30 p. s. i., 268,800 B. t. u. per hour or 269 pounds per hour. Approval limited to bare boiler. Manufactured by York-Shipley, Inc., York, Pa.

Approval No. 162.003/118/0, Model M-1200 heating boiler for steam or hot water service, all welded plate construction, dwg. No. DAB-25034, dated July 17, 1951, approved for a maximum design pressure of 30 p. s. i., 420,000 B. t. u. per hour or 420 pounds per hour. Approval limited to bare boiler. Manufactured by York-Shipley, Inc., York, Pa.

Approval No. 162.003/119/0, Model M-1500 heating boiler for steam or hot water service, all welded plate construction, dwg. No. DAB-25035, dated July 19, 1951, approved for a maximum design pressure of 30 p. s. i., 504,000 B. t. u. per hour or 504 pounds per hour. Approval limited to bare boiler. Manufactured by York-Shipley, Inc., York, Pa.

(R. S. 4405, 4417a, 4418, 4426, 4433, 4434, 4491, 49 Stat. 1544, 54 Stat. 346, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 367, 375, 391a, 392, 404, 411, 412, 489, 1333, 50 U. S. C. 1275, 46 CFR Part 52)

VALVES, RELIEF (FOR HOT-WATER HEATING BOILERS)

Approval No. 162.013/10/0, Type No. 233 CG multiple relief valve for hot-water heating boiler, two (2) ¾" No. 33 relief valves mounted on "Y" base, maximum set pressure 30 p. s. i., combined relieving capacity 485,800 B. t. u. per hour, dwg. No. 233-CG assembly dated August 6, 1951, inlet size 1¼" nominal pipe diameter, manufactured by McDonnell & Miller, Inc., 3500 North Spaulding Avenue, Chicago 18, Ill.

Approval No. 162.013/11/0, Type No. 333 CG multiple relief valve for hot-water heating boiler, three (3) ¾" No. 33 relief valves mounted on "Y" base, maximum set pressure 30 p. s. i., combined relieving capacity 728,700 B. t. u. per hour, dwg. No. 333 CG assembly dated August 6, 1951, inlet size 1½" nominal pipe diameter, manufactured by McDonnell & Miller, Inc., 3500 North Spaulding Avenue, Chicago 18, Ill.

(R. S. 4405, 4417a, 4418, 4426, 4433, 4491, 49 Stat. 1544, 54 Stat. 346, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 367, 375, 391a, 392, 404, 411, 489, 1333, 50 U. S. C. 1275; 46 CFR 53.03-60)

VALVES, PRESSURE VACUUM RELIEF

Approval No. 162.017/23/2, Shand & Jurs Fig. ST-4000 pressure-vacuum relief valve, enclosed pattern, weight-loaded pressure and vacuum poppets, all bronze construction, dwg. No. ST-7500 dated February 16, 1951; approved for size 6''; manufactured by Shand and Jurs Co., Carlton and Eighth Streets, Berkeley, Calif. (Supersedes Approval No. 162.017/23/1 published in the FEDERAL REGISTER dated Oct. 2, 1948.)

(R. S. 4405, 4417a, 4491, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 375, 391a, 489, 50 U. S. C. 1275; 46 CFR 162.017)

GAS CONSUMING APPLIANCES, LIQUEFIED PETROLEUM

Approval No. 162.020/35/0, Bastian-Morley hot water heater, Crane-Line Champion, size 30, approved by the American Gas Association, Inc., under Certificate Number 3-537-1.101, for liquefied petroleum gas service, manufactured by Bastian-Morley Co., Inc., La Porte, Ind.

Approval No. 162.020/36/0, Bastian-Morley hot water heater, Crane-Line Champion, size 40, approved by the American Gas Association, Inc., under Certificate Number 3-(537-9.1 & -1.1) .001, for liquefied petroleum gas service, manufactured by Bastian-Morley Co., Inc., La Porte, Ind.

(R. S. 4405, 4417a, 4426, 4491, 49 Stat. 1544, 54 Stat. 1028, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 367, 375, 391a, 404, 463a, 489, 1333, 50 U. S. C. 1275; 46 CFR 32.10-1, 61.25, 95.24, 114.25)

CHANGE IN NAME OF MANUFACTURER

The name of The Kilgore Manufacturing Co., International Flare-Signal Division, Westerville, Ohio, has been changed to Kilgore, Inc., International Flare-Signal Division, Westerville, Ohio, for Coast Guard Approval Nos. 160.021/3/0, 160.021/6/0, 160.024/2/0, 160.028/1/0, 160.037/2/0, and 160.040/1/0 previously published in the FEDERAL REGISTER for distress signals, signal pistols, and line-throwing appliances for merchant vessels.

Dated: September 28, 1951.

[SEAL] A. C. RICHMOND,
Rear Admiral, U. S. Coast Guard, Acting Commandant.

[F. R. Doc. 51-11937; Filed, Oct. 3, 1951; 8:52 a. m., 16 F. R. 10133-10/4/51.]

A bearing is the direction of a line of sight between two objects on the surface of the earth.

[CGFR 51-45]

TERMINATION OF APPROVAL OF EQUIPMENT

By virtue of the authority vested in me as Commandant, United States Coast Guard, by Treasury Department Order No. 120, dated July 31, 1950 (15 F. R. 6521), and in compliance with the authorities cited below, the following approvals of equipment are terminated because the items of equipment covered are no longer being manufactured or offered for marine service:

VALVES, PRESSURE VACUUM RELIEF

Termination of Approval No. 162.-017/21/0, Shand & Jurs Fig. ST-432M pressure vacuum relief valve, all clime breather valve, spring loaded, atmospheric pattern, brass body and stainless steel spring, vacuum valve spring and weight loaded, fitted with flame arrester and weather hood, dwg. No. ST-2846 dated November 25, 1939, approved for 3'' diameter for use with inflammable and combustible liquids of Grade B or lower, manufactured by Shand & Jurs Co., Berkeley, Calif. (Approved in the FEDERAL REGISTER dated July 31, 1947.)

Termination of Approval No. 162.-017/22/0, Shand & Jurs Fig. ST-1185 pressure vacuum relief valve, marine cargo breather, spring loaded, enclosed pattern with vacuum valve atmospheric inlet fitted with flame screen, pressure valve fitted with relieving lever, bronze body, stainless steel springs and bronze pallet valves, flanged ends, dwg. No. ST-1185 dated July 21, 1936, approved for 4'' size for use with inflammable or combustible liquids of Grade A or lower in closed venting system, manufactured by Shand & Jurs Co., Berkeley, Calif. (Approved in the FEDERAL REGISTER dated July 31, 1947.)

Termination of Approval No. 162.-017/24/0, Shand & Jurs Fig. ST-4160 pressure vacuum relief valve, triplex manifold, weight loaded, enclosed pattern, bronze manifold and valves, fitted with hand wheel lifting gear for pressure pallets, victaulic coupling connections, vacuum atmospheric inlet fitted with flame screen, dwg. No. ST-4160 revised September 9, 1943, approved for 4'' size for use with inflammable or combustible liquids of Grade A or lower, manufactured by Shand & Jurs Co., Berkeley, Calif., (Approved in the FEDERAL REGISTER dated July 31, 1947.)

Termination of Approval No. 162.-017/25/0, Shand & Jurs Fig. 4165 pressure only relief valve, weight loaded pressure pallet, atmospheric pattern, fitted with double flame screen, bronze body and pallets, flanged connection, dwg. No. ST-4165 revised September 9, 1943, approved for 4'' size for use with inflammable and combustible liquids of Grade A or lower in direct atmospheric vent riser, manufactured by Shand & Jurs Co., Berkeley, Calif. (Approved in the FEDERAL REGISTER dated July 31, 1947.)

(R. S. 4405, 4417a, 4491, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 375, 391a, 489, 50 U. S. C. 1275; 46 CFR 162.017)

VALVES, SAFETY RELIEF, LIQUEFIED COMPRESSED GAS

Termination of Approval No. 162.018/3/0, Type MS-6 American Car and Foundry pop type safety relief valve, liquefied petroleum gas service, steel body, resilient composition gasketed type, flanged connection, dwg. No. 31-11-867b, dated June 12, 1946, approved for 1.3136 sq. in. valve seat opening, maximum allowable working pressure 250 p. s. i., manufactured by American Car & Foundry Co., 30 Church Street, New York, N. Y. (Approved in the FEDERAL REGISTER dated July 31, 1947.)

Termination of Approval No. 162.018/4/0, Type MS-7 American Car and Foundry pop type safety relief valve, liquefied petroleum gas service, steel body, resilient composition gasketed type, flanged connection, dwg. No. 31-11-868B, dated June 12, 1946, approved for 1.5764 sq. in. valve seat opening, maximum allowable working pressure 250 p. s. i., manufactured by American Car & Foundry Co., 30 Church Street, New York, N. Y. (Approved in the FEDERAL REGISTER dated July 31, 1947.)

(R. S. 4405, 4417a, 4491, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 375, 391a, 489, 50 U. S. C. 1275; 46 CFR Part 38)

CONDITIONS OF TERMINATION OF APPROVALS

The termination of approvals of equipment made by this document shall be made effective upon the thirty-first day after the date of publication of this document in the FEDERAL REGISTER. Notwithstanding this termination of approval on any item of equipment, such equipment manufactured before the effective date of termination of approval may be used on merchant vessels so long as it is in good and serviceable condition.

Dated: September 28, 1951.

[SEAL] A. C. RICHMOND,
Rear Admiral, U. S. Coast Guard, Acting Commandant.

[F. R. Doc. 51-11938; Filed, Oct. 1, 1951; 8:53 a. m., 16 F. R. 10133-10/4/51.]

A "deadman" is a device buried in the ground used to anchor a guy or tackle.

Merchant Marine Personnel Statistics

INVESTIGATING UNITS

Coast Guard Merchant Marine investigating units and Merchant Marine details investigated a total of 728 cases during the month of September 1951. From this number, hearings before examiners resulted involving 10 officers and 58 unlicensed men. In the case of officers, no licenses were revoked, 1 was suspended without probation, 3 were suspended with probation granted, none were voluntarily surrendered, 5 were dismissed after hearing and 2 hearings were closed with admonitions. Of the unlicensed personnel, 15 certificates were revoked, 11 were suspended without probation, 19 were suspended with probation granted, 7 were voluntarily surrendered, 3 were closed with an admonition and 7 were dismissed after hearing.

A bell tower is a skeleton framework mounted on a lighted buoy within the light tower for supporting the bell.

An acetylene buoy is a lighted buoy operated by acetylene gas.

MERCHANT MARINE DECK OFFICER LICENSES ISSUED

SEPTEMBER 1951

	Original	Renewal
Master:		
Ocean	17	157
Coastwise		11
Great Lakes	1	3
B. S. & L.	5	43
Rivers		15
Chief mate:		
Ocean	21	49
Coastwise	1	3
Mate:		
Great Lakes		
B. S. & L.	3	5
Rivers	7	8
Second mate:		
Ocean	26	63
Coastwise		1
Third mate:		
Ocean	27	41
Coastwise		
Pilots:		
Great Lakes	3	1
B. S. & L.	55	154
Rivers	23	27
Master:		
Uninspected vessels	2	7
Mate:		
Uninspected vessels		
Total	191	588
Grand total	779	
Radio officer licenses issued	99	

ALWAYS CHECK SAFETY DEVICES BEFORE YOU NEED THEM

MERCHANT MARINE ENGINEER OFFICER LICENSES ISSUED

SEPTEMBER 1951

	Original	Renewal
STEAM		
Chief engineer:		
Unlimited	28	190
Limited	6	66
First assistant engineer:		
Unlimited	27	76
Limited	2	5
Second assistant engineer:		
Unlimited	32	79
Limited		1
Third assistant engineer:		
Unlimited	35	79
Limited		
MOTOR		
Chief engineer:		
Unlimited	3	65
Limited	22	55
First assistant engineer:		
Unlimited		8
Limited	3	2
Second assistant engineer:		
Unlimited	2	12
Limited		
Third assistant engineer:		
Unlimited	2	93
Limited		
Chief engineer:		
Uninspected Vessels	7	9
Assistant engineer:		
Uninspected Vessels	5	2
Total	174	740
Grand total	914	

WAIVER OF MANNING REQUIREMENTS FROM SEPTEMBER 1 TO SEPTEMBER 30, 1951

Region	Number of vessels	Deck officers substituted for higher ratings	Engineer officers substituted for higher ratings	Ordinary seamen substituted for able seamen	Wiper or coal passers substituted for qualified members of engine department	Total
Atlantic coast	136	1	3	134	66	204
Gulf coast	44		1	50	18	69
Pacific coast	50		1	25	77	103
Great Lakes	20			10	46	56
Total	250	1	5	219	207	432

NOTE.—In addition, individual waivers were granted to permit the employment of 30 able seamen holding certificates for "any water—12 months" in excess of the 25 percent authorized by statute.

ORIGINAL SEAMEN'S DOCUMENTS ISSUED MONTH OF SEPTEMBER 1951

Region	(1) Staff officer	(2) Continuous discharge book	(3) U. S. merchant mariner's documents	(4) AB any waters unlimited	(5) AB any waters 12 months	(6) AB Great Lakes 18 months	(7) AB tugs and towboats any waters	(8) AB bays and sounds [1]	(9) AB seagoing barges	(10) Lifeboatman	(11) Q. M. E. D.	(12) Radio operators	(13) Certificate of service	(14) Tankerman
Atlantic coast	55	3	1,657	151	47	8				130	168	4	1,575	10
Gulf coast	5	8	470	51	19	2				38	51	2	470	6
Pacific coast	21		669	70	67					128	57		653	3
Great Lakes and rivers			763	27	58	28				64	70	1	699	24
Total	81	11	3,559	299	191	38	0	0	0	360	346	7	3,397	43

[1] 12 months, vessels 500 gross tons or under not carrying passengers.

NOTE.—Columns 4 through 14 indicate endorsements made on U. S. merchant mariner's documents.

U. S. GOVERNMENT PRINTING OFFICE: 1951